

Appendix H
Support Facilities Preliminary and Intermediate Alternatives Analysis

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Appendix H

Support Facilities Preliminary and Intermediate Alternatives Analysis

This appendix summarizes the preliminary and intermediate alternatives development and evaluation process for the support facilities. Due to changes in the nature of some ongoing and recommended ADP projects, additional changes were made between the selection of the recommended intermediate alternative concepts and the final alternatives evaluation found in **Section 5.5**.

H.1 Evaluation Criteria

Based on the inventory of existing conditions and the requirements identified in Chapter 4, a series of alternatives was developed to meet the High Constrained demand level. Each alternative was evaluated against the qualitative and quantitative criteria developed to determine if it would meet the Airport’s requirements. These criteria included accommodating programmed (i.e., existing) facility development plans, integration with ongoing development concepts, protecting support facilities that may have relocation challenges, avoiding the demolition of functional buildings, replacing buildings beyond their useful life, considering the spatial relationships between facilities, and understanding development priorities.

H.1.1 Meeting the Base Constrained Demand Level

With little or no forecast growth for cargo tonnage and late night/early morning departure operations between the Base Constrained demand level and High Constrained demand level, the area requirement for support facilities as an aggregate were similar at the Base Constrained demand level and High Constrained demand level. Considering the Airport’s competing development priorities, the Base Constrained demand level was used to develop requirements for the development of support facility alternatives. Facility demands for the High Constrained demand level were also developed for reference, but were not used as criteria for evaluation.

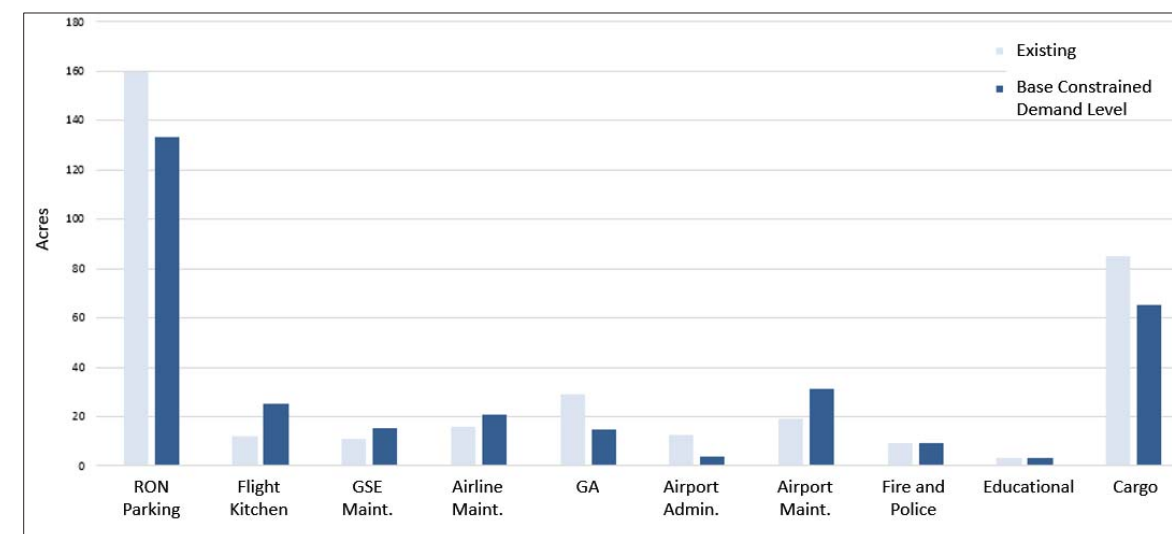
Exhibit H.1-1 presents a summary of the support facility requirements. Cargo and Remain Overnight (RON) parking positions account for the largest share of 68 percent of the total support facility land. Future cargo and RON position requirements were determined based on, respectively, the forecast cargo tonnage and annual growth in late night/early morning departure operations (0.7 percent).

The acreage requirements at the Base Constrained demand level were compared to existing conditions to identify the land area needed. The current land area for support functions comprises approximately 356 acres, including eight off-airport acres. The required land area is projected to be 322 acres at the Base Constrained demand level and 333 acres at the High Constrained demand level. The acreage surplus would decrease if other airport improvement projects require a portion of the existing area used for support facility functions.

While there may be sufficient land within the footprint of existing support function areas to meet forecast demand, future facilities must use the available acreage more efficiently. These strategies include:

- Constructing multi-level facilities
- Consolidating complementary facilities to encourage shared amenities
- Constructing employee vehicle parking on the roofs of buildings
- Designing aircraft parking positions to serve multiple uses
- Designing the apron to accommodate a diverse fleet mix
- Siting facilities in rectangular-shaped or right-sized areas to minimize space inefficiencies

Exhibit H.1-1 | Support Facilities Land Acreage Requirements Summary



Source: RS&H, March 2016

Table H.1-1 shows the landside areas¹ and the total required building area grouped by support facility.

¹ In this section, “landside” refers to surface areas include vehicle parking, circulation/landscaping, container staging, and some ground service equipment storage both inside and outside the Air Operations Area (AOA) fence; it is not restricted to “landside” (i.e., outside the AOA) land uses. The landside area excludes the building footprint area. Aircraft parking areas are excluded and generally captured as part of RON aircraft parking, general aviation, and cargo apron requirements.

Table H.1-1 | Support Facility Requirements by Building Area and Landside Area

SUPPORT FACILITY AREA	EXISTING	BASE CONSTRAINED (SQUARE FEET)	HIGH CONSTRAINED (SQUARE FEET)
Flight Kitchen (~70% located off-Airport)	513,700	951,500	1,087,000
Building	287,900	533,400	609,300
Landside	307,900	570,300	651,500
GSE Maintenance	477,348	672,400	684,800
Building	100,178	141,100	143,700
Landside	377,170	531,300	541,100
Airline Maintenance	698,948	907,900	917,200
Building	267,890	401,800	401,800
Landside	431,058	506,100	515,400
General Aviation	430,162	443,600	443,600
Building	95,632	79,500	79,500
Landside	334,530	364,100	364,100
Airport Administration	531,926	420,200	420,200
Building	142,626	256,100	256,100
Landside	389,300	164,100	164,100
Airport Maintenance	833,900	1,357,300	1,521,900
Building	147,903	205,300	234,500
Landside and Construction Staging	685,980	1,152,000	1,287,400
Building and Landside	685,980	1,152,000	1,287,400
Fire and Police	392,960	392,960	392,960
Building	59,445	59,445	59,445
Landside	328,395	328,395	328,395
Educational	148,690	148,690	148,690
Building and Landside	148,690	148,690	148,690
Cargo	3,213,300	2,415,000	2,415,000
Building	950,800	754,700	754,700
Landside	2,262,500	1,660,400	1,660,400

GSE = Ground Service Equipment

Notes: Numbers may not add due to rounding.

Totals are the land area required, including landside areas and the building footprint.

The building requirements account for the space in multi-level facilities.

Landside areas include vehicle parking, circulation/landscaping, and airside areas such as container staging and some ground service equipment storage. The landside area excludes the building footprint area. The only exceptions include landside areas comprising only employee vehicle parking for Airport administration and airline maintenance.

Aircraft parking areas are excluded and generally captured as part of RON aircraft parking, general aviation, and cargo apron requirements.

Source: RS&H, March 2016

RON aircraft parking requirements were determined for each year and by aircraft size, as shown in **Table H.1-2**. It was assumed that the 27 outdoor (i.e., not in a hangar) aircraft parking positions at the United Airlines Maintenance Operations Center would be available as RON aircraft parking positions for United Airlines aircraft. All parking positions in the East Field, including those within the Superbay Hangar, were assumed available as RON aircraft parking positions.

Table H.1-2 | Remain Overnight (RON) Aircraft Parking Requirements by Year and Aircraft Size

DEMAND LEVEL	NARROWBODY	WIDEBODY	TOTAL
Existing Capacity¹	61	32	93
2014	68	6	74
2015	68	7	75
2016	68	8	76
2017	69	8	77
2018	69	8	77
2019	69	8	77
2020	70	8	78
2021	70	8	78
2022	71	8	79
2023	71	8	79
2024	70	10	80
2025	69	12	81
2026 (BASE CONSTRAINED)	68	14	82
2027	68	14	82
2028	69	14	83
2029	69	14	83
2030 (HIGH CONSTRAINED)	70	14	84

Source: RS&H, March 2016

Notes: 1 – Existing capacity data current as of FY 2015/2016. SFO has plans to eliminate one narrowbody position in the South Field in FY 2016/2017.

H.1.2 Programmed Development Plans and Ongoing Development Concepts

As part of the alternatives development process, past and ongoing planning studies as well as the other ADP focus area alternatives studies were reviewed to identify future projects that could potentially affect the support facilities. These projects included:

- SFO staff comments
- Other ADP Focus Area studies
- October 2012 ADP Report – Facilities Inventory
- January 2014 Airport Layout Plan
- East Field Assessment and Development Report (SFO Design & Construction, March 2014)
- Consolidated Administration Campus (CAC) Programming

- Airport Hotel and S. McDonnell Road Realignment
- Plot 700 Ground Transportation Unit (GTU) Facility Environmental Review
- South Field Demolition
- Terminal 1 Redevelopment

These plans include the following changes to the support facilities:

- Demolish and relocate the majority of support facilities in the South Field:
 - Relocate the South Field Emergency Response Facility (ERF #3)
 - Relocate the South Field RON aircraft parking to a location near the new Airport hotel and configure for up to six narrowbody aircraft or three widebody aircraft
 - Relocate the ground transportation support facilities to a consolidated facility in Plot 700 (North Field)
- Construct Building 632 for cargo use (completed in 2014)
- Construct a new West Field Cargo Facility to replace Buildings 602, 606, and 612, which are in poor condition
- Construct a new West Field Parking Garage #2 to consolidate parking facilities
- Convert Building 624 to a Ground Service Equipment (GSE) maintenance facility
- Demolish Building 676 (administrative) and Building 670 (museum storage) and relocate the employees/storage into the Consolidated Administration Campus (CAC)
- Construct the CAC in the West Field (two office buildings and one parking garage)
- Relocate some Airport maintenance landside areas to the North Field
- Rehabilitate the existing Superbay Hangar (Building 1060)

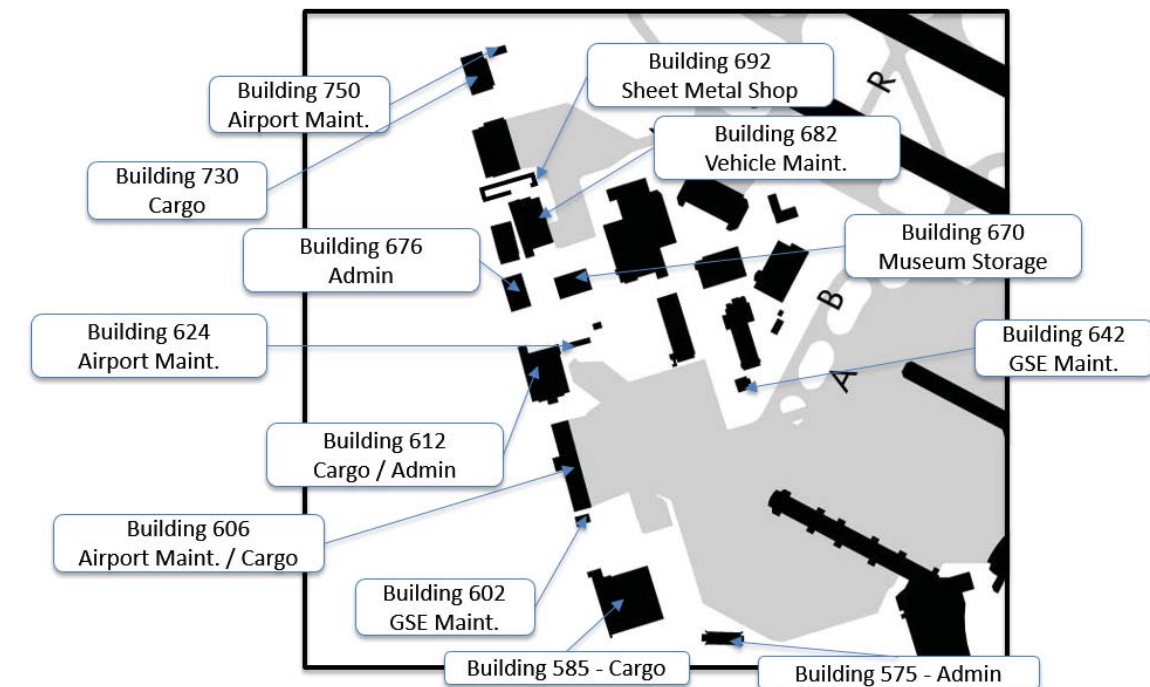
The space available for support facilities was determined based on the Big H and F&G Extension alternatives (see **Section 5.3.1**). The Big H alternative includes the construction of a new Boarding Area H, which requires the demolition of Building 575 (SFO Business Center), Building 585 (United Airlines cargo facility), and Building 602 (GSE maintenance facility). The F&G Extension alternative includes the extension of Boarding Areas F and G.

For either alternative, the associated airfield improvements to realign and resolve non-standard separation between Taxiways A and B would require the demolition of a part of Building 642, which is currently a GSE maintenance facility, as well as Building 649, which is currently the only on-Airport flight kitchen.

Other plans influencing the development of the support facility alternatives include plans to add AirTrain storage tracks in the West Field, which would require the demolition of Building 692 (SFO Sheet Metal Shop). Some flexibility was preserved for the development in the northern part of the West Field because alternatives for the consolidated rental car facility included extending that facility into the area occupied by Building 730 and Building 750 (see **Section 5.4.3.2**).

As shown in **Exhibit H.1-2**, more than half of the existing buildings in the West Field may need to be reconfigured (demolished & rebuilt) to create an organized support facility that can accommodate expansion of the airfield and boarding areas.

EXHIBIT H.1-2 | Potential Demolition of Impacted Existing Support Facilities Identified for Demolition



Source: RS&H, February 2015

H.1.3 Undevelopable Areas and Building Condition Considerations

Some of the existing facilities on the Airport cannot be relocated or removed because the costs would be prohibitive. In the West Field, these facilities include the AirTrain maintenance facility and tracks (Building 679), Telecommunications Minimum Point of Entry (MPOE) building (Building 620), the U.S. Postal Service facility (Building 660), and the planned CAC. In the North Field, these facilities include the United Airlines Maintenance Operations Center, the planned GTU facility in Plot 700, the Mel Leong Treatment Plant, and the Airport fuel farm.

Some Airport facilities are in poor condition and must be renovated or demolished and reconstructed or relocated within the planning horizon:

- South Field
 - Building 16
- West Field
 - Building 606

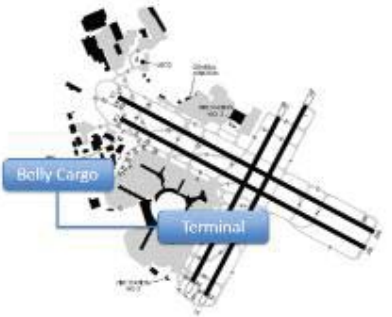

- Building 612
- Building 676
- North Field
 - Building 944
- East Field
 - Building 1059
 - Building 1070



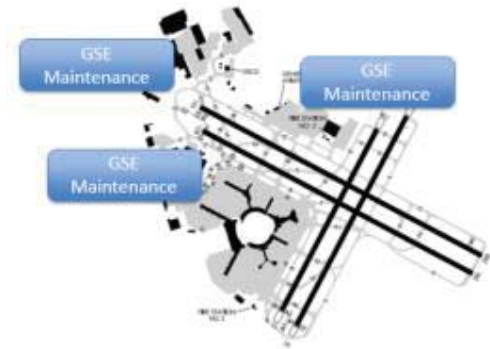
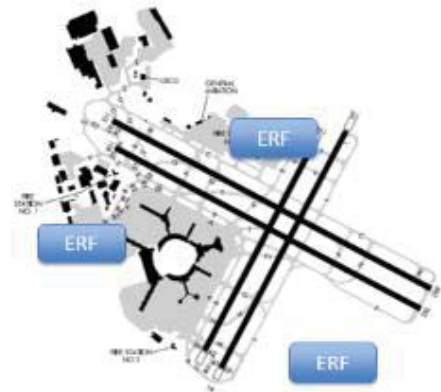
These existing building maintenance requirements were taken into consideration in the development of alternatives and phasing plans.


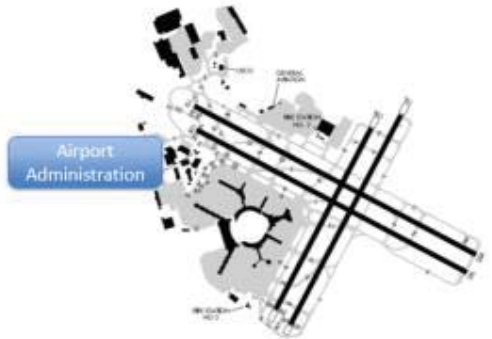

H.1.4 Spatial Relationships and Geographical Preferences

The spatial relationships among facilities are a factor in the overall efficiency of the Airport’s operation. **Exhibit H.1-3** summarizes the spatial relationship and geographic preference considerations.

EXHIBIT H.1-3 | Spatial Relationship and Geographic Preference Considerations

DESCRIPTION	ILLUSTRATION
Belly cargo operations should be located close to the passenger terminal. SFO staff identified the need to designate a single vehicle security checkpoint for belly cargo.	
Flight kitchens should be accessible to the passenger terminal, but can be located on- or off-Airport.	

DESCRIPTION	ILLUSTRATION
Minimize runway crossings and long taxiing distances by planning for close-in RON aircraft parking. Most RON aircraft in the East Field must taxi around the Runway 10L/10R ends to access the East Field. ATCT will not allow aircraft to cross the runways during predominant operating conditions.	
Airline maintenance areas should be accessible to aircraft parking areas to minimize the distance that service technicians must travel to access the aircraft they are servicing.	
GSE maintenance facilities should be positioned in multiple locations to minimize travel distances. These facilities could be moved off-Airport.	
The ERFs should be positioned in multiple locations to provide timely emergency response services. ERF #2 should remain the only Part 139-certified ARFF facility.	

DESCRIPTION	ILLUSTRATION
<p>Airport maintenance facilities should be in multiple locations to minimize travel distances.</p>	
<p>Airport administration facilities should be located near AirTrain stations for easy access by employees to the terminals and BART.</p>	
<p>Freight cargo should be located in the North Field for convenient freeway access, proximity to the airfield, and separation from passenger activity.</p>	

Source: RS&H, February 2015

SFO is a land-constrained Airport, and not all support facilities and functions could be accommodated on Airport property. The prioritization of on-Airport facilities was coordinated with SFO staff to determine the highest and best use of on-Airport land (in descending order):

1. Airfield/Terminal
2. Utilities
3. Ground Access/Parking
4. Passenger Aircraft RON Parking
5. Cargo
6. Airline Maintenance
7. General Aviation
8. Airport Maintenance
9. Administrative
10. GSE Maintenance
11. Flight Kitchen
12. Educational

The lowest-priority support facilities can function efficiently without being located on Airport property; such facilities are often located near the Airport and have secure gate access to the airfield when vehicles need to enter the airport operations area (AOA) from an off-Airport location. Examples of these facilities include flight kitchens and GSE maintenance facilities. The existing educational facility in the North Field has no inherent need to be located on Airport property. SFO staff confirmed that non-essential facilities could remain off-Airport or be relocated there if necessary.

H.2 Alternatives Development Rationale

Factors providing the basis for developing the future support facilities include:

- Accommodating the ADP forecast and the resulting calculated facility requirements
- Addressing poor building conditions
- Accommodating previously planned support facility projects
- Responding to future planned and potential terminal, airfield, and ground access/parking changes that impact existing support facilities

H.2.1 Accommodating the ADP Forecast and Facility Requirements

Support area functions currently occupy 356 acres, including eight acres off-Airport. At the Base Constrained demand level, no additional acreage is needed to accommodate all support facilities, the majority of which could be accommodated on-Airport.

Through coordination with SFO staff, three support facility functions were identified as suitable to be located off Airport property if necessary: educational facilities, flight kitchens, and GSE maintenance. All other support facility functions must be located on-Airport.

The recommended alternatives for the other ADP focus areas cause the loss of approximately 26 acres of land that was originally allocated for support facilities. Therefore, where possible, development strategies were considered for planning the future location of support facilities to gain efficiencies in the use of the existing land area. The higher potential cost of space saving strategies is offset by the potential revenue loss from tenants if they must be relocated off-Airport.

H.2.2 Addressing Poor Building Conditions

Building conditions were a factor in the development of the support facility alternatives. Buildings in poor and fair condition were prioritized for replacement. The cost estimates prepared for these buildings include either a full demolition or renovation.

On-Airport buildings in poor condition and in need of renovation or removal within the planning horizon include Building 16 in the South Field; Buildings 606, 612, and 676 in the West Field; Building 944 in the North Field; and Buildings 1059 and 1070 in the East Field.

Buildings in fair condition, but likely to be in poor condition and require renovation and/or reconstruction within the ADP 20-year planning horizon, include Buildings 585, 602, 624, 670, 692, 710, and 730 in the West Field and Building 1060 (Superbay Hangar) in the East Field.

H.2.3 Previously Planned Support Facility Projects

As documented in **Section 3.5**, several support facility projects were planned prior to or concurrent with the ADP. The previously planned support facility projects include:

- Demolition of South Field support facilities to accommodate Boarding Area B improvements
- Demolition of Buildings 670 and 676 (both currently in poor/fair condition) to construct the Consolidated Administration Campus (CAC)
- Relocation of Ground Transportation Unit in Plot 700 of the North Field
- Expansion of the Superbay Hangar, relocation of the fire suppression tanks, and reconfiguration of employee vehicle parking and RON aircraft parking areas

The support facility alternatives assume implementation of the above projects. Their plans and cost estimates have been carried forward into the recommended alternative concept.

H.2.4 Future Planned Airport Projects That Affect Support Facilities

Future planned airside and landside facilities and the potential changes to the terminal, airfield, and ground access/parking all result in an encroachment of approximately 26 acres into the West Field support facility area. As previously described, space-saving strategies were employed to manage land demand.

However, the primary impact to support facility functions in the West Field occurs from the future terminal expansion plans and the realignment of Taxiways A and B. These impacts would result in the potential demolition of the following buildings:

- Building 575
- Building 585
- Building 602
- Building 642 (a portion of the main building and the ancillary buildings)
- Building 649
- Building 650

To accommodate the relocation of tenants from these demolished buildings, some existing buildings would need to be repurposed. Where necessary, the new facilities would accommodate both the displaced and forecasted demand:

- New GSE maintenance facilities would be constructed to accommodate displaced tenants and meet the increased demand for GSE maintenance space.
- The flight kitchens in Building 649 would be relocated to Building 944 in the North Field or off-Airport.
- Building 710 would need to be repurposed to accommodate Airport maintenance or another support function.
- Many of the apron areas would need to be reconfigured to meet RON aircraft parking demand.

The costs for demolishing and repurposing the existing buildings, as well as reconfiguring the apron areas to accommodate forecast demand, are included in the overall cost estimates.

H.3 Preliminary Alternatives

The distinctive geographic areas at SFO influence the accessibility of aircraft and service vehicles on-Airport and vehicles traveling on the public roadways off-Airport.

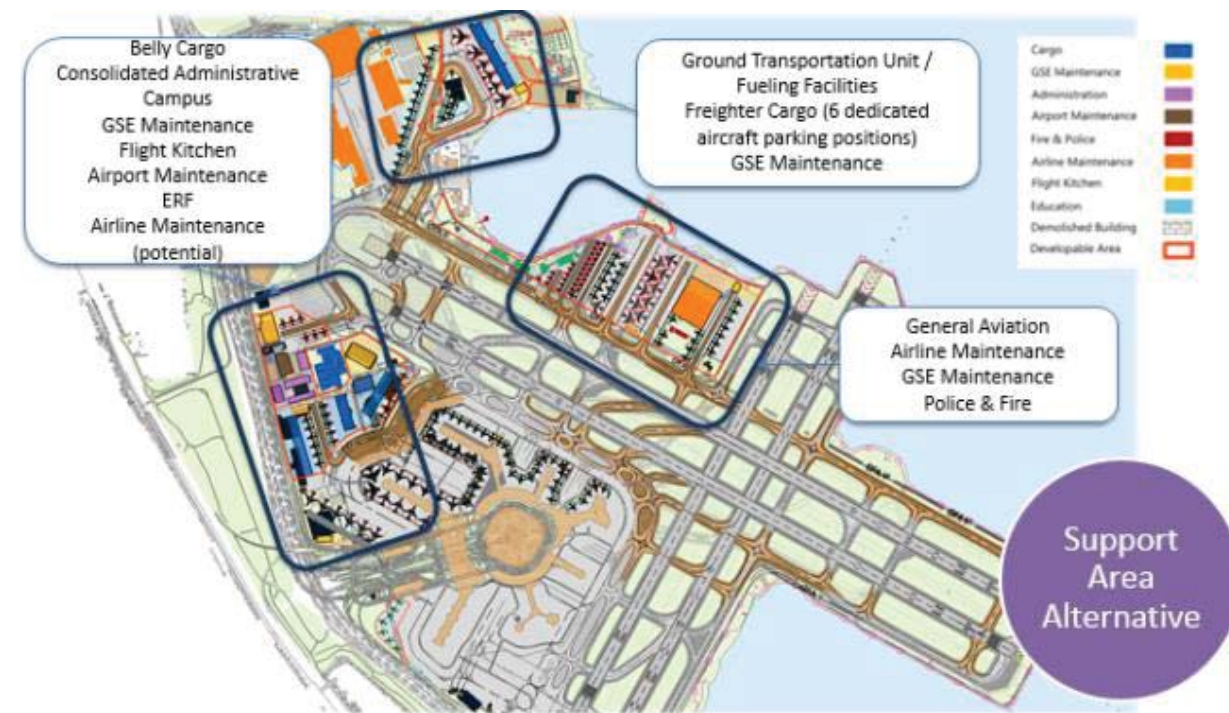
The development of the alternatives prioritized RON aircraft parking positions over all other support functions. Approximately half of the land area required for support functions is for RON aircraft parking, which ideally would be located near the terminal. Therefore, the location of RON aircraft parking was considered early in the alternatives development process to ensure a space would be available close to the passenger terminal.

After the redevelopment of Boarding Area B, the West Field will be the only support facility immediately adjacent to the terminal area. Therefore, many different functions would compete for use of space in the West Field. The West Field is already fully developed with support facility functions. Few, if any, of the existing functions can be relocated to other areas on the Airport that would permit RON parking in the West Field and benefit all users.

Therefore, the analysis of alternatives determined that the largest concentration of RON parking would remain in the East Field while some of the land area in the West Field and North Field would be made available for short-term aircraft parking, when moving aircraft between the boarding areas and the East Field would be inefficient.

Exhibit H.3-1 shows an alternative that prioritized RON aircraft parking positions in the West Field and North Field. The refinement of alternatives and discussion with SFO staff and stakeholders identified that most of the RON aircraft parking would need to remain in the East Field to preserve the West Field and North Field for other existing and planned facilities and to control program development costs.

EXHIBIT H.3.1 | Potential Alternative to Prioritize Remain Overnight Aircraft Positions



Source: RS&H, February 2015

This initial approach was later refined following the introduction of a second gate expansion alternative (F&G Extension) which resulted in greater impacts to support facilities in the West Field.

H.3.1 North Field

The North Field would be used primarily for freight cargo, RON aircraft parking, and airport maintenance. A sub-option was prepared to include a “North Loop” to accommodate additional RON aircraft parking positions in the North Field.

H.3.2 East Field

The East Field would be used for the Part 139-certified ERF, general aviation, RON aircraft parking, and airline maintenance, all of which currently exist in these areas and were deemed the highest and best uses of the area.

H.3.3 South Field

The South Field would be used for an ERF and RON aircraft parking. SFO already has plans to convert the majority of the South Field for future terminal and airfield use.

H.3.4 West Field

The relative size of the West Field and its proximity to the terminal area make it the area with the greatest flexibility for the development of support facilities. Therefore, the largest number of alternatives was developed for the West Field.

The West Field alternatives are dependent on the recommended gate expansion alternative concept. Because the F&G Extension would shift Taxiways A and B substantially into the West Field, that group of alternatives requires more demolition and reconfiguration than the Big H alternatives.

The West Field alternatives are classified by two degrees of redevelopment intensity: preserve and clean slate:

- **Preserve** prioritizes existing facilities in the West Field to the greatest practical extent while accommodating necessary RON aircraft parking, remain all-day (RAD) aircraft parking, and a “Race Track” – an area that allows arriving aircraft to hold temporarily if gate space is not available. Aging facilities and facilities that would be affected by other development (e.g., Taxilanes A and B realignment) were not maintained.
- **Clean Slate** would accommodate the same requirements, but facilities would be replaced, reused, and/or relocated to reconfigure the West Field into a more efficient layout.

Six preliminary West Field alternatives were developed:

Big H Alternatives

- Preserve A
- Preserve B
- Clean Slate

F&G Extension Alternatives

- Preserve
- Clean Slate A
- Clean Slate B

The alternatives include relocating vehicle service roads, vehicle checkpoints, and public roadways and developing the Race Track, which would be capable of accommodating one widebody and two narrowbody positions.

The West Field alternatives each provide five RON/RAD widebody aircraft parking positions based on facility requirements and SFO staff input. Through 2018, only three widebody RON/RAD positions may be required.

Following discussions with SFO staff, the North, South, and East Field development plans and the six West Field alternatives were refined and reduced to four alternatives:

Big H Alternatives

- Alternative 1A/1B
- Alternative 2

F&G Extension Alternatives

- Alternative 3
- Alternative 4

Rough order of magnitude cost estimates were completed for the refined alternatives. The South, North, and East Field alternatives were further refined and two West Field alternatives, Alternative 1B for the Big H terminal plan and Alternative 3 for the F&G Extension terminal plan, were recommended for further discussion and feedback by SFO senior staff and the SFO Planning Advisory Board.

H.4 Intermediate Alternatives

The recommended South Field, North Field, and East Field alternatives were carried forward and applied to both the Big H and F&G Extension terminal plans. Two West Field recommended alternative concepts, one for Big H and one for the F&G Extension, were carried forward. All of these alternatives meet the facility requirements at the Base Constrained demand level. The evaluation criteria include:

- Operational Efficiency
 - Maintain or Minimize Vehicular Travel Distances/Time
 - Provide Alternative Intra-Airport Access Opportunities
 - Maintain or Enhance Airport Access through Security Checkpoints
 - Maintain or Minimize Aircraft Travel Distances/Time
- Safety and Security
 - Minimize Interference between Aircraft and Vehicle Movements
- Constructability and Phasing
 - Minimize Construction Impacts
 - Ease of Phasing

- Land Development
 - Enhance Future Development Opportunities
 - Supports Adaptable Land Use
- Fiscal Sustainability
 - Supports Revenue Generation
 - Funding

H.4.1 South Field

Exhibit H.4-1 shows the South Field recommended alternative. No changes are proposed to the ongoing projects in this area.

Future planned improvements to Boarding Area B and associated taxiway realignments require the relocation of a majority of existing buildings. Tenants in those buildings will be relocated to other existing on-Airport buildings. The remaining South Field support facilities include Building 12 (ERF #3), Building 60 (SFO Data Center), several utilities, and the RON apron.

ERF #3 will be relocated slightly south of its existing location. The new ERF #3 will total approximately 22,000 square feet on a single level. Landside areas total approximately 50,000 square feet. The RON apron near Boarding Area A will be reconfigured to accommodate six narrowbody aircraft or three widebody aircraft. The apron area totals approximately 180,000 square feet. The new site of the RON apron meets the Airport's goal to locate some RON and remain all day (RAD) aircraft parking positions closer to the passenger terminal. A portion of South McDonnell Road will be realigned to accommodate the RON apron.

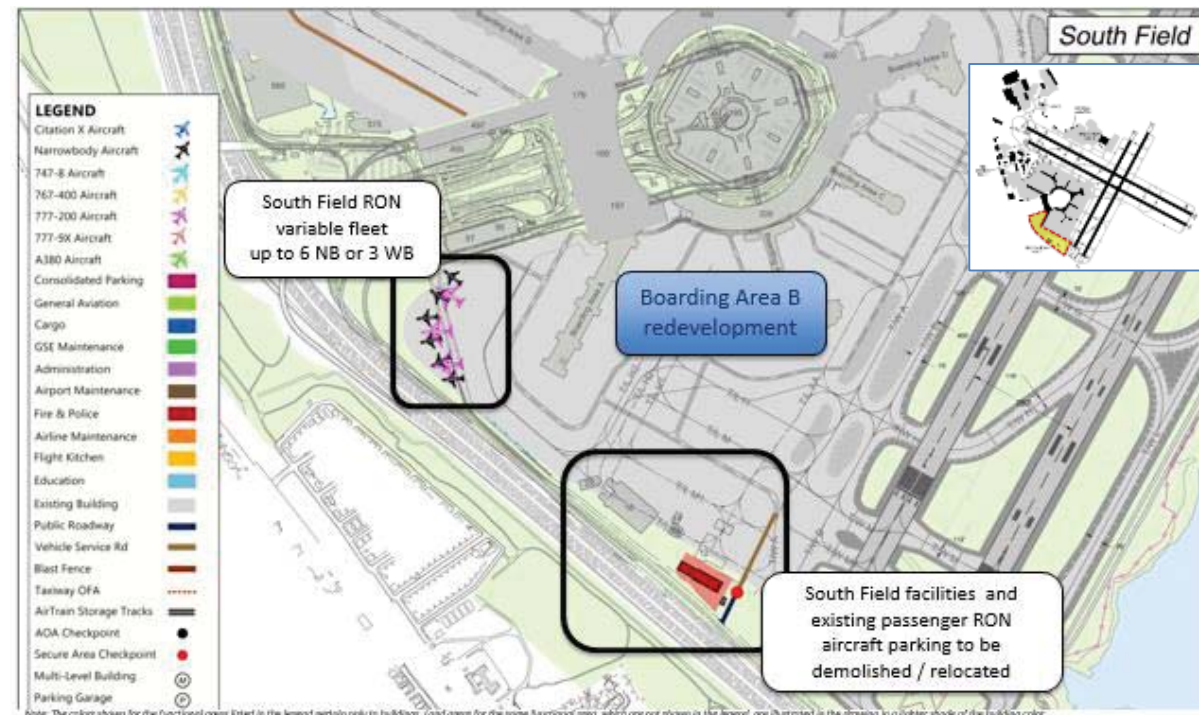
Exhibit H.4-2 shows the South Field alternative evaluation. Benefits include flexible RON aircraft parking near the terminal.

The total estimated cost of the South Field recommended alternative is \$108.3 million. The rough order of magnitude costs are summarized in **Table H.4-1**.

TABLE H.4-1 | South Field Recommended Alternative Order of Magnitude Costs

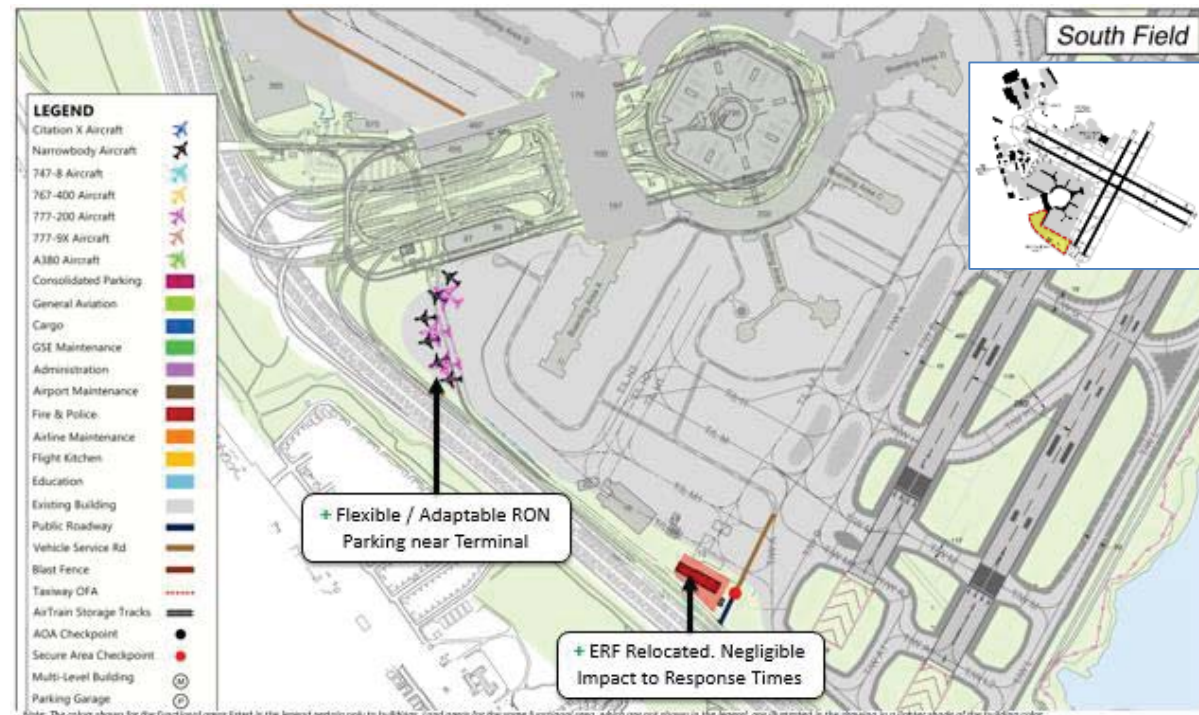
PROJECT ITEM	ESTIMATED COST
Construct RON aircraft parking apron and realign a portion of South McDonnell Road	\$48.9 million
Relocate ERF #3 and demolish existing buildings	\$59.4 million

EXHIBIT H.4-1 | South Field Recommended Alternative



Source: RS&H, June 2015

EXHIBIT H.4-2 | South Field Alternative Evaluation



Source: RS&H, June 2015

H.4.2 North Field

EXHIBIT EXHIBIT H.4-3 shows the North Field recommended alternative.

The total building requirement for processing freight cargo totals approximately 120,000 square feet through the end of the ADP planning horizon. Building 900 has a total building area of 343,000 square feet and is adequate to meet freighter cargo demand beyond the planning horizon. Building 900 would continue to be used to process freight cargo. The freight cargo operations in other on-Airport buildings (Buildings 648, 710, and 944) would relocate to Building 900. The existing six widebody aircraft parking positions in front of Building 900 are adequate to accommodate cargo aircraft demand through the planning horizon.

A new GSE maintenance building south of Building 900 would provide a space for North Field ground handlers and airlines to repair GSE. The new GSE maintenance building would total approximately 24,000 square feet on a single level. Landside areas would total approximately 90,000 square feet. The new GSE maintenance building would accommodate GSE maintenance demand through the planning horizon as well as meet previously identified goals to locate GSE maintenance close to the carriers they service and minimize travel distances.

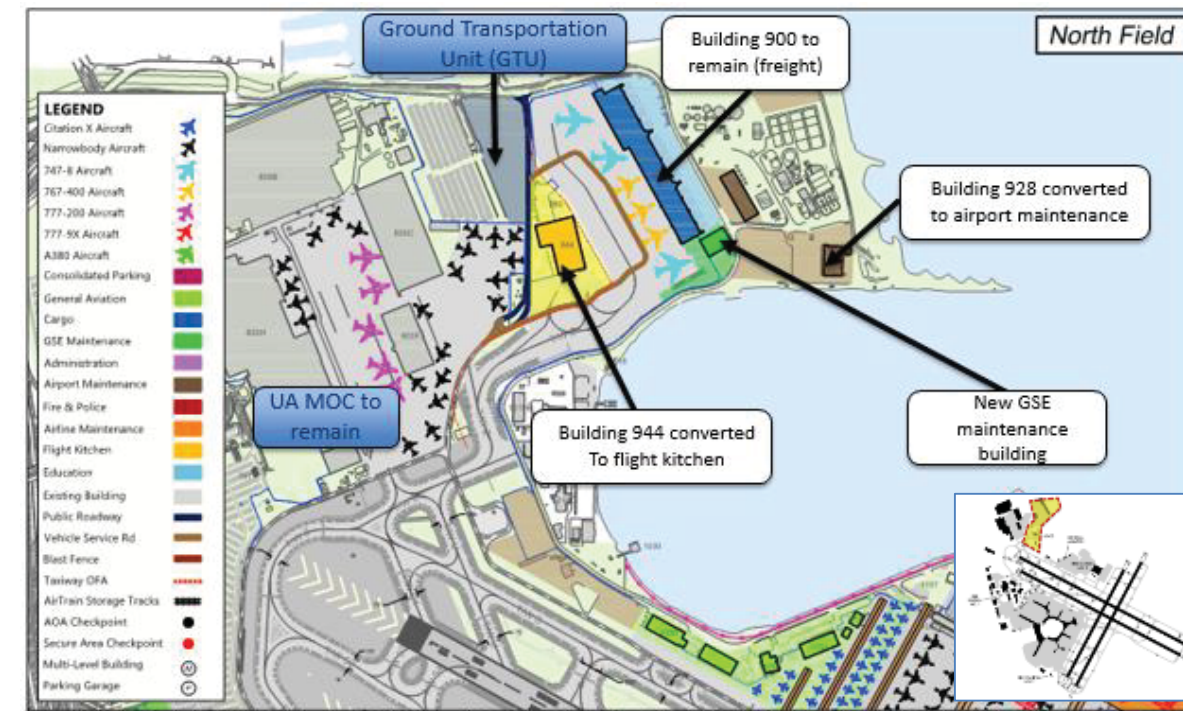
Buildings 928 and 928A are currently an educational facility for aircraft technician training. As demand for Airport maintenance space grows through the planning horizon, the educational facility would be moved off-Airport and the buildings would be converted for use by Airport maintenance personnel. Additional Airport maintenance facilities and landside areas, used primarily for storage, would be constructed near the fuel farm. The additional space would accommodate a portion of the total Airport maintenance requirement of approximately 235,000 square feet of office/workshop and building storage space, as well as about 1.1 million square feet of landside area for employee parking, circulation, materials storage, and construction staging through the planning horizon.

Building 944, which is currently in poor condition, would be renovated and converted for use as a flight kitchen to enable the demolition of the existing flight kitchen (Building 649). Existing Building 944 tenants would be relocated to other on-Airport buildings.

Other projects in the North Field include the planned Ground Transportation Unit (GTU), which consolidates ground transportation facilities currently located in the South Field and West Field. The United Airlines Maintenance Operations Center would remain in place through the planning horizon.

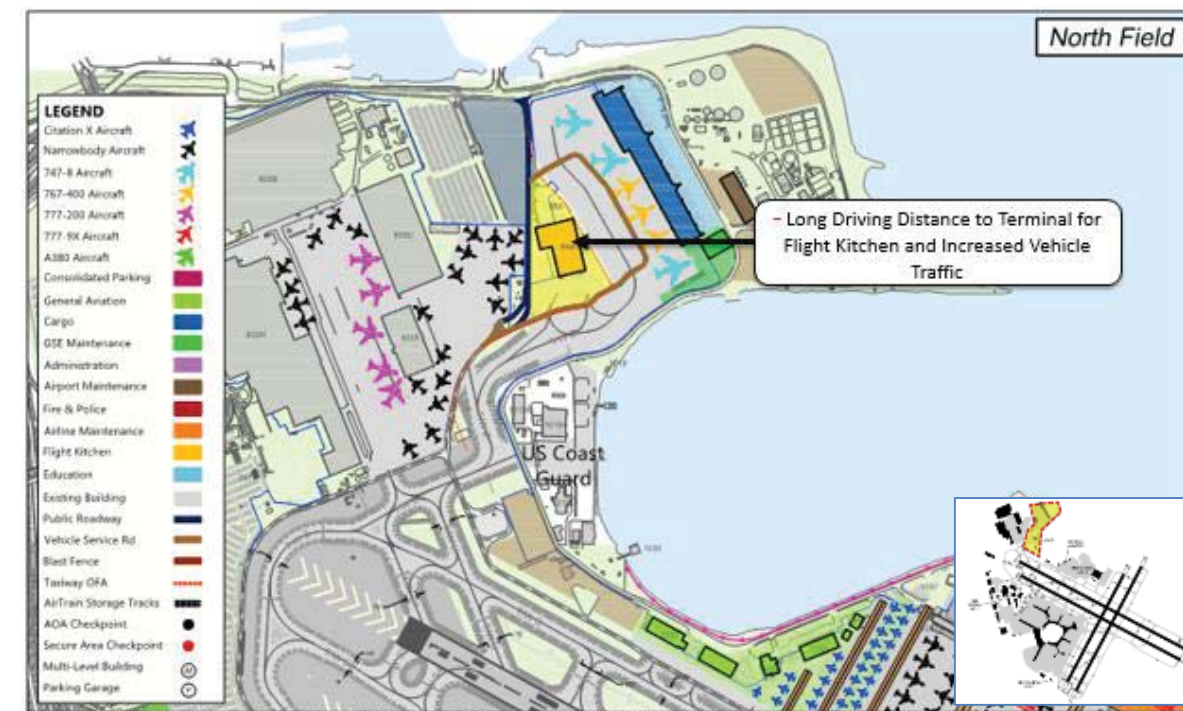
Exhibit H.3-4 shows the alternative evaluation. Disadvantages include longer driving distances to the terminal for flight kitchen facilities and increased on-Airport vehicle traffic.

EXHIBIT H.4-3 | North Field Recommended Alternative



Source: RS&H, June 2015

EXHIBIT H.4-4 | North Field Alternative Evaluation



Source: RS&H, June 2015

H.4.3 East Field

EXHIBIT H.4-5 shows the East Field Recommended Alternative.

Existing general aviation facilities would largely remain in place with one exception: Building 1055 would be relocated slightly west in order to extend the taxiway and expand the FBO apron to accommodate up to 30 Cessna Citation X aircraft (or similar mix of business jet aircraft) as required to meet general aviation demand through the planning horizon.

The majority of the East Field apron (Plots 40, 41, and 42) would continue to be used for RON aircraft parking. The existing capacity of the East Field apron, including space within the hangars, would total 26 narrowbody aircraft and 15 widebody aircraft. In the future, the apron would need to accommodate approximately 51 narrowbody aircraft and five widebody aircraft. The total number of parking positions would increase from 41 to 56 positions. The taxiways would be extended along their existing centerlines to provide access to the revised parking positions. The additional apron area would total approximately 270,000 square feet. The East Field apron pavement would be re-striped as necessary throughout the planning horizon to accommodate the evolving fleet mix.

Other planned changes in the East Field include an expansion to the Superbay Hangar of approximately 180,000 square feet to accommodate two additional widebody (Boeing 777X) aircraft for a total of six aircraft within the hangar facility. The expansion would enable the renovation of the existing Superbay Hangar. SFO plans to propose the renovation of one-half of the hangar first followed by the renovation of the remaining half at a later date. The fire suppression tanks would also be relocated near the hangar.

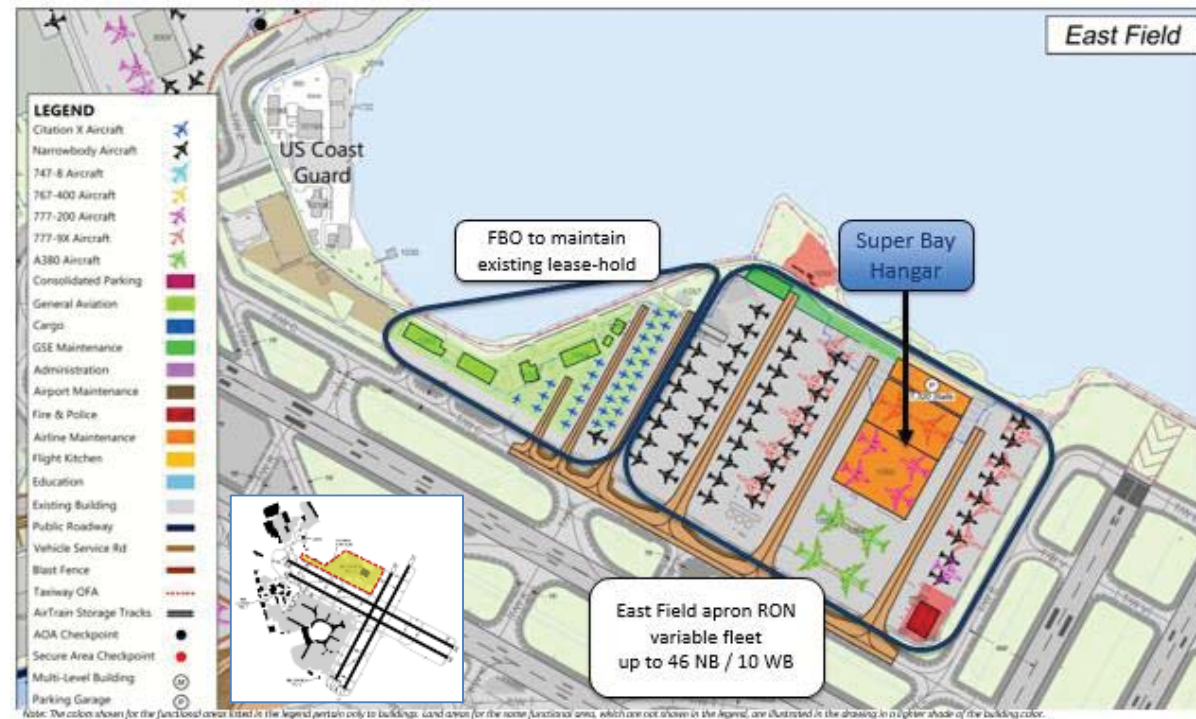
The airline maintenance employee vehicle parking lot would be condensed into a smaller footprint area due to the growing demand to accommodate RON aircraft parking and the Superbay Hangar expansion. As a result, accommodating parking demand may necessitate a parking garage. An alternative would temporarily convert some of the new aircraft parking positions into a vehicle parking lot through 2023, delaying the need for the parking garage.

A new GSE maintenance facility totaling approximately 33,000 square feet constructed close to airline maintenance and FBO facilities would meet increasing demand through the planning horizon. Landside areas for the GSE maintenance facility would total approximately 90,000 square feet. Police training facilities are currently in poor condition and would be renovated. Finally, the existing ERF #2 would be relocated to the area where Building 1070 is currently located. Tenants in Building 1070 would relocate to other on-Airport buildings.

Exhibit H.4-6 shows the alternative evaluation. The proposed plan for the East Field has several benefits:

- Maintaining the FBO in its existing location, which would avoid relocation costs
- RON aircraft parking positions are laid out in a flexible and adaptable manner and could be re-marked to accommodate fleet mix changes
- Relocation of ERF #2 reduces the distance to the midpoint of the farthest runway by approximately 700 feet
- The Superbay Hangar expansion would accommodate a larger aircraft maintenance facility

EXHIBIT H.4-5 | EAST FIELD ALTERNATIVE



Source: RS&H, June 2015

EXHIBIT H.4-6 | EAST FIELD ALTERNATIVE EVALUATION



Source: RS&H, June 2015

H.4.4 West Field

The two alternatives proposed and evaluated for the West Field include the Big H alternative and F&G Extension alternative.

Big H Alternative

Exhibit H.4-7 shows the Big H alternative.

Building 632, the new West Field Cargo Facility, and Building 642 (currently the United Airlines GSE maintenance facility) would be used as new belly cargo facilities. The new West Field Cargo Facility would be a two-level facility totaling approximately 220,000 square feet with employee vehicle parking on the roof. Construction of the West Field Cargo Facility would require the demolition of Building 606 and Building 612, which are in poor condition. Landside areas totaling approximately 216,000 square feet would be used primarily to accommodate truck docks and storage. Landside areas would also accommodate employee vehicle parking demand; however, the landside areas in front of the West Field Cargo Facility would not be able to accommodate the entire employee vehicle parking demand. Some employees would need to park on the roof of the proposed West Field Cargo Facility and in either the proposed CAC Parking Garage located along North McDonnell Road or the proposed West Field Parking Garage #2 in Plot 11.

Several modifications to the West Field would be required to accommodate the proposed realignment of Taxiway A, Taxiway B, and the vehicle service road. One vehicle maintenance bay would be removed from Building 642. Building 649, the existing flight kitchen, would be demolished to accommodate future terminal and airfield improvements. To meet future RON aircraft parking demand, the Plot 8 apron area would be reconfigured for eight narrowbody aircraft and three widebody aircraft.

The CAC program would remain as currently proposed, though a portion of CAC Parking Garage 2 may be required for belly cargo employee vehicle parking. Airport maintenance personnel would continue to use the Airport maintenance facility in Building 682 while Building 710 would also be converted to Airport maintenance. Airport maintenance employees would park on a surface lot north of Building 710, requiring the demolition of Building 730. Although 300 stalls are required throughout the planning horizon, the proposed lot is large enough to accommodate approximately 400 vehicles.

A goal of the CAC program is to provide shared amenities for Airport employees. Airport maintenance facilities would therefore be located as close as possible to the CAC to provide access to the employee amenities planned for the CAC. In addition, SFO staff expressed a desire for enhanced pedestrian access routes. A dedicated pedestrian corridor positioned between the southernmost office building at the CAC and the Airport maintenance facility at Building 710 would provide greater amenity and safety.

GSE maintenance facilities would be constructed behind Boarding Area H and near Building 750. To meet demand through the planning horizon, Buildings 624 and 648 would be converted for GSE maintenance use.

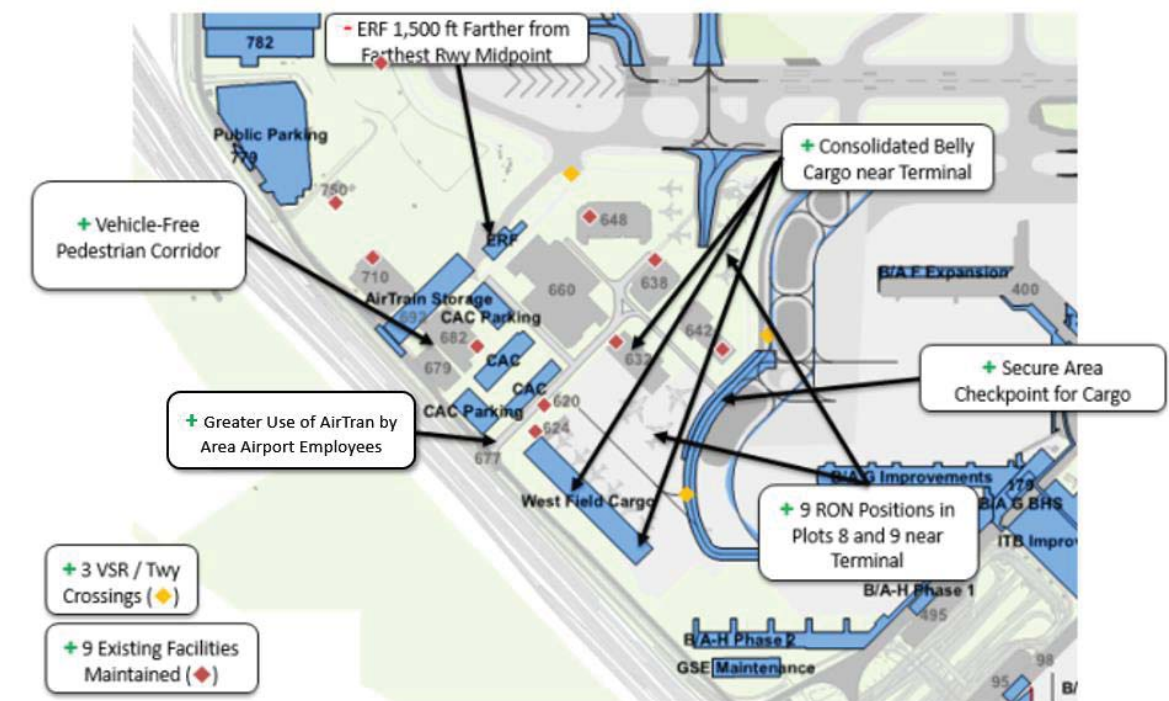
A new “Race Track” would be constructed to accommodate RON demand and allow passenger aircraft a place to hold while waiting for an occupied gate at the passenger terminal. The Race Track would accommodate one narrowbody and one widebody flow-through parking position during the day and seven narrowbody aircraft parking positions at night. The area would total approximately 252,000 square feet. The construction of the Race Track would require the demolition of Buildings 649 and 650. Flight kitchens from Building 649 would be relocated to the renovated Building 944 or off airport. Building 650 would be relocated to the area where Taxilane Y is currently located. The three aircraft parking positions currently within Plot 12 would be removed.

Buildings 620 and 638 would remain in place with no changes in function.

Exhibit H.4-7 shows the evaluation of the West Field Big H alternative. Benefits include:

- Consolidation of belly cargo facilities in a central location, thereby allowing one of the vehicle checkpoints to be dedicated for cargo use
- Eight RON aircraft parking positions close to the passenger terminal, minimizing taxiing distances for aircraft that would otherwise have to park in the East Field
- CAC and Airport maintenance facilities concentrated within the West Field, which allows for a pedestrian corridor extending from Building 710 to the CAC
- With cargo, administrative, and airport maintenance facilities located near the AirTrain station, vehicle trips between the West Field and the passenger terminal would be reduced
- The reduced number of vehicle service road to taxilane crossing points may reduce risk for vehicle-aircraft conflicts
- Eleven existing buildings remain in place, so overall costs are lower compared to earlier considered alternatives that propose the demolition and construction of additional facilities

EXHIBIT H.4-7 | West Field Development - Big H Alternative Evaluation



Source: RS&H and L&B, July 2015

F&G Extension Alternative

Exhibit H.4-8 shows the F&G Extension alternative.

Belly cargo facilities would be consolidated in existing Buildings 585 and 632 and a new West Field Cargo Facility. The proposed West Field Cargo Facility would total approximately 190,000 square feet on two levels. Landside areas totaling approximately 4.1 acres (180,000 square feet) would be used primarily to accommodate truck docks and storage and most employee vehicle parking demand. However, the landside areas in front of the West Field Cargo Facility could not accommodate the entire employee vehicle parking demand. Therefore, some employees would need to park on the roof of the proposed West Field Cargo Facility, in the proposed CAC Parking Garage, in the proposed West Field Parking Garage #2, or in a new consolidated parking garage on the site of Building 682. Building 682 would be demolished.

Buildings 642 and 649 would be demolished to accommodate the gate expansion and taxiway realignments. Tenants would be relocated to other on-Airport buildings.

The CAC program would remain as proposed, with the exception that a portion of the CAC Parking Garage may be required for belly cargo employee vehicle parking. An additional West Field Parking Garage #3 would also be constructed to serve airline, concessions, and cargo operator employees.

Airport maintenance personnel would use existing Building 710 and a proposed new Building 730 totaling approximately 120,000 square feet. The new Building 730 would require the demolition of Building 750.

Airport maintenance employees would park in the CAC parking garages as well as on the surface lot near Building 730.

Additional public roadways are proposed to provide additional access to the consolidated parking garage. As a result, the pedestrian corridor between Airport maintenance and CAC facilities would be provided for a reduced length compared to the Big H alternative.

GSE maintenance facilities would be located in existing Buildings 624, 750, a new structure behind Building 710, and another new structure in the location of the existing Building 648. The new buildings would be necessary to meet GSE maintenance demand through the planning horizon. Existing Building 648 would be demolished.

A new apron would be constructed to accommodate RON and daytime Race Track demand. The Race Track would include construction of a taxilane from Taxiway Z extending towards Building 632. The Race Track could accommodate one narrowbody and two widebody flow-through parking positions during the day and nine narrowbody aircraft parking positions at night. The construction of the Race Track would require the demolition of Buildings 648, 649, and 650. Cargo tenants in Building 648 would be relocated to other cargo facilities in the West Field and North Field. Flight kitchens would be relocated from Building 649 to the renovated Building 944 or off airport. Building 650 would relocate to the area where Taxiway Y is today. All three aircraft parking positions currently within Plot 12 near Taxiway Y would be removed.

Building 620 would remain in place with no change in function.

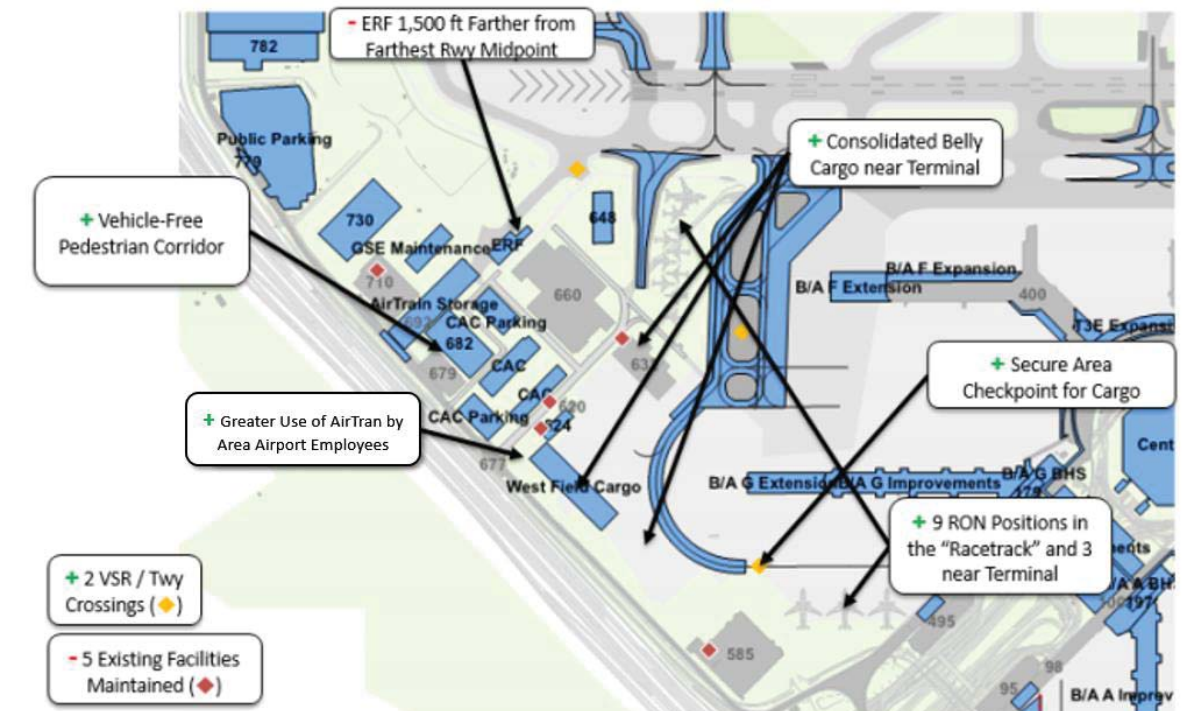
Exhibit H.1-12 also shows the evaluation of the West Field F&G Extension alternative. Benefits include:

- Consolidation of belly cargo facilities in a central location, thereby allowing one of the vehicle checkpoints to be dedicated for cargo use
- Providing 12 RON aircraft parking positions close to the passenger terminal, and minimizing taxiing distances for aircraft that would otherwise have to park in the East Field
- CAC and Airport maintenance facilities concentrated within the West Field, allowing for a pedestrian corridor extending from Building 710 to the CAC.
- The low number of vehicle service road to taxilane crossing points also indicates a likelihood of a lower risk for a vehicle-aircraft conflict

Disadvantages include:

- Overall higher costs compared to the Big H alternative due to only seven of the existing buildings remaining in place
- In comparison to the Big H alternative, the pedestrian corridor would be shorter in length due to the necessary public access roadway required for the consolidated parking garage

EXHIBIT H.4-8 | West Field Development – F&G Extension Alternative



Source: RS&H and L&B, July 2015

H.5 Recommended Intermediate Alternative Concepts

An evaluation of the two alternatives and a no-build scenario was completed based on the established evaluation criteria. **Table H.5-1** summarizes the results. Evaluation criteria include:

- Safety and Security
 - Minimize Interference between aircraft and vehicle movements
- Operational Efficiency
 - Maintain or minimize vehicular travel distances/time
 - Provide alternative intra-airport access opportunities
 - Maintain or enhance airport access through security checkpoints
 - Maintain or minimize aircraft travel distances/time
- Constructability and Phasing
 - Minimize construction impacts
 - Provide ease of phasing
- Land Development
 - Enhance future development opportunities
 - Support adaptable land use
- Fiscal Sustainability
 - Support revenue generation
 - Consider funding ability

Safety and Security

The F&G Extension alternative includes one fewer additional vehicle service road intersection with a taxiway or taxilane compared to the Big H alternative.

Operational Efficiency

Compared to the no-build scenario, both alternatives would reduce vehicle travel distances between support facilities and the airport terminal area due to the consolidation of belly cargo facilities closer to the passenger terminal. However, vehicle travel distances for the on-Airport flight kitchen facility would increase resulting from the flight kitchen relocation from the West Field to Building 944 in the North Field. Both alternatives would also enable SFO staff to walk or use the AirTrain for trips between some airport facilities. Overall taxiing distances associated with RON aircraft activity would be lower compared to a no-build scenario where a higher proportion of RON aircraft parking positions would be located in the East Field.

The primary differentiator between the build alternatives is the provision of RON aircraft parking positions in the West Field. The Big H alternative provides 18 positions, compared to 12 positions provided in the F&G Extension alternative.

Constructability/Phasing

Both build alternatives would result in substantial renovation, demolition, and construction. As a result, phasing is challenging for either alternative. However, due to the greater number of buildings that would need to be replaced with the F&G Extension alternative, phasing for the Big H alternative would be easier.

Land Development

A pedestrian corridor is an improvement compared to the no-build scenario, where employees must walk on the sidewalks along North McDonnell Road to travel between buildings. The pedestrian corridor would be landscaped, sheltered from traffic noise, and provide a much more pleasant experience. The Big H alternative provides for a longer pedestrian corridor compared to the F&G Extension alternative.

Future development opportunities in the West Field would be more limited in the F&G Extension alternative due to the greater impact of the terminal and airfield improvements.

Both alternatives were considered to have facilities that could generally be adapted for other uses if future demand shifts.

Fiscal Sustainability

Both alternatives will cost more to implement than a no-build scenario, which would require a more modest investment in construction to maintain the existing facilities. In the Big H alternative, eleven of the existing buildings remain compared to seven buildings in the F&G Extension alternative.

The Big H alternative is considered to provide more opportunities for revenue generating potential compared to the F&G Extension alternative resulting from more leasable tenant facilities in the Big H alternative.

TABLE H.5-1 | Evaluation Results

Evaluation Criteria	Alternative 1	Alternative 2
	<i>Big H</i>	<i>F & G Extension</i>
Operational Efficiency	●	◐
Safety and Security	◐	●
Constructability/Phasing	◐	○
Land Development	●	◐
Fiscal Sustainability	●	◐
Recommended Alternative	✓	✗

Source: RS&H, August 2015