Downtown San Francisco Ferry Terminal Expansion

DESIGN CONCEPT PLAN

Prepared for the Water Emergency Transportation Authority and the Port of San Francisco
by ROMA Design Group in association with Moffatt & Nichol, Page & Turnbull, and CHS Consulting Group

MARCH 2012

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This report is the result of an approximately year-long work effort undertaken by ROMA Design Group in close collaboration with the San Francisco Bay Area Water Emergency Transportation Authority (WETA) and the Port of San Francisco (Port) and which included review and comments from stakeholders and citywide interest groups as well as the Bay Conservation and Development Commission (BCDC) and other regulatory agencies. The purpose of this report is to document the Design Concepts for the Downtown San Francisco Ferry Terminal Expansion Project that resulted from this process. In addition, this report also documents the relevant background information and analysis that established the technical basis for concept development.

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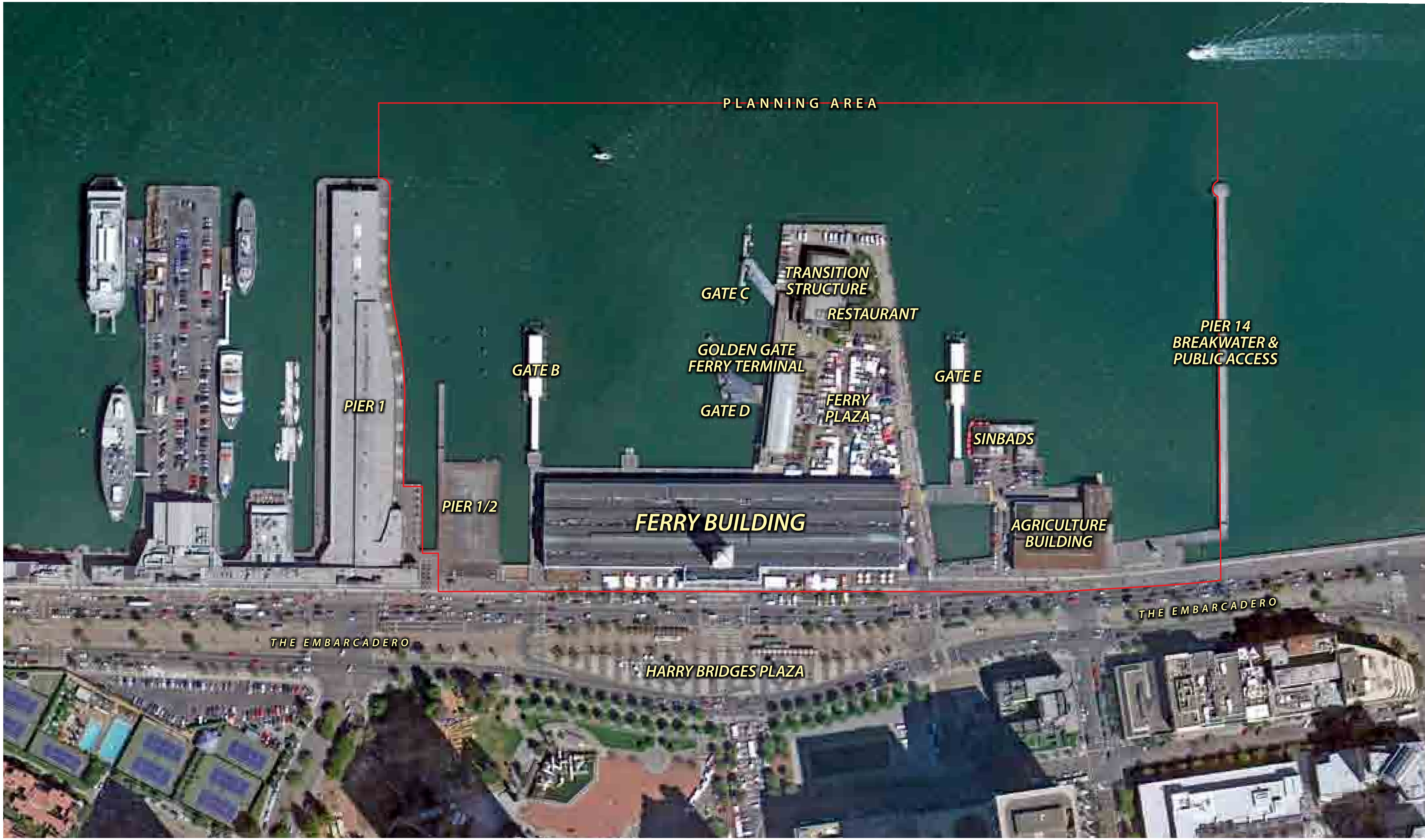


Figure 1: Project Planning Area, showing the existing ferry terminals at Gate B to the north and Gate E to the south

1. INTRODUCTION

The San Francisco Bay Area Water Emergency Transportation Authority (WETA) is undertaking preliminary engineering and design for the Downtown San Francisco Ferry Terminal Expansion Project ("the project"). The purpose of the Project is to expand and improve waterside and landside facilities at the Ferry Terminal, in support of WETA's Implementation and Operations Plan (IOP), which calls for the expansion of water transit service on San Francisco Bay, as well as WETA's Emergency Water Transportation System Management Plan (EWTSMP), which sets forth the framework for WETA's emergency operations in the event of a regional disaster.

The planning area for the project extends from the south side of Pier 1 to the north side of Pier 14 and from the Embarcadero Promenade to the Bay, as depicted on Figure 1. This area includes four existing berthing facilities - Gate B, serving Tiburon and Vallejo routes; Gates C and D serving Sausalito and Larkspur routes; and Gate E serving Alameda/Oakland and Alameda Harbor Bay routes. Gates B and E, the Pier 14 breakwater, and the connecting promenades and public access areas were built by the Port from 2001-2003 as part of the Downtown Ferry Terminal Master Plan (Phase 1), which was prepared after the Loma Prieta earthquake disabled the Bay Bridge in 1989 and focused new efforts on expanding water transit. Gates C and D were built by the Golden Gate Bridge, Highway and Transportation District (Golden Gate) in 1978. The Phase 1 berthing facilities (Gates B and E) are each comprised of a portal structure, gangway and float that accommodates vessels at various freeboard and tidal ranges, and passenger access and waiting are generally provided on the adjacent pedestrian promenade and, just prior to vessel arrival, on the gangway. The Golden Gate berthing facilities include a shoreside ticketing and waiting structure located on the Ferry Plaza and hydraulic moveable ramps that are adjusted for tidal variation.

Portions of the planning area are also within the Embarcadero Historic District which includes two structures listed on the National Register of Historic Places – the landmark Ferry Building, which was built in 1898 and renovated in 2003 for a mix of office and retail uses, and the Agriculture Building, which was built in 1915 and currently awaits future rehabilitation and adaptive reuse. The Ferry Plaza, built by Bay Area Rapid Transit (BART) on the bayside of the Ferry Building in 1971, accommodates the existing BART and Golden Gate facilities. It also provides for a variety of open space, public access and service and delivery functions and is the location of the vibrant Saturday CUESA (Center for Urban Education about Sustainable Agriculture) Farmer's Market.

This project includes landside and waterside improvements that are needed for the expansion and ultimate build-out of water transit services operated by WETA. These improvements are being designed to not only meet the purpose and need of WETA's expansion plans, but also in keeping with the historical significance of this area and its role as one of the most significant public gathering places in the City and region. The project is also being designed in consideration of Port, City and BCDC objectives for the continued improvement of activities within the area, the visual and scenic qualities of the waterfront and the enhancement of public access to bayfront resources.

While the Phase 1 improvements to the Downtown San Francisco Ferry Terminal were undertaken by the Port, the expansion proposed as part of this Project will principally be undertaken by WETA. WETA (formerly the Water Transit Authority, WTA) is a local agency with multi-county jurisdiction which was created to plan and operate new and expanded water transit service for the San Francisco Bay Area. WETA's duties include the coordination of emergency activities of all water transportation and related facilities within the region, except those provided or owned by Golden Gate. In planning this Project, WETA is working in close partnership with the Port, which has land use and planning jurisdiction at the project site. A Memorandum of Understanding (MOU) has been entered into between the two agencies to define roles and responsibilities for implementing the design and environmental review of the Project. In addition, WETA is working with BCDC which has regional permitting authority over the Bay and jurisdiction within the 100-foot shoreline band. WETA is also coordinating its efforts with stakeholders within the project area and the community at large.

Summary of Objectives

A number of objectives have been articulated for the Downtown San Francisco Ferry Terminal Expansion Project. These fall naturally into two groups – the first related more specifically to WETA's responsibilities for the development of the Ferry Terminal facilities and the second, associated with the larger land use and ownership responsibilities of the Port.

1. ***Enhance ferry ridership and strengthen the role of the area as the waterborne transit hub of the city and region***

- Expand waterborne transit service
- Provide adequate space for queuing and waiting
- Enhance passenger amenities and weather protection
- Improve intermodal connections
- Provide for disaster emergency response needs

2. ***Enhance the economic viability and role of the area as a significant gathering place in the city***

- Enhance opportunities for future Ag Building rehabilitation
- Remove dilapidated and substandard structures
- Improve the usability and quality of public spaces
- Improve activity linkages and commercial recreational potential
- Provide for pedestrian, bicycle and vehicular circulation

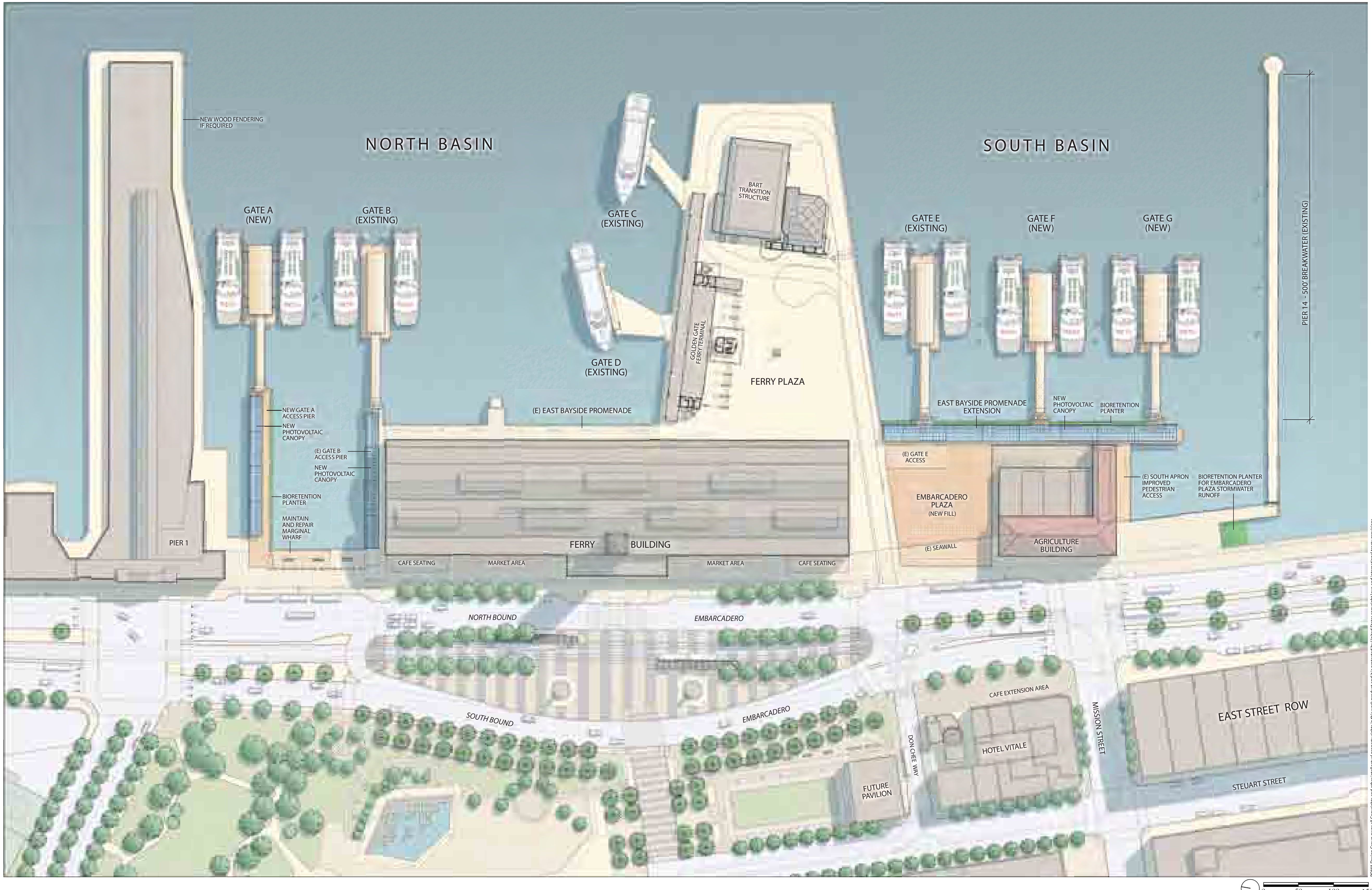


Figure 2: Preliminary Design Concept for Phase 2 Improvements (2014 - 2017)

2. THE PLAN FOR FERRY TERMINAL EXPANSION

The Ferry Building area is uniquely suited to be the hub of water transit in the Bay Region. It is immediately adjacent to the financial district – one of the region's most important employment centers, and at the foot of Market Street, which not only interconnects with the City, but also provides accessibility to the greatest concentration of citywide and regional transit opportunities. The project area is at the crossroads of the Embarcadero, which connects north and south to all of the neighborhoods and districts along the waterfront and to the new developments inland in Rincon Hill, South Beach and Mission Bay. This plan builds on the efforts undertaken by the Port in Phase 1 and describes the location, extent and character of the improvements needed for the expansion and build-out of the Downtown San Francisco Ferry Terminal.

The Downtown San Francisco Ferry Terminal currently accommodates 6 water transit routes totaling approximately 130 arrivals and departures per weekday. In addition to existing services, 7 new water transit routes serving the ferry terminal are planned by WETA. These include routes operating between San Francisco and Berkeley, Richmond, Treasure Island, Hercules, Martinez, Antioch and Redwood City. By 2035, existing and future planned water transit services at the ferry terminal are projected to serve about 32,000 riders per weekday, an approximate three-fold increase over current daily ridership levels (CSI, 2011).

The four existing gates at the Ferry Terminal currently accommodate 21-24 total weekday peak period vessel arrivals. Two of the gates (Gates C and D) are used exclusively by Golden Gate to accommodate 7-8 peak period arrivals for the Larkspur and Sausalito services. The remaining gates (Gates B and E) accommodate 14-16 arrivals during the peak period. The number of peak period vessel arrivals at WETA berths is expected to increase to between 52 and 57 arrivals and it is not possible to meet this projected increase at Gates B and E. In addition to meeting commuter peak period demand, there is a need for the berthing facilities to accommodate disabled or visiting vessels at the Downtown Ferry Terminal. Three additional gates and related berthing facilities will be needed for the existing and projected routes as well as to support emergency operations when unexpected and long-term disruption renders other components of the regional transportation system inoperable.

The plan proposes the construction of one new gate (Gate A) in the North Basin and two new gates (Gates F and G) in the South Basin (see Figures 2 and 3). In order to construct these facilities, the plan calls for the removal of the existing red-tagged Pier ½ in the North Basin and Pier 2 in the South Basin, consistent with the requirements for the removal of these structures as set forth in the BCDC Special Area Plan. Each of the gates will be provided with portal structures and guardrails similar in design to the existing ones built in Phase 1, as well as way-finding signage, furnishings, ticket machines and other passenger amenities.

The plan also proposes the provision of canopy structures at each of the existing and new gates. The canopy structures will provide weather protection and lighting, clearly define queuing areas, and provide an appropriate location for electronic signage and other audio/visual communications systems that facilitate boarding and passenger information. Further, the canopies will incorporate photovoltaic cells that could generate enough electric power to create a zero net energy project. The project will also be designed in conformance with the Port's stormwater management guidelines which were developed in conjunction with state and regional agencies. The plan includes the construction of bioretention planters that will filter stormwater before it enters San Francisco Bay.

In addition to the construction of new gates, the project will provide additional backland areas needed for pedestrian circulation, passenger queuing and waiting, public access and emergency response. For Gate A in the North Basin, the plan proposes the construction of a new access pier similar to the one built in Phase 1 for Gate B. In the South Basin, the plan proposes the extension of the East Bayside Promenade and the covering of the lagoon between the Ferry Building and the Agriculture Building to create a new Embarcadero Plaza, which will provide for the multi-direc-

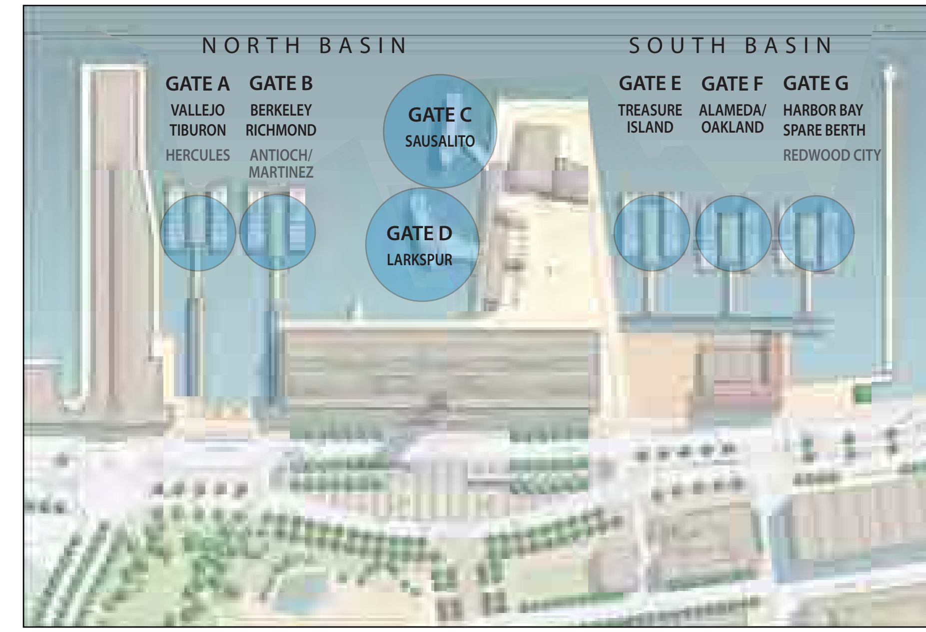


Figure 3: Potential Phased Berthing Arrangements

View of Gate B Canopy Design

Table 1: Phase 2 Improvement Summary

NORTH BASIN

DEMOLITION

24,500 square feet, Pier 1/2 and Trestle
310 Piles (Wood and Concrete)
35 Guide and Cluster Piles
33 Wood Piles for Fendering at Pier 1

DREDGING

Gate A: 9,000 cubic yards

NEW CONSTRUCTION

1. Gate A New Access Pier
   - Pier: 30' x 265' = 8,000 square feet
   - 40 Piles: 24" to 36" diameter, 135' to 140' long
   - Photovoltaic Canopy Structure :
     20' x 200' = 4,000 square feet
   - Access Gate (Steel Frame Granite Clad)
   - Guardrail: 450 linear feet
   - Ticket Machines, Benches and Signage
   - Bioretention Planter: 700 square feet (3' x 3' x 235' long)
2. Marginal Wharf: Strengthen and Repair (2,550 square feet)
3. Berthing Structures (Gate A)
   - Steel Truss Gangway: 12' to 14' wide x 92' long
     (1,300 square feet)
   - Concrete Float Complete with Fendering, Canopy,
     Fixed and Movable Access Ramps: 45' x 115'
     (5,200 square feet)
   - Guide Piles: 6 - 42" diameter 140' to 150' long
   - Dolphins: 10 - 36" diameter 145' to 155' long
   - "Chock Block" Fendering: 330 linear feet
     Wood Piles: 33 - 14" diameter x 64' long
4. Gate B
   - Photovoltaic Canopy: 4,000 square feet (20' x 200' long)
   - Ticket Machines, Benches and Signage
   - Audio, Visual, Communication and Security Monitoring
     (typical all gates)

SOUTH BASIN

DEMOLITION

6,000 square feet, 1-Story Building (Sinbad's)
20,500 square feet, Pier 2 and Access Deck
350 Piles (Wood and Concrete)

DREDGING

Gate F: 9,500 to 11,000 cubic yards
Gate G: 11,000 to 13,000 cubic yards

NEW CONSTRUCTION

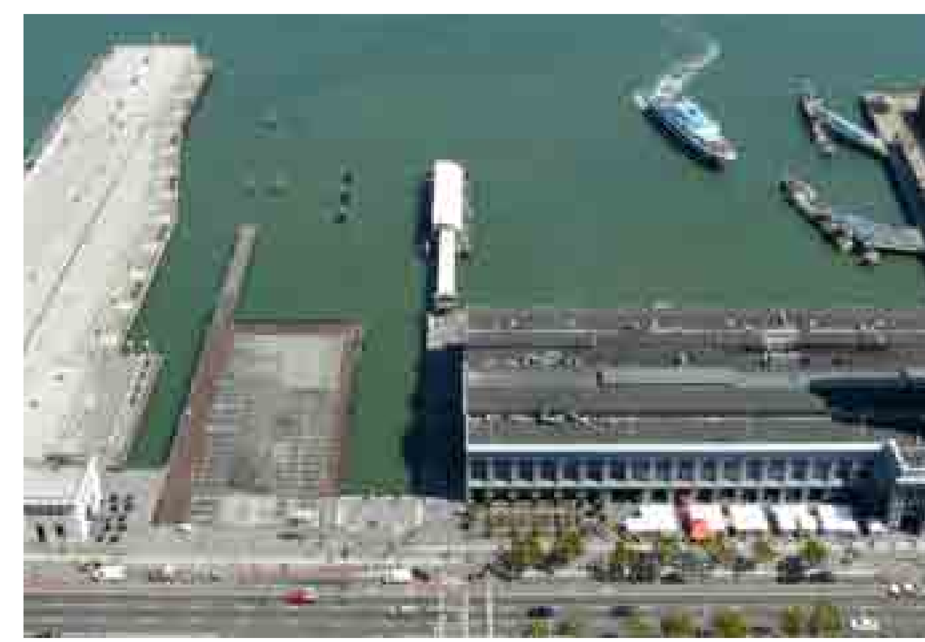
1. East Bayside Promenade: 13,850 square feet
   - Existing Deck and Piles = 1,250 square feet
   - New Deck and Piles = 12,600 square feet
   - 110 Piles: 24" to 36" diameter, 135' to 140' long
   - Gate F & G Access Gates (Steel frame, granite clad)
   - Photovoltaic Canopy: 24' x 420' long (10,100 square feet)
   - Ticket Machines, Benches and Signage
   - Guardrail: 550 linear feet
   - Bioretention Planter: 3' x 3' x 330' long (990 square feet)
   - "Chock Block" Fendering: 330 linear feet
     Wood Piles: 33 - 14" diameter, 64' long
2. Embarcadero Plaza: 24,500 square feet
   - Existing Deck and Piles: 3,000 square feet
   - New Deck and Piles: 17,000 square feet
   - 100 Piles: 24" to 36" diameter, 135' to 140' long
   - Area West of Seawall: 4,500 square feet
   - Remote Bioretention Planter at Pier 14: 1,300 square feet
3. South Access Apron
   - Retained and Improved: 2,400 square feet
   - Guardrails: 109 linear feet
4. Berthing Structures (Gates F & G)
   - New Concrete Floats and Gangways with
     6 - 42" diameter 140' to 150' long Guide Piles each
   - Steel Truss Gangways: 12' to 14' x 92' long
   - Dolphins: 14 - 36" diameter, 145' to 155' long

tional circulation requirements in this area. A quantitative summary of the project improvement program is included in facing sidebar for reference.

The project is likely to be constructed in two phases. The improvements in the North Basin may be built first to coincide with the start of the Berkeley and Richmond services, scheduled for 2015/2016. The South Basin improvements may be built at a later date to coincide with the start of Treasure Island service in 2016/2017.

Beyond accommodating the growing need for access and circulation, the intensification of ferry services will also strengthen the authenticity and maritime purpose of the area as well as its historical "raison d'etre". It will contribute to the daily and weekly rhythms of activities and add to the reasons that attract people to use the area and therefore enhance its meaning to a broader segment of the population. The ferries themselves will add to the visual interest and engagement with the Bay and an understanding of its importance in the life of the City and the region.

The ferry terminal improvements will not only provide for the landside and waterside service needs well into the future, but will also contribute to the improvement of public access to bayfront resources, and the visual, open space and aesthetic qualities of the Ferry Building area. It will remove dilapidated piers and replace them with new, attractive structures and activities that will help to anchor the north and south ends of the



Existing conditions at Pier 1/2 and Gate B

Views of Gate A and B canopy design (top), from Gate B (bottom)

View of Gates A and B from the Bay

Ferry Building. It will help to strengthen the economy of the entire area and enhance the opportunity for the future rehabilitation and adaptive reuse of the historic Agriculture Building. Furthermore, it will contribute to the continued improvement of the image, identity and role of the Ferry Building area as one of the most significant gathering places in the City.

In the North Basin, the project will result in a new connected water space close in to the Embarcadero Promenade and the recently improved Sue Bierman Park, thus heightening the immediacy to the Bay and the connection between land and water. The pier and canopy structures create a form that communicates that this is a place of embarkation. The linear form of the piers and canopies that reach out to the Bay will further strengthen the visual relationship to the Bay from inland areas. An improved and slightly elevated marginal wharf at the edge of the Promenade provides opportunities for sitting, viewing and repose between the two terminals and can also serve the general public as well as ferry patrons.

In the South Basin, a new East Bayside Promenade, equivalent in length to the one created in Phase 1 between Gate B and the Golden Gate Ferry Terminal, will establish a new edge to the Bay adjacent to open water areas and an animated theater of water-oriented activity. Inland, a new Embarcadero Plaza will extend open space activities in this area to a location that is more visible and accessible from the Embarcadero. This new open space will be located between the Ferry Building and the Agriculture Building, and adjacent to the Embarcadero Promenade, thus strengthening the relationship between the historic resources within the Embarcadero Historic District. The plaza, in addition to meeting the need for circulation, also provides a flexible environment capable of accommodating a variety of civic activities that will work well with the ebb and flow of ferry patrons and can co-exist with them. It will be a sunny, extroverted space that enlivens and enriches the area and will open up the waterfront to view and greater access, with positive ripple effects to the area as a whole. It will further create a stronger open space connection along the Promenade with activities visible from the Embarcadero. These ferry terminal improvements, like those that were made in the past, will take the waterfront another step forward in its evolution as a great urban place within the City.

View north along future East Bayside Promenade that provides access, queuing and waiting space, under cover for Gates E, F and G

The extension of the East Bayside Promenade to the south is proposed to create activity linkages and pedestrian access to the existing and future ferry terminals.

The existing lagoon interrupts pedestrian circulation and limits activity to Gate E and between the Ferry Building and Agriculture Building

Embarcadero Plaza

Damage inflicted by the earthquake, 1906

Pedestrian and vehicular traffic along the Embarcadero, 1924

Aerial oblique view of Ferry Building and Market Street, 1951

View of historic intermodal terminal, showing the vehicular subway, the transit turn-around and the elevated pedestrian bridge and multiple ferry slips, 1930s

Ferries arriving at the Ferry Building in the early years of the 20th century before the Bay Bridge was built

3. CONTEXT FOR CHANGE

The Ferry Building area is one of the most historically significant areas on the San Francisco waterfront and in the City of San Francisco. It is also an area that has undergone significant change in physical character and meaning over time. From today's vantage point, three significant and distinctive historic eras characterize the history of the Ferry Building area. The first dates back to the late 1890's when the shoreline was established and the waterfront was the scene of intense activity; the second came into being with the building of the Bay Bridge and the Golden Gate Bridge and the subsequent decline of water transit; and the third describes the present day, characterized by a renewed interest in water transit and connecting the City with the Bay.

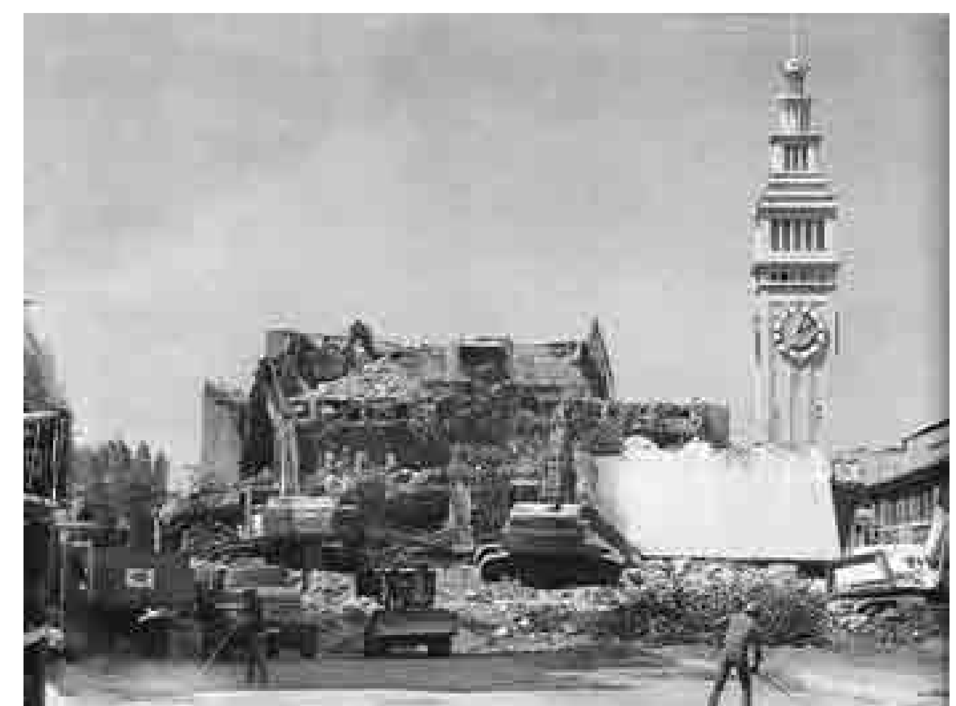
The first milestone era came about at the end of the 1800's and extended into the early decades of the 20th century when the waterfront was characterized by rapid and intensive change. The shoreline advanced bayward towards deep water through filling. Piers were extended as City streets, with filling on either side until the Great Seawall was finally built in 1896, establishing a permanent shoreline for the City. Immediately following the construction of the Great Seawall, the Ferry Building was built at the foot of Market Street and within a short period of time became one of the busiest transportation terminals in the world, second only to Charing Cross Station in London. By 1930, the Bay Area's population was only a quarter of what it is today, yet nearly 250,000 passengers traveled through the Ferry Building on a typical weekday for a total of 50 million passenger trips per year.

During these years, the area around the Ferry Building changed numerous times. Buildings were added, modified and/or taken away on the north and south sides of the building. On the bayside of the Ferry Building, docks and wharves were continuously modified, expanded and rebuilt to accommodate water transportation. Buildings and sheds crowded along the Embarcadero and directly adjoined the Ferry Building to the north and south. Ultimately, overhead pedestrian bridges, underground vehicular tunnels and transit turnarounds were added to organize the demand and intensity of transportation movement and connections from land to water.

Although originally designed to be 200 feet longer than it is today, the 660-foot length of the Ferry Building gave it singular prominence on the Embarcadero and within the City. Few buildings on the waterfront could begin to compare with its civic stature and importance at the foot of Market Street and adjacent to deepwater port in Yerba Buena Bay. The only exceptions were the early post office buildings that were located adjacent to the Ferry Building. With nearly all communications from the outside world entering San Francisco by water at that time, the Post Office demanded an important position on the waterfront. In 1896, a location to

Arriving by ferry to the downtown San Francisco waterfront, 1929

Bay Bridge under construction, 1935



Embarcadero Freeway under demolition, 1991

The Ferry Building area isolated from the downtown by the Embarcadero Freeway.

The Ferry Building and Harry Bridges Plaza, improved after removal of the Embarcadero Freeway.

Long view of the Embarcadero before removal of the freeway.

After implementation of landside and waterside improvements.

the immediate south of the Ferry Building was selected and a Romanesque Revival building was constructed for this purpose. However, while this building established a strong presence on the waterfront, critical comments were made about its appearance, specifically that by projecting forward in front of the façade of its neighbor and by virtue of its lavish ornament, it competed with the Ferry Building. In 1915, this building was demolished and replaced by the Ferry Station Post Office. This Mediterranean style building became known as the Agriculture Building when it was reassigned to the Department of Agriculture in the 1930's.

The Agriculture Building experienced significant modifications over its history. Originally two stories in the front and one-story in the back, a second-story was added to the south side of the building in 1918 and the structure was jacked up to repair the seawall in 1925. Today, it is individually listed in the National Register of Historic Places for local historical and architectural significance for its association with the centralization of San Francisco's postal services and as an example of an early 20th century Mediterranean style government building. Its historic period of significance is 1915 to 1925. Additionally, it is a contributor to the San Francisco Embarcadero Historic District (2006). But, unlike the Ferry Building, which is also a contributor to the district and individually listed in the National Register of Historic Places, the Agriculture Building has not undergone recent rehabilitation and preservation efforts and is currently in poor condition, susceptible to periodic flooding and potential damage or destruction in a major seismic event.

The second major milestone era in the history of the waterfront came after the construction of the Bay Bridge and Golden Gate Bridge in 1936 and 1937, respectively, and with the advent of the automobile age. During this period, water transit declined to the point that in the 1950's it no longer served the Ferry Building nor the San Francisco Bay Area as a whole. Buildings and sheds adjacent to the Ferry Building and ferry slips began to be removed, and by the 1940's, the streetcar turnaround at the base of the Ferry Building was eliminated along with overhead and below grade crossings. No longer a crossroads of movement and center of activity, the waterfront began to decline and soon became seen as an expedient location for functions that served other parts of the City at the expense of the waterfront itself. Ultimately, the construction of the Embarcadero Freeway in 1959 cut off the waterfront from the City. The waterfront became a place to move through on the way somewhere else rather than as a destination in itself. During this time, the Ferry Building diminished so greatly in importance that consideration was given to its removal and a number of plans were submitted for alternative use of the site. Although the building remained, it underwent many ill-conceived remodels that compromised its historic integrity and stature. The ferry slips continued to be removed, and in 1971, the BART Ferry Plaza Platform and Transition Structure were constructed as part of the Transbay Tube connection to the East Bay. This platform also became the location for the Golden Gate Ferry Terminal which was established to mitigate growing traffic congestion on the Golden Gate Bridge.

The third major milestone era was initiated in the early 1980's when the City began to turn its attention to the opportunities for redevelopment along the Northeastern Waterfront. A new vision emerged for a waterfront reintegrated with the City, with the Embarcadero playing an important role in pedestrian, bicycle and transit as well as for recreation and public access to the Bay. But, this vision was not fully realized until the 1989 Loma Prieta Earthquake damaged the Embarcadero Freeway and the decision was made to not rebuild it. After the removal of the freeway, a number of major initiatives were undertaken to realize the potential that had been envisioned for this area. As part of the Mid-Embarcadero Transportation and Open Space Project, the Embarcadero Roadway was reconstructed as a mixed mode boulevard linked to parks, plazas and promenades which helped to reorient and reconnect the cityfront to the waterfront. The Phase 1 improvements at the Downtown San Francisco Ferry Terminal, implemented by the Port, built new terminals and created the basis for future ferry terminal improvements. They also improved pedestrian access to the new facilities and, in conjunction with the preservation, rehabilitation and adaptive reuse of the Ferry Building, created activities and linkages that brought new meaning and vitality to the area.

Waterside of the Ferry Building showing areas obstructed by the mechanical room.

The Bayside Promenade after restoration of the Ferry Building.

The location of the farmer's market on the Ferry Plaza brings activity and life to the area.

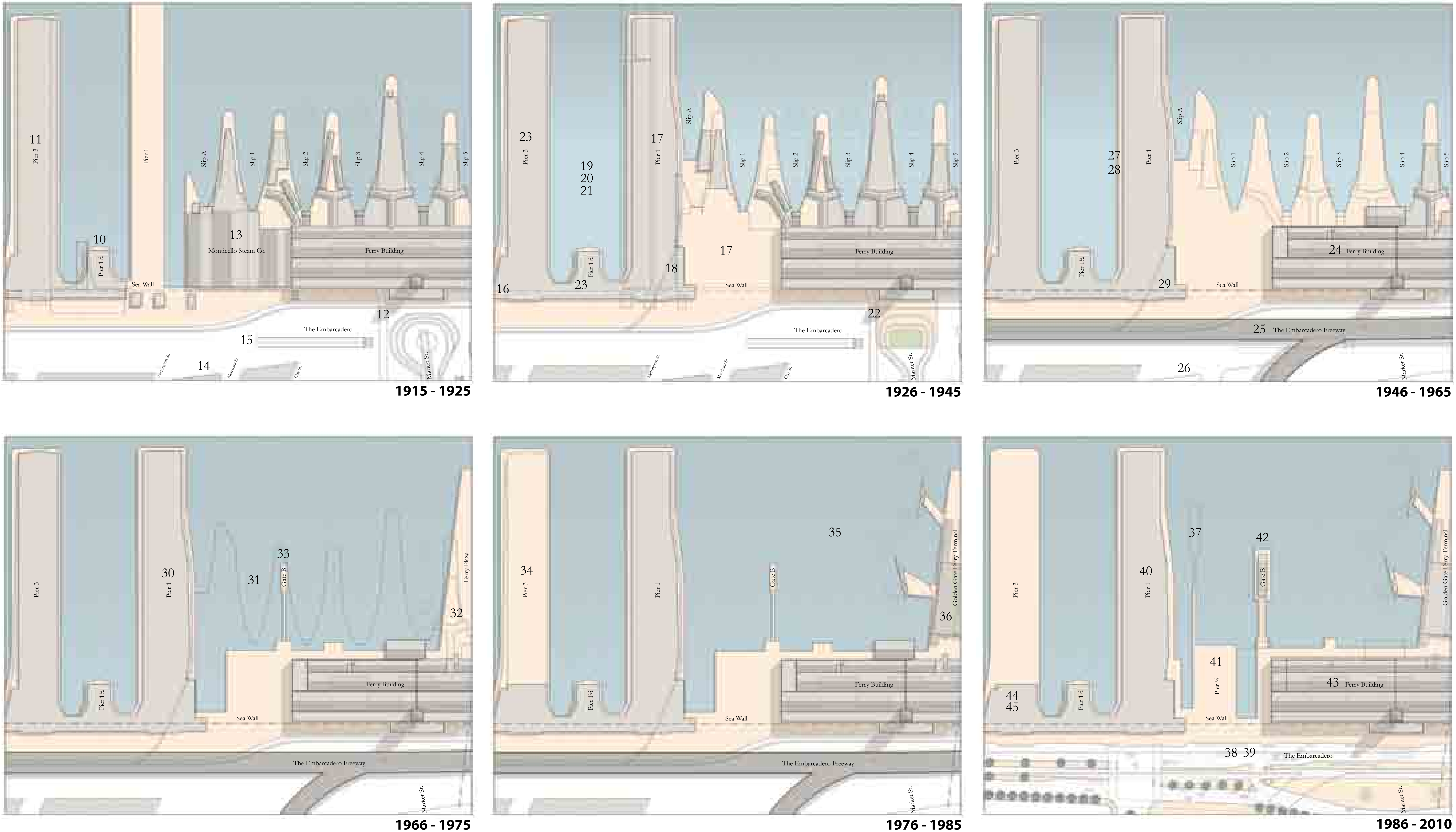


Figure 4: North Basin Summary of Physical Changes, 1915 to 2010

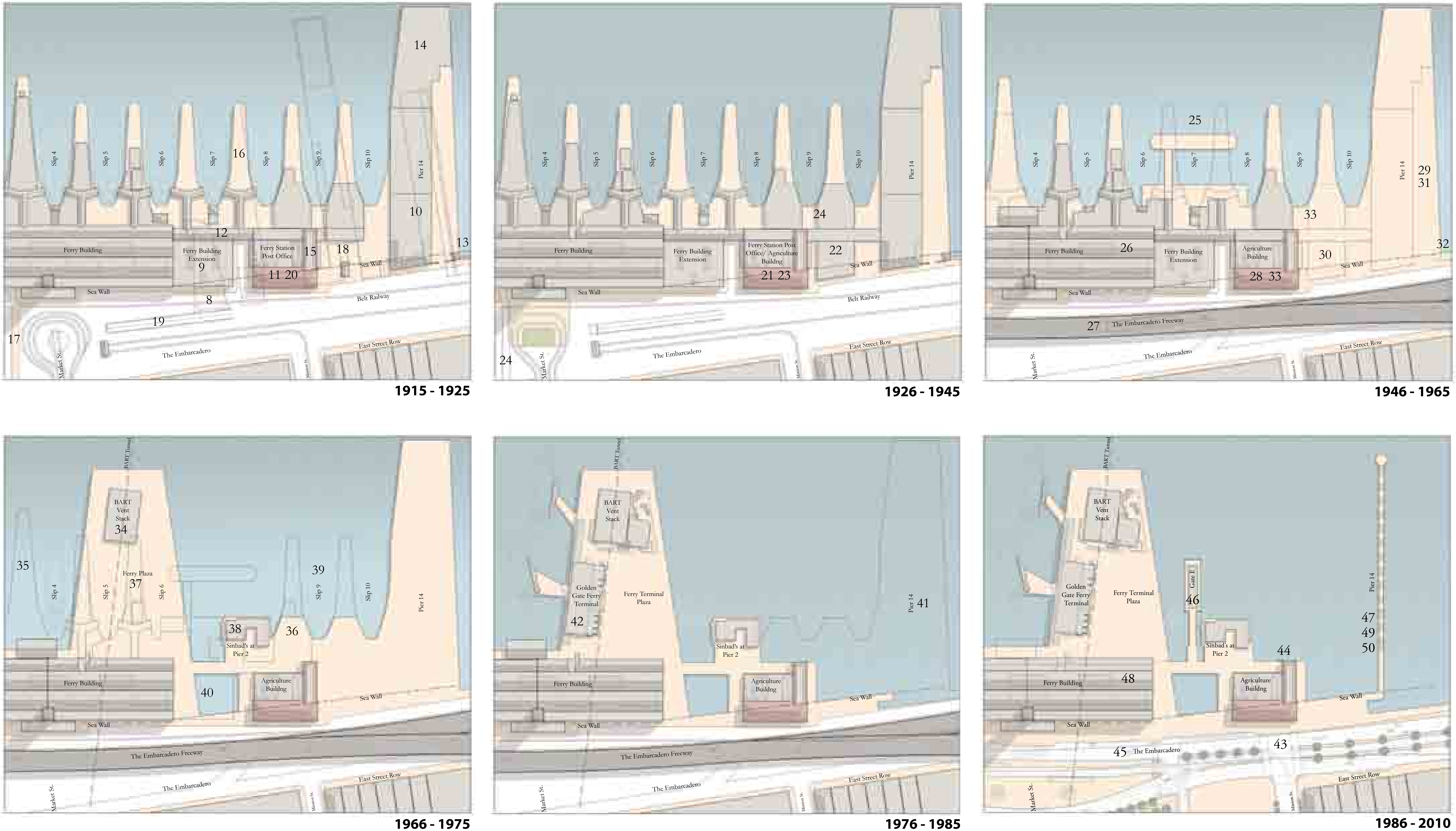


Figure 5: South Basin Summary of Physical Changes, 1915 to 2010

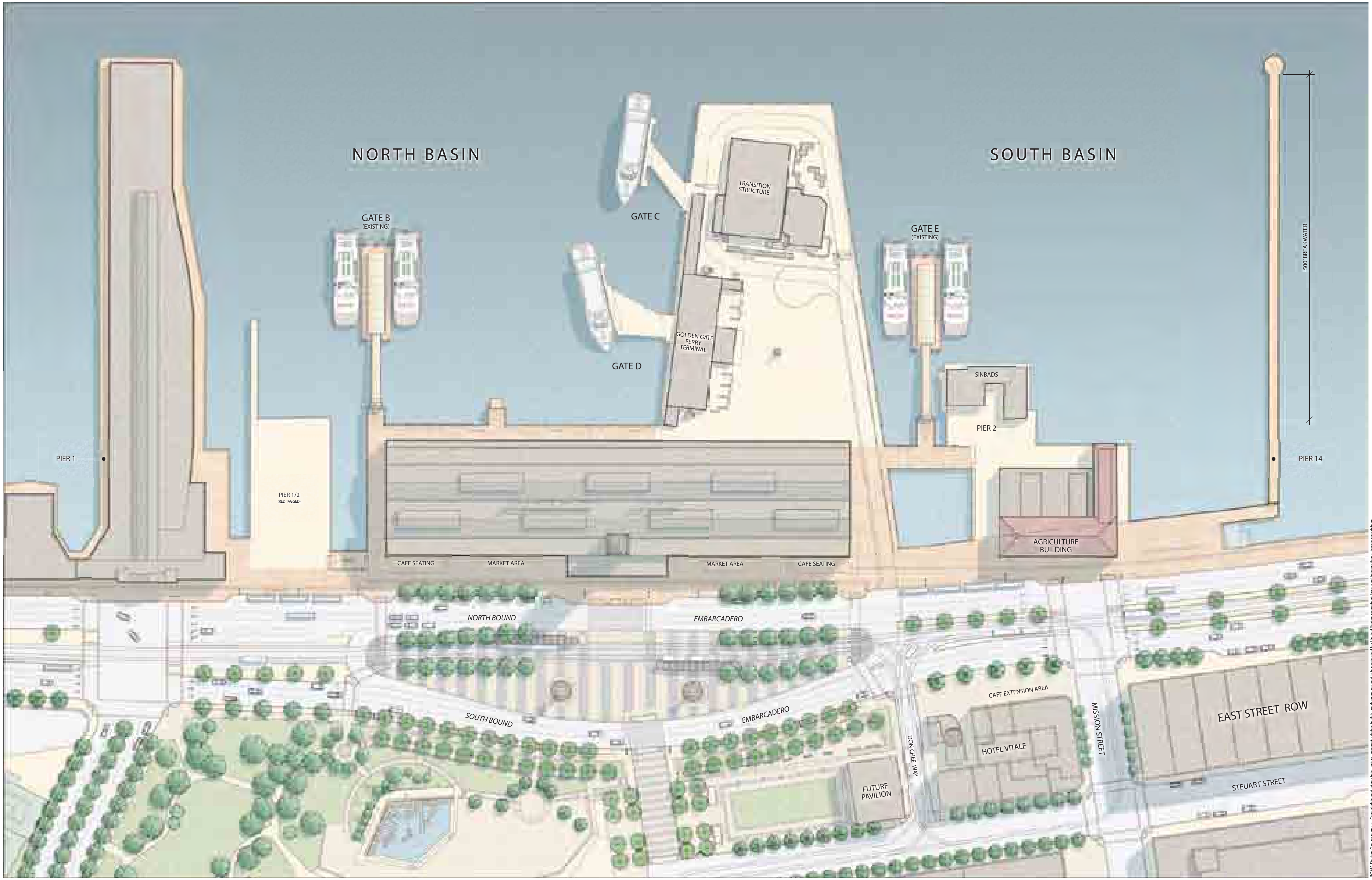


Figure 6: Downtown Ferry Terminal: Phase One, Completed 2001 - 2003

4. SUMMARY OF PHASE 1 IMPROVEMENTS

The Phase 1 improvements to the Downtown San Francisco Ferry Terminal Project were undertaken following the 1989 Loma Prieta earthquake, when water transit services were quickly expanded to address commuter issues resulting from the closure of the Bay Bridge. Subsequently, because of the success of these services, additional funding became available to implement more permanent facilities in the Ferry Building area. Although capital funding was limited during the Phase 1 development, there was a desire to consider not only what to build in the near term, but also to consider the long-term development potential and how the ferry terminal could complement other objectives for the revitalization of the Ferry Building and the surrounding area.

The Phase 1 effort (shown in Figure 6) was undertaken in conjunction with two other major initiatives: the Mid-Embarcadero Transportation and Open Space Project, which included the implementation of transportation and open space improvements in the former right-of-way of the Embarcadero Freeway; and planning and development efforts for the historic preservation and adaptive reuse of the Ferry Building. Each of these three projects contributed to the remaking of the area and the opportunities and challenges that present themselves today.

In developing the plans for the Phase 1 project, regional travel demand forecasts developed by the Metropolitan Transportation Commission (MTC) were augmented by on-board surveys of passengers and input from captains and operational managers of existing water transit routes to model potential water transit ridership demand. In addition, consultant input in coastal engineering, architecture and planning and a variety of technical fields was provided, as well as input from the Port, City agencies, BCDC and interested community groups and stakeholders. A number of alternatives were considered, evaluated, screened, and further developed relating to functional, organizational and transportation-related aspects of the Downtown San Francisco Ferry Terminal.

Fixed versus Floating Berthing Facilities

Fixed berths are utilized by Golden Gate on San Francisco Bay and are used extensively in the Pacific Northwest for larger vessels. They require hydraulic ramps and other facilities that can adjust to tidal variation, but are not generally adaptable to a wide variety of vessel types. Floating berths, connected to shore by a gangway, can more readily accommodate tidal variation, seawall heights, and the diversity of vessel types and freeboards that characterize the Bay Area fleet. Early in the development of the Phase 1 effort, it was determined that floating berthing facilities would be utilized at the San Francisco Downtown Ferry Terminal for their flexibility and ease of maintenance.

Alternative Berthing Configurations

A number of options for gate locations within the Ferry Building area were evaluated on the basis of meeting both the immediate and future needs of potential water transit service at the San Francisco Downtown Ferry Terminal. One of the alternatives considered was to keep all of the gates on the north side of the Ferry Building and rebuild Pier ½ to provide access to them. Another alternative was to locate gates on both the north and south sides of the Ferry Building. The concept of a North Basin and a South Basin (as depicted in Figure 7) was selected because it provided for a distribution of routes which would minimize crossover traffic. It also created an organization that allowed better landside accessibility to the gates, benefitting the Ferry Building area as a whole.

Once the decision was made to locate the gates to the north and south of the Ferry Building, further consideration was given to the precise location of berthing facilities in the South Basin. One option was to mirror the Golden Gate facilities (Gates C and D) to the north and to locate the new gates directly off the south side of the Ferry Plaza. Ultimately, the gates were configured in their historic relationship, perpendicular to the

Figure 7: Ferry Terminal Concept for Creating a North and South Basin

Illustrative Concept Developed as Part of the Phase 1 Efforts

Ferry Building. This arrangement provided for better vessel navigation and wind/wave conditions as well as greater flexibility for expansion in the future. The Phase 1 plan included construction of a new Gate B just north of the Ferry Building to serve the Vallejo and Tiburon routes and a new Gate E south of the BART platform to serve the Alameda/Oakland and Harbor Bay routes. In addition, the plan included a potential third gate south of Pier 2 to accommodate hovercraft, which was being considered at the time for service to the airport. The proposed airport service was ultimately not implemented and the hovercraft gate was not constructed; however, the overall concept for the potential development of four gates in the North Basin (including Golden Gate) and three gates in the South Basin was established through the Phase 1 planning process.

Alternative Breakwater Configurations

In developing the Phase 1 concept for a new South Basin, it was determined that additional protection from the southeasterly storm-driven wind/wave conditions would significantly benefit ferry operations. A variety of breakwater alternatives were developed and evaluated, including a closer-in breakwater that would be located just south of the Agriculture Building, and a more extended breakwater that would be located near the end of Howard Street. Additionally, sub-options were considered for each alternative that included arm extensions which enveloped the basin in a variety of shapes. Trade-offs between the amount of protection provided versus the navigational constraints created by the breakwater, as well as fill, public access and visual considerations were taken into account. Based on these considerations, a straight 500-foot breakwater at what is now Pier 14 with an open landside segment to allow flushing and reduce siltation was built. Figures 8 - 10 illustrate some of the alternatives that were explored.

Pedestrian Circulation

Surveys conducted during the Phase 1 effort concluded that 63% of passengers arriving at the Downtown Ferry Terminal walked to their destinations, 17% used transit, and the remainder took taxis or were picked up by private auto. The surveys also indicated that the vast majority of passengers crossed the Embarcadero at Market Street to either walk to their destinations or take transit or taxis. The major issue regarding circulation across the Embarcadero during Phase 1 had to do with the obstacles created by the freeway and, when the freeway was removed, by the "no man's land" that existed between the Ferry Building and Justin Herman Plaza.

Though not part of the Phase 1 effort, several circulation improvements were implemented as part of the Mid-Embarcadero Transportation and Open Space Project and the redevelopment of the Ferry Building. In order to facilitate the crossing of the Embarcadero, improvements were made to the foot of Market Street, which with the old freeway, had been de-emphasized as an important connection. Improvements were also implemented to create new and improved crossings to the north and south of the Ferry Building area. The space on the west side of the Ferry Building, which was utilized at that time for pull-in parking, was reclaimed for both pedestrian circulation and queuing areas for pedestrian crossings.

During this time, the Ferry Building itself posed a significant obstacle to pedestrian circulation. Access through the building was limited to one narrow corridor on the south wing and north/south bayside connections were non-existent. In addition, the bayside accessway was limited to service vehicles and was blocked off by mechanical equipment. Critical circulation improvements included the connection through the building from Market Street to the Bay and re-establishment of the historic passages in the north and south wings of the Ferry Building. In addition, the creation of a new promenade between the proposed terminal at Gate B and the Golden Gate ferry terminal was proposed. All of these circulation improvements in and around the Ferry Building were considered as part of the Phase 1 planning effort and subsequently implemented with the historic renovation and adaptive reuse of the Ferry Building. Ultimately, when the Ferry Building was restored, a new concept for a ground level central nave extending north/south through the entire building was created.

Additional pedestrian and public access improvements were also needed on the north and south side of the Ferry Building that would serve to more directly connect to the new Gates B and E. As part of the Phase 1 improvements, a new 28-foot pedestrian promenade to Gate B was built just north of the Ferry Building and a new connection from the BART platform southward was also constructed to Gate E. Both structures were built as "essential facilities" so that they would provide access to the gates after a major seismic event.

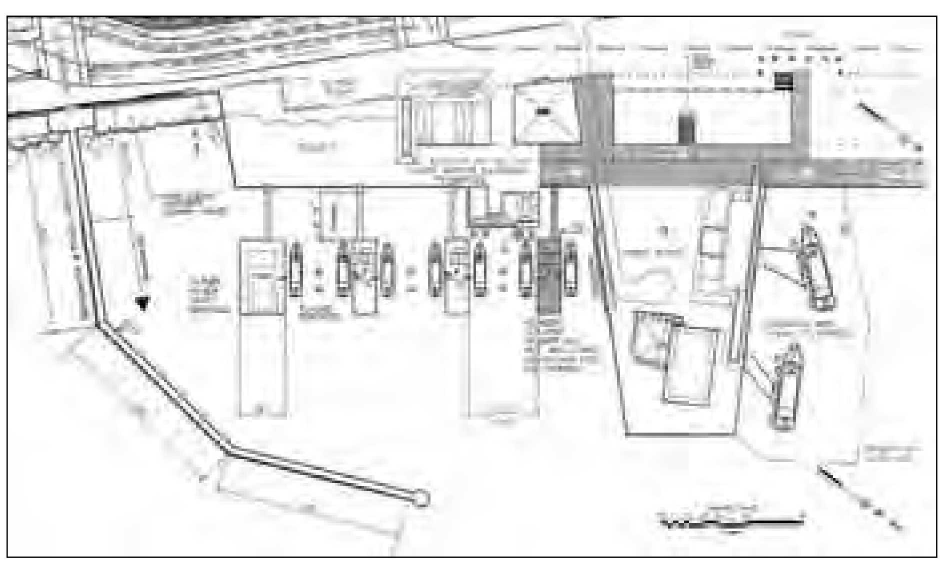


Figure 8: Howard Street Elongated Breakwater Option

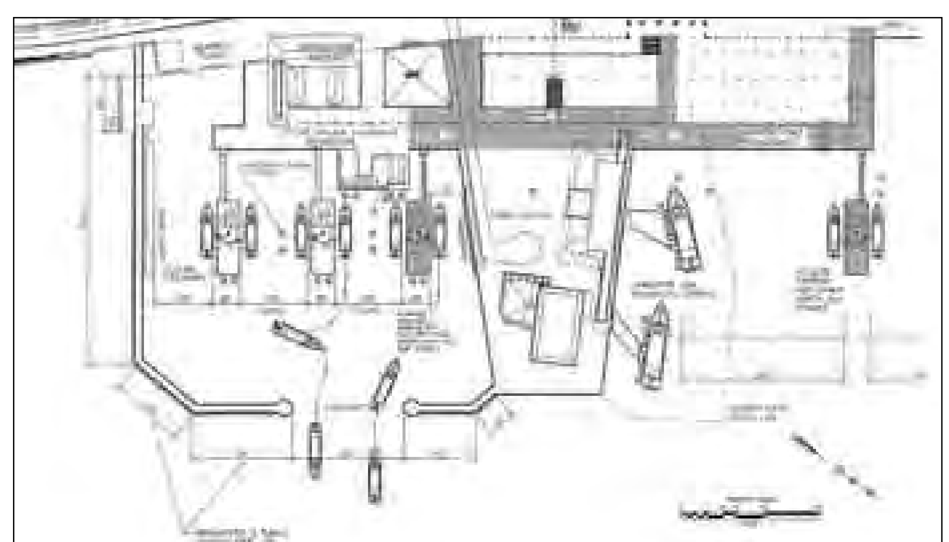


Figure 9: Pier 14 Extended Dual Arm Breakwater Option

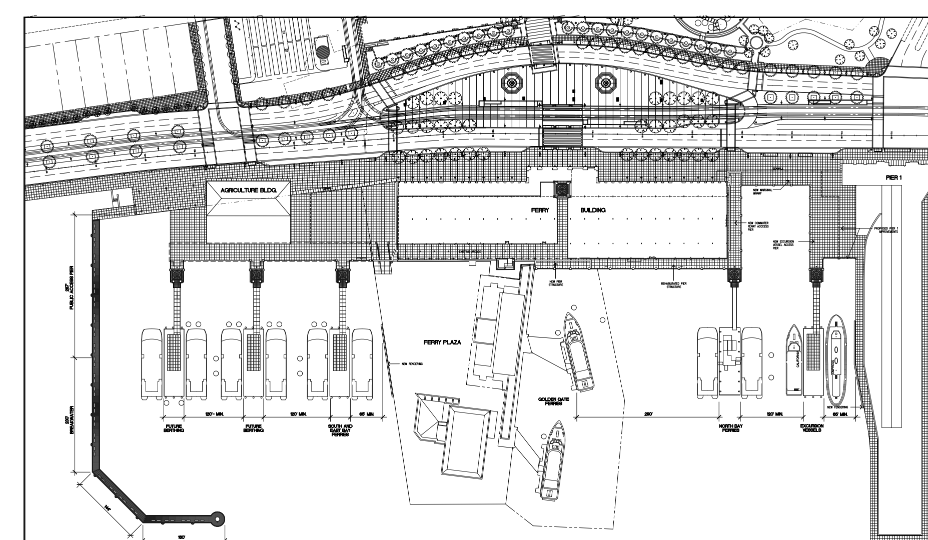
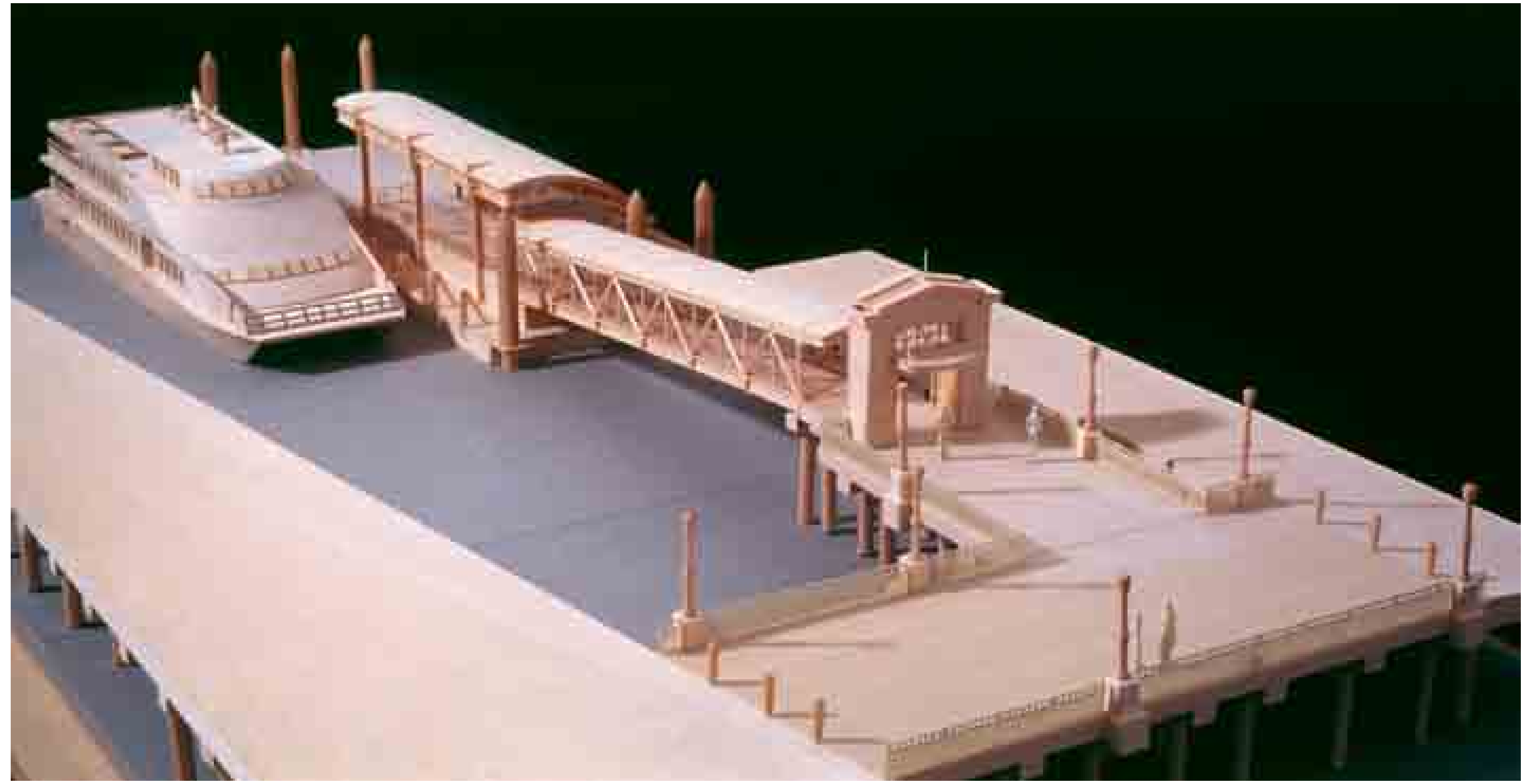


Figure 10: Pier 14 Single Bent Arm Breakwater Option

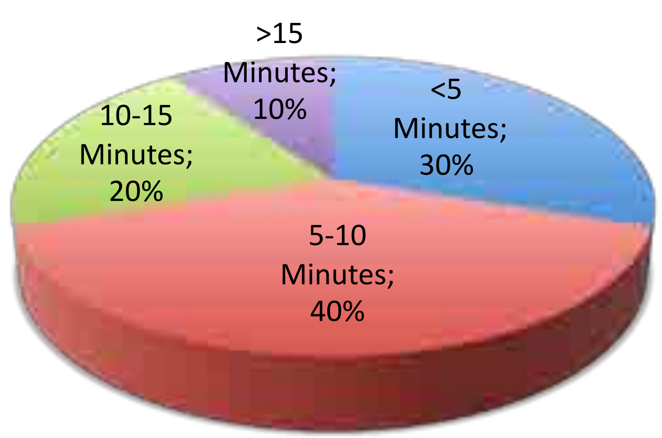
Bus/Taxi/Auto Drop-Off

Consideration was given to additional bus/taxi/auto drop-off areas, which were at that time and are today primarily located on the west side of the Embarcadero. Options included locating drop-off areas in front of the Ferry Building and to the north along Pier ½ and to the south adjacent to the Agriculture Building. Rebuilding Pier ½ and filling the lagoon south of the Ferry Building for these functions was also considered, but not pursued due to regulatory constraints limiting fill for parking and vehicular functions.

Vehicular drop-off functions already existed on the Ferry Plaza and it was recognized that some of these functions would continue to be required along with service delivery and truck loading as part of the Ferry Building restoration. However, it was also determined that bus service would create conflicts without providing significant benefit. Except for Golden Gate buses, which met the Golden Gate ferries and AMTRAK which was located at the Ferry Building, all other bus service providers preferred remaining on the west side of the Embarcadero in their current locations, where more efficient service could be provided. As a result, no new drop-off areas over water were pursued and only curbside drop-off was to be retained and was implemented on the Embarcadero on either side of the Ferry Building as part of the Mid-Embarcadero Transportation and Open Space improvement program.



Phase 1 Model of Gate E Improvements



Surveys undertaken in 1991 indicated that 65 to 70% of commute ferry passengers access the ferry boarding area within ten minutes of the scheduled departure time. Only about 10% arrive more than 15 minutes in advance of departure. Nelson Nygaard.

Figure 11: Previous Ferry Rider Survey Results

Passenger Amenities

Historically, passenger queuing, waiting, ticketing and weather protected area was provided within the Ferry Building, primarily on upper levels. The terminal facilities constructed by Golden Gate along the north side of the Ferry Plaza included enclosed, weather protected ticketing and passenger waiting areas. As part of the Phase 1 effort, options were considered for how to best provide queuing, waiting, ticketing and weather protected area for passengers at the new gates. In discussions with operators and based on the results of passenger surveys, it was determined that a dedicated facility with centralized waiting areas was not desirable, given that passengers generally buy tickets on board vessels and prefer to arrive and queue at the gate just before scheduled departures (see Figure 11).

A linear, covered area directly associated with each gate, allowing passengers to queue in an orderly manner with some level of weather protection, was considered the preferred option. Other options included an independent and covered arcade along the Bay and canopy configurations extending outward from the exterior of the Ferry Building as well as utilizing the interior Ferry Building arcade that still remained on the south wing or restoring the arcade that was filled in on the north wing.

Due to funding limitations and the anticipated renovation of the Ferry Building, none of these options were included in the Phase 1 project. Although the redevelopment of the Ferry Building ultimately did provide enclosed movement areas and a larger public room for passenger waiting, weather protected queuing areas directly associated with the gates were not pursued.

Existing areas to the south and east of the Ferry Building, showing use on a normal day, and relationship to the adjacent Embarcadero and Phase 1 ferry terminal at Gates B and E.

5. OPPORTUNITIES AND CONSTRAINTS

Previous chapters have discussed the many changes that have taken place over time within this area. The purpose of this chapter is to describe the current physical and institutional considerations that today create the context and the opportunities and constraints for ferry terminal expansion.

Site Conditions

Directly within the project area, substantial portions of the pile-supported structures have been strengthened, renovated and improved as a part of the Phase 1 project and other efforts to rebuild and reposition the area following the Loma Prieta earthquake. From a physical standpoint, the remaining areas of deterioration or substandard condition include Pier ½ and the ferry trestle structure associated with it, and Pier 2 including the associated vehicular access apron. Pier ½, which had been used by the Port to provide surface parking for approximately 82 cars, is currently red-tagged and remains vacant. Pier 2 continues to be used for vehicular access and parking and supports the BART construction shed that was adapted in the 1970's for restaurant use. Demolition of both Pier ½ and Pier 2 are called for in the BCDC Special Waterfront Plan when Phase 2 of the ferry terminal improvements are undertaken.

Leaseholds

Many portions of the Ferry Building area are under long-term lease to private development entities who have made the significant investments needed for renovation and improvement. These include AMB Property Corporation for Pier 1 north of the project area and Equity Office Partners (EOP) for the renovation and reuse of the landmark Ferry Building. The EOP leasehold also includes the Ferry Plaza, except those portions that were previously committed to the Golden Gate Ferry Terminal and the Ferry Plaza Limited Partners (FPLP). FPLP leases the restaurant facilities that are located above and adjacent to the BART transition structure. In addition, BART is the entity that built the Ferry Plaza when constructing the Transbay Tube and has rights under a Joint Powers Agreement with the State of California and the Port.

These long-term leases and agreements include the rights of vehicular access to the Ferry Plaza for service and delivery to the Ferry Building, valet drop-off to FPLP for its restaurant, and emergency and service access for the Golden Gate Ferry Terminal and for the BART transition structure. It is important to note that neither the existing improvements undertaken in Phase 1 nor the improvements proposed as part of Phase 2 are within existing long-term leaseholds. That is, the existing Gates B and E and the proposed Gates A, F and G, the East Bayside Promenade extension and the Embarcadero Plaza are all outside existing long term leasehold areas.

Improvements that have been made. *Following the removal of the Embarcadero Freeway, a number of improvements were made for much of the area, in a series of public and private efforts.*

Deck and Piles in Poor Condition. *In the North Basin, Pier ½ was red-tagged in 2010. In the South Basin, Pier 2 and Sinbad's as well as the substructure of the Agriculture Building was identified as being in poor condition.*

Long-term leaseholds *include property leased from the Port of San Francisco and comprise much of the area immediately adjacent to the Downtown Ferry Terminal.*

Historic Resources

The Embarcadero Historic District comprises a portion of the project area, extending from and including Pier 1, the Ferry Building, the Agriculture Building and the Embarcadero Promenade. The Ferry Building (Union Ferry Depot) was designed by Arthur Page Brown and constructed in 1898 and the Agriculture Building (Ferry Station Post Office Building) designed by A.A. Pyle are individually listed on the National Register of Historic Places. While this creates an important context for any development within the area, it should be noted that the Downtown San Francisco Ferry Terminal and the improvements under consideration for future expansion are not a part of the Historic District.

More specifically, the Agriculture Building is a historic resource within the project area that is in need of rehabilitation and needs to be elevated to protect against flooding. Its future improvement and adaptive reuse will be undertaken by the Port of San Francisco when the development market and the Port's financial resources warrant the investment. While this work is not a part of the project, a great deal of care will be taken to enhance, rather than limit, its future development potential.

Linkages

With the improvement of the area following the Loma Prieta earthquake in 1989, a number of linkages were made to and along the waterfront. These included the Embarcadero and Bayside Promenades, new pedestrian crossings of the Embarcadero and connections through the Ferry Building to the waterfront. In the future, new pedestrian linkages are needed, to better connect the Ferry Building and Agriculture Building and from the Embarcadero along the south side of the Ferry Building and to extend the Bayside Promenade further to the south.

Land Use and Regulatory Context

This area is within the land use and regulatory jurisdiction of the Port, whose objectives and responsibilities for this project are further described in the MOU between the Port and WETA. The Port requires that all projects within its jurisdiction are subject to review by the Waterfront Design Advisory Board prior to approval. The Port is also the responsible agency for issuance of all building permits on Port property. The area is also within BCDC's permitting and regulatory authority, whose interests include minimizing fill and maximizing public access on San Francisco Bay. Within the Ferry Building area, the BCDC Special Area Plan (amended in 2010) calls for the removal of Pier ½ and Pier 2 as part of the Phase 2 Improvements, retaining only those portions that are required for vessel berthing and public access. BCDC has Major Permit and Federal Consistency Certification authority and all projects within its jurisdiction are subject to the BCDC Design Review Process and approval by the Commission. Other agencies also have jurisdiction over the project area or resources that the project could potentially impact, particularly related to dredging, fill, water quality and fisheries. These agencies include the US Army Corps of Engineers, the US Fish and Wildlife Service and National Marine Fisheries Service, the California State Lands Commission, the State Office of Historic Preservation and the San Francisco Bay Regional Water Quality Control Board.

Stormwater Management

Water quality related to stormwater runoff is regulated under the federal Clean Water Act and implemented through a National Pollution Discharge Elimination System (NPDES) Permit Program. In 1987, a two-phase plan to regulate polluted stormwater was established. Phase I permits are required for municipal separate storm sewer systems serving populations

Port of San Francisco Embarcadero Historic District. *The Historic District includes the Embarcadero Promenade, Pier 1, and the landmark Ferry Building as well as the Agriculture Building. The ferry terminal improvements are adjacent to, but not within, the Historic District.*

Linkages that have been made. *From 2001 to 2003, a number of connections were made within the area, including the improvement of the north/south connection along the Embarcadero, the creation of a Bayside Promenade, new pedestrian crossings of the Embarcadero, and linkages within and through the Ferry Building to the waterfront.*

Improved linkages that are needed. *The linkages that still need to be made are shown in yellow and include the completion of the Bayside Promenade all the way along the waterfront, between the Agriculture Building and Ferry Building as well as extensions of the north/south circulation route through Ferry Building.*

of 100,000 or more and related to certain types of industrial facilities and construction sites greater than 5 acres in size. Phase II permits are required for separate storm sewer systems serving fewer than 100,000 people, which covers approximately 10% of the City of San Francisco, including the Port of San Francisco. To comply with the NPDES Phase II regulations, the Port and SFPUC have elected to go beyond the minimum design standards for administering post-construction control programs and develop Stormwater Design Guidelines for a post-construction control program suitable for its climate, geography and development pattern. These guidelines would apply to all projects in the Port of San Francisco that are greater than 5,000 square feet, except for those redevelopment and repair projects that involve "pier apron repair and pile replacement, pavement resurfacing, repaving and structural section rehabilitation within the existing footprint".

Within the context of the Downtown San Francisco Ferry Terminal expansion project, these guidelines would provide direction for the design of site improvements to be followed for the new Gate A access pier in the North Basin and the East Bayside Promenade extension and new Embarcadero Plaza in the South Basin. In these areas, below-grade media filters that utilize a pre-treatment settling basin and a filter bed filled with sand or other absorptive filtering media are discouraged by the Water Board. Green infrastructural solutions that filter stormwater through naturalized systems, that are not hidden from view and which will not fall apart after a few years, are strongly preferred to mechanical means of filtration.

Sea Level Rise and Flooding

A new constraint and important consideration affecting the entire San Francisco waterfront pertains to sea level rise. Addressing the impacts of sea level rise in the context of the proposed project will require a response that benefits the unique urban setting of the historically significant downtown waterfront, and the investments that have been made in existing major infrastructure and urban development. Furthermore, while the science of climate change and sea level rise is evolving, prudent solutions are required that respond to the context appropriately.

Currently, elevations along the promenade between Pier 1 and the Ferry Plaza increase going southeast from about 10.5 MLLW along the south apron of Pier 1 to about 11 MLLW at the Ferry Plaza. Elevations from the Ferry Plaza to the Agriculture Building decrease going southeast, from about 11 feet MLLW at the Ferry Plaza to about 9 MLLW near the south edge of the Agriculture Building. The finished floor of the Ferry Building area is at an elevation of about 11.5 MLLW and the queuing area for Gate E is at an elevation of about 11.8 MLLW. Gate B was built at an elevation of 11.4 MLLW and Gate E was built at 11.76 feet MLLW to provide adequate slopes for drainage and to conform to the elevational context of the Ferry Building.

The 100-year return period still water level (SWL), which includes astronomical tide, storm surge and tsunamis over the period of observation, in the vicinity of the project is about 9.2 MLLW. Comparing this to existing elevations, it is apparent that the "freeboard" (difference in elevation between the deck elevation and the 100-year water level) ranges from 1 to 2 feet.

The Total Water Level (TWL) differs from still water level and represents the superposition of wind waves, Pacific swell, boat wake and wave runup at any given SWL elevation. Unlike SWL, it is a dynamic water level that may occur for only a few seconds at a time, albeit repeatedly over the period of a storm or boat passage. It is the highest elevation reached by the water, however short-lived it is. The distinction between SWL and TWL is important to note particularly along coastal areas, because embankments exceeded by SWL elevation constitutes an inundation or large-scale flooding scenario whereas embankments exceeded by TWL elevation constitutes an overtopping scenario that could lead to short-term flooding if the storm duration is prolonged.

The 100-year return period SWL is generally considered by the Federal Emergency Management Agency (FEMA) to be the Base Flood Elevation, or "BFE", as it is traditionally referred to. For coastal areas exposed to waves, the BFE also needs to consider storm wave runup and overtopping to protect shore adjacent structures or facilities. The flood elevation to be used in this case is the 100-year return period TWL, which is a combination of tide, wave and storm-surge induced flooding. It is also referred to as the 1% Annual Chance of Occurrence Event.

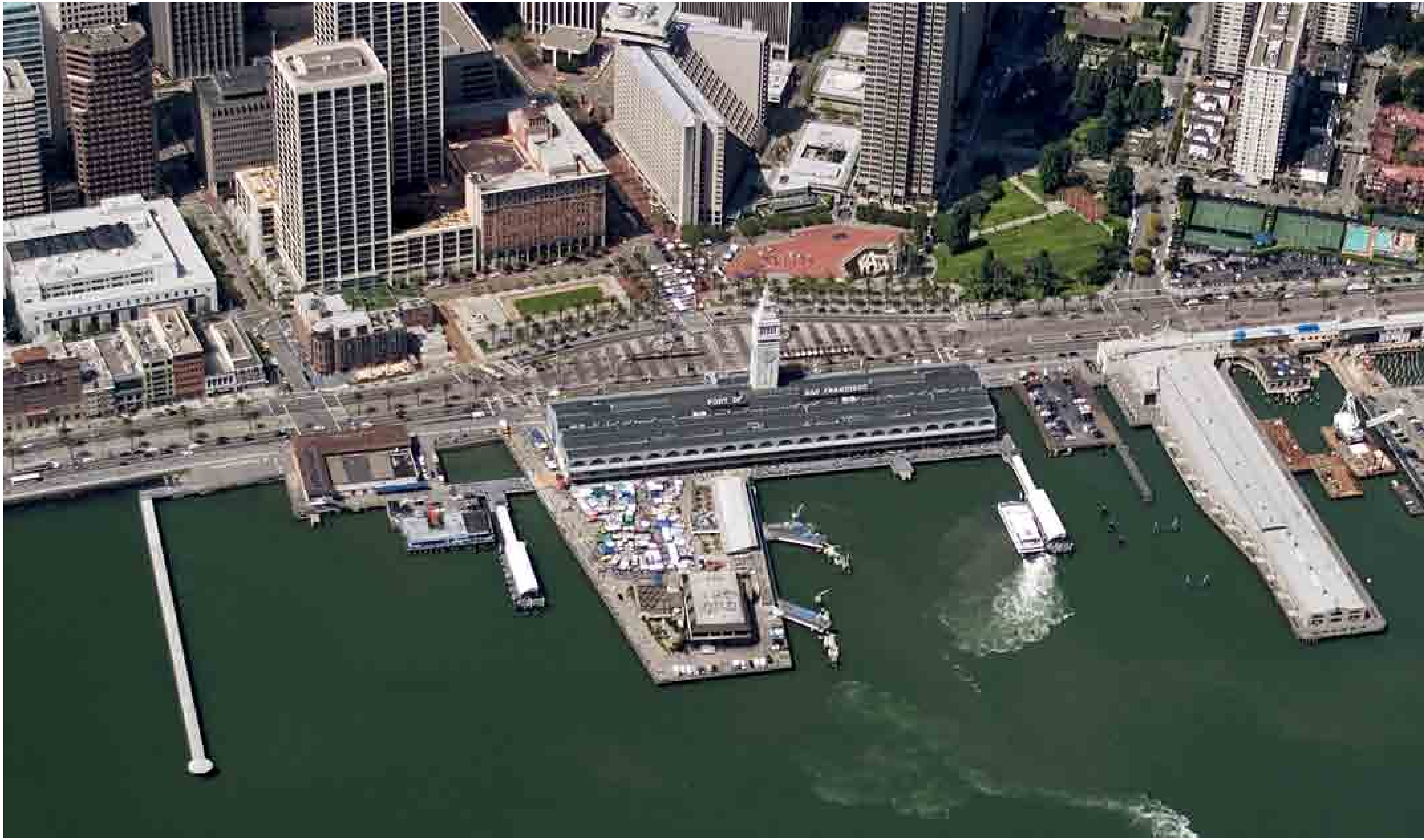
To determine the 1% Annual Chance of Occurrence Event, various return period events of tides, storm surge and wave action cannot be simply combined; rather an analysis of wave heights and storm surges occurring at different tides using statistical methods is required. Although this effort has not been conducted for this phase of the project, experience has shown that the 1% Annual Chance of Occurrence Event for moderately exposed

High tide during storm on February 14, 2011

locations along the San Francisco waterfront is approximately 1 to 2 feet higher than the 100-year return period SWL. This would result in a TWL of about 10.2 to 11.2 MLLW.

Future gates and berthing facilities should be constructed as high as possible (13 to 13.5 MLLW) in recognition of the flood hazards and sea level rise considerations; however, elevations will also need to conform to existing conditions that cannot be changed and provide adequate slopes to meet drainage and ADA accessibility requirements.

While flooding is generally not an issue at the Downtown San Francisco Ferry Terminal, problems of flooding affect the Agriculture Building and the apron area around the building, which slopes from about 10.5 MLLW at the northwest edge to about 9.5 MLLW at the southeast end. In recent years, the Agriculture Building has on occasion flooded when a high tide and storm surge coincide. Recent FEMA flood maps (FEMA 2008) show the Ag Building and the apron around it as a Special Flood Hazard Area indicating that the area is part of a floodplain. Although the rehabilitation and adaptive reuse of the Agriculture Building is not a part of this project, the design of the Ferry Terminal expansion needs to take into account that in the future, the Agriculture Building will need to be raised (as it has in the past for repair of the Great Seawall in 1925) to protect it from flooding.



View to Downtown Ferry Terminal and Mid-Embarcadero (May 2005)

6. WATERSIDE FERRY TERMINAL DESIGN REQUIREMENTS

Existing Services

The Downtown San Francisco Ferry Terminal currently has four gates (Gates B, C, D and E) with services to Tiburon, Sausalito, Larkspur, Vallejo, Alameda/Harbor Bay, and Alameda/Oakland Jack London Square. Gate B accommodates Tiburon and Vallejo ferries, Gates C and D accommodate Sausalito and Larkspur routes, and Gate E accommodates the Alameda/Oakland and Alameda Harbor Bay routes. Golden Gate is in the process of preparing plans to improve their facilities at Gates C and D; however, the details of improvements are unknown at this time. Profiles of individual routes are presented below, based on peak season levels of service.

Alameda Harbor Bay. This route is operated by WETA and presently includes 6 peak-only, weekday-only trips between Downtown San Francisco and the Harbor Bay Ferry Terminal in Alameda.

The Alameda Harbor Bay service generally operates from the north side of Gate E at the Downtown San Francisco Ferry Terminal and utilizes 25-knot, side-loading catamaran vessels. AM peak period weekday arrivals are at 6:55, 7:55, and 8:55 a.m. PM peak period weekday departures are at 4:35, 5:35, and 6:35. A final trip leaves Downtown San Francisco at 7:35 p.m. Average weekday ridership is approximately 650 passenger trips with peak period maximum vessel loads of 125 passengers. Reverse AM peak period flows from Downtown San Francisco to Alameda Harbor Bay and reverse PM peak period flows from Alameda Harbor to Downtown San Francisco are light.

Alameda/Oakland. This route is operated by WETA and presently includes 12 weekday trips and 8 weekend trips between Downtown San Francisco and the Main Street Ferry Terminal in Alameda and the Jack London Square Ferry Terminal in Oakland, as well as mid-weekday and weekend service between Downtown San Francisco and Pier 41.

The Alameda/Oakland service generally operates from the south side of Gate E at the Downtown San Francisco Ferry Terminal and utilizes 25-knot, side-loading catamaran vessels. AM peak period weekday arrivals are at 6:30, 7:35, and 8:40. PM peak period weekday departures are at 4:20, 5:20, 5:45, and 6:25. Average weekday ridership is approximately 1,500 passenger trips with peak period maximum vessel loads of 170 passengers. Reverse AM peak period flows from Downtown San Francisco to the East Bay terminals and reverse PM peak period flows from East Bay terminals to Downtown San Francisco are light.

Larkspur. This route is operated by Golden Gate Ferry and presently includes 20 weekday trips and five weekend trips between Downtown San Francisco and the Larkspur Ferry Terminal.

The Larkspur service generally operates from Gates C and D at the Downtown San Francisco Ferry Terminal and utilizes a combination of 20-knot monohull and 35-knot catamaran vessels. AM peak period weekday arrivals are at 6:20, 7:05, 7:40, 8:20, and 8:50. PM peak period departures are at 3:00, 3:35, 4:25, 4:55, 5:20, 5:55, and 6:20. Average weekday ridership is approximately 4,500 passenger trips with peak period maximum vessel loads of approximately 345 passengers. Reverse AM peak flows from Downtown San Francisco to Larkspur and reverse PM peak period flows from Larkspur to Downtown San Francisco are moderate.

Sausalito. This route is operated by Golden Gate Ferry and presently includes nine weekday trips and six on the weekend between Downtown San Francisco and the Sausalito Ferry Terminal.

The Sausalito service generally operates from Gates C and D at the Downtown San Francisco Ferry Terminal. AM peak period weekday arrivals are at 7:35 and 8:45 and PM peak period departures are at 4:00 and 5:30. Daily weekday ridership is approximately 1,400 passenger trips with peak period maximum vessel loads of approximately 150 passengers. Reverse AM peak period flows from Downtown San Francisco to Sausalito and reverse PM peak period flows from Sausalito to Downtown San Francisco are considerable.

Tiburon. This route is operated as an unsubsidized commuter service by the Blue and Gold Fleet and presently includes 8 peak-only weekday-only trips between Downtown San Francisco and the Tiburon Ferry Terminal. Blue and Gold Fleet also operates mid-weekday and weekend service between Pier 41 and Tiburon, as well as very limited mid-weekday and weekend service between Downtown San Francisco and Pier 41.

The Tiburon commuter service generally operates from the north side of Gate B at the Downtown San Francisco Ferry Terminal. AM peak period arrivals are at 6:20, 7:10, 8:10, and 9:05 and PM peak period departures are at 4:25, 5:25, 6:15, and 7:15. Average weekday ridership is approximately 600 passenger trips with peak period maximum vessel loads of 150 passengers.

Vallejo. This route is operated by the City of Vallejo and presently includes 12 weekday trips and 7 weekend trips between Downtown San Francisco and the Vallejo Ferry Terminal, as well as limited mid-weekday and weekend service between Pier 41 and Vallejo.

Table 2: Existing Ferry Ridership

Route	Daily Ridership	Peak Period Ridership	Peak Arrivals	Peak Period Headway
Sausalito (Golden Gate)	1,442	200	2	70 min
Larkspur (Golden Gate)	4,615	1,235	5-6	30-45 min
Vallejo	2,330	560	4	25-60 min
Tiburon (Blue & Gold)	358	280	4	50-60 min
Alameda/Oakland	1,500	250	3-4	65 min
Alameda-Harbor Bay	660	295	3-4	60 min
Total Berths	**10,905**	**2,820**	**21-24**	

Figure 12: Existing and Potential New Ferry Routes

The Vallejo service generally operates from the south side of Gate B at the Downtown San Francisco Ferry Terminal and utilizes 35-knot side-loading catamaran vessels. AM peak period weekday arrivals are at 6:30, 7:30, 8:00, and 8:45. PM peak period weekday departures are at 3:30, 4:30, 5:15, and 6:00. Average weekday ridership is approximately 2,400 passenger trips with peak period maximum vessel loads of 220 passengers. Reverse AM peak period flows from Downtown San Francisco to Vallejo and reverse PM peak period flows from Vallejo to Downtown San Francisco are moderate.

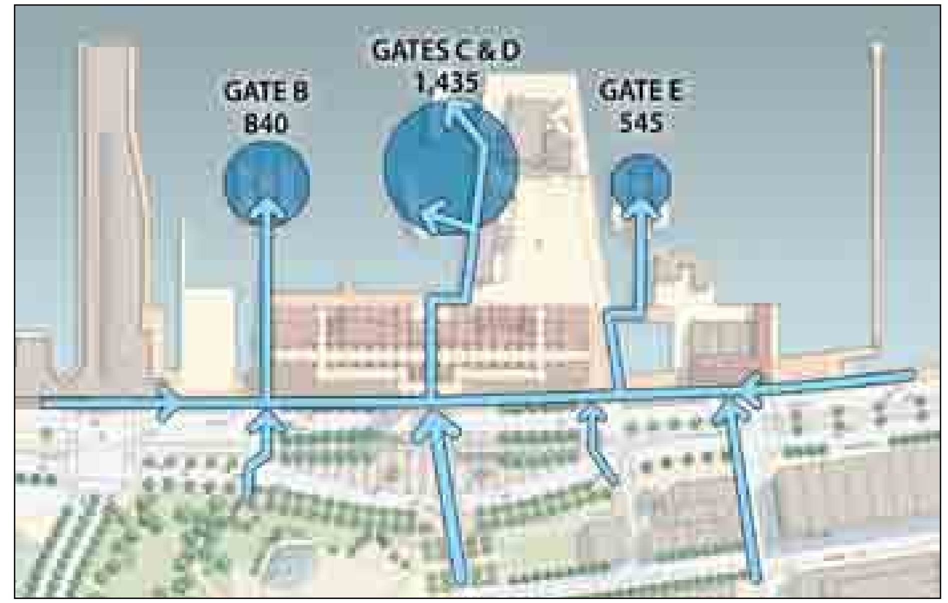


Figure 13: Current Peak Period Ridership

Potential New Routes

The Downtown San Francisco Ferry Terminal currently accommodates 6 water transit routes. As set forth in the IOP and summarized in Figure 12, WETA plans to operate 7 new water transit services, for a total of 10 to Downtown San Francisco. WETA's new North Bay routes would include Berkeley, Richmond, Hercules, Martinez and Antioch. WETA's new Central and South Bay routes include Treasure Island and Redwood City. These routes are in various stages of development and are based on current planning assumptions. New service for Berkeley and Richmond would be initiated by 2015/2016; for Treasure Island by 2016/2017; and for Antioch, Martinez, Hercules and Redwood City by 2020.

Projected Ridership

For all of the existing and planned Downtown routes except for Treasure Island, this report utilizes the 2035 ridership projections prepared in 2011 by Cambridge Systematics (CSI). For Treasure Island, it utilizes the ferry ridership projections prepared by Fehr & Peers as part of the environmental documentation for future redevelopment. For the environmental document Fehr & Peers prepared a Base and Expanded Transit Scenario for both a build-out and reduced program. The Treasure Island projections utilized in Table 3 are for the Expanded Transit Scenario and for the build out of the proposed development project, which includes 8,000

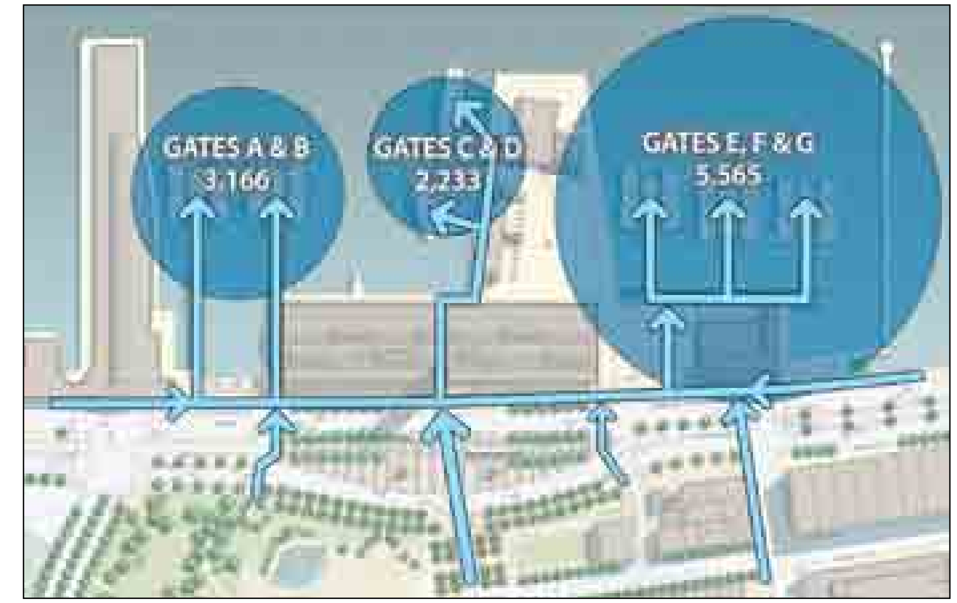


Figure 14: 2035 Peak Period Ridership

Table 3: Treasure Island Peak Hour Travel Demand Summary

Route / Scenario	PROPOSED DEVELOPMENT Base Transit Scenario	PROPOSED DEVELOPMENT Expanded Transit Scenario	REDUCED DEVELOPMENT Base Transit Scenario	REDUCED DEVELOPMENT Expanded Transit Scenario
AM Peak Hour				
East Bound	238	359	201	305
West Bound	403	599	321	480
Total AM Peak Hour	***641***	***958***	***522***	***785***
PM Peak Hour				
East Bound	479	719	404	609
West Bound	343	516	292	442
Total PM Peak Hour	***822***	***1,235***	***696***	***1,051***
Saturday Peak Hour				
East Bound	221	385	226	345
West Bound	252	334	199	301
Total Saturday Peak Hour	***473***	***719***	***425***	***646***

Source: Fehr & Peers prepared in 2010 and 2011 for Treasure Island EIS-EIR document

Table 4: Projected 2035 Ferry Ridership

ROUTE	Daily Ridership	AM Peak Period Ridership	PM Peak Period Ridership	Peak Arrivals	Maximum Peak Period Headway
North Bay					
Golden Gate Berths:					
Sausalito	1,799	591	591	3-5	30 min
Larkspur	4,634	1,642	1,642	5-6	20 min
Subtotal	*6,433*	*2,233*	*2,233*	*8-11*	
WETA Berths:					
Vallejo	2,289	945	920	5	30 min
Tiburon (Blue & Gold)	836	299	299	4-5	30 min
Berkeley	1,589	635	635	5	30 min
Richmond	1,715	647	647	5	30 min
Hercules	565	203	203	2-3	60 min
Antioch	445	193	193	2-3	60 min
Martinez	614	244	244	2-3	60 min
WETA Subtotal	*8,053*	*3,166*	*3,141*	*25-29*	
North Bay Subtotal	***14,486***	***5,399***	***5,374***	***33-40***	
Central and South Bay					
WETA Berths:					
Treasure Island	10,746	3,087	3,087	10	15 min
Alameda/Oakland	4,886	1,357	1,686	10	15 min
Alameda-Harbor Bay	1,815	699	699	5	30 min
Redwood City	214	93	93	2-3	60 min
WETA Subtotal	***17,661***	***5,236***	***5,565***	***27-28***	
Total Berths	**32,147**	**10,635**	**10,939**	**60-68**	
Total WETA Berths	**25,714**	**8,402**	**8,706**	**52-57**	

Source: 2035 projections by Cambridge Systematics prepared in 2011 for all except Treasure Island
Treasure Island projections by Fehr & Peers prepared in 2010 and 2011 for EIS-EIR document

dwelling units in addition to commercial, recreational and entertainment uses. Although peak period ridership was not calculated by Fehr & Peers for the environmental documents, they indicated that the peak hour demand is assumed to be 40% of the total 2-1/2 hour peak period and that was utilized as a basis for the peak period calculations. The projections prepared by CSI and Fehr & Peers indicate that, the existing and future planned water transit services at the Downtown San Francisco Ferry Terminal will serve approximately 32,147 riders per weekday, roughly a three-fold increase over current ridership levels. For WETA berths, the current daily ridership of 4,848 passengers is anticipated to increase to 25,714 by 2035 as new expansion services are implemented, which represents nearly a six-fold increase in patronage.

The majority of the existing and planned routes connect places of residence to work opportunities in Downtown San Francisco. Characteristic of commuter travel, the weekday AM and PM peak periods are generally equivalent for most routes. In Alameda/Oakland and Treasure Island, however, the weekday PM peak period is larger probably because there are a greater variety of trips due to the mixed-use nature of both destinations. Today, the week-end ridership is fairly limited except for the Golden Gate Ferries which serve recreational destinations in Marin. However, as the San Francisco waterfront continues to develop as a recreational and open space destination and as facilities such as the Exploratorium, are built, the potential of ferry ridership for week-end recreational purposes is likely to increase.

Vessel Characteristics and Berthing Requirements

WETA's existing fleet will soon consist of 12 vessels, including four vessels that will soon be transferred from the City of Vallejo. The vessels in the WETA fleet, as shown in Table 5, have a variety of passenger capacities, freeboard heights, service speeds and ages, however all vessels are side-loading. The fleet ranges in size from 149 to 399-passenger capacity with vessels ranging in service speed from 25 to 35 knots. It is assumed that a 299-passenger side-loading vessel will be utilized for operating the new routes. This vessel is assumed to be a high-speed aluminum catamaran vessel that is 135 feet long by 39 feet wide and will include snack bar, restroom and bicycle facilities on board. The 25-knot vessels will have propeller propulsion and will likely be utilized for the shorter routes, whereas the 34 to 38 knot vessels will be hydro-jet propelled and will likely be utilized for the longer routes.

Table 5: Existing WETA Vessel Fleet

Vessel	Capacity	Freeboard (in)	Service Speed	Year Built	Service
Encinal	400	64	25	1985	Alameda/Oakland
Peralta	318	62	25	2002	Alameda/Oakland
Bay Breeze	250	84	25	1994	Harbor Bay
Harbor Bay Express II	149	42	28	1995	Harbor Bay
Intintoli	300	114 for/108 aft	34	1997	Vallejo
Mare Island	300	114 for/108 aft	34	1997	Vallejo
Solano	300	114 for/108 aft	34	2004	Vallejo
Vallejo	368	68	34	1991/2001	Vallejo
Gemini	149	94.5	25	2008	Spare
Pisces	149	94.5	25	2008	Spare
Scorpio	199	94.5	25	2009	SSF
Taurus	199	94.5	25	2009	SSF

WETA 149/199 Passenger Vessel

The existing and future side-loading vessel fleet can be berthed on a standard floating facility such as those currently utilized at the Downtown San Francisco Ferry Terminal and the South San Francisco Ferry Terminal. The existing floating facilities in the Ferry Building area are comprised of steel floats while the new South San Francisco Terminal is a concrete float design which WETA intends to use as a prototype for future WETA berthing facilities due to reduced maintenance requirements. Both floating facilities include moveable ramps that can be adjusted to respond to variations in vessel freeboards. The berthing structures for the side-loading vessels include floats, gangways and guide piles, as well as dolphins and fendering along the side of existing or proposed pile supported structures as required. The concrete floats to be utilized are approximately 45 feet wide by 115 feet long. They are accessed by steel truss gangways that are approximately 12 to 14 feet wide and 92 feet long. The gangways are designed to rise and fall with tidal variations while meeting Americans with Disabilities Act (ADA) requirements. The gangway and float design also includes weather protection canopies, consistent with those used at Gates B and E.

For Treasure Island, the PM eastbound peak represents the design basis for calculating vessel size and determining headway requirements. The Fehr & Peers projected maximum peak hour demand at full build-out of 719 passengers in the PM eastbound direction could be accommodated in a 199-passenger side-loading vessel every 15 minutes, a 299-passenger side-loading vessel every 20 minutes, or a 399-passenger side-loading vessel every 30 minutes. The analysis undertaken by Fehr & Peers also indicates that ridership will increase with the reduction in headways and the provision of more frequently scheduled ferry service. The frequency of headways affects ridership more than the size of the ferry vessel. Although a 699-passenger bow-loading vessel was considered in early studies for Treasure Island service, the projections prepared by Fehr & Peers clearly demonstrate that a standard WETA 299-passenger, side-loading vessel with 20 minute headways will more than adequately satisfy the projected demand for Treasure Island service. The concept plan assumes that side-loading vessels will be utilized for Treasure Island service and for all the other new routes. At the same time, the plan does not preclude changes in the future that would allow the use of bow loading vessels if circumstances change.

Operational Planning for Berthing Facilities

As previously mentioned, Phase 1 established the potential capacity and location for additional berthing facilities at the Downtown San Francisco Ferry Terminal. In the North Basin, there is the opportunity for one additional terminal, Gate A, and in the South Basin, there is the potential for two additional terminals, Gates F and G. Phase 1 also envisioned the general assignment of North Bay routes to the North Basin and Central and South Bay routes to the South Basin.

From an operational planning perspective, the current design effort tested and reconfirmed the parameters previously established, based on updated route and ridership projections to 2035. The testing assumed one additional gate in the North Basin and two additional gates in the South Basin and the general assignment of North Bay and Central and South Bay routes to the respective basins established previously. Within these general parameters, specific gate assignments were determined for each of the services based on projected ridership, service frequency, queuing and boarding needs, navigational concerns and dredging requirements. In addition, anticipated start dates are considered for each service so that the testing could include the phased demand for the service needs.

The peak period ridership projection represents the greatest volume of passengers that need to be accommodated and the greatest number of arrivals that need to be provided for at each of the berthing facilities. The allocation of the number of projected peak period arrivals to each of the gates will indicate whether the berthing demand can be accommodated, whether there is additional unmet demand or whether there is excess capacity. The estimated number of 2035 peak period arrivals for existing and future planned services is shown in Table 4. For all of the routes, the number of projected vessel arrivals in the AM and PM peak periods is the same. The AM peak period is generally considered to be between 6:30 and 9 AM and the PM peak period is generally considered to be between 4:30 and 7 PM. In addition, in most cases, the volume of passengers between AM and PM is also the same, however, for a few routes, such as Alameda/Oakland and Treasure Island, the volume of passengers is more significant in the PM period.

In the operational analysis, the peak period assumes the greater of the AM and PM volumes of passengers. Further, it assumes that all existing and new WETA gates will include floats that provide two berthing opportunities for side-loading vessels, one on the north and one on the south. WETA's operational assumptions are that each gate can accommodate 4 vessel arrivals per hour if only one side of the float is used and 6 vessel arrivals per hour if both sides of the float are used. Assuming a 2-1/2 hour peak period, ten arrivals can be accommodated if one side of a float is used and 15 can be accommodated if both sides are used. An illustrative schedule, indicating generally how the berthing requirements of the AM peak period for the projected number of arrivals, is shown on Table 6. Based on the number of arrivals in the 2035 projections, there would be 13 peak period arrivals at Gate A. At Gate B, there would also be 13 peak period arrivals, assuming that the same vessel serves both Antioch and Martinez. There would be 10 peak period arrivals at Gates E and F and 8 at Gate G, which is intended to serve as a spare berth.

The four existing gates at the Downtown San Francisco Ferry Terminal currently accommodate 20 total AM peak period vessel arrivals. Two of the gates (Gates C and D) are used exclusively by Golden Gate and accommodate six AM peak period arrivals for the Larkspur and Sausalito services.

Table 6: Illustrative Berthing Schedule: AM Peak Period Arrivals

	GATE A			GATE B			GATE C	GATE D	GATE E	GATE F	GATE G	
A.M. Peak Period Arrivals	Vallejo	Tiburon	Hercules	Berkeley	Richmond	Antioch/Martinez	Sausalito	Larkspur	Treasure Island	Alameda/Oakland	Harbor Bay	Redwood City
6:15												
6:30	●			●				●	●	●		
6:45		●			●		●		●	●		●
7:00	●		●	●		●		●	●	●	●	
7:15		●			●		●		●	●		
7:30	●			●				●	●	●	●	
7:45		●			●		●		●	●		●
8:00	●		●	●		●		●	●	●	●	
8:15		●			●		●		●	●		
8:30	●			●				●	●	●	●	
8:45		●			●		●		●	●		●
9:00			●			●		●			●	
9:15												
9:30												

The remaining gates (Gates B and E) accommodate 14 arrivals during the AM peak period. If no new berthing facilities are built, based on the projected ridership forecasts, the number of peak period arrivals that would have to be accommodated at Gates B and E would increase to between 47 to 57 vessels. In addition to increased demand for vessel arrivals, there exists and will continue to be a need to accommodate the additional berthing requirements for emergency service and the berthing requirements for a disabled or visiting vessel. Clearly, the two existing gates are inadequate to meet the three to four-fold increase in peak period demand and the need for an emergency and/or spare berth.

The conclusion of the operational analysis is that all of the existing and potential new berthing capacity, comprising five total WETA gates in the North and South Basins, will be needed to meet existing and projected future demand. With the provision of the five gates and utilizing the assumption that six 299-passenger vessels can disembark per hour per gate, these gates would provide the potential to evacuate approximately 1,800 passengers per hour per gate, for a total of 9,000 passengers per hour. The analysis indicates that the assignment of the proposed North Bay routes to the North Basin and the proposed Central and South Bay routes to the South Basin can be achieved so that crossover traffic can be minimized. The analysis indicates that the need for an additional gate in the North Basin would be triggered by the initiation of Berkeley and/or Richmond service, projected to start in 2015/2016. The need for an additional gate in the South Basin would be triggered by the initiation of Treasure Island service, projected to begin in 2016/2017.

The specific assignment of routes to gates is a function of a number of factors, including the desire to minimize crossover traffic and how to best meet the landside requirements related to circulation, queuing and waiting. While certain gates in this operational analysis have been assumed for particular services, the project is designed to allow for operational flexibility if scheduling, weather, maintenance requirements or other considerations require a reassignment, either temporarily or permanently, to other gates.

North Basin Operational Analysis

In the North Basin, currently, Vallejo and Tiburon service is provided at Gate B. With the construction of Gate A, it may be desirable to relocate the Vallejo and Tiburon routes to this new gate. Vallejo has one of the largest demands for queuing and waiting in the PM peak period and the additional landside capacity may provide advantages for waiting passengers. The new services to Berkeley and Richmond, which are scheduled to begin in 2015/2016, would then be provided from Gate B. Altogether, it is projected that there will be 6,429 passengers arriving daily at Gates A and B by 2015/2016. The projections indicate that 2,526 passengers will be arriving during the AM peak and 2,501 passengers will be departing during the PM peak period. This equates to 10 peak period arrivals per gate or 4 peak hour arrivals per gate, indicating that, although both gates would be required by 2015/2016, they could at that time provide the needed service on one side of both floats, allowing the other side to be used if there are inadvertent delays or other scheduling demands.

With the future addition of Hercules, Martinez and Antioch, the volume of daily passengers would increase to 8,053, with 3,166 AM peak period passengers and 3,141 PM peak period passengers by 2035. It is estimated that 25 to 29 vessel arrivals would be required at Gates A and B during the peak period by 2035. This volume would be within an acceptable capacity range of 20 to 30 peak period vessel arrivals for the two gates.

South Basin Operational Analysis

In the South Basin, Gates E, F and G would provide berthing for Central and South Bay routes. Although Gate E currently provides for Alameda/Oakland and Harbor Bay services, the analysis indicates it would be a more optimal location for the Treasure Island service because it provides the most direct routing for the short trip and a larger potential backland area for the high volume passenger travel anticipated. The Alameda/Oakland and Harbor Bay services would then be relocated to Gate F, which would eliminate crossover traffic with the frequent Treasure Island vessels. In the future, when the Alameda/Oakland service requires an increase in vessel arrivals, Harbor Bay could be located at Gate G along with the future Redwood City service and the use of that gate as a spare berth.

Treasure Island service at Gate E is projected to serve 10,746 daily passengers by 2035. During the AM peak period, it is anticipated to have 898 eastbound and 1,498 westbound passengers, for a total of 2,396 passengers. During the PM peak period, it is anticipated to have 1,797 eastbound and 1,290 westbound passengers for a total 3,087 passengers. It is anticipated that up to 10 vessel arrivals and/or departures could be required if 15-minute headways are needed to serve the PM peak period needs. This would equate to 4 departures per hour, which could be accommodated by a side-loading vessel on one side of a float.

Alameda/Oakland and Harbor Bay services at Gate F are projected to serve 6,701 daily passengers by 2035 with 2,056 passengers during the AM peak period and 2,385passengers during the PM peak period. It is anticipated that 10 vessel arrivals for Alameda/Oakland and 5 vessel arrivals for Harbor Bay for a total of 15 vessel arrivals to meet the peak period service needs. This would equate to 6 arrivals per hour, which could be accommodated by utilizing both sides of the float. However, in order to provide for greater flexibility, Harbor Bay service could also be located at Gate G.

Gate G could accommodate future Redwood City as well as Harbor Bay service, as discussed above. With the two services berthing ferries at Gate G, only one side of the float would be required, leaving the other side to be available as a spare berth for a vessel that needs to be temporarily moored due to a vessel break-down, a visiting vessel, or an additional vessel that may be required for emergency service and special events. Furthermore, this additional capacity will be needed during the temporary relocation of service from another gate during periodic service requirements for float reconstruction, repair and/or maintenance.

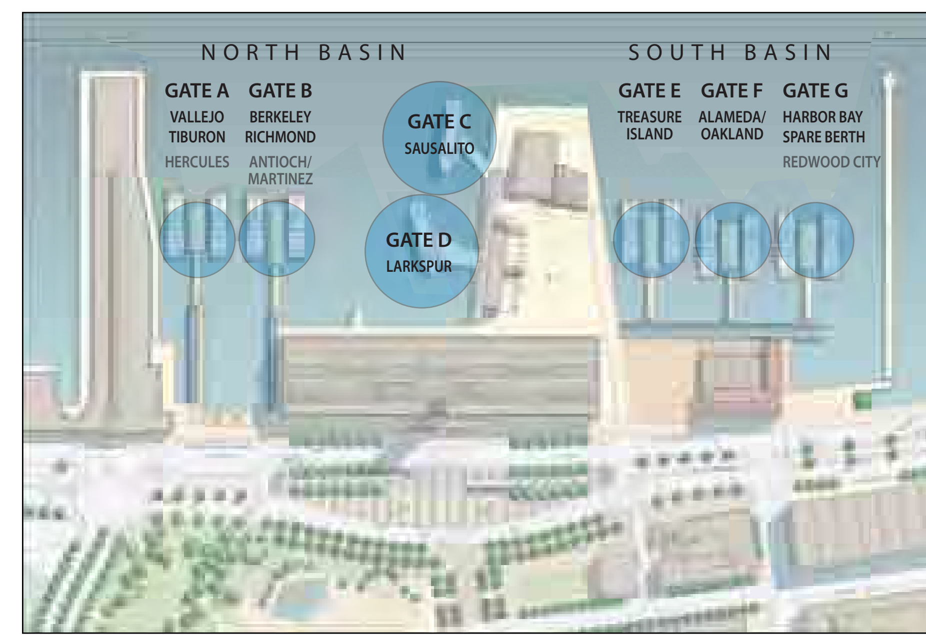
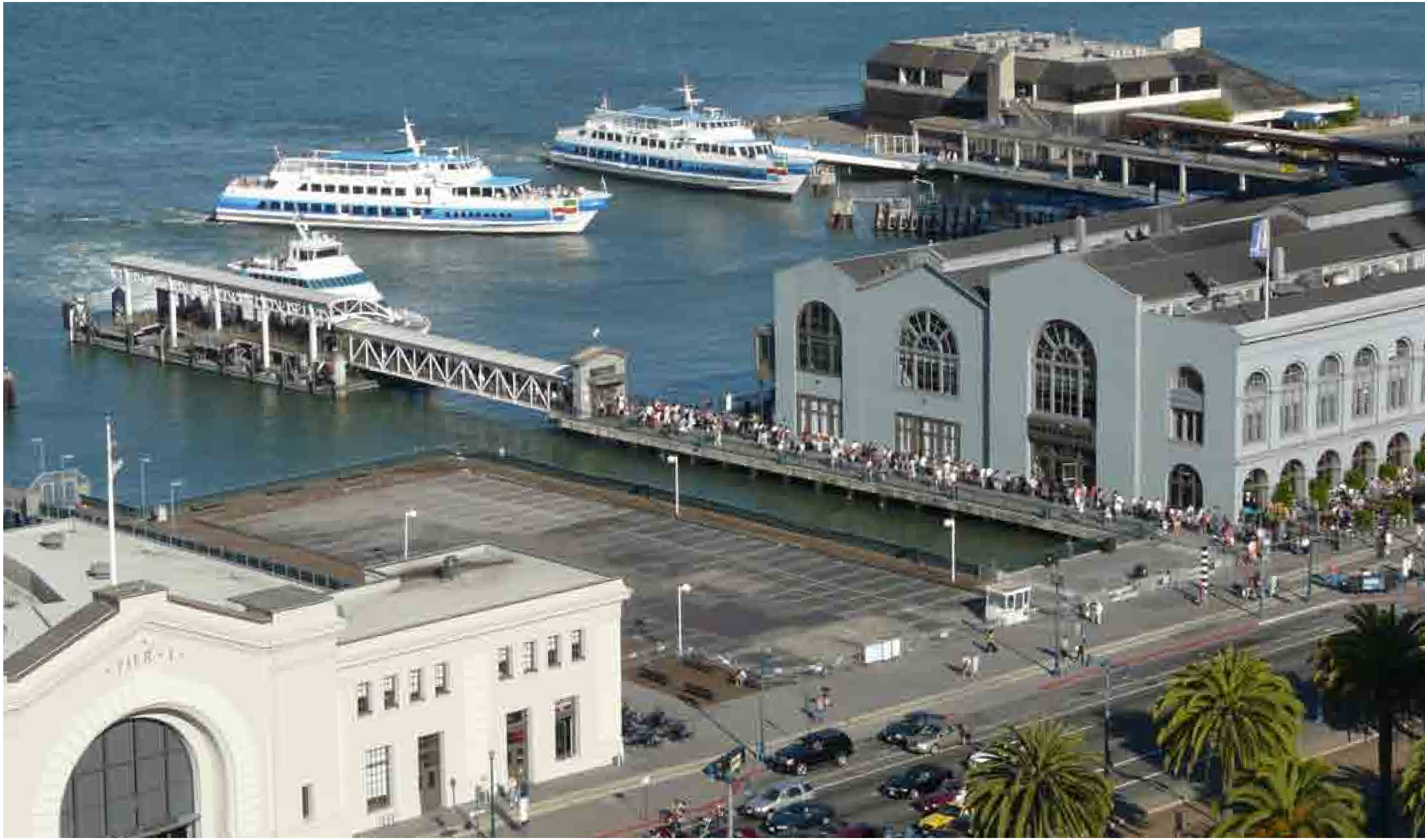


Figure 15: Potential Phased Berthing Arrangements



View of the North Basin area showing passenger queuing for the Vallejo ferries at Gate B.

7. LANDSIDE DESIGN REQUIREMENTS

The landside design requirements for this project consider how the growth and development of the water transit system at the Downtown San Francisco Ferry Terminal can be accommodated within the dynamic context of an evolving waterfront and its relationship to the City. The following section describes the key factors affecting landside design of the Project. Prime amongst these are the needs for pedestrian access areas to the new terminals and the space requirements for passenger queuing and waiting and for emergency response. The requirements of the project are addressed within the context of the ongoing and future needs of the area as a whole for bicycles and transit and service, delivery and emergency vehicles.

Pedestrian Circulation

For planning and analysis purposes, the peak period is assumed to be the greater volume of projected ridership for either the AM peak period (from 6:30 to 9 AM) or the PM peak period (from 4:30 to 7 PM). For most of the commuter routes, the AM and the PM peak period volumes are either the same or very similar, with the exception of Alameda/Oakland and Treasure Island where the PM is greater. Today, on a weekday during the peak period, approximately 840 passengers arrive at Gate B in the North Basin, 1,435 passengers arrive at the Golden Gate Ferry Gates C and D, and 545 passengers arrive and/or depart at Gate E in the South Basin. By 2035, the projected volume of ferry passengers is anticipated to increase during the peak period to 3,166 arriving in the North Basin (Gates A and B), 2,233 at Gates C and D, and 5,565 arriving and/or departing from the South Basin (Gates E, F and G).

In addition to the ferry passengers, there is an even greater number of pedestrians who are attracted to the retail, restaurant and office destinations in the Ferry Building and other nearby Port venues and the farmer's markets which occur on Tuesdays, Thursdays and Saturdays. During weekdays, lunchtime attracts the largest volume of pedestrians to the area. According to a recent survey by DKS Associates, pedestrian counts during the two-hour mid-day peak period from 12-2 PM indicated about 3,500 pedestrians arriving from the north side of the Ferry Building, about 8,000 pedestrians entering the center of the building on axis with Market Street and about 3,500 pedestrians arriving from the south side. On Saturdays during the mid-day peak, the numbers swell to about 7,500 arriving from the north side of the Ferry Building, 20,000 entering the center of the building, and 7,500 arriving from the south side.

The overall volume of ferry passengers generally tends to be significantly less than that of general pedestrians visiting the area and the peaking patterns are very different. The ferry passengers tend to be focused within the commuter AM and PM peak periods on weekdays, whereas the general public tends to peak in the middle of the day, with pedestrian numbers more than doubling during the same period on Saturdays at the time of the CUESA farmer's market. Because the peaks are at different times of the day and week, ferry passengers and general pedestrians have a synergistic relationship that together contributes to the overall life and vitality of the area.

On-board surveys, pedestrian counts and field observations indicate that the vast majority of ferry passengers walk from the Ferry Terminal to the opposite side of the Embarcadero where they continue to walk, transfer to another form of transit, or take a taxi to their destinations. Surveys also indicate that ferry passengers typically travel along the most direct route to their destinations. As indicated on Figure 16, most use the Market Street corridor and the crosswalks at that location to approach the gates. Almost all of the ferry patrons headed to Golden Gate ferries come through the central passage of the Ferry Building. Most (70%) of those who are going to the Vallejo/Tiburon ferries cross the Embarcadero at Clay Street which directly connects with the access pier to Gate B. Others (20%) cross at Market Street and walk northwards along the Embarcadero promenade to Gate B and typically don't go through the Ferry Building. Only a very small percentage (2%) comes from the north to approach Gate B. The approach to Gate E is more evenly divided. Most (60%) use the Market Street corridor and once they have crossed the Embarcadero proceed

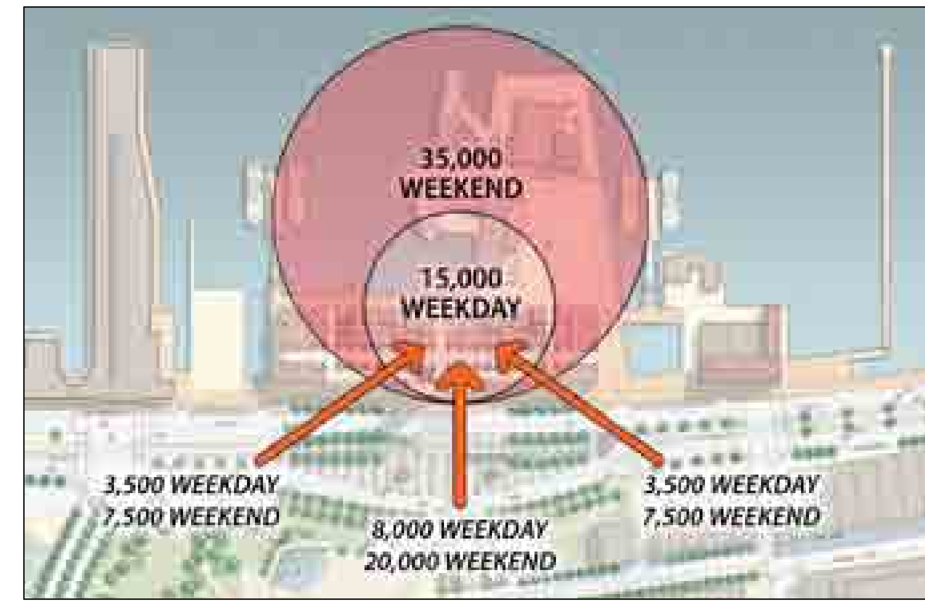


Figure 16: Midday General Public Pedestrian Volumes

Figure 17: Pedestrian Trip Distribution

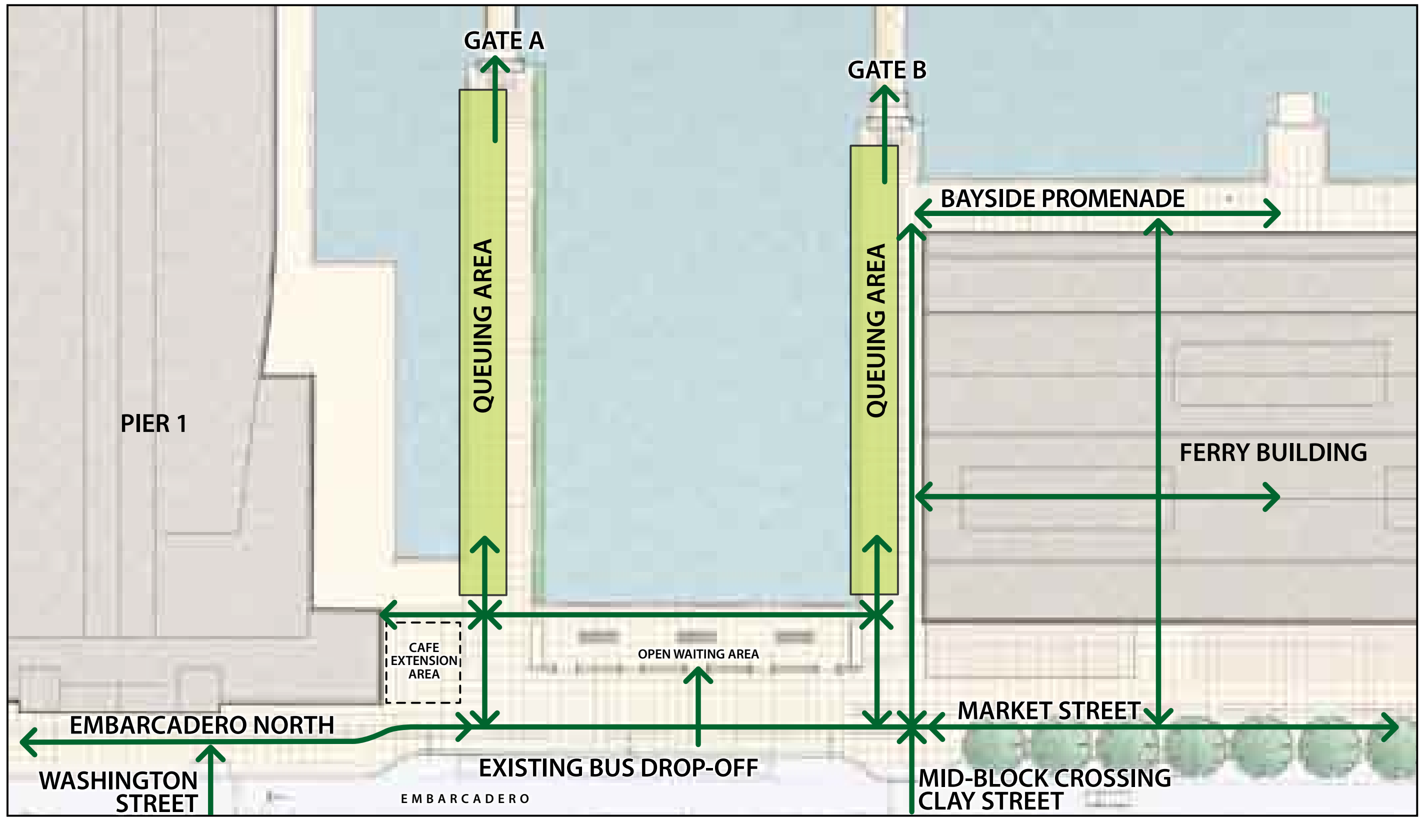


Figure 18: Gates A and B - Queuing, Waiting and Pedestrian Desire Lines

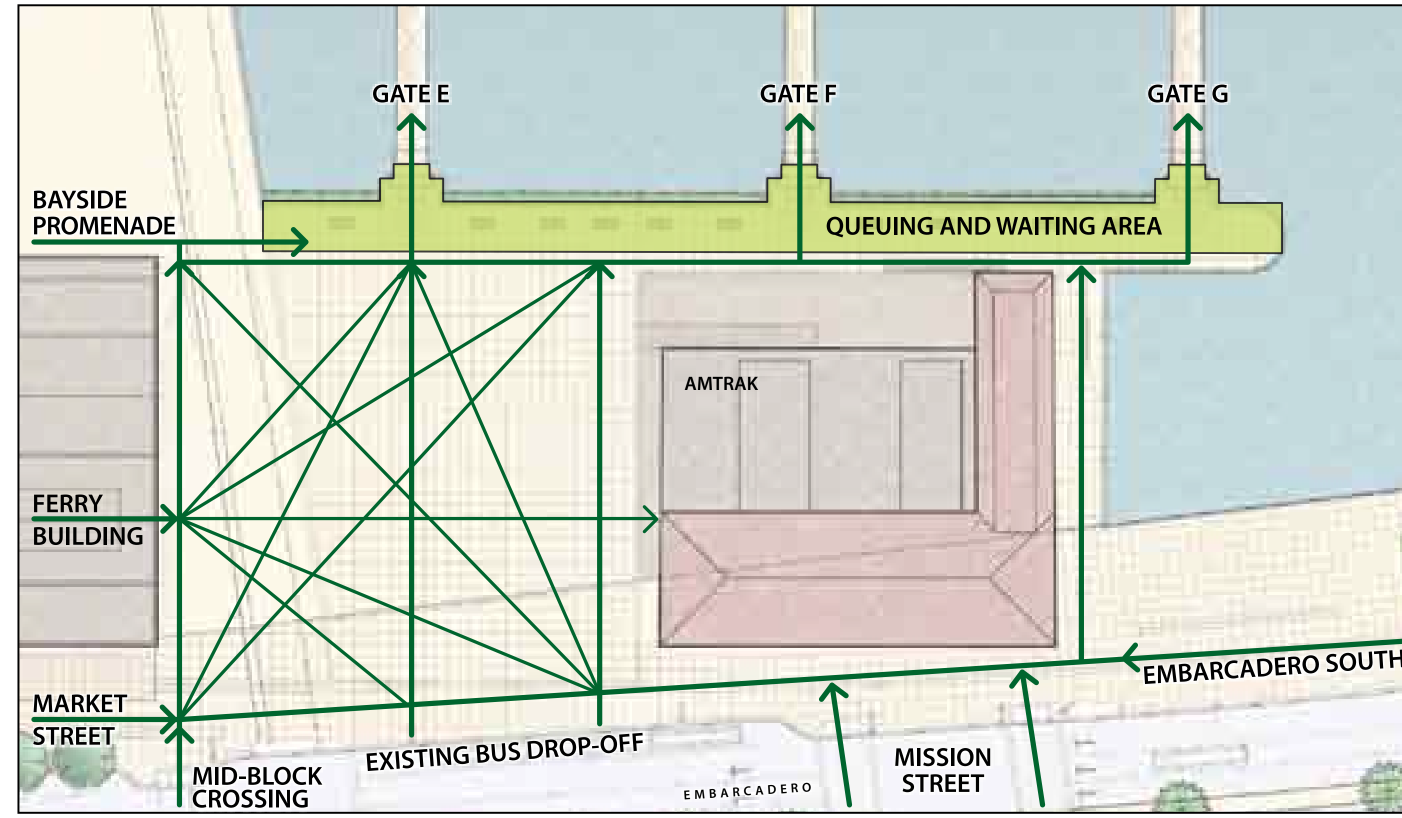


Figure 19: Gates E, F and G - Queuing, Waiting and Pedestrian Desire Lines

southward to Gate E along the southern edge of the Ferry Building and north of the existing lagoon. Others (40%) come from the south and proceed eastward to the gate, also just south of the Ferry Building and north of the lagoon. Very few utilize the apron just north of the Agriculture Building, likely because it appears to be more appropriate for parking and vehicular access than for pedestrians.

The behavior of pedestrians using the ferry system varies greatly from the morning to the afternoon peak period. In the morning peak period, the majority of passengers arrive into the City. As the ferries land, there is a surge of disembarking passengers that move in platoons along the pedestrian access ways within the Ferry Building area and then ultimately cross the Embarcadero to their destinations. During the PM peak period, passengers arrive more gradually and then queue and wait for the arriving vessels. The queuing and waiting is generally located as close to the portal for embarkation as possible and organized in orderly queue lines so that passengers are able to secure a place on the vessel and also to be able to get to a seat or a location of their preference.

Today, arriving ferry passengers disembarking from Gates B and E proceed in platoons of 4 to 8 people to the Embarcadero. The width of the queue to a great degree is dependent upon the space available and walking speed of the passengers. Assuming 4 feet per second for pedestrian movement, it would take approximately one minute for one pedestrian platoon exiting a vessel to traverse the 250 feet of length of pier that connects Gate B to the Embarcadero Promenade. To disembark a fully loaded vessel, multiple platoons of passengers would be required over a relatively short period of time. At the Market Street intersection, passengers form larger platoons of 20 to 25 people to cross the Embarcadero. The crossing is timed to the signal phasing of the intersection. The volume of passengers and the amount of time that they occupy both the access piers to the gates and the promenades and intersections on the Embarcadero is relatively short. A 28-foot wide pier at Gate B and the 30-foot wide access pier proposed at Gate A would adequately provide for the access requirements for disembarking passengers while allowing additional space for general public access and circulation as well.

In the South Basin, however, only a 10-foot wide pedestrian access way located south of the Ferry Building along the edge of the existing lagoon currently provides for passenger circulation to the existing and potential future gates. This narrow access way currently limits movement of ferry passengers to and from Gate E and in the future, it would not be possible to serve the significant increase in passengers that is projected during the peak period for both the existing and future gates. Pedestrians would inadvertently have to use the vehicle roadway to the Ferry Plaza, which would create potential vehicular/pedestrian conflicts. That area is the prime service vehicular access for not only the Ferry Building, but the other uses on the Ferry Plaza. The existing lagoon creates significant circulation bottleneck to gates in the South Basin as passengers tend to come in from both the north and south to access the Ferry Terminal.

This project proposes covering the lagoon to create a pedestrian plaza built as an "essential facility" that would accommodate future circulation needs and enhance public access to the existing and future South Basin gates and for staging for emergency evacuation. A plaza form is ideally suited to handle large pedestrian volumes with diverse multi-directional flows. It is well suited to accommodate the anticipated AM peak period surging and platooning of arriving passengers and the gradual intermittent arrival of passengers who will be departing during the PM peak period. It would best accommodate dual directional passenger flows, with a significant number of passengers both arriving and departing in the inbound and outbound directions at the same time in both the AM and PM peak periods. With the covering of the lagoon to create a plaza, adequate space will be available for the quality of pedestrian movement that allows individuals to select their own comfortable speed of locomotion, to by-pass slow moving pedestrians, to easily accommodate cross and reverse flow movements, and to avoid conflicts with other pedestrians that may have different motivations.

The creation of a plaza area, even with the large number of daily and peak period passenger volumes will allow opportunities for social interaction, when desired, but limit forced friction and unwanted engagement. This is especially important because there will be other pedestrian movements and flows that are related to retail activity, sociability and public access to the Bay in the proposed plaza area. Ultimately, the plaza will also strengthen the activity linkages between the Ferry Building and the Agriculture Building, thus enhancing its potential for future rehabilitation and adaptive reuse, which is an important objective of the Port and the City.

Queuing and Waiting

The Ferry Building area currently functions as a mixed-use activity area that meets not only the requirements of water transit services, but also serves as a major public gathering space in the City. This project will continue to foster a mixed-use approach, providing queuing and waiting areas that can also serve as public access and pedestrian circulation areas. Captured waiting areas, such as those used by Golden Gate Ferry at Gates C and D were not recommended or implemented as part of Phase 1 and are not intended to be utilized for the future ferry terminals being developed for WETA.

During the AM peak period, passengers arrive from the vessels, disembark and move across the Embarcadero to their destinations. In the PM peak period, generally passengers arrive 10 to 15 minutes prior to departure and tend to queue in an orderly, linear fashion to ensure they obtain their desired place aboard the vessel. Maximum passenger capacities on water transit vessels are strictly adhered to pursuant to United States Coast Guard regulations. Once capacity aboard a vessel has been reached, additional passengers will not be allowed to board. A queuing area that accommodates a full passenger load for a departing vessel is desired in close proximity to each gate and of a size adequate to meet a full boatload queue. It is important to note, however, that due to peak directional travel patterns, the queuing period for commuter vessels is only 2-1/2 hours in the late afternoon. For all other times, queuing areas can also function for general public access and pedestrian circulation as well.

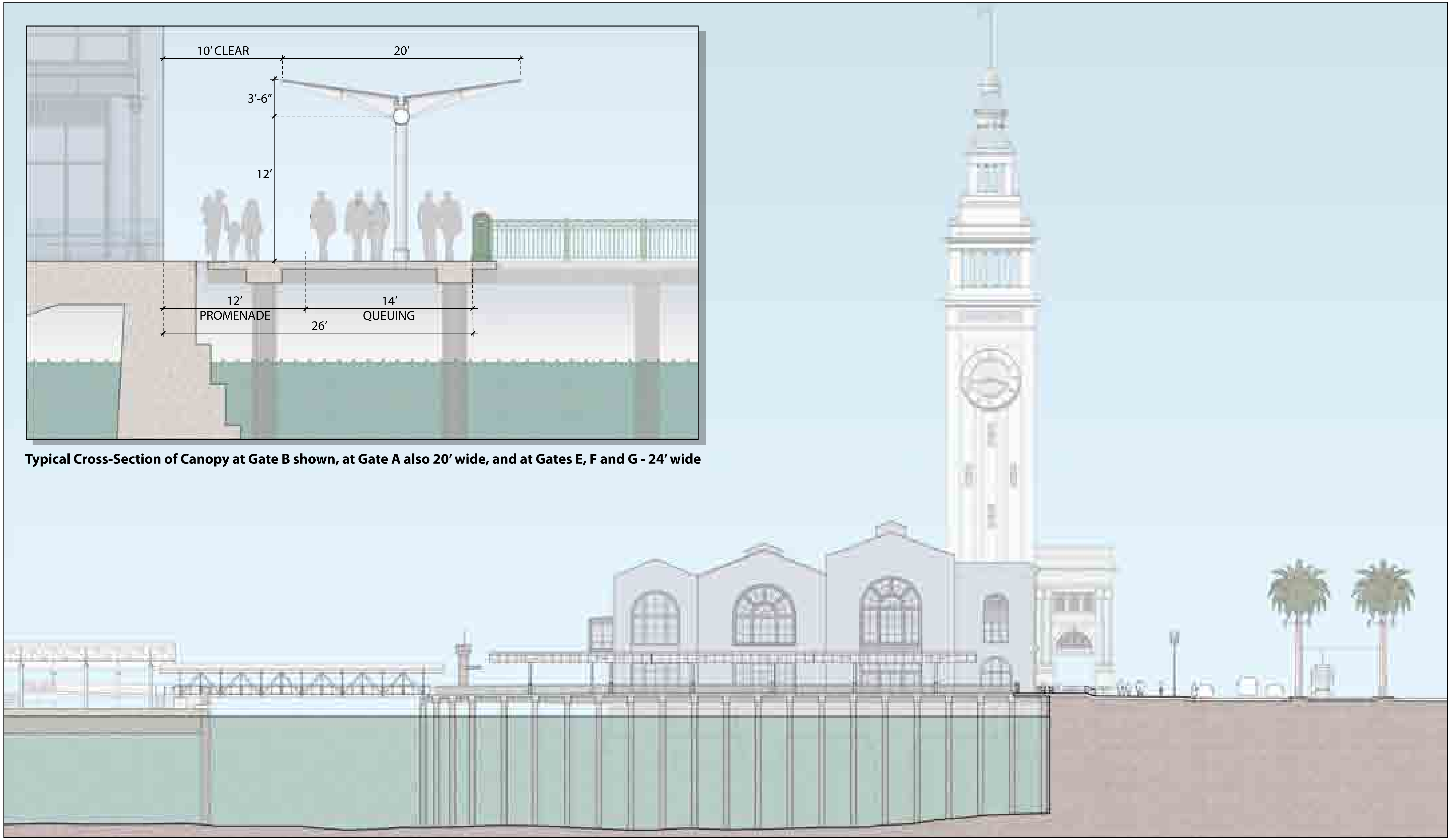
As ridership increases and other uses in the area intensify over time, it will become increasingly important to create a clear demarcation of where queuing areas are and how they can be organized to most efficiently meet queuing requirements without obstructing general public access and pedestrian circulation areas. Although canopies were proposed in Phase 1, they were not built due to budget limitations since covered waiting areas are currently not available. In addition, although the Coast Guard did not want queuing taking place on the gangway, they are now allowing it on an interim basis. In the future, the project proposes to provide a canopy structure near each gate (see Figure 20). These will create an organizational structure for queuing and waiting and will allow for passengers to more efficiently queue into multiple lines as commonly found in airports and other transportation terminals and to provide protection from inclement weather. Signage on the canopy structure can also indicate the sequence of passenger queuing and identify where passengers with bicycles and/or passengers who need special assistance in boarding should queue. Furthermore, canopy structures will provide organized locations for audio-visual and real time information related to vessel arrivals, departures, service notifications and other necessary passenger information.

In addition to the queue lines under the canopies, waiting areas will be provided in close proximity to each gate where passengers who arrive early can stand or sit prior to queuing. The need for additional waiting space is more closely associated with weekend or visitor travel than it is with commuter travel, as commuter passengers tend to arrive close to the scheduled ferry arrivals, minimizing the need for waiting areas during peak weekday periods. The peak demand for weekend events in the Ferry Building area far exceeds the daily requirements associated with the ferry terminal and currently there is more than adequate open space areas for passengers to mill around, sit and wait prior to getting into a queue for boarding a vessel. Passengers have many opportunities within the Ferry Building area to wait and pass their time shopping. While the need for additional waiting areas may be minimal, benches should be provided in close proximity to the gates for passengers that wish to wait close to the terminals prior to getting into a queue for boarding.

In calculating the space needs for queuing, it is assumed that an individual occupies an elliptical space that is approximately 24 inches wide and 18 inches deep. Studies have shown that bus commuters standing in line, whether to purchase tickets or to wait for a bus, require approximately 19 to 20 inches for inter-person spacing. Based on this data, it is assumed that each individual requires approximately 7 to 10 square feet to queue, while passengers with a bicycle require a somewhat larger space, approximately 15 to 20 square feet. There is an average of 20-25 bicycle storage areas on a typical 299-passenger vessel. Assuming that up to 25 passengers board a vessel with a bicycle at 20 square feet per bicyclist and 10 square feet/person for the remaining 274 passengers, a queuing area of approximately 3,500 square feet is required.

In the North Basin, the new Gate A access pier will need to accommodate a queuing area of approximately 3,500 square feet with overhead weather protection. At Gate B, a canopy structure is required along the bayside of the existing access pier (see Figure 18). The existing Gate B pier is approximately 28 feet wide. The queuing requirements of Gate B can be accommodated efficiently in multiple lines in approximately 14 feet, leaving an additional 14 feet for general public access and circulation. Currently, because a multiple line queuing structure is not provided at Gate B, the queuing tends to be thinner and longer and often wraps around to the Embarcadero Promenade, making general public access more difficult.

The queuing areas for Gates E, F and G in the South Basin (see Figure 19) will extend along the edge of the new East Bayside Promenade, providing a canopied queuing area of approximately 10,500 square feet. This area will provide an adequate space for queuing passengers at the three gates. In the South Basin, it is anticipated that the volume of passengers arriving and departing at the same time will be greater. It is also anticipated that the circulation requirements for the ferry passengers and for the general public will come from multiple destinations and more cross-traffic is anticipated. Therefore, in addition to the queuing area, a plaza-like space between the Ferry Building and Agriculture Building will most appropriately provide not only for the circulation requirements but for the waiting areas, with many options for standing, sitting, socializing and shopping while waiting for a ferry to arrive.



Typical Cross-Section of Canopy at Gate B shown, at Gate A also 20' wide, and at Gates E, F and G - 24' wide

Figure 20: Gate B Queuing Area Canopy Design Concept for Organization, Signage and Weather Protection

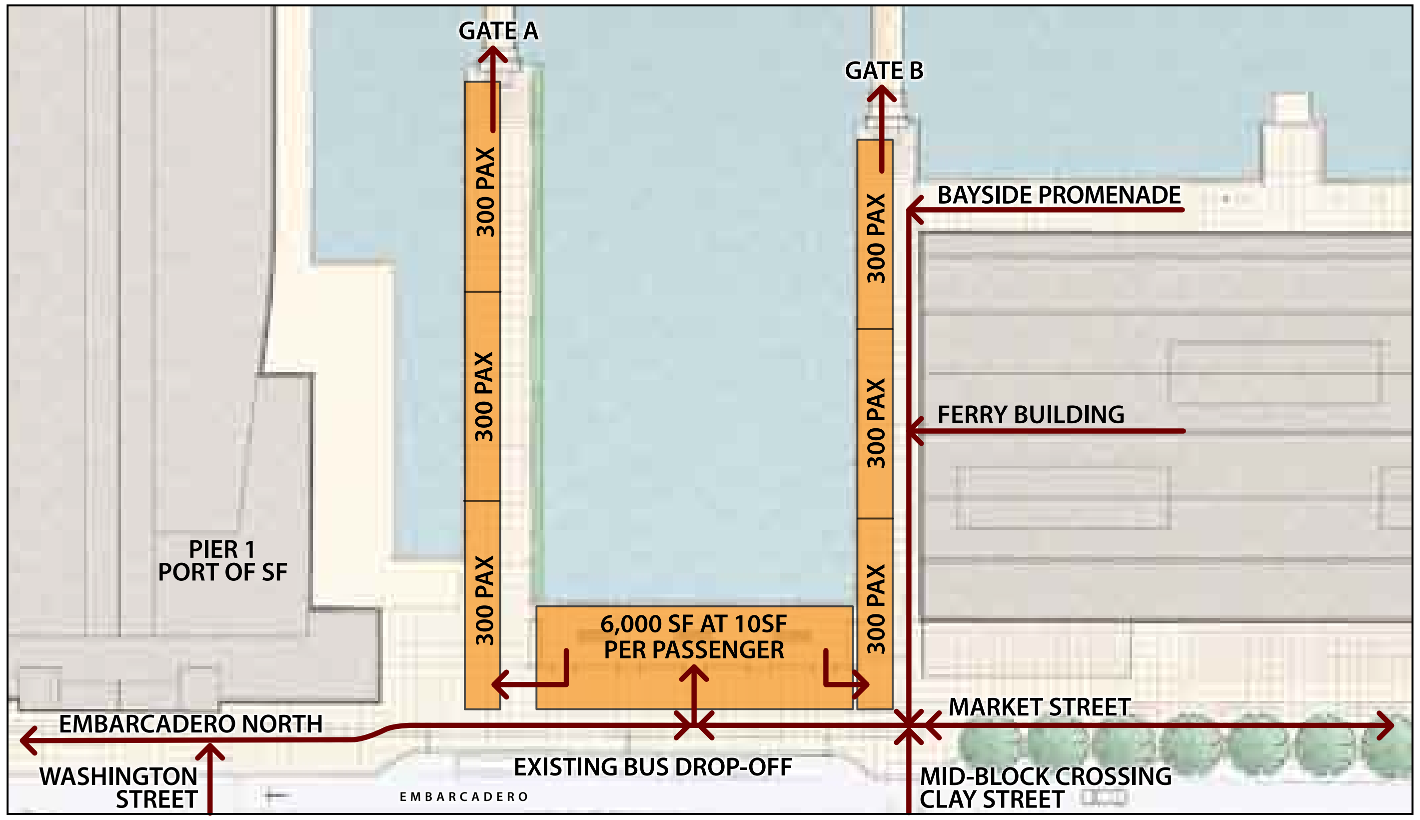


Figure 21: North Basin - Queuing, Waiting & Emergency Evacuation

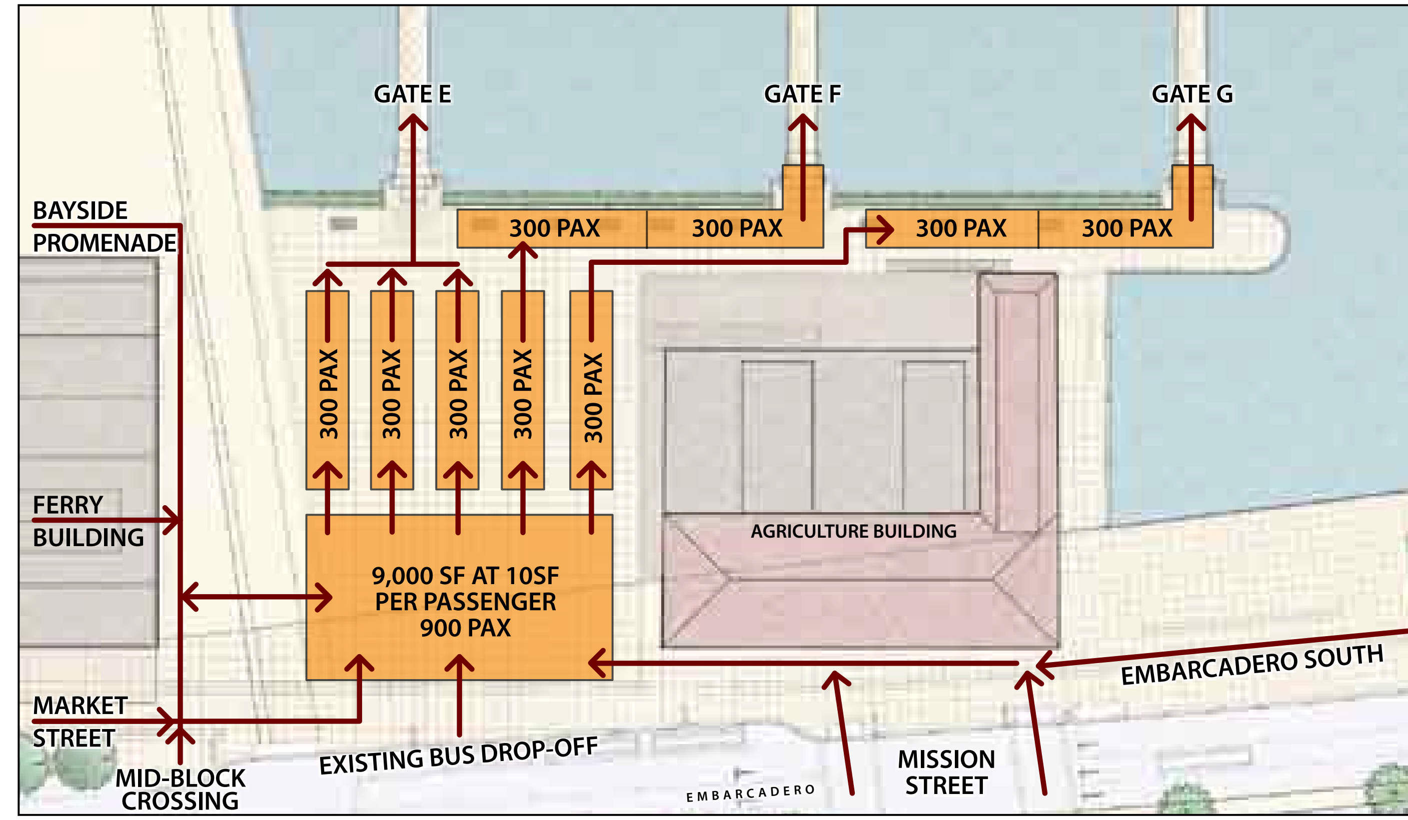


Figure 22: South Basin- Queuing, Waiting & Emergency Evacuation

Emergency Response

In addition to the queuing and waiting areas needed to support daily commuter service, adequate landside areas must be provided in order to meet WETA's emergency operation needs. Landside needs for emergency operations were developed based on the evacuation capacity of the WETA fleet operating in an emergency response situation, which was determined based on the number of anticipated fleet vessels available, vessel passenger capacities and destinations which affect travel time.

Assuming that 299-passenger vessels are available and that up to six vessels per hour can disembark from each of the gates in the event of an emergency, the total emergency evacuation capacity of each new gate was calculated. In the North Basin, Gates A and B would have a total emergency evacuation capacity of up to 3,600 passengers/hour. In the South Basin, Gates E, F and G would have a total emergency evacuation capacity of up to 5,400 passengers/hour. In total, at build-out of the Downtown San Francisco Ferry Terminal, up to 9,000 passengers/hour could be evacuated from San Francisco assuming full availability and utilization of the Port and WETA facilities in the Ferry Building area. Additional evacuation capacity could be provided by Golden Gate Ferry, which would likely utilize its captured waiting areas at Gates C and D, in addition to landside space on the Ferry Plaza, to meet their emergency operation needs.

In determining the landside requirements for emergency evacuation, it is important to note that the amount of space available is only one factor to consider. Crowd management is an additional factor that is essential not only to evacuate passengers in an organized, orderly and efficient manner, but also to prevent crowds from panicking and thus creating potentially dangerous situations. The confidence and sense of security of a large crowd is closely tied to the amount of real time information and communication that is provided. Staff would be required to help organize queues, inform passengers and generally provide a sense of safety and security. In calculating the space required for waiting and/or queuing, additional passenger space will be needed for movement and crowd control which would need to be demarcated in some fashion, such as with stanchions and retractable belts. Predetermined holes for stanchions are not recommended, because they don't provide the flexibility that is needed in case of an emergency and

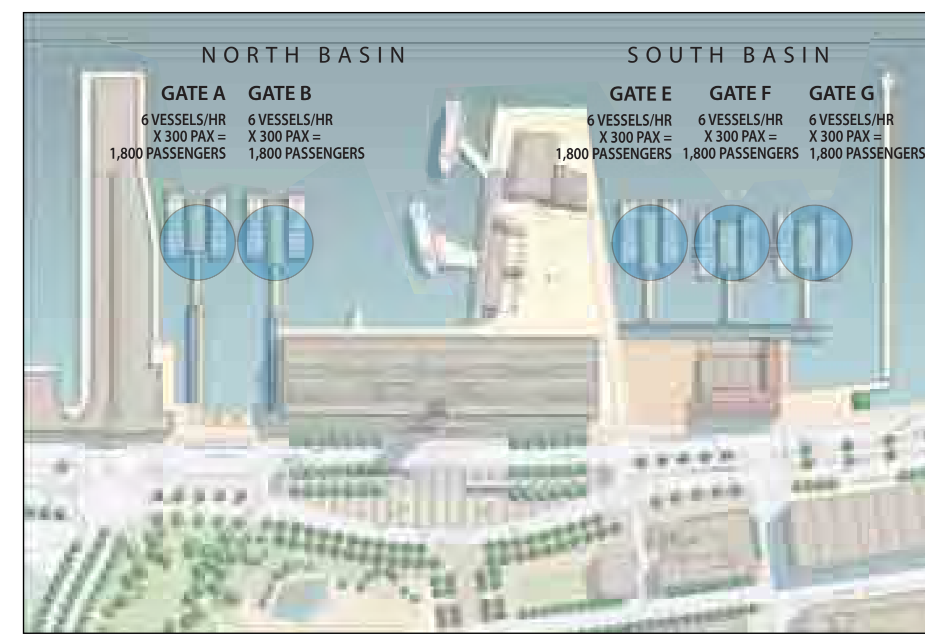


Figure 23: Emergency Evacuation Berthing Capacity

it is difficult to address the tripping hazard and water retention that a hole in the pavement would create.

During emergency operations, queuing space could be reduced to as little as 5 square feet per passenger, as opposed to 10 square feet required during regular commute periods. This would create an occupancy level similar to that of a queue at a busy escalator or stairway, which allows adequate space for standing without touching others, but with little ability to move freely. Any occupancy level offering less than 5 square feet per passenger would involve involuntary touching and create an uncomfortable and potentially dangerous situations for queuing passengers.

Waiting space in an emergency condition might be reduced to as little as 10 square feet per passenger depending on the length of time that passengers must wait until they can get into a queue and onto a vessel. At 10 square feet per passenger, it is assumed that most everyone would be standing and movement would be on an "excuse me" basis. In calculating areas and in applying them for emergency queuing and waiting, it is important to note that the movement of the crowd has temporal and dynamic characteristics. That is, passengers will be arriving, waiting, queuing, boarding and departing in cycles as vessels arrive and as passengers flow into the area.

Landside requirements for queuing and waiting areas during emergency operations have been evaluated for both the North Basin (Gates A and B) and South Basin (Gates E, F and G) based on total passenger/hour emergency evacuation capacities and a 5-square-foot per passenger queuing area requirement. For emergency operations in the North Basin area, approximately 1,000 passengers could be queued at each of the two gates with a maximum wait time of 30 minutes. This would be equivalent to approximately three boatloads of passengers at each gate. In addition, approximately 450 passengers or 1-1/2 additional boatloads could be accommodated in a 4,500 square foot waiting area between Gates A and B, assuming 10 square feet per passenger. It is assumed that these passengers in the waiting area would be directed into the queues as vessels are boarded, at which point additional passengers from the Embarcadero, adjacent promenades, the Ferry Building, or other nearby areas would take their place in the waiting area. Figure 21 illustrates the queuing and waiting space arrangement that could be organized for emergency evacuation in the North Basin area.

For emergency operations in the South Basin, as in the North Basin, 5 square feet/passenger for queuing areas and 10 square feet/passenger for waiting areas are assumed for planning purposes. This assumption, as in the north, also assumes that crowd management personnel are available to assist in directing and organizing the staging and flow of passengers from waiting areas to queuing areas and to the vessels. It assumes that movement space is accounted for separately between the ferry queues and the waiting areas. Figure 22 illustrates how approximately 1,000 passengers could be queued at each of the three gates with a maximum wait time of 30 minutes. This would be equivalent to nine boatloads of passenger along the entire South Basin or a boatload of passengers at each gate. Approximately 900 additional passengers could be accommodated in a 9,000 square foot waiting area between the Ferry Building and Agriculture Building. It is assumed that these passengers in the waiting area would be directed into the queues as vessels are boarded, at which point additional passengers from other nearby areas would take their place in the waiting area. In addition to queuing and waiting space for emergency response, storage space will also be required for temporary barriers, stanchion equipment and signage utilized for emergency operations, or other peak capacity special events, seasonal or holiday travel extremes, etc.

Vehicular Circulation

The Ferry Building area has evolved from an auto-oriented to a pedestrian-oriented environment and continues to do so. Within the Ferry Building area, the use of the pile supported deck structures for vehicular movement and parking has significantly declined over time. Pier ½ has been red-tagged and is no longer used for parking. Pier 2 and the apron area north of the Agriculture Building are currently used for vehicular access and parking but they are required to be eliminated by BCDC. Pier 1 utilizes the drop-off area along the Embarcadero directly to the south for service access. The Agriculture Building currently utilizes the Pier 2 apron area for service access, but will likely utilize the curbside area directly adjacent to the building in the future for service access, once area improvements are made.

The pile and deck-supported areas that continue to support vehicular access within their long-term leaseholds include the Ferry Building (EOP), the CUESA Farmer's Market and FPLP. During the weekday, the Ferry Building has service delivery truck and van access requirements. On Saturdays, CUESA utilizes trucks as part of the farmer's market and parks trucks on the bayside of the BART Transition Structure. FPLP has valet drop-off requirements. In addition, Golden Gate and BART have emergency vehicular access and service requirements that occur on an occasional basis. All of these requirements are accommodated on the Ferry Plaza, which is accessed from the Embarcadero along a driveway on the south side of the Ferry Building. For the Project, neither Gates A and B in the North Basin nor Gates E, F and G in the South Basin will require additional vehicular access above and beyond what normally would be required for occasional service, maintenance and emergency response.

The Ferry Plaza is currently used for service delivery supporting the Ferry Building and other tenants.

Bicycle Circulation

The potential of creating a more sustainable environment in San Francisco, interest in a healthier lifestyle, and the efforts of bicycle activists, have brought to the forefront a vision of a bicycle interconnected City, which is being taken seriously and priorities and methods of implementation are being pursued. Two of the most prominent elements of the vision of interconnected bicycle ways are on Market Street and the Embarcadero and current efforts are underway to realize them.

Bicycles have not historically been a significant component of ferry ridership. This is particularly true for the commuter routes, where, as previously mentioned, the vast majority of ferry passengers walk to their destinations. For recreational trips, there generally appears to be a somewhat greater number of bicycle passengers. For example, the recreational use of rental bicycles is promoted with ferry service on the Golden Gate Sausalito route, which results in larger volumes of passengers with bicycles on weekends and during the holiday or vacation season.

Whether for work or recreation, bicycle use has, according to the SFMTA, grown by 71% in San Francisco over the past five years and is anticipated to continue to grow in the future, particularly as safe and convenient bicycle circulation systems are established. If bicycle-friendly circulation systems grow and develop at the origin and destination cities of a ferry route, then the market opportunity for increasing ferry ridership will be significantly enhanced. Most ferry riders that use bicycles today, bring them on the ferry from home and take them to their destination. Therefore ,bicycle parking related to ferry ridership is not a requirement, however it is needed for public access purposes and for the commercial recreational uses in the Ferry Building area. Recently, an innovative program of bicycle valet parking was implemented by the San Francisco Bicycle Coalition to encourage bicycle use and to provide bicycle parking for the CUESA Farmer's Market. In terms of ferry ridership and bicycle use, one of the greatest future potentials may be the use of a rental bicycle program that allows a bicycle to be picked up and dropped off at multiple points in the City. This kind of system has been implemented in many cities around the world and more recently in the United States and an initial pilot program is to be implemented in San Francisco this year.

Bicycle movement is increasing within the City of San Francisco

Bicyclists within the project, whether connecting to the ferry system or destined to other activities in the Ferry Building area, are expected to dismount and walk their bicycles to their destination. Pedestrians and bicyclists need to share the crosswalks, plazas, promenades and other public access ways within the project area. In order to avoid bicycle/pedestrian conflicts, enforcement and a culture of mutual respect needs to be fostered.

Intermodal Transfer

The Ferry Building area is within a 10 to 15 minute walking distance of one of the greatest concentrations of transit service in the United States. It is located at the terminus of Market Street, the main east/west spine that interconnects the City with a multi-layered transit corridor providing regional, citywide and local transit service. Within a quarter mile walking distance are 20 transit stops serving 13 bus routes, 6 light rail lines, a cable car line, a streetcar line and BART. These services are primarily located on the inland side of the Embarcadero, where they can more centrally serve downtown employees and residents. Ferry passengers generally walk across the Embarcadero to get to transit or taxis. Ferry passengers can readily take advantage of extending the reach of ferry accessibility by taking one of the modes that are available within walking distance.

In the future, there may also be the opportunity for private transit shuttles timed to ferry schedules to pick up and drop off passengers and take them to and from specific employment destinations. The implementation of private transit shuttles related to ferry service has had significant success in other cities, such as New York. Within the Bay Area, private shuttles have been used by Genentech, Google and Facebook. Currently, in the North Basin, there is a drop-off area between the proposed Gate A and the existing Gate B which is used for service access to Pier 1 and, on occasion, by the Vallejo buses. In the South Basin, there is a drop-off area located between the driveway entrance to the Ferry Plaza and the Mission Street crosswalk. This drop-off area is utilized by the Amtrak buses, and may in the future serve the service needs of the Agriculture Building. Both of these drop-off areas are each approximately 180 feet in length and could accommodate three full-size buses. While there are no plans to implement or accommodate additional shuttle service as part of this Project, if these areas are to be used in the future by the employer shuttles in the AM and PM peak periods, time management of the limited curb space would be required.

A wayfinding system was recently designed for this area which can be extended and augmented as necessary.

Overview of the existing Downtown Ferry Terminal.

8. THE IMPROVEMENT PROGRAM FOR FERRY TERMINAL EXPANSION

In order to meet both the landside and waterside requirements for ferry service, existing structures need to be demolished and removed, dredging needs to be undertaken, new deck and pile construction must be built and berthing facilities, utilities, furnishings, fixtures and equipment must be installed. This chapter describes each of these required improvements.

Demolition

To accommodate the new gates, demolition of deck and pile construction will be required. In the North Basin, the demolition and removal of Pier ½ and the trestle structure associated with it and the guide and cluster piles of a former ferry terminal will be required to make way for the construction of Gate A and the North Basin landside improvements. Approximately 24,000 square feet of deck construction, 310 wood and concrete piles and 35 guide and cluster piles would be demolished. In the South Basin, the demolition of Pier 2 and the associated vehicular access apron will be required for the construction of the new Gates F and G and the South Basin landside improvements. The demolition includes a 6,000 square foot one-story building (Sinbads), 20,500 square feet of deck construction and approximately 350 wood and concrete piles. A more specific description of the location of the demolition requirements is shown on Figure 24.

Dredging

Dredging will be required to ensure adequate depths for service operations on the three new gates. Existing water depths are based on the most recent survey data for the ferry terminal basins prepared in April 2008 by eTrac Engineering for the Port. This data generally indicates existing depths ranging between 8 and 10 feet below mean lower low water (MLLW) at Gates F and G and between 7 and 10 feet below MLLW at Gate A. Side loading vessels are assumed to require a navigable depth of 10 feet, while concrete floats require a depth of 12 feet below MLLW. Based on these requirements plus two additional feet for overdredging, which is industry practice, dredge quantities were developed. As shown in Figure 25, approximately 9,000 cubic yards of dredge material would need to be removed in the North Basin and in the South Basin, approximately 9,500 to 11,000 cubic yards of dredge material would need to be removed for Gate F, and approximately 11,000 to 13,000 cubic yards for Gate G. At both Gates B and E, where vessels currently berth, no additional dredging will be required.

In addition to the dredging analysis, an analysis of sedimentation and scour potential was undertaken by Moffatt & Nichol in September 2011. The preliminary analysis did not provide any indication that the berthing arrangement or the potential design of the ferry terminal facilities would need to be reconsidered. The analysis concluded that although some minor maintenance dredging would likely be required under the floats, there was little evidence that the berths and approach areas would need dredging over time. In terms of scouring, the conclusion reached was that any scouring in the new berths would be comparable to what is found in the existing berths.

Berthing Facilities

It is assumed that the concrete float and steel truss gangway that is being built for the South San Francisco Ferry Terminal, with minor refinements, will become the standard for the WETA Ferry Terminal. The facility would include a 45-feet-wide by 115-feet-long concrete float and a 92-foot long steel truss gangway that is approximately 12 to 14 feet wide with 10 feet clear for passenger movement. The length of the gangway is determined by the maximum slope requirements for ADA accessibility within the design tidal range, which is utilized for this type of marine structure. Six steel guide piles, 42 inches in diameter, approximately 140 to 150 feet long, embedded into the sand layer and extending 18 feet MLLW will be required to hold the float in place.

In addition, 4 to 6 dolphins may be needed at each terminal to protect against the collision of vessels with the float or adjacent vessels or structures. In total for both basins, it is estimated that up to 24 dolphins may be needed. It is assumed that the dolphins will be constructed in a similar manner to those that are currently being built and installed at the South San Francisco Ferry Terminal. Each of the dolphins will include a donut-shaped, impact-resistant foam structure which will rise and fall with the tides and is placed over a 36-inch by 145 to 155-foot long pile. The dolphin piles need to extend 20 to 25 feet above MLLW.

In addition to the use of dolphins for protection of adjacent structures, "chock block" fendering may be required along the edge of existing or future pile supported structures to prevent damage to the pier structure and/or to the passenger cabin on a vessel, if the vessel were to run into and under the edge of the pier. In Phase 1, the Port implemented this approach along the southern edge of the BART platform. The "chock block" fendering is comprised of large 12 inch square pressure treated wood blocks which are run continuously along the edge of the pier structure and are connected to the side of the pier, with stainless steel threaded rods. In addition, the wood blocks are tied together with 14-inch round wood piles that are 64 feet long and placed 10 feet on center. It is anticipated that this type of fendering will be needed along the edge of the East Bayside Promenade that extends southward from the BART platform adjacent to Gates E, F and G. It may also need to be added along the edge of Pier 1 to replace the existing fendering if, upon further investigation, it is determined to be inadequate. It is estimated that a maximum of 330 linear feet of "chock block" fendering with 33 14-inch diameter by 64-foot long wood piles along the edge of the East Bayside Promenade and along the edge of Pier 1 would be provided.

Deck and Pile Construction

In order to meet the landside requirements for the Ferry Terminal, new deck and pile structures built to "essential facility" standards are required. Some adjacent existing structures will need to be strengthened and repaired. The components of deck and pile construction for the North and South Basins are described as follows:

North Basin

Gate A Access Pier. In the North Basin, a 30-foot wide, 265-foot long and approximately 8,000 square foot pier will be constructed as an "essential facility" to provide access to the berthing facilities at Gate A. It is estimated that this pier will be supported by 40 piles. The pier will extend to the seawall but will not be supported by it. Seismic joints will be required between the pier and the seawall and between the pier and the adjacent marginal wharf to the north and south. The pier would be built to conform to the existing promenade grade which is approximately 10 MLLW and then would gradually rise bayward to 13 to 13.5 MLLW where the gangway of the new berthing facility at Gate A will connect to the pier. It is assumed that the pier will slope at no more than 2% southward for drainage in compliance with ADA requirements.

Marginal Wharf. In addition to the pier, approximately 2,550 square feet of the existing marginal wharf will be strengthened and repaired in a similar manner that was undertaken by the Port recently on the area directly to the south. This area is supported on one edge on the seawall and includes approximately 12 concrete piles. The work would include the strengthening of the piles, where needed, and the construction of a new deck structure, comprised of beams and flat slab areas with a topping slab. It is assumed that this structure would be elevated approximately 18 inches above the adjacent grade to match the level of the newly reconstructed portion. The landside edge facing the promenade would include steps and wall sections built in a similar pattern and manner to the Port's section to the south. On the waterside edge of the marginal wharf, a flush entry would be provided to the adjacent structure to allow for ADA accessibility. A seat wall will be utilized to resolve the transition in grade in a similar manner to what was implemented in Phase 1 between the public access way to Gate B and the Port reconstructed portion of the marginal wharf.

South Basin

East Bayside Promenade. The East Bayside Promenade will be built to match the bayward extension of the promenade built in Phase 1 adjacent to the Ferry Building north of the Ferry Plaza. The promenade will be approximately 13,850 square feet, including a 1,250 square foot portion of the Gate E public access improvements built in Phase 1 to "essential facility" standards. The new promenade will be built to these standards to provide an approximately 30-foot wide pedestrian accessway to Gates E, F and G. It is estimated that the East Bayside Promenade would be supported by 110 piles.

Embarcadero Plaza. The Embarcadero Plaza adjoins the East Bayside Promenade and extends westward to the promenade along the Embarcadero from the BART platform to within 11 feet of the Agriculture Building on the south. The southern edge of the plaza is defined by the breakpoint between the concrete pile construction that is part of the Agriculture Building and the wood pile construction of the apron to the north which currently serves as the vehicular accessway to Pier 2. The plaza will be created in part by the covering of the lagoon east of the seawall and

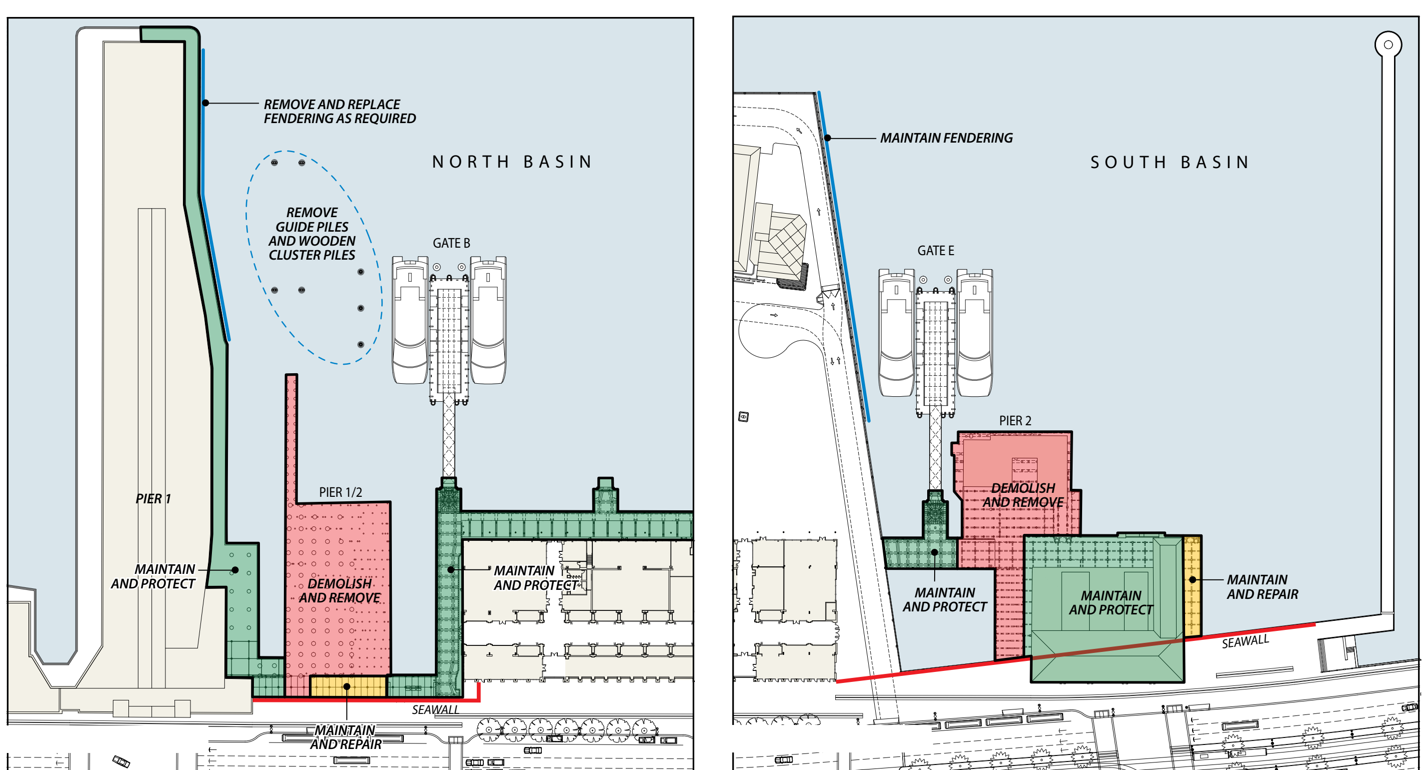


Figure 24: Demolition - North and South Basins

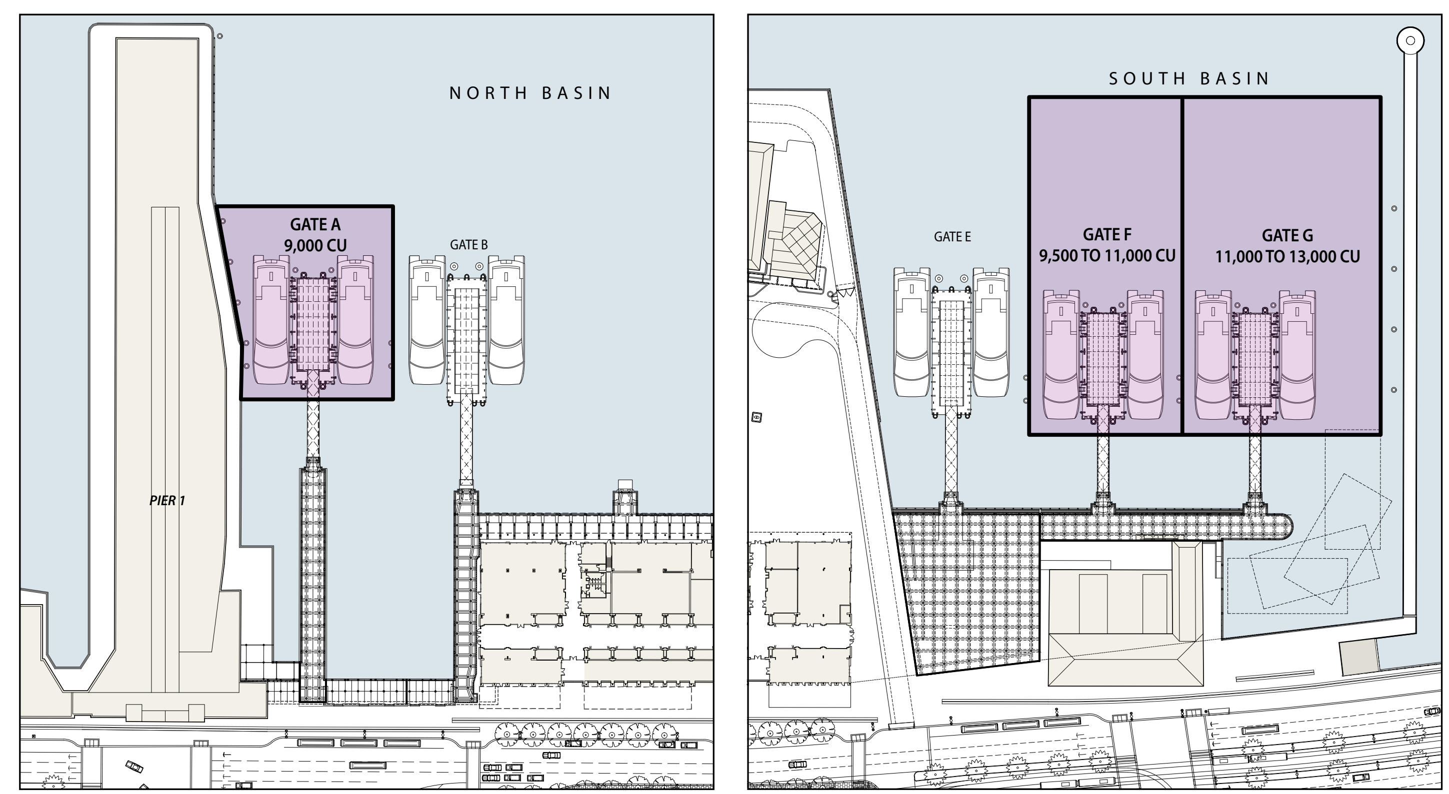


Figure 25: Potential Dredging Footprint Phase 2 - North and South Basins

the replacement of a portion of the apron area north of the Agriculture Building. It will include approximately 17,000 square feet of new deck and pile construction built to essential facility standards which will be integrated with the existing 3,000 square feet of Gate E access improvements built in Phase 1. It is estimated that 100 piles will be needed to support the new over water deck construction. Due to the need to integrate fully the Phase 1 improvements, the topping slab of the Phase 1 area will be removed and replaced in an integral manner with the construction of the new paving for the plaza. The new paving will be extended to include the East Bayside Promenade and to an approximately 4,500 square feet area west of the seawall to create a unified appearance and a cohesive functional identity for all of the landside improvements in the South Basin area.

South Access Apron. The existing 20-foot wide, 2,400 square foot apron along the southern edge of the Agriculture Building, which is in fair condition according to the Port, will be upgraded and converted from vehicular access and parking to pedestrian access on an interim basis until the Agriculture Building is renovated. The improvements to the south apron include limited upgrade of the paving, the addition of steps and an ADA access ramp to connect to the new East Bayside Promenade, which will be built at a higher elevation and the addition of a code-compliant guardrail.

Furnishings, Fixtures and Equipment

A number of elements need to be located on the new deck and pile construction and on the strengthened and repaired marginal wharf and south access apron to provide for ferry terminal operations, passenger safety, comfort and convenience and general public access purposes. The elements include portal structures, guardrails, canopies for queuing and waiting areas, lighting, Clipper card readers, add-fare machines, benches, trash receptacles, wayfinding and real time signage, audio-visual and other communication systems. All of the furnishings, fixtures and equipment required for the ferry terminals are assumed to be supported by the new pier structures or the repaired and improved existing structures that are part of the Project. To the greatest extent, they will be surface mounted, either on top, below or on the side of the structures, and will require only minor additional reinforcing, if any.

The existing portals at Gates B and E will be retained and three new portals will be built for Gates A, F and G. The new portals will match the design of the existing portals which utilize a steel frame structure that is clad in granite and stainless steel to create a distinctive entry to the berthing facilities and provide for access control. Guardrails will be provided along the edge of the Bay, of a design similar to those that were implemented as part of the Phase 1 Ferry Terminal and Ferry Building improvements. In the North Basin, it is estimated that approximately 450 linear feet of guardrail will be required at the new Gate A access pier and 85 linear feet of guardrail will be required adjacent to the marginal wharf improvements. In the South Basin, it is estimated that 550 linear feet of guardrail will be required along the edges of the East Bayside Promenade and 109 linear feet of guardrail will be required for the southern access apron.

Steel and glass canopy structures are to be constructed for queuing and waiting passengers at all of the existing and new gates. A canopy that is 4,000 square feet in size (20 feet wide by 200 feet long) will be built on the new Gate A access pier and the existing Gate B access pier. In the South Basin, a 10,100 square foot canopy that is 24 feet wide and 420 feet long will be built at Gates E, F and G. The canopies will be glazed and will incorporate photovoltaic cells and audiovisual information systems and lighting. It is desirable to incorporate a bird deterrent system and an automatic washing system to facilitate maintenance. Recent innovations related to high frequency bird deterrent systems should be explored for incorporation into the canopy design.

Utility Requirements

The main runs of the utility extensions for the berthing facilities will be placed in conduits below the pier structures so that they are more readily accessible for maintenance purposes; however, some of the power and communication conduits may also be located in the topping slab. A final determination of how the utility extensions will be provided should be undertaken as part of the Final Design of the Project.

Based on prior experience, it is assumed that each new gate (Gates A, F and G) from the portal to the gangway and float, would need 100 to 115 KW of 480V, 3-phase power. Conduits for communication, a 2-inch potable water service for wash-down and a 6-inch dry standpipe for fire protection will be required for each of the new gates, assuming that neither the float nor the gangway will need to be sprinklered; that neither sewage

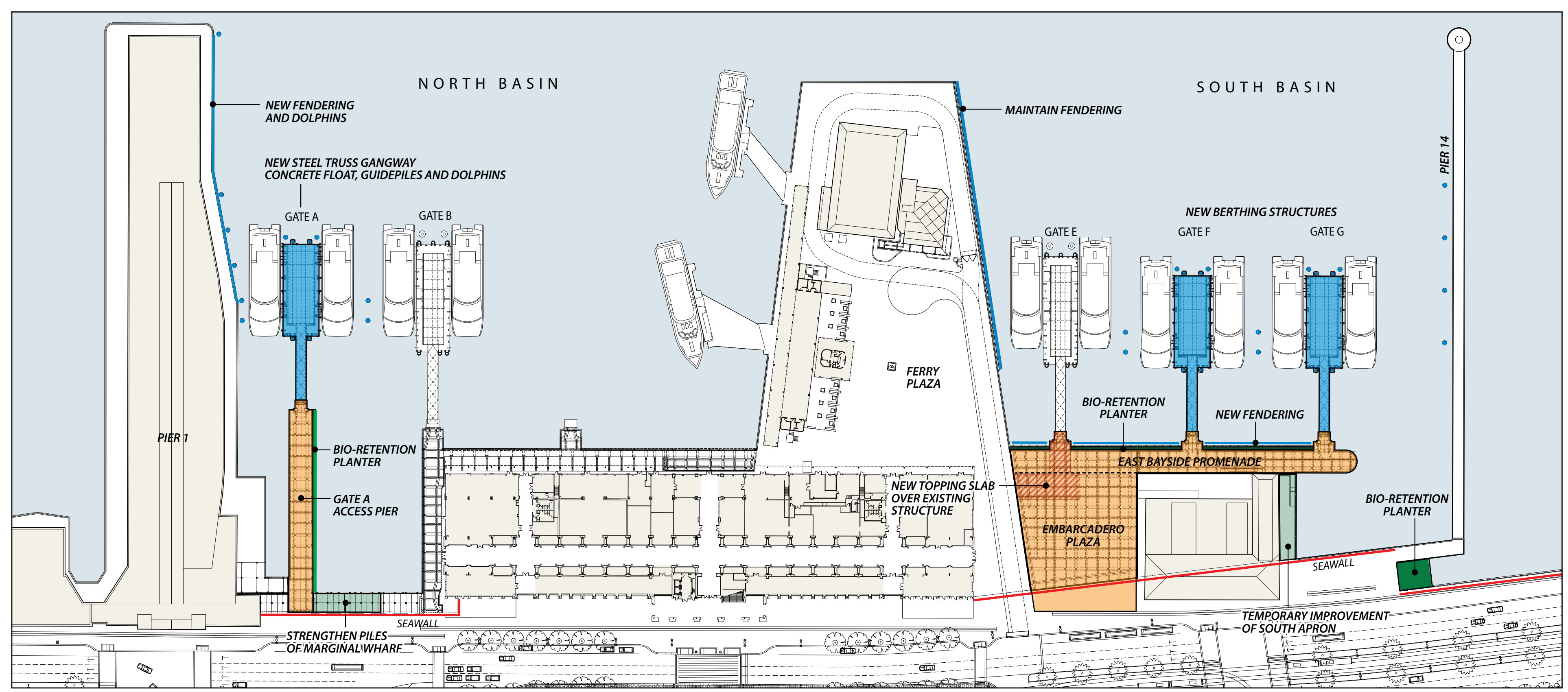


Figure 26: New Construction

pump-out nor fueling for the vessels will be required, and that shore power for vessels will not be provided, except at Gate G which is anticipated to be used as a potential layover berth. Emergency power will need to be provided to all of the ferry facilities. It is anticipated that an emergency generator to serve both Port and WETA will be needed and a suitable centralized location will be determined in conjunction with the Port.

For the public access areas that provide for pedestrian circulation, queuing and waiting, it is assumed that 1-1/2 foot candles of illumination will be adequate, particularly in consideration of the ambient light that is already available in the area. For the public access areas, potable water service and hose bibs for wash-down will be needed. Additional fire hydrants or dry standpipes are assumed to be unnecessary, however this needs to be confirmed with the Port's Fire Marshall.

It is WETA's intention to design a zero net energy project. Photovoltaic cells will be incorporated into all of the canopies provided in conjunction with the queuing and waiting areas at each of the gates. The electric consumption of the project is estimated at approximately 140,000 annual Kilowatt hours. This electric demand can be offset by the estimated 200,000 annual Kilowatt hours which could be generated by the photovoltaic cells. The energy demand and energy generating requirements are summarized on Tables 7 and 8.

Grading, Stormwater Drainage and Water Quality

Within the Downtown Ferry Terminal area, all of the deck and pier areas that drain directly to the Bay were constructed prior to current federal and state water quality regulations. The existing areas include those that are or have been used for vehicular movement, parking and pedestrian movement. In the North Basin, the project will result in the demolition and removal of 17,900 square feet of auto-oriented, pile-supported deck area and 8,900 square feet of pedestrian-oriented deck area that currently drains to the Bay. In the South Basin, it will result in the removal of approximately 12,200 square feet of pile supported deck structure at Pier 2 that is currently utilized for automobile access and parking and that currently drains to the Bay. It will also result in the removal of approximately 10,200 square feet of deck and pile structure associated with Pier 2 that is pedestrian in nature and/or non-auto-oriented and that currently drains to the Bay. The removal of these auto-oriented and vehicular access areas is a very important step towards achieving higher levels of water quality in the Bay. It is assumed that all of the new deck and pile construction to be undertaken as part of the Ferry Terminal improvements will be designed to current standards based on the Stormwater Design Guidelines established by the Port. The location and extent of the existing drainage areas are shown on Figure 27.

In the North Basin, the construction of a new access pier for Gate A of approximately 8,000 square feet (30 feet wide by 265 feet long) is proposed. The pier will be for pedestrian access only. It will be designed to conform at the western edge to the existing promenade, which is at approximately 10 MLLW. It will rise to an elevation of approximately 13 MLLW at a 5% maximum slope and maintain that elevation until the gate. For drainage, the pier will also cross slope for drainage to the south at no more than 2% where it will drain into a bioretention planter located on the south side of the pier for the treatment of surface stormwater run-off before it enters the Bay. The planter will be approximately 3 feet wide

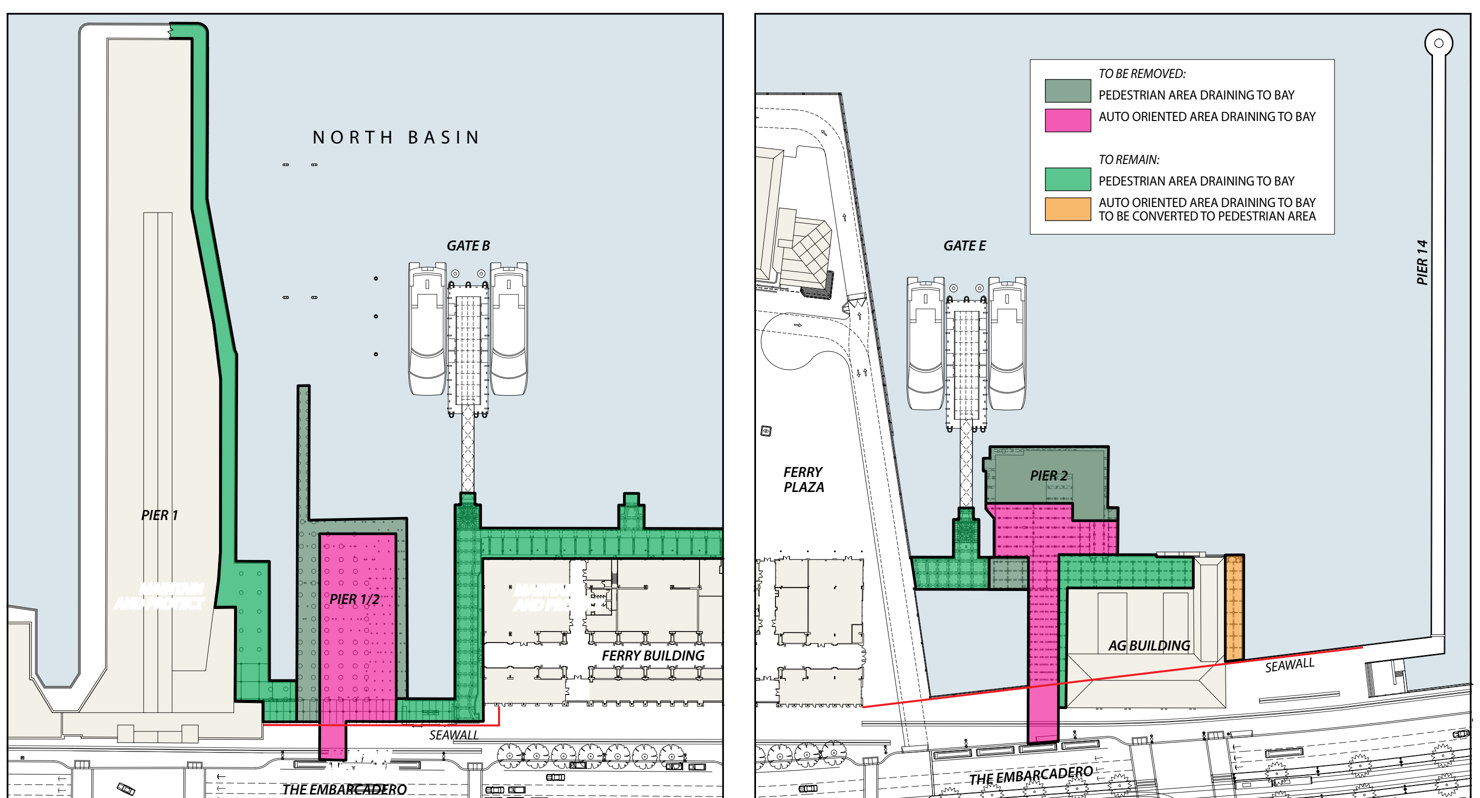


Figure 27: Existing Watersheds - North and South Basins

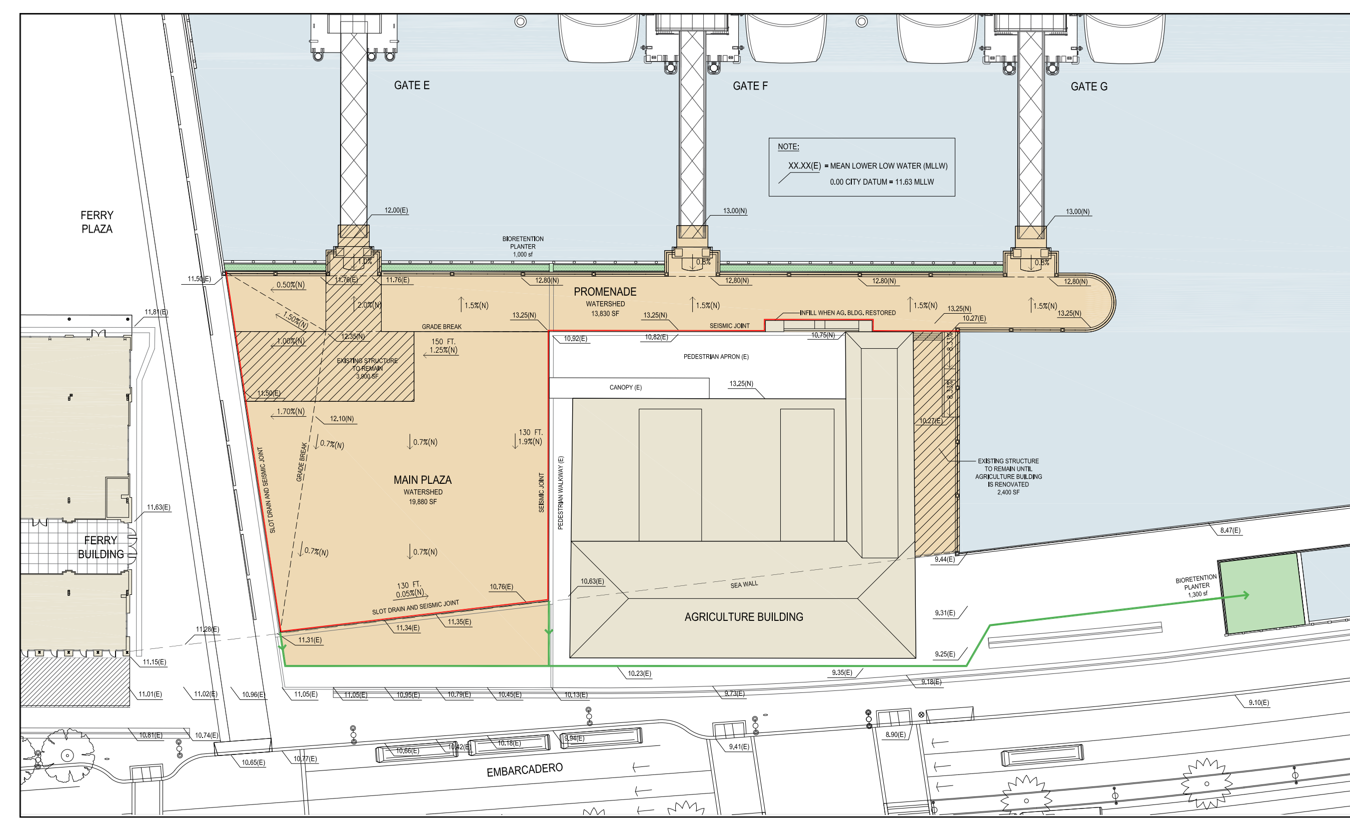


Figure 28: Grading

and 3 feet deep and will provide for a half foot of ponding; 1-1/2 feet of bioretention soil mix and 1 foot of drainage rock. The depth of the planter will place the bottom at an elevation of approximately 10 MLLW, which is above the projected highest estimated tide. The required area of treatment is sized conservatively using LEED SS 6.2 requirements and is estimated to be 506 square feet. Because the treatment area is calculated at this conceptual design phase of the project, the final required treatment area may vary somewhat. The final calculations will be established during final design and are subject to confirmation by the Port.

There are two existing areas in the North Basin that will be improved but are considered exempt from the stormwater treatment requirements based on the Port guidelines. The first includes about 2,550 square feet of the Marginal Wharf which was once used for vehicular parking and which will be strengthened and repaved for pedestrian use only. The second includes the addition of a canopy on a portion of the existing Gate B pedestrian access pier which currently drains to the Bay. The addition of a 4,000 square foot canopy on this pier does not change the amount of stormwater runoff and it is assumed, therefore, that the area will also continue to drain to the Bay. The location and extent of the future drainage areas in the North Basin are described on Figure 27.

In the South Basin, approximately 29,600 square feet of new deck and pile structure will be constructed for pedestrian access only and approximately 4,250 square feet of existing deck and pile that currently serves to access Gate E and was built as part of the Phase 1 improvements will be retained. The total watershed area, including existing and new construction is approximately 38,350 square feet. The area will be graded to conform to the existing grades along the northern and western edges to provide for unimpeded pedestrian access from the Ferry Building and the Embarcadero Promenade. The existing grades at the western conform edge, which also coincide with the edge of the seawall, vary from 11.3 MLLW on the north to 10.7 MLLW on the south. Along the northern conform edge adjacent to the Ferry Building lease line, the existing grades vary from 11.5 MLLW on the east to 11.3 MLLW on the west. The grading concept also calls for the East Bayside Promenade, which provides access to Gates E, F and G, to rise in grade as it proceeds from the north to the south and slope towards the Bay at no more than 2% for drainage. The portal at Gate E, which was constructed as part of the Phase 1 improvements, is at approximately 12 MLLW. The portals at Gates F and G are intended to be constructed at 13 to 13.5 MLLW.

There are two drainage areas that comprise the South Basin watershed. The East Bayside Promenade will drain to the east towards the Bay and the main plaza area will drain to the west towards the Embarcadero. The East Bayside Promenade portion of the watershed, approximately 13,850 square feet of impervious area, will drain to a bioretention planter for treatment of runoff prior to entering the Bay. The planter will be approximately 3 feet wide and 3 feet deep and will provide for ½ foot of ponding, 1-1/2 feet of bioretention soil mix, and 1 foot of drainage rock, for a total depth of 3 feet. The bottom of the planter will vary somewhat along its length but will be set at approximately 9.5 MLLW, thus placing it above the highest estimated tide which is projected for design purposes. The required area of treatment for the East Bayside Promenade watershed is estimated to be 777 square feet, based on LEED SS 6.2. This is a conservative estimate, however the treatment area may vary when Final Design calculations are undertaken and a Stormwater Control Plan is prepared for permitting purposes.

The main plaza area, which comprises approximately 24,500 square feet of impervious surface area, will drain predominantly to the north and west where it will be captured as part of a drainage system that also incorporates the need for a seismic joint between the existing BART platform on the north and the seawall on the west. The water that is captured along both of these edges will be transported by gravity to a landscape treatment area of approximately 1,300 square feet that replaces the tidal staircase which was constructed in the early 1980's and has since been fenced off because it is unsafe. Using LEED SS 6.2 requirements, 563 square feet will be needed for stormwater treatment of run-off from the main plaza. Therefore, an additional approximately 700 square feet of bioretention capacity is created within this area which could potentially serve other treatment requirements in the future or offset the requirements of the pedestrian areas that are currently exempt from the requirements. In order to provide adequate depth and slope for gravity conveyance of the stormwater runoff along the main plaza edges, the effective depth of the treatment system would need to be located at approximately 4 MLLW. This would require pumping of the treated water back above the mean highest high tide for discharge into the Bay, see Figure 28.

In the South Basin, the retention and repaving improvements of the southern apron of the Agriculture Building are considered exempt from the stormwater treatment requirements. As shown in Figure 27, the 2,400 square foot apron currently drains to the Bay and is currently used for vehicular parking but once improved, it will be for pedestrian use and public access only.

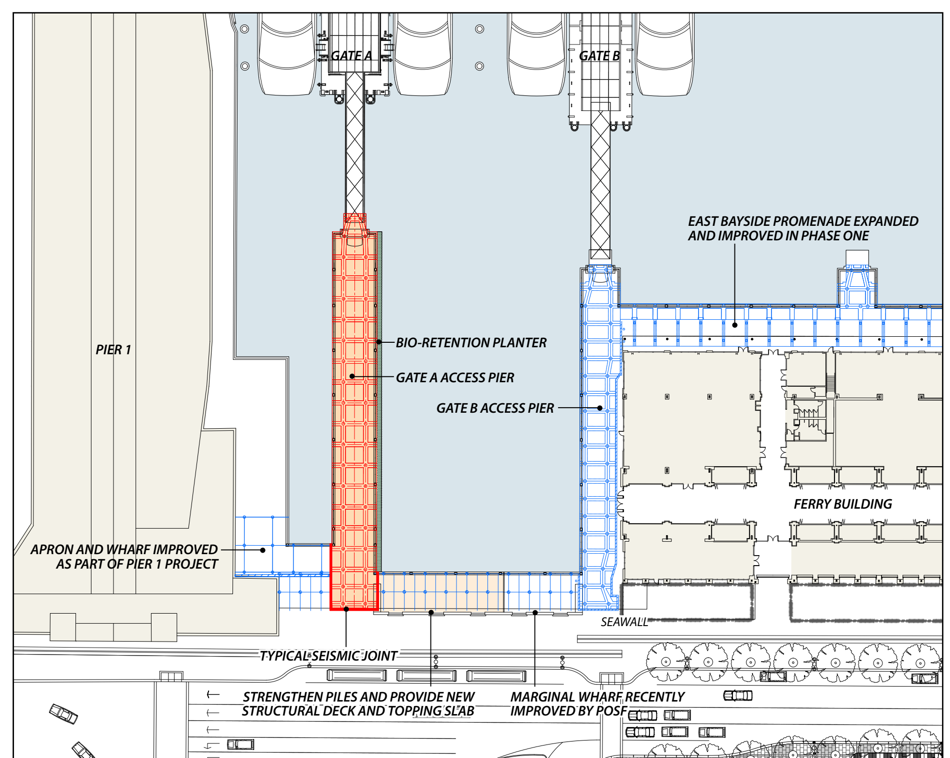


Figure 29: Preliminary North Basin Structural Concept

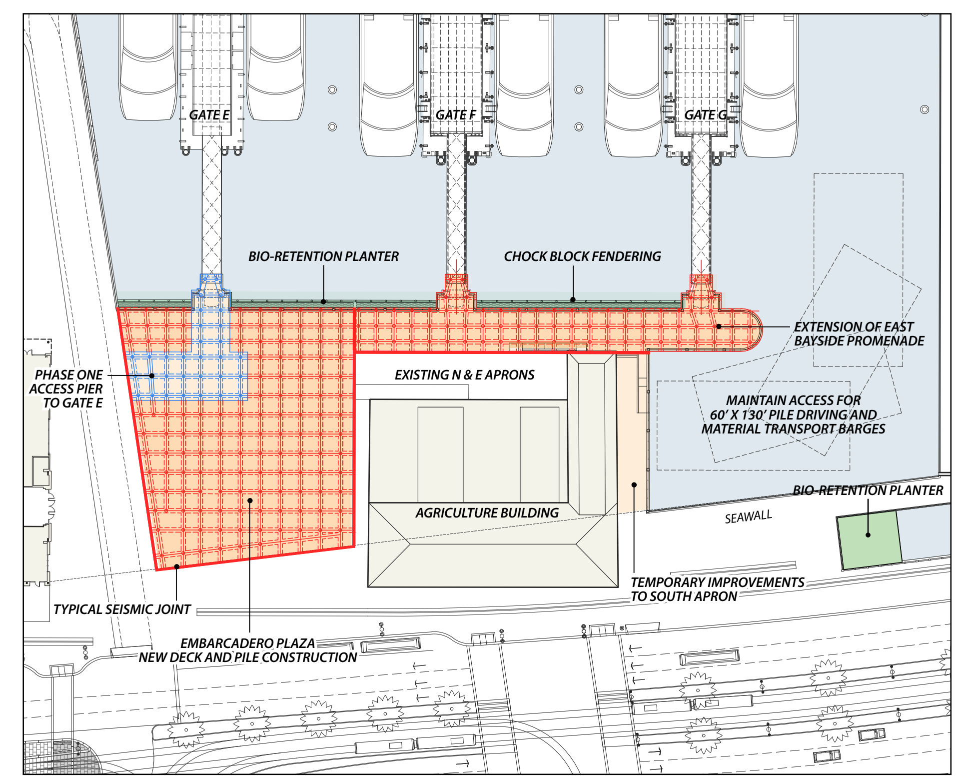


Figure 30: Preliminary South Basin Structural Concept

9. CONSTRUCTION STRATEGY

A significant portion of the construction activity related to the Ferry Terminal expansion will occur off-site. This would include construction of steel or pre-cast piles, concrete floats, gangways, structural frames for the portals, canopies, railings and many of the furnishings, fixtures and equipment. If pre-cast construction is utilized for the deck structure, that would also be built off-site. The construction strategy focuses on the on-site construction activity and the site area, equipment and workforce requirements associated with it.

Demolition

The demolition work that will be undertaken includes both concrete and wood piles and a concrete or combination of wood and concrete deck structure. In many cases, the deck structure is also covered with asphalt. It is not known at this time to what degree creosoted piles and/or timbers or other treated wood exists, but it is anticipated that some are likely to be found. The majority of the treated wood material is likely to be over 25 years old, but that needs to be confirmed before demolition occurs. The age of the piles has implications on disposal requirements. Prior to pier and pile removal, a management plan would be prepared to ensure management of treated wood in accordance with the Department of Toxic Substances Control (DTSC) Treated Wood Waste guidance.

In undertaking the demolition, it will be important to appropriately protect and, as necessary, support existing improvements until new construction is undertaken. It is anticipated that all of the construction-related demolition will be performed from barges over water. Two methods are often utilized for the removal of piles – they can either be cut off below the mud line or pulled to avoid potential conflicts with new construction. Although it avoids conflicts with future pile driving, the pulling of piles can increase turbidity and may create voids that can impact existing structures. However, since the majority of the demolition that will be undertaken in the North and South Basins is sufficiently removed from existing structures, little or no impact is expected from pulling of piles during demolition. The only potential area of concern is related to the Agriculture Building foundation piles. Since the aprons on the north, east and south sides will be retained until the building is renovated, an adequate buffer zone between the Agriculture Building foundation piles and the areas to be demolished is assumed. The ultimate decision of whether to pull or cut off piles as well as where and how much to pull and cut off will not be made until Final Design or Construction phases of the project.

Equipment Needs. The demolition effort will include one diesel powered derrick barge with a choker or clamshell bucket for the pulling of piles and/or a crane-operated chain saw for cutting the piles, an excavator with jaws and/or shears for the removal of the deck. There will be one disposal material storage barge which will be, when fully loaded, taken to an appropriate disposal site. The barges are typically brought to the site by a 900-horsepower diesel powered tugboat. In many cases, once the barges are delivered, a smaller tugboat, which is kept on site, will be utilized to move the barges from place to place. Although a diesel powered electric generator will be located on the barge, most, if not all, of the equipment will be diesel-powered and therefore will not need electricity. If the piles break off or need to be cut off, attempts will be made to first cut them with the crane-operated chain saw at or just below the mud line. In a worst case, if that is not possible, the piles may need to be cut off by divers with underwater cutting tools. A small craft with an outboard gasoline engine is typically utilized in transporting workforce to the barge and for the owner's representative, construction manager, inspector and/or principal of the General Contractor who oversee the demolition work.

Workforce Requirements. The derrick barges will have a crew of four, which includes one operator, two deckhands, and one engineer. The tugboats require a captain and two deckhands, however the tugboat with a full crew is only needed when the barges are brought to the site. The tugboat that moves the barges on site can be operated by the same individual that operates the derrick barge, if he/she holds a captain's license. In addition to the main workforce, two to four laborers for debris capture may be required. If divers are required, a diving team comprised of four divers is typically assumed. If piles are pulled, it is assumed that the crew on the derrick barge can pull approximately 10 piles per day, while it is estimated that a diving team can cut approximately 4 piles per day. Beyond the demolition crew, there will be the need for supervision, management and oversight. This would include one supervisor, one part-time construction manager, and a principal from the General Contractor who will visit the site a few times during the demolition work. In summary, 7-10 people will be required for the demolition work and 2-3 people will be required for supervision, management and oversight. A total of 15 to 18 people will be required, however, the maximum on-site per day is estimated at 11 to 14. The tugboat crew would come and leave the site on the vessel while the remainder of the work force would probably arrive by land. Those arriving by land could come by transit or car share, particularly since tools and equipment will be located on the barges and they do not need to be provided by each worker. The construction manager and the representative of the General Contractor, who are part-time and come in and out, would most likely drive and would need a parking space close by. Assuming all of the remaining work force during demolition drive to work, approximately 14 parking spaces would be required; however, except for the two or three on site, the remainder could be provided in parking areas in close proximity to the Ferry Building.

Dredging

After demolition is completed, the required dredging for the new gates will need to be undertaken. Dredging in SF Bay is regulated by the Dredged Materials Management Office (DMMO) and procedures for sampling and testing the proposed dredged material have been clearly identified by the agencies that comprise the DMMO.

Sediment samples would be collected and tested in accordance with these requirements. Disposal of dredged material would likely be at one of four locations, depending on disposal site capacity, availability of disposal site, results of sampling, and discussions with DMMO. These locations would be as follows:

- San Francisco Deep-Ocean Disposal site (SF-DODS) which is located 50 miles offshore from San Francisco Bay.
- In-Bay disposal sites (possibly Alcatraz Disposal site)
- Upland Disposal for Beneficial Reuse (active site at the time of ferry terminal construction)
- Upland disposal at a landfill or confined disposal facility

Equipment Needs. Although other forms of dredging could conceivably be used, considering the limited volumes of dredge materials anticipated and limited work area, it is assumed that the dredging activity will be undertaken from a derrick barge with a 10 cubic yard clamshell bucket and that the dredge spoils will be deposited on a scow dump barge with 2,500 cubic yard capacity and ultimately taken to an approved disposal site. As with demolition, a 900 horsepower diesel-powered tugboat would deliver the barge, while a smaller 600 horsepower tugboat could be used to move the barge around during dredging. A small craft with an outboard gasoline engine would be required for the survey crew.

Workforce Requirements. It is assumed that an operator, two deck-hands and an engineer would be needed on the derrick barge, three crew members would be needed on the tugboat and a surveyor and an assistant would be needed on the survey boat which is only required on a part-time basis during the dredging operation. It is assumed that the tugboat crew would arrive on the vessel and that the crew on the derrick barge and on the survey boat would arrive by land. As in the demolition, no tools would need to be brought by the crew and therefore, they would be encouraged to take transit to work or carpool. If the crews were to drive to work, they would park in available off-site parking areas and walk to the construction site. If all of the crews were to drive separately, a maximum of 4 to 6 parking spaces would be required for the duration of the dredging activity.

Berthing Facilities

The floats, gangways, guide piles, dolphins and fendering will be built off-site and delivered by barge to the site for installation. The equipment and workforce requirements for the driving of the guide piles, dolphins and for the wood fender piles are the same as those that are required for the installation of pile-supported deck structures, which are discussed subsequently. The workforce requirements for the utility connections and minor on-site outfitting of the berthing structures that may be required are also similar to the workforce requirements for the furnishings, fixtures and equipment to be located on the pier structures.

New Deck and Pile Structures and Wharf Reconstruction

The new deck and pile structures will be built to "essential facility" standards and will be designed to appropriate weight and loading requirements. It is estimated that the dead-load weight of the structure will be in the range of 200 to 300 pounds per square foot, depending upon the type of construction that will be utilized. New piers will need to support a uniform live load of a minimum of 100 pounds per square foot and a vehicle live load that will support a HS-20 truck. They must meet seismic load requirements which must be identified through specific investigations in the Final Design phase; however, an acceleration of 1.0g, for a seismic design category "F" and a site class "E" can be used as an order of magnitude assumption until these investigations are undertaken.

It is anticipated that the new pier structures designed to "essential facility" standards will be supported by 24 to 36 inch diameter piles, spaced at 12-16 feet on center. Piles need to be located approximately 3 pile diameters away from existing piles. For example, a 24-inch pile needs to be located a minimum distance of 6 feet from an adjacent pile. This includes the piles that support the seawall along the western edge of both the South and North Basins. In these areas, it is important to remember that there is likely to be rip-rap along the toe of the wall, and therefore the further away from the rip rap that the pile can be located, the thinner the rip-rap that the pile must penetrate. Assuming in general that the finished grade of the new pier structures will be set at approximately 13 MLLW, and that the structure, including the topping slab, is approximately 2-1/2 feet in depth, the top of the piles will be located at approximately 10.5 MLLW. The length of the pile is based on geotechnical recommendations that call for the pile tips to enter and extend into the sand layer, which is estimated to range from an elevation of approximately -115 to -130 MLLW. On the basis of the above assumptions, the length of the piles for the new pier structures will be in the range of 135 to 140 feet. Prior to initiating pile-driving, it is recommended that side-scan sonar and sub-bottom profiles be obtained regardless of the method that is used for demolition and the amount of dredging that is undertaken. It is important to identify potential objects or obstructions located at or just below seabed due to past demolition and construction efforts so as to anticipate and potentially avoid conflicts.

Precast concrete or steel pipe piles can be used to support the new pier structures. Concrete piles with sufficient concrete cover to reinforcing, do not have the corrosion issues associated with steel pipe piles and are preferable for this reason; however, to minimize noise impacts, it is likely that piles will have to be vibrated in place, which limits the choice to steel piles. The corrosion issues of steel piles can be mitigated with one or a combination of the following: coatings, sacrificial steel thickness and sacrificial anodes. If steel piles are utilized, a rebar cage must be inserted into the pile and extended to engage the deck and beam structure above. The rebar cage area will then be filled with concrete to create the appropriate moment transfer between the deck and the piles. Based on past experience, it is anticipated that approximately 7 feet of the rebar cage must be inserted into the top of a 24-inch pile and approximately 9 feet of the rebar cage must be inserted into the top of a 36-inch pile. It is assumed that regardless of pile size, approximately 2 feet of the cage will extend into and be integrated with the deck construction. If cast-in-place piles are utilized after they are driven to appropriate depths, rebar will be inserted into voids specifically cast into the pile for this purpose and grouted in place. Then, the extended rebar will be integrated and cast into the deck construction. The final determination of the appropriate reinforcing size, depth, etc., for moment transfer will be made during Final Design.

The new pier deck design will likely be a two-way concrete beam and slab system that is moment resistive and that can be built with either precast or cast-in-place construction, or a combination of the two. It is assumed that the new deck structure will be comprised of approximately 24-inch deep beams centered on piles and where necessary can be cantilevered approximately 7 feet to the outside edge of the structure. It is assumed that a flat slab of approximately 10 inches will be utilized to span between beams and that the cantilevered ends between two beams would be framed out so as to create a continuous and flush end to the pier. An edge beam will provide for a 2-foot wide by 5-inch deep containment edge for the topping slab that will be placed over the structural deck. The 5-inch topping slab will be separated from the deck structure by a slip-sheet so as not to telegraph any cracking that may occur in the cast-in-place structural sections or, if a precast system is used, to cover the joints between the precast elements. The concrete mix for the topping slab is assumed to be of an architectural quality that will include both integral color and a light sandblasted finish and sawcut joints consistent with the appearance and quality of the concrete that is used for the Embarcadero Promenade and pedestrian ways surrounding the Ferry Building.

There are advantages and disadvantages to both the precast and cast-in-place approaches to construction, that will be considered more thoroughly during Final Design, before a final decision is made about which approach or combination of approaches will be taken. However, it is already evident at this stage of design, that the precast approach offers distinct advantages within the context of the active and constrained waterfront setting of the project. The advantages of the precast system versus cast-in-place construction are that it is less disruptive, because there is no need for in-place extensive formwork and reinforcing bar placement, which will reduce the overall time spent in the field. In addition, precast construction is generally of a better quality, since girders and deck planks are cast in a controlled environment at a fabrication yard. Although concrete trucks cannot be eliminated altogether, as joints and topping slab must be cast in place, significantly fewer trucks overall will be required to deliver the concrete, which is an important consideration in the congested and active environment of the downtown waterfront. With the precast system, the landside construction staging requirements are significantly reduced. The delivery of the precast segments and the construction staging can, to a great extent, be accommodated on barges, and the girders and planks can be transported and stored on the barges during construction. The disadvantages of precast construction are that it requires more space to accommodate post-tensioning anchorages and post-tensioning operations; requires specialty equipment for post-tensioning; and close tolerances need to be maintained in the precast elements so that they fit the supporting framework.

The advantage of cast-in-place construction is that it allows more flexibility for pile placement, which is especially a concern in in-water locations where there has been a history of pile construction and demolition and piles may not be able to be precisely located. The construction of false work and cast-in-place concrete is a more traditional approach and therefore can be more competitive by not requiring specialty subcontractors which will be needed for post-tensioning. The disadvantage of the cast-in-place construction is that it requires longer periods of on-site construction activity and has significant requirements for construction staging and truck delivery. For purposes of estimating the number of trucks that will be needed to deliver concrete to the site as part of new construction, it is assumed that approximately 9.5 cubic yards of concrete can be delivered in place by a 10 cubic yard capacity concrete truck. The difference between what is assumed and what is actually supplied is based on the fact that typically there is concrete loss due to spillage, oversizing, clean-out, testing and/or a loss in the pumping system. The on-site workforce and equipment requirements will vary significantly, depending upon whether a precast or a cast-in-place construction approach is utilized. Although Final Design will determine the construction approach to be undertaken, for the purpose of this Preliminary Design document, it is assumed that in the North Basin, a pre-cast approach will be utilized for the construction of the new Gate A access pier. It is estimated that 356 cubic yards of concrete will be needed for the containment edge and for the connections of the deck panels to the piles. It is also estimated that 90 cubic yards of concrete are needed for the cast-in-place topping slab. For the reconstruction of the marginal wharf, if it is assumed that the entire deck structure (beams and flat slab) will need to be reconstructed, and that a 2-foot beam section with a 10-inch flat slab, a 2-foot wide containment edge and a 5-inch topping slab is utilized, approximately 142 cubic yards of concrete will be required. For the North Basin, a total of 47 concrete trucks will be needed for the new deck and pile construction and for strengthening the marginal wharf.

In the South Basin, due to the configuration and the multiple adjacencies with existing structures, and the need to integrate the previously constructed access area to Gate E, a cast-in-place approach is assumed. It is estimated that 1,488 cubic yards of concrete will be needed for the beam and flat slab construction of the new deck. It is estimated that approximately 35,000 square feet of new paving with an appropriate setting bed will be required for all of the landside improvements. It is therefore assumed that approximately 200 concrete delivery trucks will be needed to provide the concrete for the South Basin area.

Utilities, Furnishings, Fixtures and Equipment

Guardrails will be built off site and delivered by either truck or barge and installed on the containment edge of the topping slab that are part of the pier structure. The steel canopy frames will be built off-site in lengths that can be transported by truck or barge for installation on-site. The glazing of the canopy structures and the electrification and communication wiring and the installation of the wayfinding, electronic signage, security and lighting will be done on-site after the canopy frames are installed. The steel frame of the portal structures will be fabricated off site and delivered by truck or barge for installation on site. The wiring and communication requirements of the portals and the granite and stainless steel cladding will be undertaken on site, once the frame is erected. The doorways that are built off-site will be delivered and installed along with the light fixtures, signage and communication devices required for the finishing of the portal structures. The furnishings will include Clipper Card readers, add-fare machines, benches, trash receptacles and any additional lighting beyond what is provided with the canopies. All of the power and communication requirements of these furnishings will be cast in place in the topping slab and the furnishings will be fabricated and delivered and then installed on site. For the Gate A access pier and the East Bayside Promenade, the surface flow of storm water will be collected in reinforced, pre-cast bioretention planters. These will be built off-site in segments suitable for transport by truck or barge and will be installed with appropriate soil, irrigation and plant materials on site. For the Embarcadero Plaza, which drains primarily to the west, stormwater will be collected and transported by gravity in pipes placed below grade west of the seawall leading to the bioretention planter which will be built with cast-in-place concrete on site and located south of the Agriculture Building adjacent to Pier 14. The planter will include an adjacent vault for pumping of the stormwater after treatment into the Bay.

Equipment Needs. The construction of new deck and piles, the strengthening of the marginal wharf in the South Apron, and the utilities, furnishings, fixtures and equipment installation will be undertaken in an integrated manner. Typical equipment needs include one derrick barge with a vibratory hammer, one or more material storage barges, the tugboats that will move the barges, utility boats with an outboard engine for surveying, supervisory, engineering and architectural professionals. There will be the need for concrete trucks and pumpers, lowboy truck for granite delivery and other paving materials, delivery vans for furnishings, fixtures and equipment, specialized trucks for the delivery of glazing, and pick-up trucks for smaller items. A scissor lift, cherry picker, electric forklift and scaffolding will be required for the construction of vertical elements above the deck and piles. The derrick barge with the vibratory hammer and the tugboats and the majority of the vehicles, the scissor lift and cherry picker will be diesel powered. The utility boats will be gasoline powered. Small tools will be required for each of the major trades that will be involved in construction. This includes iron-workers tools, an arc welder, woodworking tools, table saws, skillsaws, drills, power fasteners and routers, concrete handtools and a concrete saw, masonry tools, glazing tools, and electrical, mechanical and plumbing tools. Most of these smaller tools are hand or electric operated. It is assumed that electric power will be made available from the existing power supply in the Ferry Building area for use during construction. It is assumed that there would be a diesel powered generator in case of electric needs that cannot be fully met from existing sources or for special purposes. Delivery of materials for the landside improvements would be by barge for the piles, pre-cast decking, steel frame access gate, steel canopy, and steel beams for temporary falsework. Delivery by truck would include concrete, granite cladding for the access gate, granite paving for the South Bayside Promenade, glazing for the canopies, miscellaneous lighting, signage and audiovisual equipment, ticket machines and benches, plumbing, fire protection, and mechanical, electrical and communication supplies. Delivery by barge or truck would include framing and falsework timber, guardrail, and the bioretention planters.

Workforce Requirements. There are various stages of construction within the project that have different workforce requirements and these workforce requirements are for varying periods of time. The workforce is comprised of three different types of work that need to be undertaken to complete the project.

Workforce A is needed to operate the tugs that bring the derrick barge and material barge to the site and move them around; to operate the derrick barge and drive the piles; build the falsework and formwork; place the rebar; and finish the structural concrete work for the deck. This workforce includes supervisors, construction managers and inspectors and on a part-time basis, surveyors, representatives of the General Contractor and the design consultants.

Workforce B includes the workforce necessary to install and complete all of the elements that are located on the surface improvements above the structural deck. That includes utility extensions, including rough and finished electrical and plumbing work; structural frames for the gates and the cladding for the gates; placement of the canopies that are built off-site and the glazing and electrification that is completed on-site; placement of the guardrails and lighting that are built off-site; placement of the planters and ultimately the plant materials and irrigation associated with them; and placement of furnishings, fixtures, ticketing equipment, signage, etc. This also includes the construction of seismic joints and the placement and finishing of the topping slab or the setting of paving materials. This workforce also includes supervisors, construction managers and inspectors and, on a part-time basis, surveyors, representative(s) of the General Contractor and the design consultants.

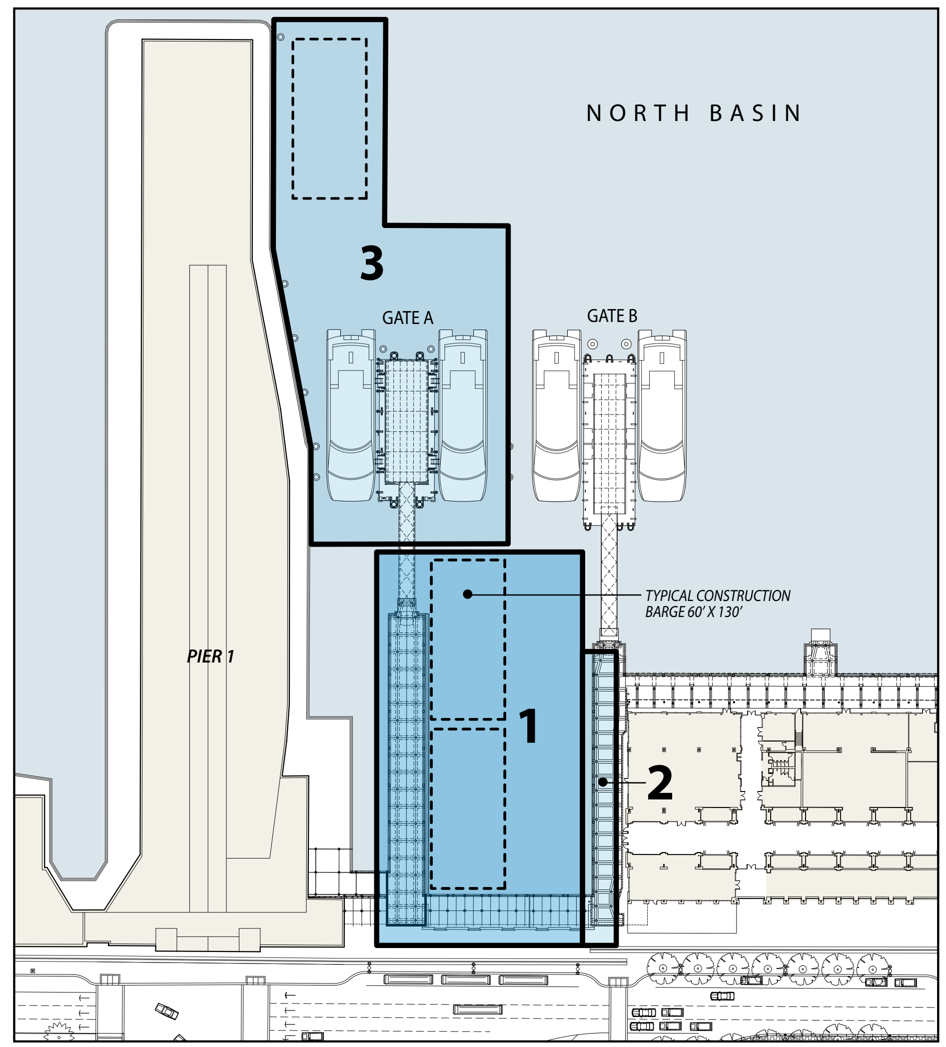


Figure 31: Construction Zones - North Basin

1 GATE A PIER AND MARGINAL WHARF
2 GATE B CANOPY
3 GATE A BERTHING FACILITIES

Workforce C includes the workforce necessary to install the floats and gangways that are being built off-site including driving and setting the guide piles and dolphins. This workforce includes supervisors, construction managers and inspectors and on a part-time basis, surveyors, representatives of the General Contractor and the design consultants.

North Basin Construction Staging

The North Basin improvements are intended to be undertaken with the least disruption possible to existing uses and activities within the area; therefore, the majority of the construction will be undertaken from offshore barges. The existing marginal wharf scheduled for improvement

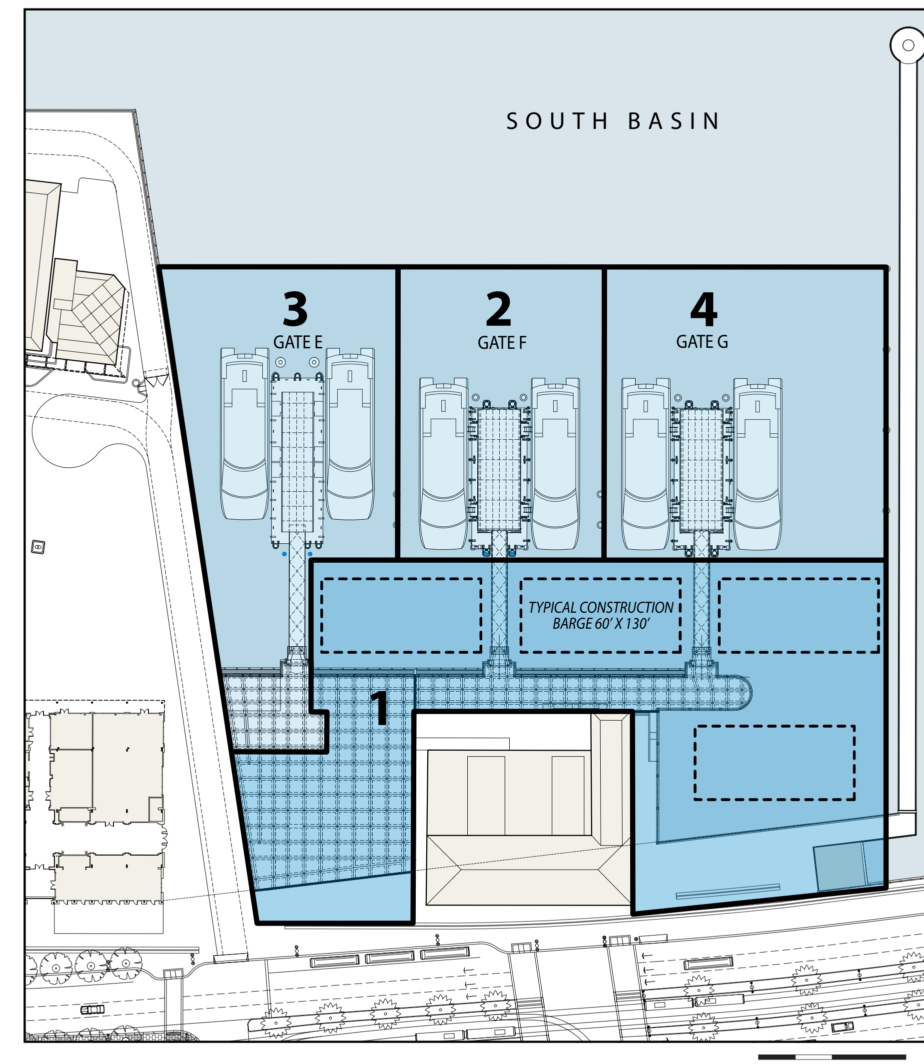


Figure 32: Construction Zones - South Basin

1 GATES E, F & G PILE-SUPPORTED DECK
2 GATE F BERTHING FACILITIES
3 GATE E BERTHING FACILITIES AND DECK
4 GATE G BERTHING FACILITIES

will be utilized in support of construction staging requirements until the Gate A access pier has been constructed and at that time, the marginal wharf will be improved.

As shown in Figure 31, there are three zones with varying durations of work activity related to new construction in the North Basin area. It is assumed that *Zone 1* would be the first in the sequence of work effort in the North Basin and it is the location where the most extensive on-site work would be undertaken. Within Zone 1, there are two construction stages. In the first stage, the structure of the new access pier is constructed and the marginal wharf repaired. In the second stage utilities are extended and the furnishings, fixtures and equipment that are located on the access pier and the marginal wharf are provided. At the end of the second stage, the topping slab for both the marginal wharf and the pier will be completed. It is estimated that the first stage of construction work within Zone 1 will take approximately 4 months and that the second stage will take approximately 5 months. The total construction time frame within this zone is estimated to be between 8 to 9 months.

The work effort within *Zone 2* is limited to the installation of the Gate B canopy which will be undertaken in an overlapping time frame with Zone 1. The steel canopy to be located on Gate B will be built and coated off-site and delivered and craned into place from barges within Zone 1. The work in Zone 2 will be undertaken after the structural concrete work in Zone 1 has been completed and generally within the same time frame that the second stage of construction is being undertaken.

Zone 3 is the in-water area where the new float and gangway would be located and where the guide piles and dolphins associated with the berthing facility would be provided along with new fendering if required. Since most of the elements will have already been constructed off-site, they will be brought to the site by barge, put in position and connected in a fairly short amount of time. It is estimated that 1 to 2 months would be required to complete the work effort in this zone.

Workforce Requirements. During the first stage of construction in Zone 1, *Workforce A* would be needed for pile-driving, marginal wharf repair, false work and the setting of the pre-cast concrete panels and the closure pours. This work would be undertaken over a period of approximately 4 months. The workforce would consist of 4 people on the derrick barge (the operator, 2 deckhands and an engineer); a crew of 3 on a tugboat; and 2 part-time surveyors. A crew of 2 ironworkers would install the falsework and work on the rebar attachments for the pre-cast units; and a crew of 4 would set the pre-cast unit and complete the closure pours and the pile connections. It is important to note that the entire workforce will not be on site the entire time that construction is taking place. Furthermore, it is assumed that the tugboat crew would arrive by water and that the remainder of the work force would arrive by land. Most, if not all of the work force arriving by land, would be encouraged to come by transit or car share, particularly since most of the tools and equipment will be located on the barges and they do not need to be provided by each worker. The construction manager and the representative of the General Contractor and the representative of the design team, who are part-time and come in and out, would most likely drive and need a parking space close by. Assuming all of the remaining work force during this stage of construction drove to work, approximately 15 parking spaces would be required; however, except for approximately 3 on-site parking spaces, the remainder could be provided in parking areas in close proximity.

The second stage of construction in Zone 1 would coincide with the construction of the canopy in Zone 2. It is estimated that the construction time frame for the second stage of work in Zone 1 would be 5 months and 2 months in Zone 2. *Workforce B* would be required for this effort in both zones. The workforce would probably include 2 ironworkers, 1 mason and 2 laborers, 4 glaziers, 2 sheet metal contractors, 4 concrete workers, 2 plumbers and 2 electricians. Not all of these would be on site for the entire duration of this construction period, however it is assumed that at any one time there might be 15 to 20 workers on site plus the supervisor, the construction manager/inspector, the part-time General Contractor Principal and the part-time design consultant. During this phase of construction, it is assumed that some workmen would bring tools with them to the site, but it is also assumed that barges would be made available for lay-down and on-site fabrication. It is assumed that the newly constructed 8,000 square foot Gate A pier would serve as a construction staging area.

It is assumed that many of the subcontractors would go to the yard and pick up vehicles, tools, equipment, laborers and co-workers before they arrive to the project site; therefore, it is assumed that there would be on average of two people per truck. It is assumed that some of the labor force could arrive by transit or ferry. On this basis, 10 parking spaces would be needed for the full-time construction activities and an additional 3-4 for the supervisors, construction manager/inspector and part-time staff. If necessary, all of this parking could be accommodated in tandem and on a temporary basis on a portion of the Gate A access pier. Of course, the parking would have to be moved around as construction on the pier proceeded and would be relocated when the topping slab is installed, but during that time, it is assumed that only the concrete workers would be on-site.

In Zone 3 for the North Basin, *Workforce C* would be required over the estimated 1 to 2 month duration. The workforce would consist of 4 people on the derrick barge (the operator, 2 deckhands and an engineer); a crew of 3 on a tugboat; and 2 part-time surveyors. The workforce also includes a supervisor and construction manager/inspector and part-time representative of the General Contractor and the design consultants. It is assumed that the tugboat crew would arrive with the vessel and that the 4 on the derrick barge would arrive by land. The workers would be encouraged to arrive by transit or car share because they do not need to bring their tools with them. The supervisor and construction manager/inspector would probably arrive by truck and would need to park nearby. The part-time surveyors and the representative of the General Contractor and/or design consultants would come in and out for short periods of time and only a few times during the process. It is assumed that during this stage of construction, parking for 5 to 7 cars would be desirable but could be accommodated in public parking spaces nearby. Two to three would be desirable closer in, for the short duration visits.

South Basin Construction Staging

In the South Basin, as in the North Basin, the improvements would be undertaken with the least disruption to existing uses and activities within the area and therefore the majority of the construction will be undertaken from offshore barges. In the South Basin, additional considerations arise from the need to integrate the existing Gate E facilities with the new construction and the need to maintain ferry operations during construction.

As shown in the attached diagram, there are four zones with different durations and types of construction activity in the South Basin. *Zone 1* would be the first in the sequence of the work effort and is the location where the most extensive work would be undertaken. There are two construction stages within this zone with some significant overlap between them. The first stage builds the new structural deck that provides access and circulation for all of the gates within the South Basin. When completed, the structural deck will become a construction staging area for the second stage of construction within

Zone 1 and construction in the other zones within the South Basin area. The construction time frame in this zone is somewhat extended because it needs to overlap with the construction activity in Zones 2 and 3.

It is assumed that, while the structural deck is being built in Zone 1, the pedestrian access to Gate E will be maintained through the Phase 1 improvements. In order to undertake the additional improvements needed to expand the pedestrian areas and integrate them with the construction at Gate E, the existing ferry service would be relocated to Gate F. Therefore, the float and gangway at Gate F needs to be made operational and pedestrian access would be provided at Gate F while the additional work in Zone 1 is proceeding.

The first stage of construction in Zone 1 will include the delivery and placement of approximately 200 steel or concrete piles that support the new deck. These piles will be placed from barges working off-shore. The structural deck that sits on the piles could be built in pre-cast segments off-site and delivered to the site, but because of the nature and shape of the deck structure and the necessity to incorporate the new construction with what was built in Phase 1, it is assumed that the construction of the deck will be undertaken entirely on site with cast-in-place concrete. This would include placement of falsework, building of formwork, placing of rebar and pouring of concrete from pumper trucks.

It is anticipated that most of the first stage of construction activity in Zone 1 will take place from floating barges and on the waterside, the zone includes space for up to four 60-foot by 130-foot derrick and material supply barges. During this stage of construction, it would be advantageous to utilize the landside portion of the future Embarcadero Plaza and the plaza area between the Agriculture Building and Pier 14 for construction staging as well. When the first stage of construction is completed, construction activity can be staged from the structural deck of the Embarcadero Plaza and the East Bayside Promenade extension. The second stage of construction activity in this zone provides for the installation of the portals, the guardrails and the canopy structure, and utilities and other furnishings, fixtures and equipment that are placed on the structural deck, and ultimately for the completion of the topping slab that will provide the finished paving for the entire area. This stage of improvements includes the placement of the bioretention planter along the edge of the East Bayside Promenade along with the "chock block" fendering and the associated wood piles. It includes the seismic joints along the north and western edge of the Embarcadero Plaza in conjunction with the stormwater collection system and the conveyance piping and the construction of the stormwater bioretention planter adjacent to Pier 14.

The first stage of construction is estimated to take approximately 12 months. The second stage of construction is estimated to take approximately 6 months, although the time period might be extended to 8 months due to the overlap that is required for construction in the other zones. The total construction time within Zone 1 is assumed to be in the neighborhood of 18 to 20 months.

Zone 2 is the in-water area where the new float and gangway for Gate F will be located and where the guide piles and dolphins associated with the berthing facility will be provided. Since most of the elements will have already been constructed off-site, they will be brought to the site by barge, put in position and connected in a fairly short amount of time. It is estimated that 1 to 2 months would be required to complete the work in this zone. After Gate F has been made operational, the Alameda/Oakland and Harbor Bay service will be relocated to this gate. Provisions will need to be made for safe pedestrian access through the adjacent landside area while improvements are being completed and construction staging activities for other construction zones are still underway.

The *Zone 3* construction effort includes delivery and placement of 15 steel or concrete piles and the expansion and integration of the pedestrian access areas for Gate E with those that are being completed in Zone 1. It includes the relocation of the existing steel float and gangway to a yard for servicing and its replacement in the same location.

After the removal of the existing steel float and gangway, construction in this zone will include a new structural deck for the expansion of the pedestrian access area. When that has been completed, the work in this zone will include extension of the topping slab and canopy being placed in Zone 1, completion of the stormwater bioretention planters, completion of the "chock block" wood fendering, placement of guardrails, lighting and equipment in this area. The work within this zone is estimated to take 3 to 4 months.

Zone 4 includes the location of a new float and gangway and the provision of guide piles and dolphins. It is assumed that approximately 1-2 months are required for the completion of this work effort.

Workforce Requirements. In the South Basin, during the first stage of construction in Zone 1, *Workforce A* would be needed for pile-driving, false work to support the formwork for the beams and flat slab, setting of the rebar, and pouring and finishing of the concrete support structure. When the structure has adequately cured, it would include the stripping and removal of the forms and the falsework. This work would be undertaken over a period of approximately 12 months. The workforce during this period of time would consist of 4 people on the derrick barge (the operator, 2 deckhands and an engineer); a crew of 3 on a tugboat; and two part-time surveyors. A crew of 4 ironworkers would be needed to install the falsework and 3-4 crews of 2-3 people each would afterwards work on the rebar placement within the formwork. There would be 3 crews of 4-5 carpenters each working on the formwork, for a total of 12 to 15 people. There would be 2 crews of 4 people each, or 8 people total, working on the placement and finishing of the concrete. When the concrete work is formed and cured, the carpenters and ironworkers would remove the formwork and the falsework which is estimated to take 1 month. During this phase of construction, the setting of the piles and the construction staging for the falsework and formwork, rebar and for the stripping of the falsework and formwork would be from the barges within Zone 1. In this stage of construction, there would be 1 supervisor, 1 construction manager, 1-2 inspectors, 2 surveyors, 1 part-time representative of the General Contractor and 1-2 representatives of the design consultants, who would stop by on a part-time basis.

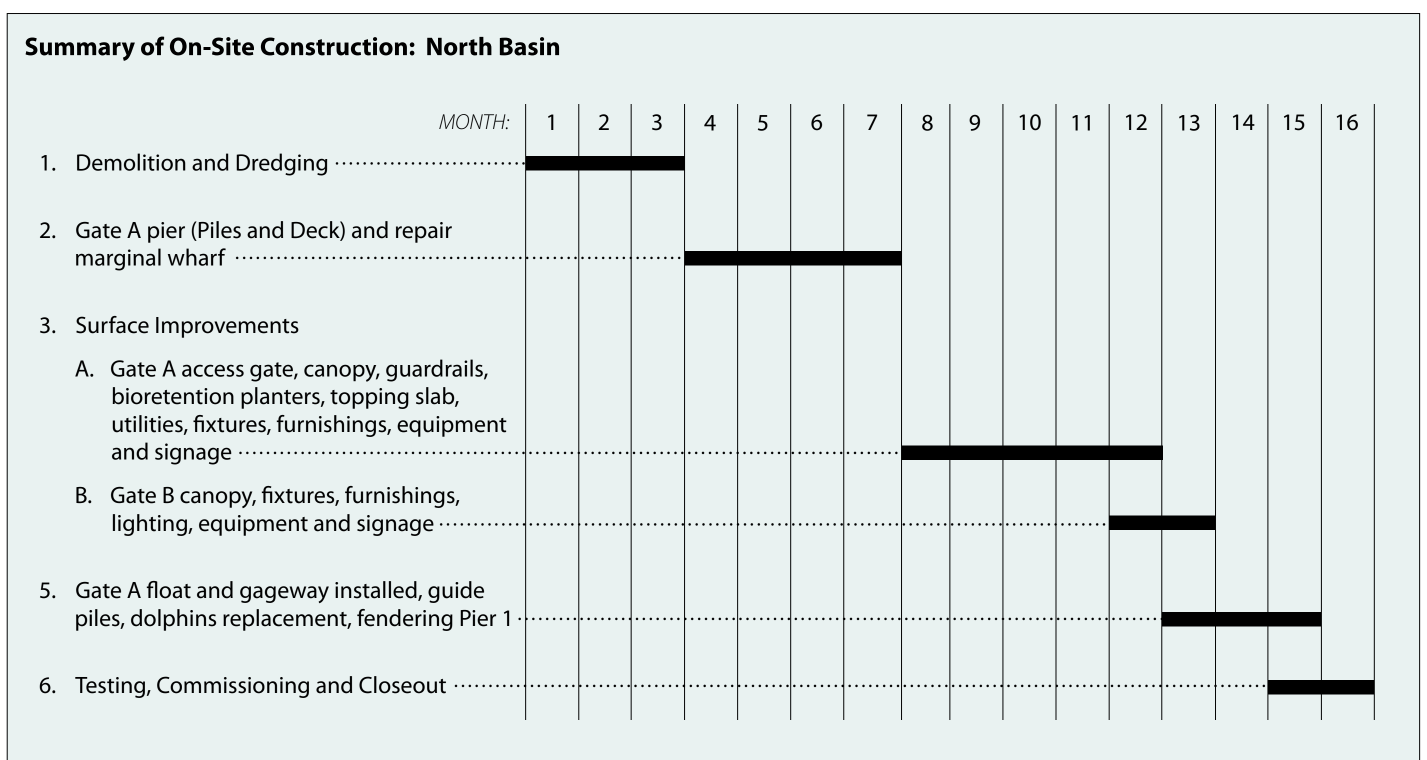
It is important to note that the entire workforce will not be on site the entire time that construction is taking place. For example, the pile driving will take 4 people plus the tugboat operators over a period of 3 months;

the falsework will take 4 ironworkers one month after the piles are completed; the formwork will take 12-15 woodworkers for 3 months; the reinforcing would take 6-12 people 3 months to complete; the concrete work would take one month for 8 people; and the stripping would take 4-8 people 1 month after curing. During the first four months, there would be 4-8 people; during the next 6 months, there would be 18-25 people and during the next two months, there would be 8 people in addition to the supervisor, the construction manager, the inspectors, and the part-time surveyors (who will be primarily there during the pile driving) and the part-time representatives from the General Contractor and the design consultants.

It is assumed that the tugboat crew would arrive with the vessel and that the remainder of the work force would arrive by land. Most, if not all, of the work force arriving by land could come by transit or car share, particularly since most of the tools and equipment will be located on the barges and do not need to be provided by each worker. The construction manager, the representative of the General Contractor and the representative of the design team, who are part-time and come in and out, would likely drive and would need a parking space close by. The workforce would be encouraged to take transit or car share. Assuming all of the remaining work force during this stage of construction would come to work two in a vehicle, the demand for parking during the peak time period would be about 9-12 parking spaces, plus 6 for the supervisory and part-time personnel, for a total of approximately 15-20 spaces. However, except for approximately 6 on-site parking spaces, the remainder could be provided in parking areas in close proximity.

The second stage of construction within Zone 1 will, to some degree, overlap with construction in Zones 2, 3 and 5 and will be undertaken by *Workforce B*. It is estimated that the construction time frame for the second stage of work in Zone 1 would be 6-8 months. The workforce would likely include 2 ironworkers, 2 masons and 4 laborers, 4 glaziers, 2 sheet metal contractors, 8 concrete workers, 2 plumbers and 4 electricians. Not all of these would be on site for the entire duration of this construction period, however it is assumed that at any one time there might be 20 to 25 workers on site plus the supervisor, the construction manager and inspectors, the part-time General Contractor Principal and the part-time design consultant. During this phase of construction, it is assumed that some workmen would bring tools with them to the site and therefore may need to have their truck close by. It is appropriate to assume that with this workforce, 2 people on average would come in every vehicle. Based on that assumption, 10-12 parking spaces would be needed for the workplace plus the 6 parking spaces for the supervisory and part-time General Contractor and design consultants, for a total of 16-18 parking spaces. It can be assumed that all of these parking spaces could, if desired, be accommodated on a portion of the newly constructed deck area which would be used for construction staging.

In Zone 2, *Workforce C* would undertake the work over the estimated 1 to 2 month time frame. The workforce would include 4 people on the derrick barge (the operator, 2 deckhands and an engineer); 3-person crew on a tugboat; and two part-time surveyors. The workforce includes a supervisor and construction manager/inspector and a part-time representative of the General Contractor and the design consultants. It is assumed that the tugboat crew would arrive with the vessel and the 4 on the derrick barge would arrive by land. They would be encouraged to arrive by transit or car share because they do not need to bring their tools with them. The supervisor and construction manager/inspector would arrive by truck and would need to park nearby. The part-time surveyors and the representatives of the General Contractor and design consultants would come in and out for short periods of time and only a few times during the process. It is assumed that this stage of construction will overlap the second stage of construction in Zone 1; therefore, the parking requirement discussed in Zone 1 would be increased by 2-3 parking spaces, which could be accommodated on the newly constructed deck.



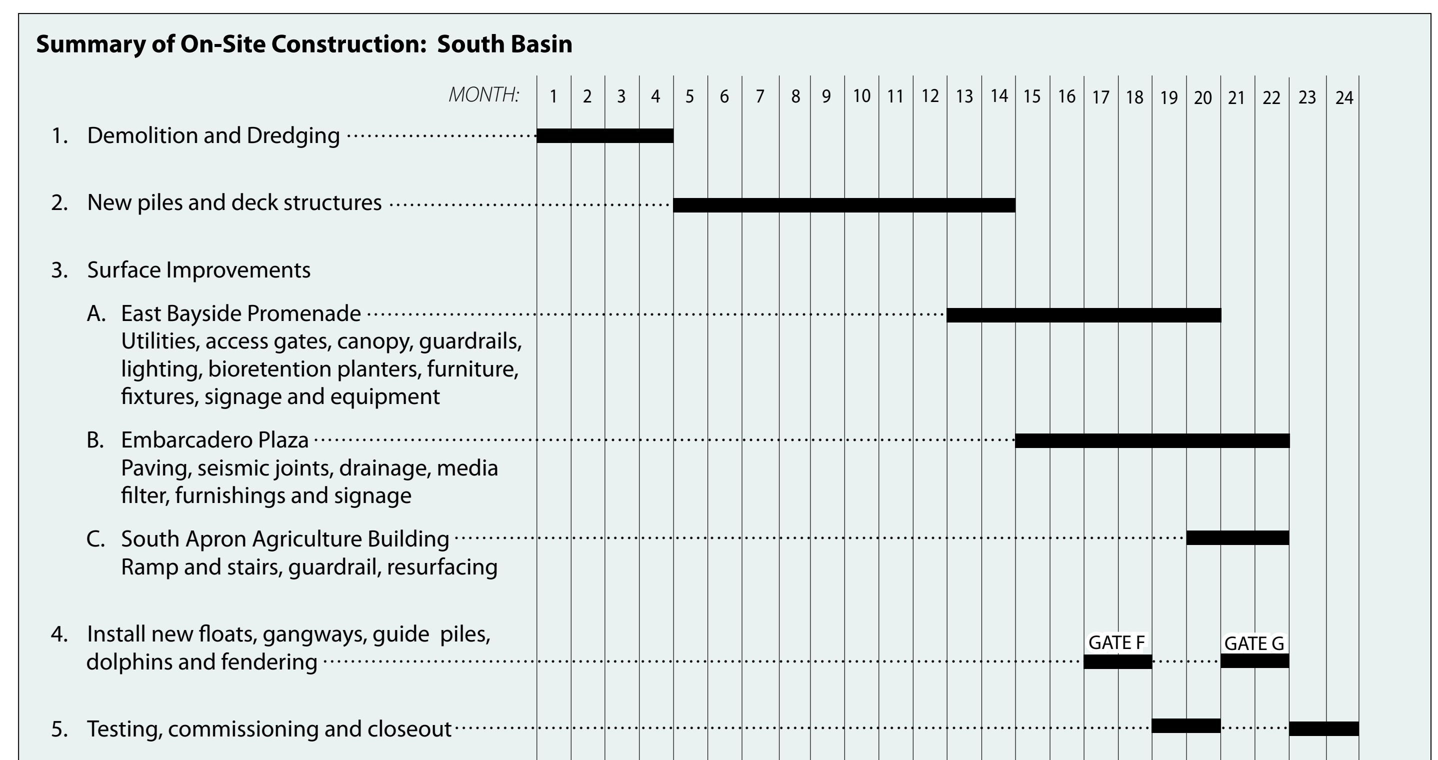


Table 7: Electrical Consumption Estimated Demand

	Area sq. ft.	Estimated Electrical Load watts/sf	Total Load Kw	Annual Operating Hours	Annual Electrical Consumption Kw/Hrs
FERRY TERMINALS					
Gangway Lighting Berths					
Per Berth			3.50	420	1,470
Subtotal (5 Berths)			3.50	2,100	7,350
Float Lighting Berths					
Per Berth			26.50	420	11,130
Subtotal (5 Berths)			26.50	2,100	55,650
Hydraulic Ramps Berths					
Per Berth			64.00	97	6,208
Subtotal			64.00	485	31,040
Communications and Security					
Per Berth			3.60	1,456	5,242
Subtotal (5 Berths)			3.60	7,280	26,208
Total Per Berth					24,050
Total (5 Berths)					**120,250**
PUBLIC ACCESS LIGHTING					
Gate A Access Pier	8,000	0.12	0.96	2,900	2,784
Gate B Access Pier	5,000	0.12	0.60	2,900	1,740
Gates E, F & G Access Pier	13,000	0.12	1.56	2,900	4,524
East Bayside Promenade and Embarcadero Plaza	20,000	0.12	2.40	2,900	6,960
Total Public Access Lighting					**16,008**
TOTAL ELECTRICAL CONSUMPTION					**136,258**

Note: It is assumed that shore power would only be provided for Gate G and it would only be used on an occassional basis. Therefore electrical consumption for shore power is not included.

Table 8: Electrical Consumption and Photovoltaic Power Generation

	Power Demand Kwh/yr	Photovoltiac Supply Kwh/yr	Available Power Kwh/yr
Gate A			
Ferry Terminal	24,050		
Public Access Pier (Canopy - 4,000 SF)	2,784		
Subtotal: Gate A	**26,834**	**40,350**	**13,516**
Gate B			
Ferry Terminal	24,050		
Public Access Pier (Canopy - 4,000 SF)	1,740		
Subtotal: Gate B	**25,790**	**40,350**	**14,560**
Gates E, F & G			
Bayside Ferry Terminals (3)	72,150		
Public Access Pier (Canopy - 10,100 sf)	4,524		
East Bayside Promenade & Embarcadero Plaza	6,960		
Subtotal: Gates E, F & G	**83,634**	**101,884**	**18,250**
TOTAL	**136,258**	**182,584**	**46,326**

Table 9: Conceptual Design - Preliminary Construction Cost Budget Estimate: North Basin

Item #	Description	Quantity	Unit	Unit Cost	Total Cost	Notes
Mobilization/Demobilization					***$1,389,000***	
a	Mobilization	1	LS	$931,000	$931,000	
b	Demobilization	1	LS	$458,000	$458,000	
Demolition					***$1,267,500***	
1	***Pier 1/2***				***$1,225,000***	
a	Remove Existing 300 Piles (wood & concrete)	310	EA	$0	$0	see next item
b	Remove 24,500 SF deck	24,500	SF	$50	$1,225,000	includes removal of piles
2	***Fendering Pier 1***				***$16,500***	
a	Remove 300 LF 12" x 12"	330	LF	$10	$3,300	
b	Remove 33 14"dia x 64ft long wood piles	33	EA	$400	$13,200	
3	***Guidepiles & Cluster Piles***				***$26,000***	
a	Remove 26 Piles	26	EA	$1,000	$26,000	
Dredging					***$252,000***	
1	***Gate A***				***$252,000***	
a	9000 CY	9,000	CY	$28	$252,000	assume 90% clean and 10% contaminated materials at $25/CY and 50/CY respectively
New Construction					***$16,347,250***	
1	***Gate A Pier (essential structure)***				***$4,120,000***	
a	265' long Precast Concrete Framing and Deck	8,000	SF	$300	$2,400,000	
b	Topping Slab	8,000	SF	$15	$120,000	
c	24"-36" x 140' long steel piles, vibrated in	40	EA	$40,000	$1,600,000	assume 30"dia x 3/4" (235lb/ft)
2	***Repair Marginal Wharf***				***$810,750***	
a	Assume repair 20% of existing piles	3	EA	$2,500	$7,500	assumes ~ 10 lf of repair per pile
b	New deck and topping slab	2,550	SF	$315	$803,250	
3	***Replace Pier 1 Fendering***				***$181,500***	
a	Chock Block, 12"x12" pressure treated wood	330	LF	$50	$16,500	
	14" dia x 64' long wood piles	33	EA	$5,000	$165,000	assume Greenheart piles
4	***New Gate A Berthing Facility***				***$8,020,000***	
a	Concrete Float & Steel Truss Gangway (complete)	1	EA	$6,600,000	$6,600,000	92' long gangway, 45'x115' concrete float
b	Guide Piles 42" dia x 150' long	6	EA	$70,000	$420,000	assume 42"dia x 1" (438lb/ft)
c	36" dia x 155' long dolphins	10	EA	$100,000	$1,000,000	assume 36"dia x 1" (375lb/ft)
5	***Architectural Finishes***				***$2,965,000***	
a	Access Gate	1	LS	$450,000	$450,000	
b	Granite Paving	700	SF	$150	$105,000	
c	Canopy Structure Gate A	4,000	SF	$250	$1,000,000	
d	Guardrail	450	LF	$450	$202,500	
e	Bioretention Planter	700	SF	$225	$157,500	
f	Canopy Structure Gate B	4,000	SF	$250	$1,000,000	
g	Amenities- Furnishings, Signage	1	LS	$50,000	$50,000	
5	***Utilities***				***$250,000***	
a	Electrical - for lighting ,power and comms.	1	LS	$150,000	$150,000	
b	Water for washdown & ballasting	1	LS	$50,000	$50,000	
c	Fire Protection	1	LS	$50,000	$50,000	
	Subtotal, North Basin				**$19,255,750**	
	Insurance, bonds, etc. @ 5%				$962,788	
	Contractor's OH&P@ 15%				$2,888,363	
	Total Construction Cost, North Basin				**$23,106,900**	
	Contingency @ 20%				**$4,621,380**	
	Total Estimated Cost, North Basin				**$27,728,280**	

Notes:
(1) Estimate does not include soft costs, such as engineering, environmental permitting, site investigations or construction management
(2) Estimate for floats/gangways includes structural items, navigation/mooring hardware, hand rails/roof cover, electrical & utilities, and engineering

Table 10: Conceptual Design - Preliminary Construction Cost Budget Estimate: South Basin

Item #	Description	Quantity	Unit	Unit Cost	Total Cost	Notes
Mobilization/Demobilization					***$3,150,000***	
a	Mobilization	1	LS	$2,111,000	$2,111,000	
b	Demobilization	1	LS	$1,039,000	$1,039,000	
Demolition					***$1,205,000***	
1	***Sinbads***				*$180,000*	
a	Remove Existing 1-story building	6,000	SF	$30	$180,000	
2	***Pier 2***				*$1,025,000*	
a	Remove Existing 350 Piles (wood & concrete)	350	EA	$0	$0	see next item
b	Remove 20,500 SF deck	20,500	SF	$50	$1,025,000	includes removal of piles
Dredging					***$672,000***	
1	***Gate F***				*$308,000*	
a	9,500 to 11,000 CY	11,000	CY	$28	$308,000	assume 90% clean and 10% contaminated materials at $25/CY and 50/CY respectively
2	***Gate G***				*$364,000*	
a	11,000 to 13,000 CY	13,000	CY	$28	$364,000	assume 90% clean and 10% contaminated materials at $25/CY and 50/CY respectively
New Construction					***$40,273,125***	
1	***New Access Deck***				*$18,046,500*	
a	C.I.P. Concrete Framing and Deck	32,155	SF	$300	$9,646,500	
b	24"-36" x 140' long steel piles, vibrated in	210	EA	$40,000	$8,400,000	assume 30"dia (235lb/ft)
2	***Gate E Berthing Facility***				*$900,000*	
a	Service & Relocate Steel Float & Steel Truss Gangway	1	EA	$900,000	$900,000	
3	***New Gate F Berthing Facility***				*$7,020,000*	
a	Concrete Float & Steel Truss Gangway (complete)	1	EA	$6,600,000	$6,600,000	92' long gangway, 45'x115' concrete float
b	Guide Piles 42" dia x 150' long	6	EA	$70,000	$420,000	assume 42"dia x 1" (438lb/ft)
4	***Gate G Float & Gangway***				*$7,020,000*	
a	Concrete Float & Steel Truss Gangway (complete)	1	EA	$6,600,000	$6,600,000	92' long gangway, 45'x115' concrete float
b	Guide Piles 42" dia x 150' long	6	EA	$70,000	$420,000	assume 42"dia x 1" (438lb/ft)
5	***New Dolphins***				*$1,050,000*	
a	36" dia x 155' long	14	EA	$75,000	$1,050,000	assume 36"dia x 1" (375lb/ft)
6	***New Fendering***				*$181,500*	
a	Chock Block, 12"x12" pressure treated wood	330	LF	$50	$16,500	
	14" dia x 64' long wood piles	33	EA	$5,000	$165,000	assume Greenheart piles
7	***Architectural Finishes East Bayside Promenade & Embarcadero Plaza***				*$5,710,625*	
a	Architectural Topping Slab	38,315	SF	$25	$957,875	
b	Granite Paving	2,100	SF	$150	$315,000	
c	Access Gate F&G	2	LS	$450,000	$900,000	
d	Canopy Structure Gate	10,100	SF	$250	$2,525,000	
e	Guardrail	550	LF	$450	$247,500	
f	Amenities- Furnishings, Signage	1	LS	$250,000	$250,000	
g	Bioretention Planter	990	SF	$225	$222,750	
h	Remote Bioretention Planter	1,300	SF	$225	$292,500	
i	Media Filter/Pump Station	1	LS	$175,000	$175,000	
8	***Utilities***				*$225,000*	
a	Electrical - for lighting, power and comms.	1	LS	$150,000	$150,000	
b	Fire Protection & Water for washdown & ballasting	1	LS	$75,000	$75,000	
9	***South Apron Improvement***				*$119,500*	
a	Stairs & Access Ramp	1	LS	$50,000	$50,000	
b	Resurfacing	2,400	SF	$5	$12,000	
c	Guardrail	110	LF	$450	$49,500	
d	Lighting	4	EA	$2,000	$8,000	
	Subtotal, South Basin				**$45,300,125**	
	Insurance, bonds, etc. @ 5%				$2,265,006	
	Contractor's OH&P@ 15%				$6,795,019	
	Total Construction Cost, South Basin				**$54,360,150**	
	Contingency @ 20%				**$10,872,030**	
	Total Estimated Cost, South Basin				**$65,232,180**	

Notes:
(1) Estimate does not include soft costs, such as engineering, environmental permitting, site investigations or construction management
(2) Estimate for floats/gangways includes structural items, navigation/mooring hardware, hand rails/roof cover, electrical & utilities, and engineering

Table 11: Preliminary Fill Calculations

	Removed Fill	Replaced Fill	New Fill	Net Fill
North Basin (Pier 1/2)	24,500	7,700	1,025	(15,775)
South Basin (Pier 2)	20,500	9,760	21,600	10,860
Total	**45,000**	**17,460**	**22,625**	**(4,915)**

Notes: Calculations do not include:
1. Differentation between solid fill (piles) and shadow fill (deck and bioretention planters)
2. Gangways (@ 1,300 sf each) considered cantilevered shadow fill
3. Floats (@ 5,200 sf each) considered floating fill