RECOVERY PLAN

APRIL 28, 2017

HONOLULU AUTHORITY for RAPID TRANSPORTATION

4/28/2017

Krishniah N. Murthy
HART Interim Executive Director and
Chief Executive Officer

Date

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Note to Reader:

The financial scenarios included in this Recovery Plan were specifically requested by the United States Federal Transit Administration (FTA), which has been closely monitoring the State of Hawaii Legislature's actions related to the possibility of extending the General Excise and Use Tax surcharge that currently funds the Honolulu Rail Transit Project's local share. Consequently, the financial scenarios contained in this Recovery Plan are not intended to presume or assume any final actions by the Hawaii Legislature, the concurrence of Governor Ige with whatever those final actions might be, or to further presume the legislative prerogatives of the City Council and the Mayor of the City and County of Honolulu with respect to enacting an ordinance pursuant to any state statutory authority that may be provided by the Hawaii Legislature and Governor Ige. The FTA has required that this Recovery Plan be submitted by April 30, 2017, in advance of any final action by the state legislature and before any consideration by the Governor, Honolulu City Council, or the Mayor. Once final action by the state legislature, the Governor, the Honolulu City Council, and the Mayor is known with respect to any extension of the GET surcharge or can be reasonably anticipated based on their actions, the FTA has invited Honolulu Authority for Rapid Transportation to supplement this Recovery Plan based on the reality of the funding ultimately available to the Project.

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Acronyms

AGS	Airport Section Guideway and Station Group
AIS	Archaeological Inventory Survey
APA	Administrative Procedure Act
APTA	American Public Transportation Association
BOE	Basis of Estimate
CAM	Critical Access Milestone
CCGS	City Center Section Guideway and Station Group
CEQ	Council on Environmental Quality
CMS	Contract Management System
CSC	Core Systems Contractor
DB	Design-Build
DBB	Design-Bid-Build
DBOM	Design-Bid-Operate-Maintain
DTS	City and County of Honolulu, Department of Transportation Services
EAC	Estimate at Completion
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
FFGA	Full Funding Grant Agreement
FHSG	Farrington Highway Station Group
FTA	Federal Transit Administration
FY	Fiscal Year
GET	State of Hawaii General Excise and Use Tax
HART	Honolulu Authority for Rapid Transportation
HDOT	State of Hawaii Department of Transportation
HECO	Hawaiian Electric Company, Inc.
HRTP	Honolulu Rail Transit Project
ICE	Independent Cost Estimate
KHG	Kamehameha Highway Guideway
KHSG	Kamehameha Highway Station Group
kV	Kilovolt
LCC	Leeward Community College
LPA	Locally Preferred Alternative
MOS	Minimum Operable Segment
MPIS	Master Project Integrated Schedule

MSF	Maintenance and Storage Facility
MTA	Metropolitan Transportation Authority
NEPA	National Environmental Protection Act
NTP	Notice to Proceed
O&M	Operations and Maintenance
OahuMPO	Oahu Metropolitan Planning Organization
OTS	Oahu Transit Services, Inc.
P-3	Public-Private Partnership
PHGT	Pearl Highlands Parking Garage and Transit Center
PMOC	Project Management Oversight Contractor
PMP	Project Management Plan
R&O	Risks and Opportunities
ROC	Rail Operations Center
ROD	Record of Decision
ROW	Right-of-Way
RSD	Revenue Service Date
SCC	Standard Cost Category
SEIS	Supplemental Environmental Impact Statement
SUE	Subsurface Utility Engineering
TCE	Temporary Construction Easement
TCP	Traditional Cultural Property
TIA	Time Impact Analysis
TIFIA	Transportation Infrastructure Finance and Innovation Act
TOD	Transit-Oriented Development
UH	University of Hawaii
USDOT	United States Department of Transportation
WBS	Work Breakdown Structure
WMATA	Washington Metropolitan Area Transit Authority
WOSG	West Oahu Station Group
WOFH	West Oahu/Farrington Highway Guideway
YOE	Year of Expenditure

1 Executive Summary

1.1 Introduction

On December 19, 2012, the Federal Transit Administration (FTA) and the City and County of Honolulu (City) formalized a partnership by signing a Full Funding Grant Agreement (FFGA) for the Honolulu Rail Transit Project (HRTP or Project). The Honolulu Authority for Rapid Transportation (HART) is the semi-autonomous public transit authority responsible for the planning, construction, and expansion of the fixed guideway transit system for the Project. The HRTP is a 20-mile fixed guideway rail system with 21 stations extending from East Kapolei to Ala Moana Center. By 2030, nearly 70% of Oahu's population and more than 80% of the island's jobs will be located along the 20-mile rail corridor, with stations at key commuter and visitor destinations such as the Honolulu International Airport, Joint Base Pearl Harbor-Hickam, and downtown Honolulu. The initial General Excise and Use Tax (GET) surcharge was intended to provide a 70% local share (30% federal share), which is one of the highest local share overmatches in the FTA New Starts Program.

The Project has faced numerous challenges since its inception that have resulted in cost increases and schedule delays. Project planning and cost estimates were developed in the midst of a recession and were hampered by a number of events that were beyond the anticipation of the original parties. At the same time, there were well-intended decisions to award various Project construction contracts to stimulate local job creation prior to completing all third-party agreements, contractor interface requirements and, in some cases, applicable designs. Consequently, these early contract awards had subsequent cost and schedule impacts that have contributed to the need for this Recovery Plan.

In addition, delays associated with Notice to Proceed (NTP), the Archaeological Inventory Study (AIS), and Traditional Cultural Properties (TCPs)—which suspended construction activities on the West Oahu/Farrington Highway Guideway (WOFH), Kamehameha Highway Guideway (KHG), and Maintenance and Storage Facility (MSF) contracts—had a large impact on project costs totaling $172 million, including escalation. Moreover, the lawsuit delays pushed construction activities into the recovery years following the recession, which had a cascading impact on schedule and, in turn, had even further cost impacts on the Project. Finally, an equally harmful and even longer-term cost impact, also beyond the control of the Project sponsor, is the fact that Honolulu became the most expensive city for construction in the United States for the years 2012 through 2016, according to the Rider Levett Bucknall National Construction Cost Index. While the execution of some early contracts in hindsight was unfortunate and had substantive cost impacts, there were also many cost impacts that could not have been anticipated.

Despite these challenges, HART, the City, and the Mayor's Office are committed to construct and deliver the Project as described in the FFGA—20 miles with 21 stations. This commitment is clearly dependent on whether the Project will have access to sufficient local funds to cover the gap between the revised estimated cost to complete the Project and

available funding. HART is in the process of developing a financial plan to provide the additional needed funds which clearly requires the support of the State of Hawaii Legislature, the Governor of the State of Hawaii, the Honolulu City Council, and the Mayor. While the legislative process is not yet complete and the Project cannot presume the outcome of the legislative and executive actions of the State of Hawaii and the City, this Recovery Plan demonstrates that HART has diligently developed and put in place management structures, controls, and procedures that are as important to the recovery of this Project as are the needed additional funds.

This Recovery Plan details the organization's core competencies and the development and implementation of critical project management, risk management, and cost and schedule controls that are essential to the recovery of this Project. HART is also proactively evaluating additional opportunities to reduce project cost and revising future contract language and requirements based on knowledge gained from having prepared, awarded, and managed prior alternative delivery transit contracts. Cost and schedule controls will be increasingly important as the Project moves into Honolulu's dense urban core.

1.2 Management Capacity and Capabilities

HART is confident that it can successfully deliver the Project with its experienced key personnel and core competencies. As detailed in Section 3.2.3 of this Recovery Plan, HART now has in place a core group of individuals who have the qualifications and experience to complete a major transportation project of this scope and complexity. A continuing challenge for the Project has been hiring and maintaining experienced rail transit and construction managers. Given the fact that this is Honolulu's first rail transit construction project, its remote location 2,400 miles from the U.S. mainland, and the fact that it is one of the most expensive cities in the United States in which to live, hiring and retaining experienced personnel has been a challenge. Section 3, "Management Capacity and Capabilities," outlines the steps HART is taking to immediately address open senior management positions and describes longer-term efforts to mentor Hawaii-based personnel to the skills and experience needed to assume leadership roles.

The HART Interim Executive Director and CEO, Krishniah Murthy, reinforced his commitment to cost control and containment by consolidating Procurement, Contract Administration, and Construction Claims into a single division that reports directly to him, which allows him to effectively monitor Project cost and schedule. The Contract Change Procedure has been streamlined to provide a system of checks and balances, define timelines for resolution, deliver briefings to the HART Board, and ensure a budget allocation in advance of the change process. A Project Change Control Board was also established to allow senior management to independently analyze change orders from a programmatic level and to analyze potential secondary impacts to Project cost and schedule. The revised Change Order Procedure will be formally presented to the HART Board for review and adoption.

HART understands the importance of project controls, which has been noted as a specific area of concern by the FTA and the recent American Public Transportation Association (APTA) peer review. Project Controls has worked to re-baseline the Project schedule and budget and to develop a trend analysis for the early detection of cost overruns, schedule impacts, and project risk. Stronger communication and coordination with stakeholders has made the Master Project Integrated Schedule (MPIS) a more robust tool to manage the Project at all levels.

In 2016, HART increased its focus on risk by implementing a formal risk modeling program that uses a rigorous bottom-up analysis and cross-departmental input to establish confidence in Project cost and schedule. The recently established Risk Management Committee meets monthly to review the health of the Project as it relates to contingency drawdown curves and risk exposure. These discussions enable executive managers to more closely monitor project risk items and allow risk owners to apply mitigations to prevent cost and schedule impacts.

The HART Operations and Maintenance (O&M) Division is dedicated to containing costs and maintaining scheduled system openings by ensuring a seamless transition from capital construction and commissioning to passenger service. The HART O&M Division meets regularly with the City Department of Transportation Services (DTS) leadership to actively work on a roadmap to revenue service. During this phase of the Project, the HART O&M Division remains focused on organizational development and planning, ensuring system operability and maintainability, and evaluating and communicating operations and maintenance cost implications.

1.3 Cost Reductions and Containment

HART has implemented cost containment and cost reduction measures including revising contract requirements and packaging strategies, implementing value engineering, evaluating soft costs (such as consultants), and proactively evaluating the costs and benefits of an interim opening. HART has also adopted recommendations from the recent APTA Peer Review and plans to hold a follow-on Peer Review by the summer of 2017 focused on technical competency of its core group, interactions with utility companies, and contractual negotiations and administration.

HART and the Hawaiian Electric Company, Inc. (HECO) have collaborated to address a significant cost risk associated with the guideway structure impinging on safety clearance areas for HECO's electric transmission and distribution lines. Although there are still negotiations underway to fully manage this risk, HART and HECO have identified alternative service maintenance vehicles to address the working clearance needed between HART's rail guideway and HECO utilities and associated steel and wood poles. HECO granted HART variances to their original clearance requirements in certain areas, allowing the Project to avoid costly overhead and underground utility relocations. The Airport Section Guideway and Station Group Contract (AGS) will use a combination of alternate service vehicles,

increased Navy easements, and redesigned (re-framed) pole arms to avoid undergrounding the nine-pole 138 kilovolt (kV) system fronting Joint Base Pearl Harbor-Hickam. Addressing these issues thus far has resulted in saving the Project approximately $138 million in potential Project cost. The City Center Section Guideway and Station Group (CCGS) design team is in the review process with HECO to underground all of HECO's utility lines along Dillingham Boulevard. These efforts, along with the revised Risk Management and Project Controls structures and actions, are intended to contain cost and schedule growth associated with this specific risk.

1.4 Completion of the FFGA Scope (Plan A)

Using the project management techniques, risk analysis, cost containment, and project controls described in this Recovery Plan, HART has developed an updated Project Cost of $8.165 billion and an updated Revenue Service Date of December 2025. HART believes that this cost estimate and schedule are realistic and achievable. HART is committed to completing the original FFGA scope in accordance within this cost and schedule. HART acknowledges that the federal funding commitment for the Project is capped under the FFGA and that the additional funds needed to complete the FFGA scope must be provided from non-federal sources.

Pending actions by the Hawaii State Legislature, the Governor, the Honolulu City Council, and the Mayor, the completion of the Project to Ala Moana Center—the original scope of the FFGA—is the preferred alternative.

As the discussion of the "build to budget" Plan B in Section 7 makes clear, terminating the Project at the Downtown Station results in the elimination of seven stations, has virtually no contingency allocation, cuts Project ridership by as much as 60%, and will require significant Project delays in order to complete (and potentially litigate) a required Supplemental Environmental Impact Statement. In addition, HART will have to evaluate and re-negotiate the scope of the Core Systems, Fare System, and Elevator and Escalator contracts, resulting in significant delay and contract cancellation claims that may offset much of the anticipated savings from an abbreviated system. These analytics call into question whether Plan B would be a project of independent utility.

While this Recovery Plan cannot at this writing state precisely how the entire $8.165 billion estimated cost to complete the Project (without financing costs) will be achieved, pending the necessary state and City legislation, the result of the analysis contained in this Recovery Plan is that Plan A—completion of the FFGA scope—is the only viable Project alternative from a financial, ridership, and operationally practical perspective.

1.5 Conclusion

The Project is 36% complete, based on the weighted value of progress of the individual construction and design contracts. The Project is scheduled to open for passenger service

on December 31, 2025, and has a current construction cost estimate total of $8.165 billion inclusive of contingency, excluding finance costs.

In addition to ongoing responsibilities and the actions stated in the Recovery Plan, HART's major upcoming milestones include procuring the CCGS Design-Build contract and HECO coordination. The CCGS Design-Build contract is the last major contract to be procured and the critical path for the overall Project. Utility relocation is a significant part of the CCGS Design-Build contract in Honolulu's urban core, and HART is proactively performing pre-construction Subsurface Utility Engineering and geotechnical work. These final contracts will benefit from lessons learned and value engineering (described in Section 4 of the Recovery Plan) as well as updates to Project Controls, particularly the robust MPIS and Risk Assessment.

This Recovery Plan clearly demonstrates HART's confidence in and commitment to successfully completing the FFGA Scope, Plan A, by continuing to strengthen its core competencies and focus on cost containment and risk management. The analysis of the "fallback project," Plan B, reveals many challenges, including the questionable independent utility of such a project. Additionally Plan B has no contingency, which the FTA as a policy has not allowed on any rail transit construction project utilizing federal funds.

This Recovery Plan lays out potential local funding needed to meet the current cost estimate and complete the Project, not including financing costs. It also details a carefully developed and internally tested analysis of the Project's management capacity and capability, which has resulted in a management structure oriented toward swift implementation of project controls designed to manage identified risks.

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2 Project Background

2.1 Purpose of the Recovery Plan

In this Recovery Plan, HART will demonstrate the following to the satisfaction of the FTA:

1. HART has the management and technical capacity and capability to successfully complete the full scope of work of the Project defined in the FFGA.
2. HART has developed a realistic and achievable updated Capital Cost Estimate for the completion of the Project.
3. HART has developed a realistic and logical updated Project Schedule that will assure the full Project can be opened to Revenue Service by the revised Revenue Service Date of December 2025.
4. The Grantee (City and County of Honolulu), working closely with HART, will identify dedicated sources of funding and provide the additional funding to make up the difference between the original FFGA Project Cost and the updated Capital Cost Estimate, through local financial resources that are stable, reliable, and committed to the Project.

This Recovery Plan sets forth documentation in support of each element outlined above and provides an updated report on the status of the current Project. Additionally, this Recovery Plan includes an updated Financial Plan with potential scenarios based on discussions with elected officials. HART acknowledges the consideration for the primary source of additional funding, the extension of the current GET surcharge, is still under consideration in the State Legislature. HART will submit a supplement to the Recovery Plan based on the outcome of State Legislative and subsequent City actions. The process to finalize any legislation that would provide additional funding could potentially extend through October 2017, as described in Section 6.2 below.

2.2 Project Description

The HRTP is a 20-mile-long fixed guideway rail system featuring 21 stations that extends from East Kapolei on the west side of the island of Oahu to Ala Moana Center on the east side via Honolulu International Airport. The alignment is elevated, except for a 0.6-mile at-grade portion at the Leeward Community College station. The system will be operated and maintained at the 43-acre Rail Operations Center (ROC, formerly known as the Maintenance and Storage Facility [MSF]) near Leeward Community College (LCC). The system also features fully automated, driverless trains; a fare vending system; and passenger screen gates.

Figure 2-1 HRTP System Overview

2.3 Project History

The Project was preceded by decades of rail planning dating back to 1967, which has led to the current Locally Preferred Alternative (LPA) for the Honolulu High-Capacity Transit Corridor Project extending from East Kapolei to Ala Moana. Below is a chronology of key events in the Project's history:

- July 2005: The Hawaii State Legislature authorized—and in August 2005 the Honolulu City Council approved—a 0.5% GET surcharge to provide non-federal local funding for a new rail transit system.
- August 2005: The City Department of Transportation Services (DTS) initiated an Alternatives Analysis following the FTA Section 5309 New Starts Program (now known as the FTA Major Capital Investment Grant Program).
- January 2007: The City selected the LPA, steel-wheel on steel-rail, and began collecting the GET surcharge. The City then initiated work on the Project's Environmental Impact Statement (EIS) and preliminary engineering for the system.

- February 2007: The Honolulu City Council passed City Council Resolution 07-039 approving the selection of the Minimum Operating Segment (MOS) from East Kapolei to Ala Moana Center, via Salt Lake Boulevard. The MOS was subsequently amended to serve the Honolulu International Airport—deferring the Salt Lake portion of the alignment.
- November 2009: The City executed its first contract for the project, a Design-Build (DB) services contract with Kiewit Pacific Company for the West Oahu/Farrington Highway Guideway (WOFH).
- June 2010: The Final Environmental Impact Statement (FEIS) for the Project was approved by the FTA, with publication of the FEIS on June 25, 2010.
- November 2010: Oahu voters approved a City Charter Amendment establishing HART, to create a semi-autonomous public transit authority responsible for the planning, construction, operation, maintenance, and expansion of the City's fixed guideway mass transit system.
- January 2011: A Section 106 Programmatic Agreement was signed. FTA issued its environmental Record of Decision (ROD) for the Project on January 18, 2011, providing pre-award authority for right-of-way (ROW) acquisition, utility relocation, and acquisition of rail vehicles.
- December 19, 2012: The City and the FTA signed an FFGA for a project consisting of 20 miles and 21 stations, a total estimated project cost of $5.12 billion with a committed federal share (subject to annual congressional appropriations) of $1.55 billion, and a full system revenue service date of January 31, 2020.
- January 2016: A five-year extension to the GET was adopted and was anticipated to yield $1.2 billion in additional local funds to the Project.
- June 2016: On June 6, 2016, the FTA directed HART to submit a Recovery Plan by August 7, 2016, which demonstrates that HART is working to contain costs and minimize delays in schedule impact. In July 2016, FTA extended the deadline to submit the Recovery Plan to December 31, 2016. Subsequently, FTA further extended the deadline for the submission of this Recovery Plan to April 30, 2017.

2.4 Major Project Issues

The Project has been hampered by a number of events that were beyond the anticipation of the originating parties. These included issues related to the National Environmental Protection Act (NEPA) involving three federal cooperating agencies that arose very late in the EIS process as the Project was obtaining final signoffs from these agencies (which affected the alignment of the Project near the airport), historic preservation issues at the slated Pearl Harbor Station, and a Native Hawaiian Programmatic Agreement matter. Some early contracts also were awarded before final agreements had been reached with various

third parties such as the University of Hawaii (UH) and its associated campuses, the State of Hawaii Department of Transportation (HDOT), Hawaiian Electric Company, Inc. (HECO) and other utilities, and other State and City agencies.

In awarding some early contracts, the Project did not sufficiently account for the necessary integration and interface activities between the major contractors or have a fully integrated Master Project Schedule. While some early contract awards were well-intended decisions designed to stimulate local construction jobs in the wake of the "Great Recession" of 2009 to 2011, when viewed in hindsight those decisions were mistakes on the part of HART that resulted in substantive cost and schedule impacts on the Project. Additionally, the single most costly impact to the Project, which was beyond the control of the Project sponsor as further described below, was the cessation of all construction activities for 13 months because of project litigation, which had a cascading effect on cost and schedule.

Below is a summary of key issues and their impacts to the Project:

- As a result of the NTP, AIS, and TCP delays, the Project incurred $172 million in delay costs on the two west-side guideway DB and the MSF DB contracts.
- The AIS delay was a 13-month delay that overlapped with the NTP delays on the west-side guideway and MSF DB packages.
- WOFH specifically incurred a total delay of 23.5 months and delay related costs in the amount to $107 million which includes construction escalation. (Note: These amounts reflect only the WOFH, KHG, and MSF contract delay costs. It does not include soft costs [agency staff, rent, etc.] or legal costs that resulted from the delays.)
- In January 2011 a lawsuit was filed in state court that challenged the City's initiation of construction of the first section of the Project without completion of archaeological surveys and approval of the State Historic Preservation Division of all four project sections for the full 20 miles of the Project. The City's action was consistent with long-standing practice in the state for large construction projects, as well as being consistent with federal regulations.
- The initial ruling by the Oahu Circuit Court was in favor of the City and federal defendants, citing long standing construction practice in the state. The State's Intermediate Court of Appeals upheld the lower court's ruling on appeal. The case was then appealed to the Hawaii Supreme Court in 2012, which ruled in favor of the plaintiff by a vote of 9-0. This decision resulted in a cessation of all construction activities for nearly 13 months pending the completion of archaeological surveys for the entire project.
- A second lawsuit was initiated in Federal District Court in May 2011, by plaintiffs claiming that there had been inadequate consideration of alternatives in the EIS with regard to NPEA and cultural and historical sites. In November 2012, the court held

that only three of the multiple claims by the plaintiffs required further analysis. However, the court also imposed an injunction on further work on the City Center segment of the Project and froze further acquisition of real property in downtown. The City initiated a Supplemental Environmental Impact Statement (SEIS) to address all three issues in December 2012, which was completed and released in June 2013. Upon review of the SEIS by the District Court, the court dismissed all of the claims of the plaintiffs.

- The plaintiffs then appealed the District Court decision to the Ninth Circuit Court of Appeals. In February 2014, the Ninth Circuit Court of Appeals upheld the lower court's decision, lifting the injunction and, with the prior resolution of the state court lawsuit, allowed the Project to resume construction.

- In March 2011, the City selected the vendor for the vehicle/core systems Design-Build-Operate-Maintain (DBOM) Contract, Ansaldo Honolulu Joint Venture (AHJV). Protests by the two unsuccessful vendors resulted in a nine-month delay in awarding the AHJV contract, which in turn resulted in a $8.7 million settlement of delay claims by AHJV. These costs have grown further as a result of yet additional collective project delays.

- As delays began to build as a result of these events, it became evident that the failure of the Project to sufficiently address the integration between the major contractors or have in place a fully integrated Master Project Schedule, as well as major assumptions for future contracts that would later prove to be incorrect, culminated in substantial negative consequences in the Project cost and schedule.

- To compound this problem, the Project experienced extraordinary increases in the cost of construction following these delays, as well documented in the Ryder Levett Bucknall Comparative Cost Index of major United States cities from 2009 through 2016 (Appendix E). During the period of mid-2009 to 2011, when cost estimating for the FFGA was being completed, United States cities—including Honolulu—went through a relatively flat period of escalation in construction costs. Beginning in 2012, construction costs escalated significantly, with Honolulu's construction costs escalating to the highest construction costs among major cities in the United States, maintaining that position for four years through the fourth quarter of 2016.

- In March 2013, the Hawaii Electric Company, Inc. (HECO) stated that as a "rule of thumb" the minimum horizontal working clearances for their existing overhead lines were 50 feet for 138kV lines, 40 feet for 46kV lines, and 30 feet for 12kV lines. Based on recommendations from the Project's engineering and design consultants, action to address these specified clearances was deferred. This decision continues to have significant cost and schedule ramifications on the Project.

- In August 2014, the bids received for the construction of nine west-side rail stations exceeded budget estimates by more than 63%, or $100 million, signaling a major

change in the construction market and resulting in the cancellation of the station solicitation.

- In the wake of the west-side rail station contract cancelation, a Project Risk Update presentation was made to the HART Board in November 2014, in which HART determined that the Project Cost would be $550 million to $700 million over the FFGA budget. Further, HART was faced with a persistent funding deficit stemming from overestimating the revenue yield from the GET surcharge and from a funding gap to replace $210 million in FTA Section 5307 funds (these funds were included in the FFGA Financial Plan, but then were required to be withdrawn from the Project's Financial Plan to assure those funds for use by TheBus), resulting in a total estimated budget gap of $910 million.
- In January 2016, the City recommitted to the Project and announced its intention to seek an extension of the GET from the state legislature and the City Council to cover the funding gap, consistent with the FFGA assurances imposed on the City in the event of a funding shortfall.
- In June 2015, the City and HART obtained approval of a five-year extension of the GET surcharge from the State Legislature. This five-year extension was anticipated to yield $1.2 billion in additional local funds to the Project, which increases the local/federal match ratio of the Project to a 75% local / 25% federal match. The Honolulu City Council adopted an ordinance to extend the GET surcharge for an additional 5 years to 2027 in January 2016.
- In May 2016, HART received preliminary values for the Independent Cost Estimate (ICE) for the City Center Guideway and Stations DB package that indicated an estimated cost $719 million higher than anticipated (the preliminary ICE at $1.3 billion versus the FFGA budget of $581 million). With the projected funding shortfall for the Project, the procurement of the City Center Guideway and Stations DB package was suspended, which shifted the entire schedule out to the end of 2024.
- In June 2016, the FTA directed HART to submit a Recovery Plan; in developing its Recovery Plan, and in particular in addressing overall project management and management capacity and capability issues, HART has identified and made a good faith effort to act on the lessons learned in the prior stages of Project development.

3 Management Capacity and Capability

The purpose of this section is to describe HART's organizational structure, including key personnel, and to demonstrate its management and technical capabilities to successfully complete the Project within the proposed budget and schedule.

3.1 Overview

The HART Project Management Plan (PMP) describes the overall management approach for the HRTP and has been extensively updated since Revision 5. The sixth revision focuses on management of the project during construction and addresses comments and recommendations by the FTA's Project Management Oversight Contractor (PMOC) on project management and control procedures. HART will submit the PMP by June 2017.

3.2 Project Staffing and Personnel

Figure 3-1: Organizational Chart and Key Departmental Updates – Senior Management

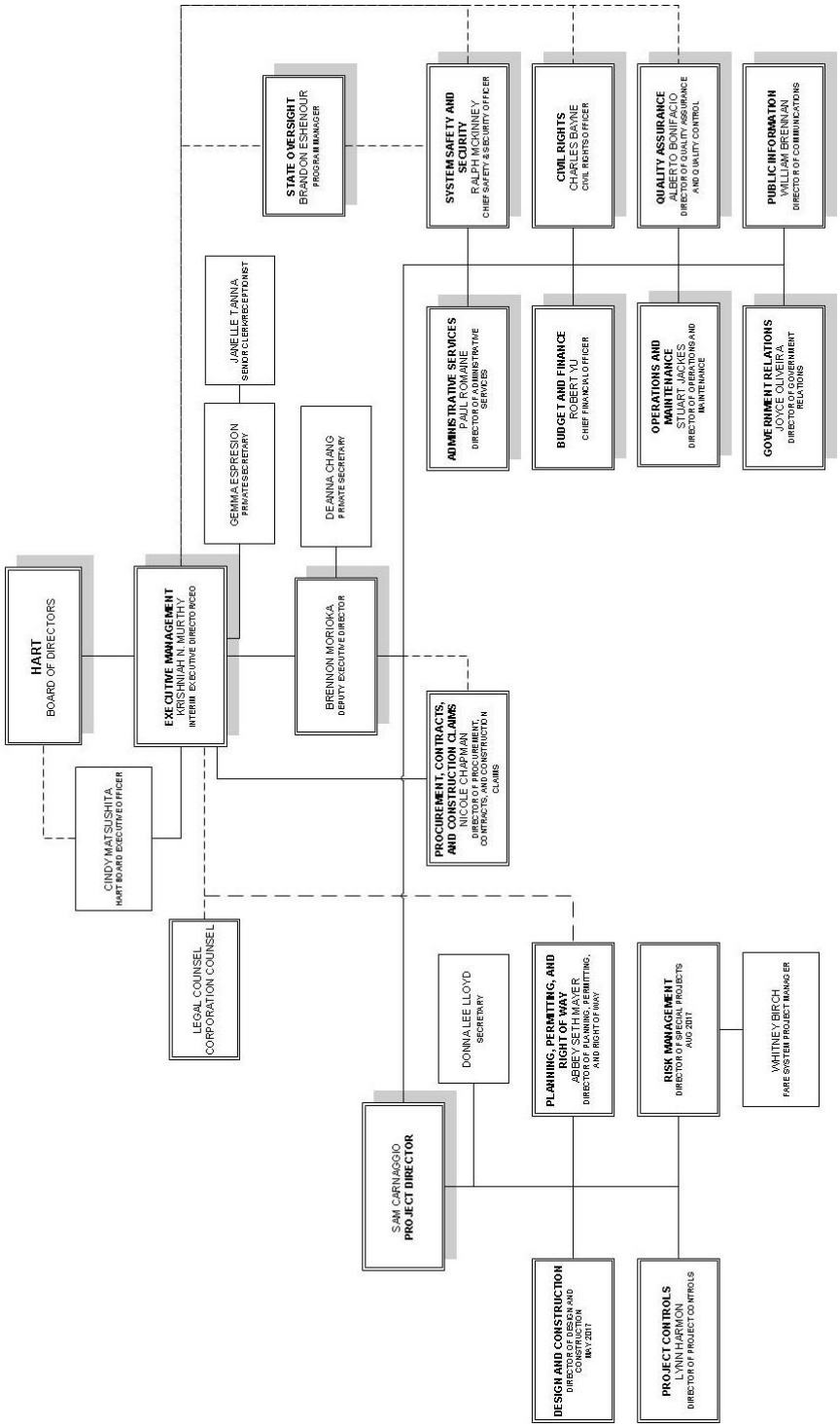


Figure 3-2: Organizational Chart and Key Departmental Updates – Design and Construction Division

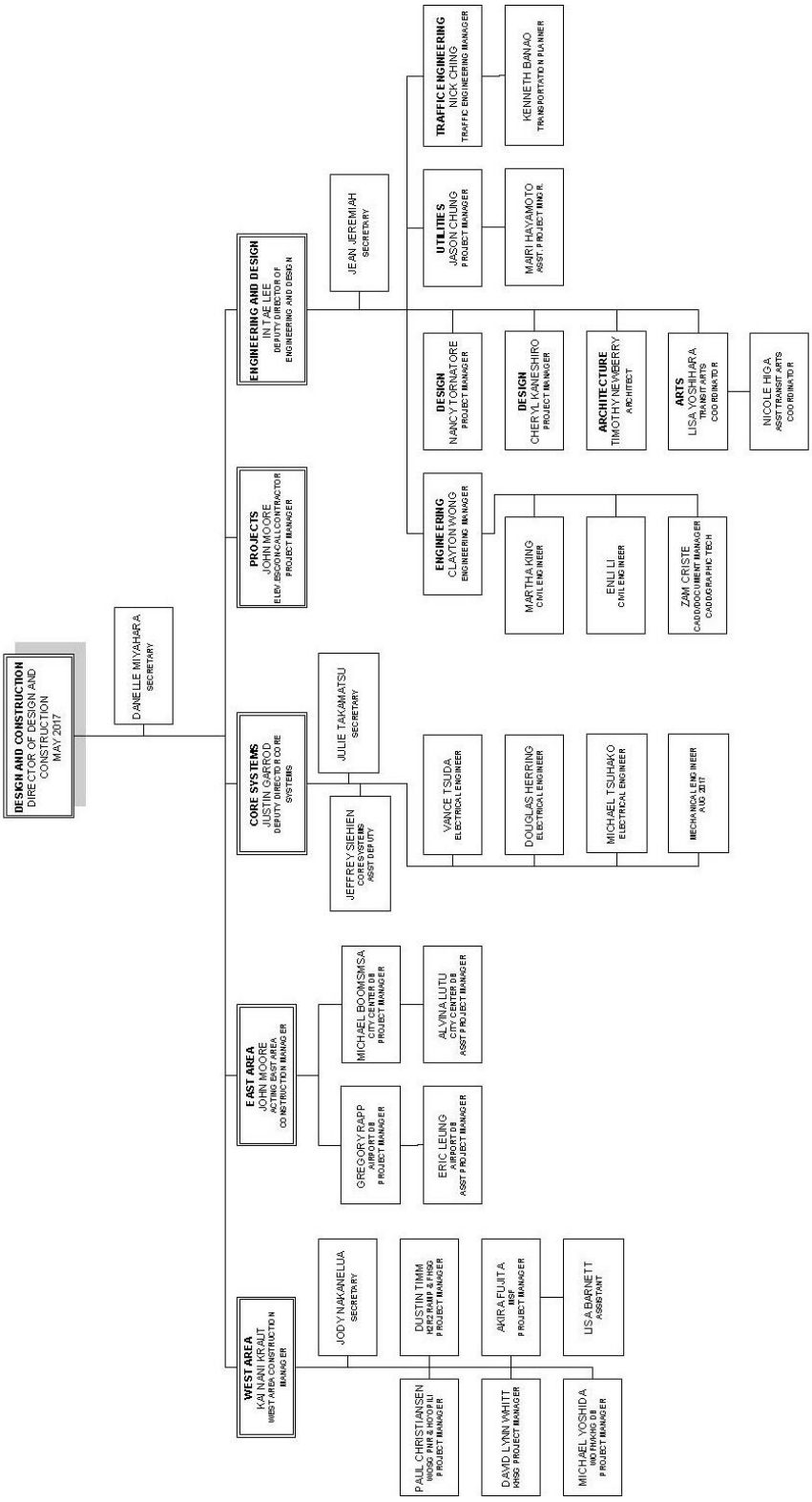
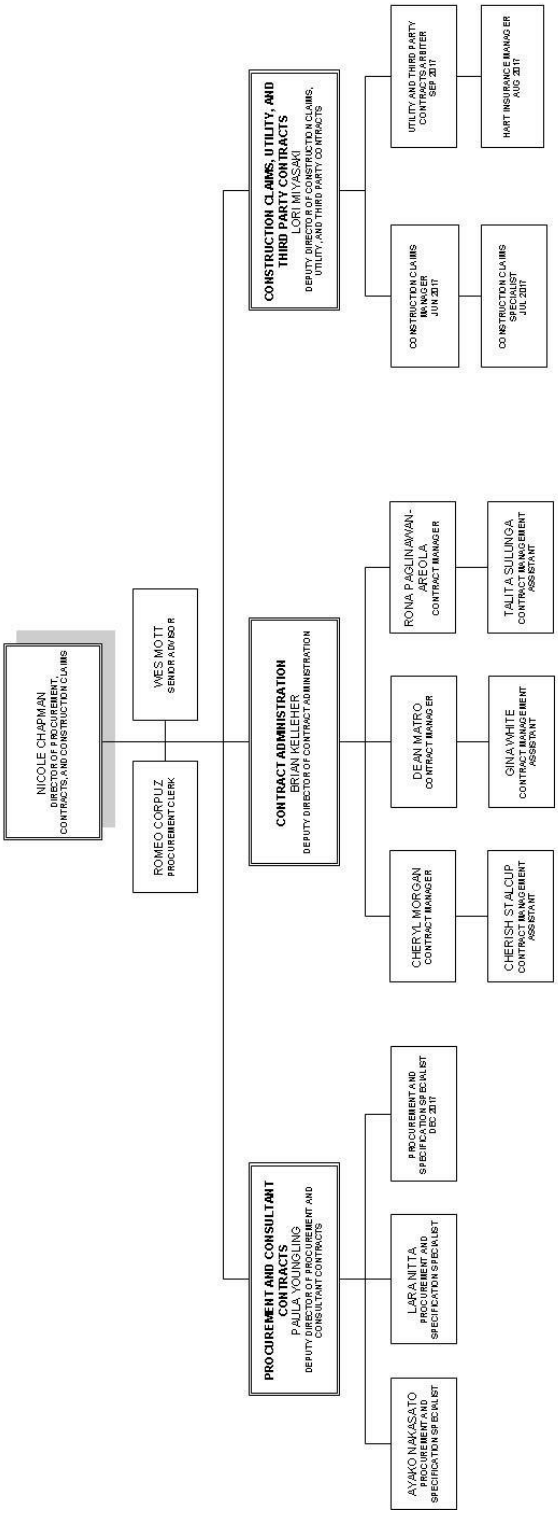


Figure 3-3: Organizational Chart and Key Departmental Updates – Procurement, Contracts, and Construction Claims Division



3.2.1 HART Board of Directors

HART is governed by a 10-member board composed of the Director of the State Department of Transportation, the Director of the City Department of Transportation Services, and six volunteers from the community: three appointed by the Mayor, three by the City Council. The Director of the City Department of Planning and Permitting also serves as a non-voting member. The voting members appoint the tenth member to the board.

The Board is the policy-making body of the authority and appoints and evaluates the HART Executive Director and CEO. The Board adopts HART's annual operating and capital budgets, adopts a six-year capital program, adopts rules and regulations, and carries out other duties as authorized by law. The Board's powers are primarily stated in the City Charter Section 17-104.

In November 2016, voters approved a charter amendment clarifying the responsibility of the HART Board to establish policies and regulations regarding the development of the rail system, the internal management and organization of HART, and the allocation of decision-making authority between the Board and the agency's Executive Director and staff. In addition, the charter amendment additionally provides for the establishment of a rate commission and placed the operations and maintenance responsibilities for bus, paratransit, and rail with the DTS.

The current composition of the HART Board of Directors is particularly well-suited to address the current needs of the HRTP. Members contribute their substantial knowledge and experience in varied disciplines, including government, policy, construction management, financing, labor relations, law, public planning, and transportation. Board members provide a significant level of policy guidance and support in furtherance of the Project's goals; most recently, members have devoted a substantial amount of time in advancing GET extension legislation, the Recovery Plan for the FTA, and the hiring of the Interim Executive Director and CEO, as well as the search for the permanent Executive Director and CEO.

3.2.2 Executive Director and CEO Search

The Board of Directors has engaged Karras Consulting, an executive search firm with 25 years of experience recruiting in the public sector, to assist in its efforts in finding a permanent Executive Director and CEO. Karras Consulting, in concert with the Board's Permitted Interaction Group and HART's Interim Executive Director and CEO, Krishniah Murthy, are working towards identifying HART's permanent Executive Director and CEO in late summer or early fall of 2017. Mr. Murthy, whose current contract runs through December 4, 2017, has committed to assist with the transition to the permanent Executive Director and CEO. See Appendix F for the complete job posting for the HART Executive Director and CEO.

3.2.3 Qualifications of Key Personnel

HART understands the critical nature of consistency as it relates to project management and the success of the Project. This understanding has led HART to establish the following core group of individuals who have extensive transit and construction experience and the values required to successfully complete a project of this magnitude:

- **Krishniah Murthy, Interim Executive Director and CEO:** Mr. Murthy has over 45 years of professional experience in rail transit programs. In his last assignment before his retirement, Mr. Murthy was the Executive Director of Transit Project Delivery for the Los Angeles County Metropolitan Transportation Authority (MTA) from 2007 to 2014. At the end of his tenure, the program had approximately $9 billion of projects in various stages from concept to construction. Prior to his MTA engagement, Mr. Murthy had 35 years of transit project design and construction experience working on various U.S. and international projects including Atlanta, Dallas-Fort Worth, Phoenix, San Diego, Los Angeles, New Delhi, and London.

- **Brennon Morioka, Deputy Executive Director:** Dr. Morioka is not only a professional engineer, but has a Ph.D. in civil engineering. He has been the Deputy Executive Director of HART for the past four years and is an integral part of the agency's interface with the Hawaii State Legislature, Governor, Mayor, and City Council. He was previously the Director of HDOT, where he directly oversaw an annual budget of $2 billion for HDOT's capital and operating and maintenance programs for all of Hawaii's state highways, airports, and commercial harbors. Dr. Morioka has also served as Executive Vice President of Shioi Construction and as Vice President and Hawaii Area Manager of CH2M. His local construction knowledge and experience, relationships with government agencies, and business ties have proven invaluable to the Project.

- **C. S. Carnaggio, Project Director:** Mr. Carnaggio has 35 years of experience in design and construction in the transportation industry, with the last 18 years of his career being exclusively in transit. He brings a unique combination of experience at both federal and regional transit agencies, having served for four years at FTA as the Director of Engineering and 14 years delivering capital projects for regional transit agencies such as WMATA and MTA in Baltimore. Having delivered major projects very similar to the HRTP, Mr. Carnaggio's leadership experience and transit knowledge provides HART with the assurance that sound delivery decisions are made.

- **Robert Yu, Chief Financial Officer:** Mr. Yu has over 25 years of experience in the public transportation industry. Prior to joining HART in March 2017, he served as Senior Vice President and Deputy General Manager for Oahu Transit Services, Inc. (OTS), the operator and manager of Honolulu's bus and handi-van system, from 2009 to 2017 and Vice President of Finance and Administration from 1992 to 2009. Before his career in public transportation, Mr. Yu held various financial and audit

positions at Chevron USA and Grant Thornton CPAs in San Francisco and Hawaiian Electric Industries in Honolulu. He is a Certified Public Accountant.

- **Nicole Chapman, Director of Procurement, Contracts, and Construction Claims:** Ms. Chapman has been with HART for four years and has over 20 years' experience in procurement and contracts, including serving as procurement and contracts legal counsel for the City and County of Honolulu and the City and County of San Francisco. Prior to working in the government sector, she worked for a defense litigation law firm and served as in-house counsel in the Bay Area and Hong Kong. Ms. Chapman's local knowledge of laws relating to construction contract procurement and interpretation of agreement language adds to HART's ability to manage contracts.

- **Lynn Harmon, Director of Project Controls:** Ms. Harmon has over 25 years of industry experience working for some of the largest public sector clients as well as Blue Chip private sector companies. She has experience in providing cost engineering, estimating, scheduling, change management, risk management, progress reporting, and contracts administration throughout the life-cycle of both traditional and complex Design-Build projects. Ms. Harmon's varied experience includes transit projects across the Middle East and Los Angeles Metro Heavy Rail Subway Systems, Light Rail Systems, and Metrolink Commuter Rail System. She is currently a Treasurer on the Women in Transportation Hawaii Chapter.

- **Abbey Seth Mayer, Director of Planning, Permitting, and Right of Way:** Mr. Mayer has approximately 15 years of experience leading planning organizations in the state of Hawai'i, including serving as the State Planning Director from 2008 to 2011. For the last 6 years, he served as the president and founder of Mayer & Associates Consulting, Inc., a Honolulu-based consulting firm participating in a wide variety of projects, including private developments, government planning initiatives, government-financed affordable housing developments, and large-scale alternative energy projects. Mr. Mayer's local knowledge and expertise concerning the programmatic requirements has earned the confidence of FTA and PMOC.

- **Stuart Jackes, Director of Operations and Maintenance:** Mr. Jackes brings 37 years of experience in automated rail transit operations and maintenance, policy, planning, regulation, economics and logistics, much of it with SkyTrain in British Columbia. He has been involved with a number of system expansion projects and was the Project Operations Manager on the TransLink Evergreen Line Rapid Transit Project and brings a career of extensive knowledge of automated rail transit to the HART project. Mr. Jackes' hands-on experience in fully automated transit operations well serves the need for details critical to the operation and safety of the HRTP.

- **Ralph McKinney, Chief Safety and Security Officer:** Mr. McKinney has 19 years of experience in safety certification in the transit industry. He is a technical expert on programs, regulation, and compliance with FTA, FRA, TSA, USDOT SSO, and APTA

policies and standards. Mr. McKinney's experience also includes acting as a liaison with State and Federal agencies regarding safety and security certification at the Chicago Transit Authority and the Utah Transit Authority.

- **Justin Garrod, Deputy Director of Core Systems:** Mr. Garrod, who serves as the Core Systems team lead, has 18 years of experience as a project manager and a Senior Systems Engineering Manager, managing Systems Engineering Projects similar to the HRTP including such system elements as Signaling, TPSS, Communications, SCADA, and Fire Detection Systems. This includes 12 years of experience managing rail vehicle procurements from design through qualification testing, manufacturing, on-site testing, and commissioning, warranty and ongoing operations at Sound Transit.

- **Kai Nani Kraut, West Area Construction Manager:** Ms. Kraut is a licensed engineer and a certified construction manager who brings relevant knowledge and experience from working directly for the City and County of Honolulu as the former Deputy Director of Transportation Services and previously for FHWA Hawai'i Division as the Utility Liaison and Transportation Engineer for Oahu, Maui, and American Samoa. In her over 23 years of experience, Ms. Kraut has represented the federal, state, and city governments and understands the requirements of federally funded construction projects. Within the last 15 years in Hawaii, she has participated in some of the largest transportation projects in the state and several ARRA transit projects with the City. She understands the stakeholders' needs and policies and is able to navigate them to aid a project's success.

- **John Moore, Acting East Area Construction Manager:** Mr. Moore has over 46 years of experience in management, design, and construction of major public and private works projects, including transit. As a licensed contractor in Florida, he was the qualifier for Stone and Webster and later for URS. Mr. Moore was also recognized by the courts in Dade County Florida as an expert witness in Construction. For the past six years with HART, he has had various responsibilities, including being the Deputy Resident Engineer for the KHG contract; leading the completion of the AIS trenching; being the lead in resolving the delay and escalation claims received from Kiewit for the MSF, WOFH, and KHG contracts; being the Project Manager for the On-Call Contractor and the Elevator and Escalator contracts; and is currently the Interim Construction Manager for the Airport and City Center portions of the system, including the remaining twelve stations.

3.2.4 Staffing Strategy and Approach

HART continues to actively recruit through its website, industry periodicals at the national level, and local media, as well as outreach to local agencies and engineering firms. HART has successfully recruited highly qualified individuals to fill the Chief Financial Officer and the Deputy Director of Procurement positions, with the full support of the Office of the Mayor.

HART is currently interviewing candidates to fill the following key vacancies: Director of Design and Construction, Safety Certification Manager, and the recently vacated East Area Construction Manager and Risk Manager positions. HART anticipates filling these key positions within the next several months. Recent meetings with the Office of the Mayor and the City's Department of Human Resources to establish a plan that provides stability for essential Project personnel have been encouraging.

HART's hiring and retention issues are not specific to rail construction personnel but have occurred at all levels of staffing and in all division of HART, including the administrative offices which do not require any form of rail or even construction experience. HART is also committed to employee retention by developing a succession plan focused on career progression, preparation for leadership roles, retaining institutional knowledge, and fair compensation for local staff. In addition, HART has taken the first steps to create an employee-friendly working environment with minimal stress and a corporate policy of positive communication and staff support.

3.3 HART Process and Procedure Changes

The following section describes changes to HART's processes and procedures which have been implemented to control costs, maintain schedule, and provide credibility in reporting moving forward.

3.3.1 Management of Current Contracts

3.3.1.1 History of HART Change Procedure

HART's Change Management program attempts to minimize the financial impact of Contract Change Orders to the Project. While Change Orders are not completely avoidable, proper policies and procedures can minimize their number and severity. HART has engaged the services of Mr. Henry Fuks, who was a Los Angeles County MTA construction manager for over 2 decades and has vast experience in managing large-scale projects with similar challenges. In April 2015, HART established a Contract Administration Division in an effort to streamline and bring uniformity to the contract change process. Additionally, HART recognized challenges that had not been addressed by the initial Contract Change Procedure and revised it accordingly. The following key areas were addressed:

- Revision 1 (August 2015):
  - The role of Contract Managers, who would review merit determination and negotiation strategy memos, was established.
  - Contract Managers were given the responsibility to prepare the Change Order documents to streamline and bring uniformity to the process.
  - Contract Administration implemented a "single Change Order file" process, which included checklists of all required documents.

  - A Time Impact Analysis (TIA) narrative was required as part of the supporting documentation for a Change Order.
  - The Project Manager was required to obtain funding and funding availability in advance of proceeding with a change, rather than at the end of the process, when presenting the change for approval.
- Revision 2 (September 2016):
  - Language was added to expressly state that HART does not allow "parceling" or piecemealing changes to avoid Board approval. (Note: This language was included in an abundance of caution and to demonstrate that HART was not in the business of implementing changes in this manner.)

3.3.1.2 Implementation of Further Improvements

In January 2017, the Interim Executive Director and CEO rolled out a change to the HART organizational chart, whereby Procurement, Contract Administration, and Construction Claims were gathered under one division and the Director of Procurement, Contracts, and Construction Claims would report directly to the Executive Director and CEO. This change was made to institutionalize checks and balances for change orders by having reviews conducted by an entity independent from the Project Management team.

HART is currently in the process of evaluating and revising the Contract Change Procedure. In the interim, on March 2, 2017, the Project Director and the Director of Procurement, Contracts, and Construction Claims collectively rolled out an interim procedure requiring the Director of Procurement, Contracts, and Construction Claims and the Director of Project Controls to approve merit determination of all changes going forward.

The following areas are being evaluated for Revision 3:

- Implementing a Project Change Control Board for all contract changes over $100,000. This will provide management an opportunity to review the change from a programmatic perspective for changes greater than $100,000. (All changes equal to or greater than $1,000,000 will continue to be subject to HART Board approval, as a continued check and balance.)
- Establishing time procedures with timelines for resolution at each phase of the process.
- Providing clearer direction to the field team on the use of unilateral change orders.
- Requiring a schedule network, in addition to the TIA narrative. The network is defined as the sequence of new activities that are proposed to be added to the existing schedule, which identifies the predecessors to the new activities and demonstrates the impacts to successor activities. This will allow for a more effective evaluation of the impact to the baseline activity.

Revision 3 of the Contract Change Procedure is scheduled to be rolled out in late April 2017. With these improvements, the HART Procurement, Contracts, and Construction Claims Division will provide stronger leadership in the change management process and work closely with the field team by providing training and support to ensure that contractors are performing in accordance with the terms, conditions, and specifications of the contract; that documentation sufficient to detail the history of the changes are included during the change process; and that the change order process, including the newly-established timelines for the change process, is rigorously followed.

3.3.2 Project Controls

3.3.2.1 Project Controls Overview

Project Controls includes the data gathering and analytical processes used to predict, understand, and manage the cost and schedule outcomes of a project. For any major transit project, effective Project Controls are a critical element of successful project cost and schedule management.

In 2013 the Project's General Engineering Contractor, who provided significant schedule and cost estimating support for HART, was replaced which created a vacuum in knowledge that has taken time to fill. To address these issues, and to provide more robust and effective project controls system, HART has obtained the services of a specialty firm, namely Nexus Consulting and Management Services, Inc., to evaluate the HART Project Controls processes and provide a system assessment to explore what is currently in use and to assist in the implementation of any changes that are deemed appropriate to enhance effectiveness and efficiency, to provide a more robust system solution to manage the project.

HART has several specific software systems that are presently being used to manage the Project and relies primarily on Oracle's Contract Management System (CMS). CMS was made the Project's central data repository and reporting system to manage the flow of project documents, control project cost, and provide reports. HART staff has experienced some high-level issues with CMS that are currently being evaluated for system and process improvements, as discussed below:

- CMS and the City's accounting system are not connected, and staff members manually enter financial information into both systems. Manually entered data is prone to error and takes longer to process because of duplication of effort in entering the same information into multiple databases.
- Bottlenecks exist in document processing because of limitations in the electronic sequential review process. Duplication of effort occurs as project staff are required to enter review comments manually on hardcopies and simultaneously electronically in the system.
- Using multiple databases requires manual reconciliation to detect manual data entry errors, variances, and other inconsistencies between various systems.

- Drafting monthly reports requires the HART Project Controls Division to rely on different reports from various systems and manual input from other divisions every month. HART currently has no single complete repository of project data for report generation.
- The current interface could be more user-friendly, intuitive, and simpler to use.

In response to the issues highlighted above, the HART Project Controls Division is committed to the following: simplifying and making business processes more efficient; centralizing the focus of information on analysis, reporting, and communication; and providing a full-integrated project system.

The HART Project Controls Division will be considering recommendations from an upcoming Condition Assessment Report of the CMS system in the second quarter of 2017, which is expected to address the present state of the software system; describe how enhancements can make the HART systems fully-integrated by addressing interface issues amongst the individual system platforms; identify a phased development and implementation approach along with an associated timeline; and demonstrate how enhancements will simplify reporting and the workflow process—initiation, updating, and approvals—at the various management levels.

The HART Project Controls Division is implementing process changes in the way it gathers and processes information and the standardization of reports. These reports by design are intended to assist managers in identifying any potential schedule issues and cost risks, to aid their focus of addressing and mitigating potential schedule delays early, easing potential cost overruns, and foster a goal-driven communication within management.

3.3.2.2 Trends

The Project has undergone major scope revisions and approved changes yielding significant cost and schedule impacts. In dealing with this and potential cost escalations, the HART Project Controls Division performs rigorous and continuous predictive analysis in key areas of where costs can be reduced or schedule delays can be mitigated.

Both the schedule and budget are undergoing a re-baseline. Once established, forecasting cost and schedule variances to the re-baseline will be documented through a new trend report process. The trend analysis will allow for and document early detection of potential cost overruns, schedule slippages, and project risks associated with individual contracts or interface elements of the Project. The HART Project Controls Division monitors the approved project budget and documents potential variances throughout the life of the Project. The HART Project Controls Division is also tracking any changes to the original project scope of work which result in an increase to the Project's approved budget, as they can only be submitted for approval by the Board after a committed funding source has been established.

3.3.2.3 Contingency

Contingency is shown as a line item in the Project budget and is derived from the bottom-up risk assessment as described in Section 3.3.3 below. HART manages and updates all risks that may affect completion of the Project within the approved budget and schedule on a monthly basis and re-runs the network model each quarter.

3.3.2.4 Master Project Integrated Schedule (MPIS)

The Project Master Integrated Schedule is the chief program management tool that ties information for all elements of the Project together and provides the necessary assistance in the planning and management of a complex execution plan for the Project. It is developed with a supporting basis and assumption report and is comprised of a hierarchy of program tasks and benchmark interim milestones, through both an Interim and System-wide Revenue Services Date (RSD).

Over the past several months, the HART Project Controls Division has undertaken a new course in enhancing the MPIS by shifting the focus back to using the schedule as the central point of communication in analyzing progress and reporting metrics to both a field level and executive management level. In its reviews of the present state of the MPIS, the HART Project Controls Division identified critical areas of deficiency that were preventing the MPIS from being able to be used as a tool to meet this focus:

- There was a lack of consistency in the use of activity coding, calendars, and Work Breakdown Structure (WBS) coding.
- The schedule updating procedures needed to be revised.
- There was a lack of owner-specific and third-party interface information in the MPIS (such as inclusion of Regulatory Agency approvals, inspections, certifications, and other utility activities—such as utility relocation and HECO power and activation activities).
- There was a disconnect of inter-project logic ties of Major Milestones and Critical Access Milestones (CAMs) to schedule activities.
- There was an unclear Critical Path at a Program Level.
- Total Float values were inconsistent and excessive, requiring a review of logic ties (as they may be missing successor tie[s]).
- Constraints, specifically hard constraints, were being used throughout the MPIS to hold a date in the system. This presented an issue, in that it would override the sequencing logic used for forecasting and accurate reporting of any potential forecasted delays.
- Integration of testing activities from the feeder schedule was missing in MPIS.

- Safety and Security activities are not updated or accurate in the MPIS.
- There was a lack of detail for upcoming planned work (information for the east-side segment shown at a planning level).
- There was a lack of standardized schedule reports and look-aheads of the MPIS information.

In the past, the construction portion of the MPIS schedule was updated by uploading the received contractor progressed schedule directly into the MPIS. This was recognized as a concern that was quickly rectified. Presently, monthly updates are validated through the Resident Engineer, Inspector, and Project Manager.

The HART Project Controls Division has prioritized its effort on performing the following initial Quality Control checks and validations:

- Activity coding and WBS coding
- Total float values
- Use of constraints

The Division is presently revising affected activities to correct or eliminate them as appropriate. Many of the adjustments incorporated into the MPIS over the past month from the time of this writing are the biggest contributing factors to establishing an integrated schedule. It is important to note that additional work is necessary with respect to the WBS coding effort and detailing of the east-side segment of work, which is expected to be an ongoing work in progress.

In addition, the HART Project Controls Division recognized a general deficiency in how it was interacting with the Project's internal groups. Project Controls has initiated a stronger communication and coordination effort with the HART Division Directors that has resulted in an enhancement of the detail and integrity of the schedule information, specifically for interface, turnover of activities and milestones, levels of detail information within the schedule, and accurate logic ties. A majority of logic detail has been incorporated in the MPIS leading up to the Interim RSD, but it is expected to be further defined for the complete system-wide RSD especially for the Eastside segments, as detailed information from Testing, Safety and Security, and other portions of work is incorporated. Information is presently at a summary level in these areas, but additional details from these sections are anticipated to be completed by the third quarter of 2017.

In parallel to this work effort, the HART Project Controls Division is reviewing and realigning its scheduling procedures and methods; Time Impact Analysis objectives and recommended methods; and standardized report formats and layouts that include an analysis section for the schedule information (for visibility and consistency). Project Control's objectives continue to be re-aligned to implement industry standards, especially in schedule-level

reporting presentations that will be aimed at the project, senior, and executive management levels for their respective review and oversight.

This realignment in Project Controls' processes is also leading into the development of a new internal Monthly Schedule Report, with sections feeding into the published Monthly Project Status Report, as appropriate. These reports are expected to show more detailed layout options; a Critical Path and Analysis section; a Look-ahead Schedule; a Major Milestone and Critical Access Milestone Schedule and Analysis section; Third-Party Turnover and Interfaces section; a ROW section; a Core Systems, Testing, and Analysis section; and an Area of Concern section—to identify present and potential issues. This is expected to be implemented by the end of the second quarter of 2017.

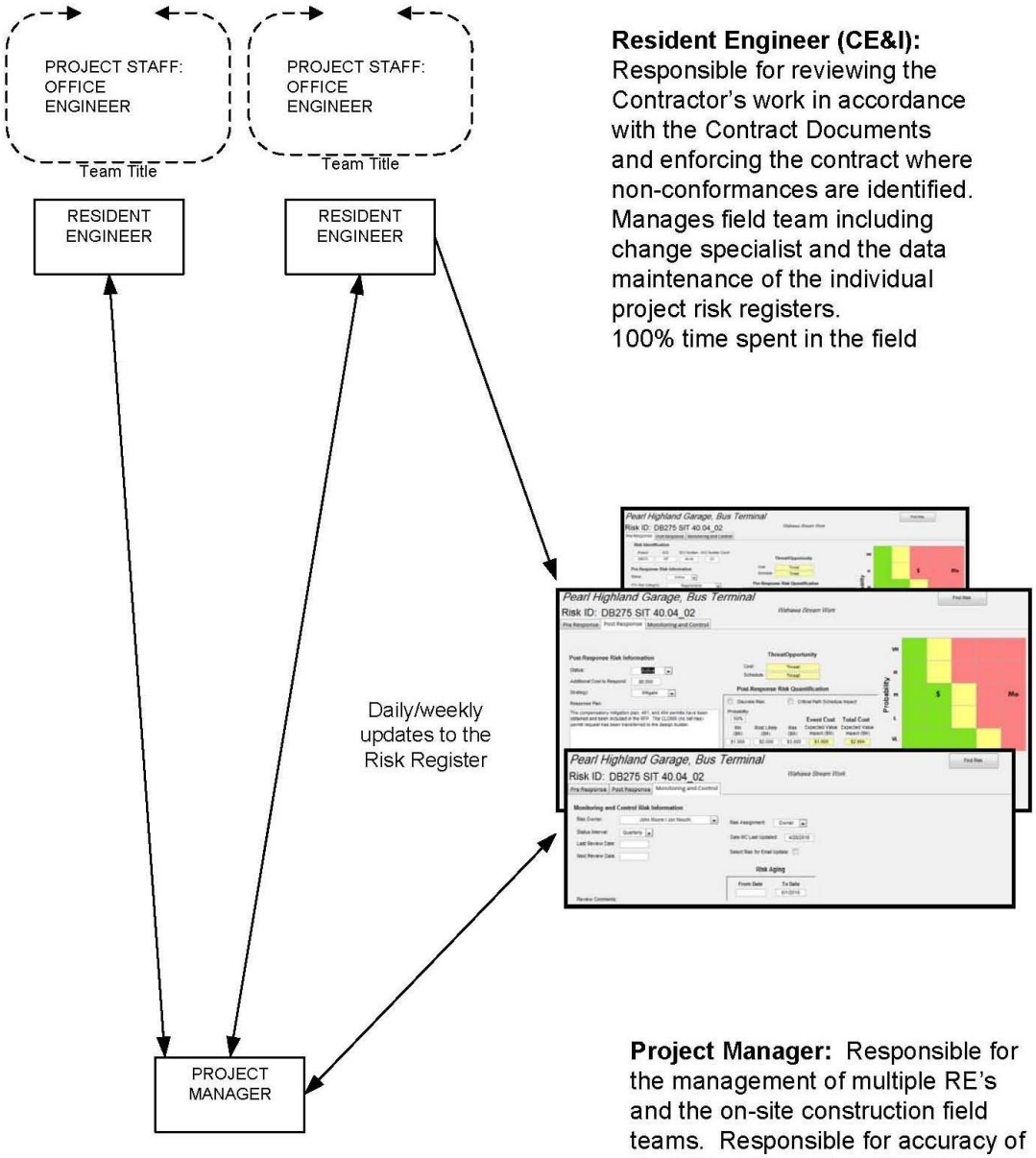
Project Controls' goal is to make the MPIS and system reports available as a centralized tool for communication and presentation of current Project status and critical activities; analysis of any variances; identification of issues or concerns, mitigations, or recommendations; and workaround plans.

3.3.3 Risk Management Program

The HART Risk Management Program helps to establish confidence in the HRTP cost and schedule projections. The Risk Program includes the identification, categorization, and assessment of risks and opportunities (R&O) related to each individual contract. A network risk model uses a bottom-up risk assessment to define cost and schedule R&O impacts for each contract to other contracts, and to the Project as a whole. In 2016 HART increased its focus on risk with the implementation of formal risk modeling efforts that include rigorous analysis and cross-departmental meetings to determine mitigation strategies. Quantifying the cost and schedule R&O impacts will assist the Project team in decision-making and risk management. HART has also developed a monitor and control process that generates reports to assist the Risk Manager and Project Managers in tracking contingency funds.

The weaknesses in the west-side DB contracts, including contract language and requirements as described below, are identified as risks for AGS and CCGS and are top mitigation priorities. The Risk Management Program process flowchart is depicted in the following figures:

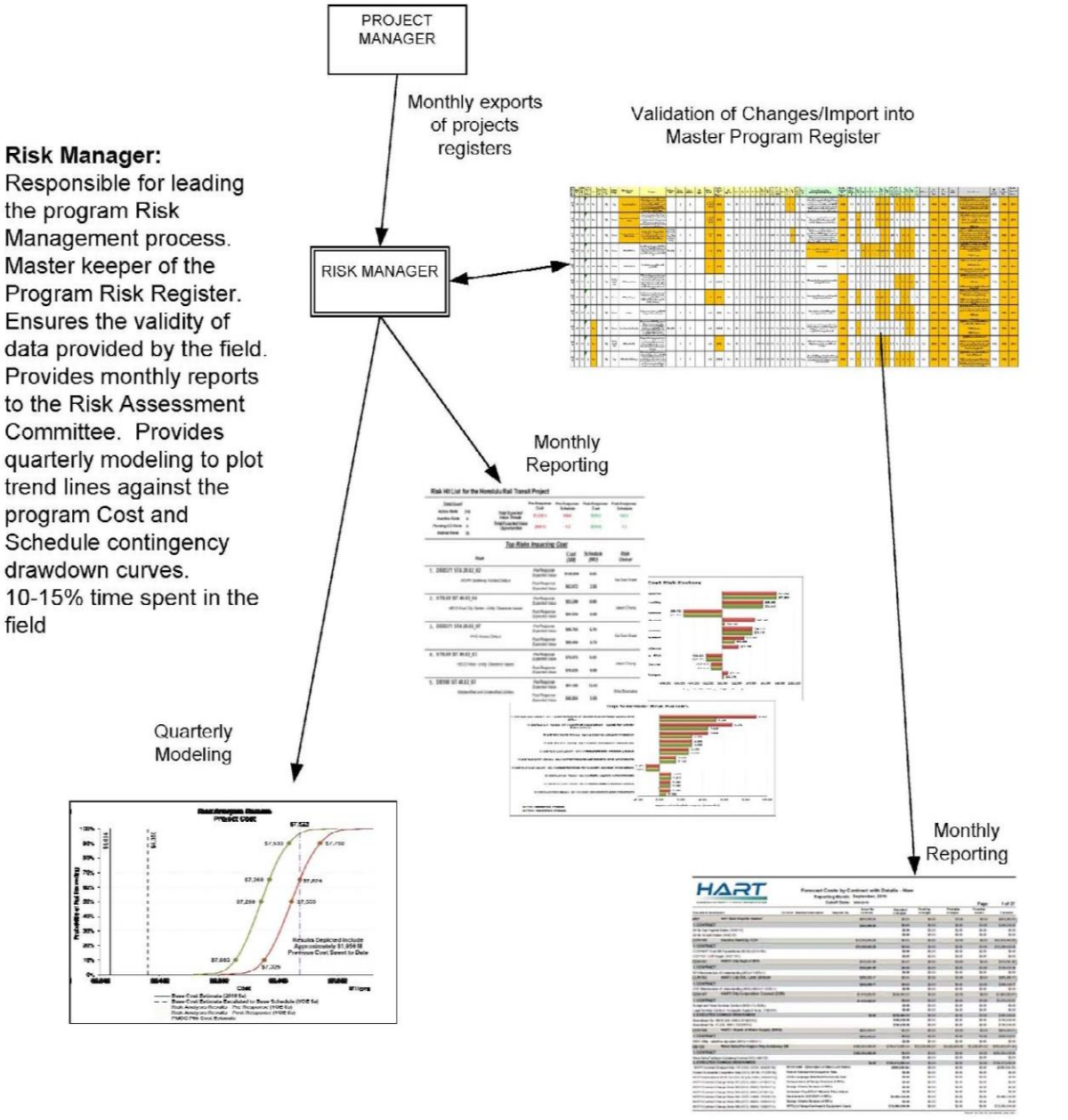
Figure 3-1: Field Office Risk Management Flowchart



Resident Engineer (CE&I): Responsible for reviewing the Contractor's work in accordance with the Contract Documents and enforcing the contract where non-conformances are identified. Manages field team including change specialist and the data maintenance of the individual project risk registers. 100% time spent in the field

Project Manager: Responsible for the management of multiple RE's and the on-site construction field teams. Responsible for accuracy of the information entered in the risk register including identifying new risks.

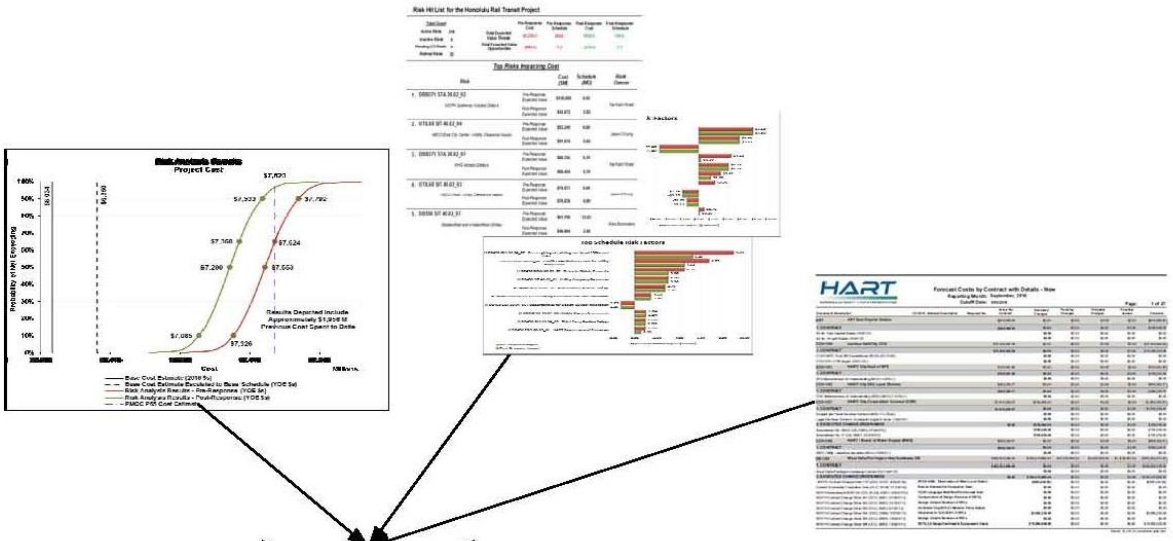
Figure 3-2: Risk Manager and Project Controls Flowchart



Risk Manager: Responsible for leading the program Risk Management process. Master keeper of the Program Risk Register. Ensures the validity of data provided by the field. Provides monthly reports to the Risk Assessment Committee. Provides quarterly modeling to plot trend lines against the program Cost and Schedule contingency drawdown curves. 10-15% time spent in the field

RMS/Project Controls: Will receive a monthly export from the RMS system during the 2nd week of every month. This export will be imported into CMS to track and run forecast reports (shown below) to be provided to executive management and the PMOC.

Figure 3-3: Risk Management Reports and Committee Flowchart



Modeling and Reporting: Modeling will occur on a quarterly basis resulting in updated cost curves, cost and schedule contingency drawdown curves, and extended overhead delay costs.
On a monthly basis, a summary of top risk by project and program will be produced along with cost and schedule tornados. This report along with the monthly forecast will inform management on the health of each project and the program as it relates to cost and schedule.

Risk Management Committee: Consisting of the positions shown above. This committee will meet monthly to review the health of the program as it relates to the RCMP planned contingency drawdown curves as well as the near-term and long-term risk exposures. The reports will be provided by the risk manager and meetings will be chaired by the Project Director. Purpose of the meeting will be to give the executive managers insight from the field of what challenges the teams are facing and what mitigation strategies are being employed in the field. Pending change orders as well as future change orders would be discussed within this group as well.
0-5% time spent in the field

The Project is currently monitoring 215 active risks and 15 pending change orders and has closed 90 risks since June 2016. The following is a list of the top three risks, which account for $250 million, or 38% of the total risk profile:

- Re-baselining the Core Systems Schedule to meet a Final Overall Baseline Schedule, extending the RSD from January 2022 to December 2025
- Working with HECO to relocate the overhead utilities on the west side to underground locations
- Re-baselining the Core Systems Schedule to meet an Interim Baseline Schedule, extending the RSD from January 2017 to December 2021

The following is a list of the top three schedule risk factors, which have the potential to impact the project by approximately 30 months:

- Misidentified or unidentified utilities which might occur in remaining west-side efforts or east-side contracts
- HDOT or DTS requirements for conformance with their standards
- ROW acquisition for City Center

A more comprehensive listing of the cost and schedule risk factors is included in Appendix D. This excerpt from the Risk Tractability Log shows how each risk factor includes a detailed description, a pre-response estimate, a post-response estimate, and the individual risk owners. It also shows the overall risk and potential recommended mitigation for the program.

3.3.4 Operations and Maintenance Roadmap

The HART O&M Division is dedicated to containing costs and maintaining scheduled openings by ensuring a seamless transition from capital construction and commissioning to operation and maintenance of the system. The approval of the 2016 Charter Amendment 4 to the Revised Charter of the City and County of Honolulu 1973 (2000 edition), as amended, places operations and maintenance responsibilities for rail with DTS. The HART O&M Division meets regularly with DTS leadership to actively work on a roadmap to revenue service. HART and DTS also discuss DTS's branding initiatives for the rail system and fare system card. In addition, leadership of HART, DTS, and OTS meet on a monthly basis to develop planning for intermodal (bus-rail) service integration and Transit-Oriented Development (TOD) to improve system connectivity needs in relation to current design and construction.

The HART O&M Division is also working toward a seamless transition by leading the O&M organizational and procedural development, including its continued commitment to hiring and training local staff and fostering its ongoing relationship with the Leeward Community College Workforce Development program. A proactive approach to O&M staffing will allow

HART to build institutional knowledge and dedicate adequate resources to develop the policies, procedures, and programs, such as the Transit Asset Management Program, needed to ensure HART's success during the transition to and start of system operation.

The HART O&M Division will also continue to assist with ensuring operational readiness and cost containment by evaluating and communicating operations and maintenance implications to Project decision-makers and stakeholders and facilitating operational and safety policy discussions. The HART O&M Division reviews Project documents, capital construction, Memoranda of Understanding, and third-party agreements to ensure operability and maintainability and provides additional Project oversight and consultation to Project teams. The HART O&M Division is also committed to maintain system assets in a State of Good Repair and provide analytics to prioritize maintenance activities. The HART O&M Division also provides oversight of the Core Systems Contractor's O&M mobilization progress.

In order to assist the City in identifying funding sources, HART, in full coordination with DTS and OTS, put together preliminary cost estimates for the interim and full O&M service periods.

3.3.5 Safety Oversight

The HART Chief Safety and Security Officer leads the HART System Safety and Security Division and is responsible for managing all Project safety and security activities and ensuring all Project safety and security requirements are met. The HART Safety Team has recently completed the annual update of both the Safety and Security Management Plan and the Safety and Security Certification Plan. The updates to those plans reflect HART's commitment to taking a risk-based approach to mitigating hazards which helps ensure the safe and secure design, construction/installation, and operation of the system. These changes will provide more clarity on why an identified hazard should be introduced and tracked to closure. The changes will also provide clearly defined steps for mitigation, verification, and acceptance that the hazard has been reduced to its lowest acceptable level of risk. Starting April 2017, the HART System Safety and Security Division will provide quarterly updates to the HART Board of Directors. The updates will include the status of safety and security certification, a brief summary on important safety and security issues, and activities that may impact the Project schedule and budget. The HART Safety Team will continue to effectively and efficiently manage its resources in support of HART's ultimate goal of delivering a safe and reliable public transportation system to the citizens and visitors of the Honolulu area.

As mandated by Title 49 of the United States Code of Federal Regulations (CFR) Section 633 and Title 29 CFR Sections 1910 and 1926, HART is responsible for ensuring its employees are provided with a safe work environment. Contractors are also responsible for providing their employees, subcontractors, and visitors with a safe and healthy work environment. The federal Occupational Safety and Health Administration measures a safe work environment by comparing the number of recordable incidents to the total hours worked. HART's

current incident rate of 0.76 is five times lower than the State of Hawaii average of 3.8 and nearly six times lower than the national average of 4.5. This low incident rate allows HART to take advantage of premium savings in the Owner-controlled Insurance Program, pay lower claim amounts, and maintain the Project schedule and budget.

As Safety Certification is critical to the success of the project, the HART Safety Team works closely with HDOT, who has the approval authority for entry into passenger service, and all of the Project teams to track and verify all safety related requirements. Regular meetings are held with HDOT to keep it informed of all safety activities in progress. The HART System Safety and Security Division will, upon completion, deliver a fully certified system to the HART O&M Division and DTS to begin Revenue Service Operations.

3.3.6 Decision-making Matrix

In 2015, the PMOC urged HART to develop and utilize a Decision-making Matrix to help to make the necessary decisions to move the Project forward while identifying potential issues, anticipating the deadlines for decisions on the issues, and executing mitigation actions to resolve the issues. In 2016, HART initiated a robust Risk Management Program in which Project Managers became fully involved, and it has been a successful tool in making appropriate project decisions. (The Risk Management Program is described in more detail in Section 3.3.3 above.) During that time, the Decision-making Matrix became less of a priority and went unused. HART is now re-instituting the Decision-making Matrix and will continue to use it as a tool for everyday processes and for making presentations regarding status for the PMOC monthly update meeting. An excerpt from the latest Decision-making Matrix is provided in Appendix C.

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4 Cost Reductions and Containment

4.1 Methodology and Approach

HART continues to apply the knowledge gained from having prepared, awarded, and managed eight multi-million, multi-year alternative delivery transit contracts to ongoing and future work. This will become increasingly important as the Project moves into Honolulu's dense urban core. HART's commitment to explore all cost containment and cost reduction measures are further described below.

4.2 Value Engineering and Lessons Learned

HART has consistently sought to apply lessons learned and the principles of value engineering to design and construction contracts to improve overall Project cost and schedule. Some of the areas analyzed by the Project teams include the following:

- Developing a contract packaging strategy to lower costs by increasing competition.
- Moving towards Design-Build procurement and re-packaging where appropriate to lower costs.
- Revising contract language, in collaboration with various construction and procurement stakeholders, to provide clear direction and minimize disputes.
- Removing non-essential design and construction elements to reduce cost.
- Performing pre-construction Subsurface Utility Engineering (SUE) and geotechnical investigations.
- Reviewing various Project financing options.
- Allowing contractors more control over Maintenance of Traffic.
- Utilizing precast and offsite fabrication to reduce cost and schedule.
- Utilizing partnering to resolve construction issues in the field.
- Utilizing a Dispute Review Board to minimize or avoid potential impacts and prolonged litigation.

HART is exploring other opportunities for cost containment and cost reduction as detailed below.

4.3 Soft Costs

HART has undertaken a review of its consultants to address its soft costs and non-direct construction costs, as suggested by the PMOC. HART is taking steps to evaluate consultant

scope, performance, qualifications, and technical competencies. HART will also need to systematically evaluate soft costs in all program areas. Upon completion of the soft cost evaluations, HART will bring recommendations to the Executive Director and CEO and the HART Board for adoption.

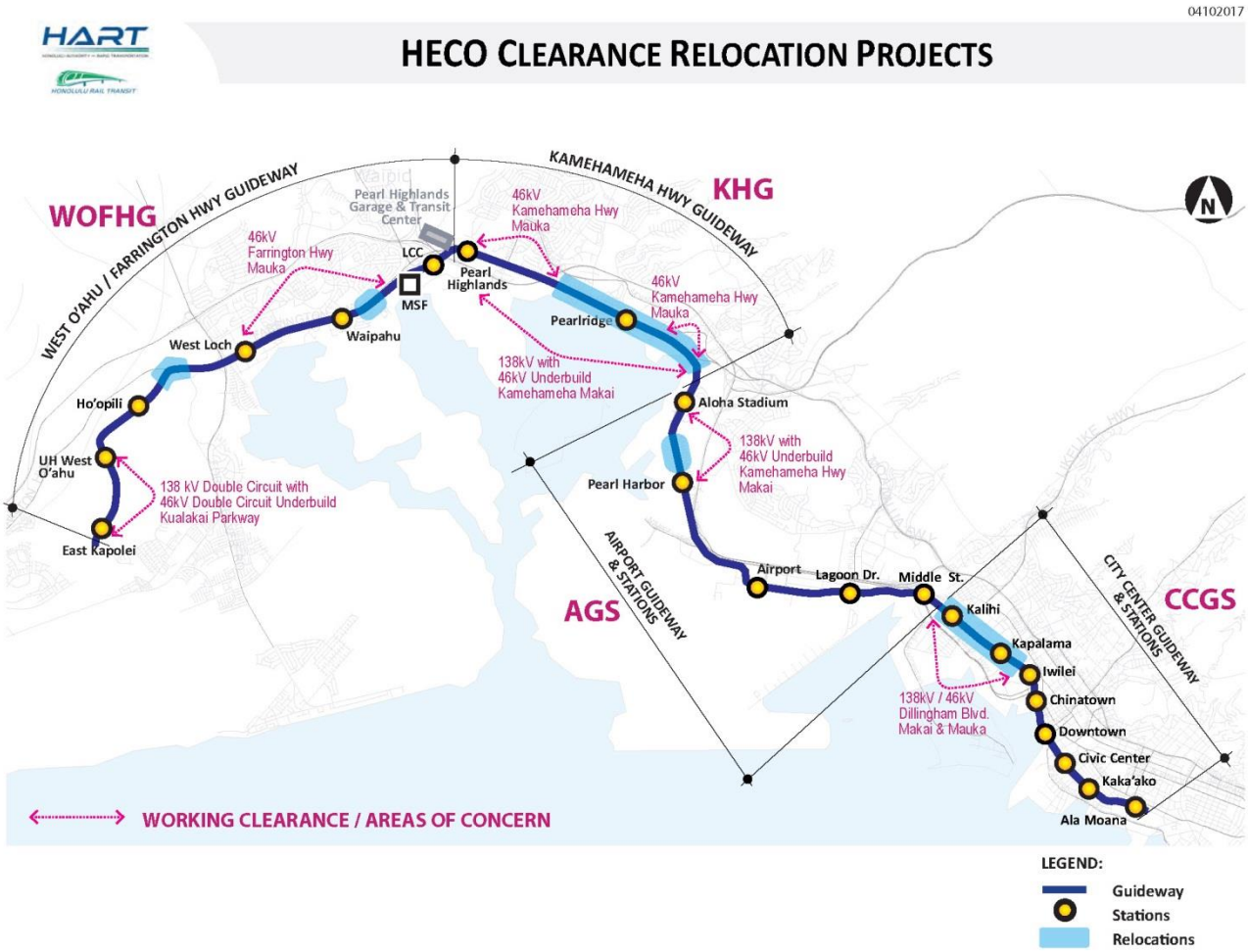
4.4 Peer Reviews

HART has held numerous peer reviews to strengthen the organization by receiving constructive and unbiased feedback from industry leaders. The recent APTA review provided insight with regards to technical management capacity and capability, contract administration and change order process, and claims management. HART has started implementing most of the suggestions from this latest review. HART is committed to hold a follow-on Peer Review focused on management and technical competency of the organization, interactions with utility companies, and contractual negotiations and administration by the summer of 2017.

4.5 HECO Utility Relocation and Alternative Equipment

The current system alignment has major impacts on multiple utilities, and HECO in particular has had the most influence on the Project cost and schedule. HECO's self-established clearance requirements conflicted with the construction and operation of the HART system. HART and HECO were able to collaborate and identify alternative equipment (vehicles) to address working clearance concerns between HART's rail guideway and HECO's high-voltage 138kV transmission, 46kV sub-transmission, and 12kV distribution power lines and associated steel or wood poles. The necessary horizontal working clearances that HECO requires are 50 feet for 138kV power lines, 40 feet for 46kV power lines, and 30 feet for 12kV power lines. Refer to Figure 4-1 below for a map showing the areas of concern.

Figure 4-1: HECO Clearance Relocations



HART has agreed to underground portions of HECO's utility lines, provide HECO funds to purchase the new alternative vehicles, and provide storage space for these vehicles. Because HECO has granted variances to their original clearance requirements in certain areas, the Project can avoid costly overhead and underground utility relocations and save an estimated $138 million. The clearance solutions vary for each section of HART's alignment and are detailed in Appendix L.

The AGS and CCGS contracts both have significant HECO utilities that need to be relocated underground. AGS will use a combination of alternate service vehicles, increased Navy easements, and redesigned (re-framed) pole arms to avoid undergrounding the nine-pole 138kV system fronting Joint Base Pearl Harbor-Hickam. The CCGS design team is in the review process with HECO to underground all of its utility lines along Dillingham Boulevard. HECO's facilities relocation and coordination with the Project DB contractors remain a high-risk item.

4.6 Interim Opening

HART, along with its stakeholders and partners, are currently evaluating the merits of a system interim opening prior to full project completion to the Ala Moana Center Station. An interim opening would be a tremendous opportunity to stress test the system and evaluate performance under reduced service levels and ridership conditions. As detailed below, there is absolutely no difference in the operational readiness and safety requirements for any type of passenger service. HART acknowledges that after several years of interim service, there would be a diminishing benefit in relation to O&M cost and ridership. Thus, the responsible parties must weigh the cost versus benefit as they decide on an interim opening date. Irrespective of the decision to pursue an interim opening, HART intends to be ready to operate and maintain a system from East Kapolei to Aloha Stadium at the end of 2020.

4.7 Cost Containment and Cost Savings Evaluations

The figures below identify potential cost saving opportunities for the Project. A complete list of cost reductions and cost containment items are shown in Appendix B.

Figure 4-2: Project Scope Change Cost Savings

Updated this month? (Y/N)	Primary / Secondary	Scope Change Concept	System wide Potential Savings	Design / Schedule Impacts
	Primary	Construction Camera Surveillance	<$1M	Minor
Y	Primary	Eliminate landscaping	<$1M	Minor
	Primary	Defer stations and guideway to "Build to Budget"	$0.4 - $1.0 billion	Re-procurement
Y	Primary	Maintain overhead utilities wherever possible	$30M - $200M	Very Significant
Y	Secondary	Pearl Highlands Garage & Transit Center	$25-90M	Significant
Y	Secondary	End Guideway at Downtown	$100M+	Very Significant
Y	Secondary	Core Systems - Electrical Power Back-Up	$12M	
Y	Secondary	Station - Downtown Station	$5M - $10M	Very Significant
Y	Secondary	All aesthetic treatments	$5M - $10M	Significant
Y	Secondary	Defer or postpone / Eliminate a station	>$20M	Significant
Y	Secondary	Reduce plaza areas	$5M - $10M	Significant
Y	Funding	Eliminate three crossovers	$2M	Minor
Y	Secondary	Procure more extensive mapping of existing utilities	$100M	Significant
Y	Primary	Shift Guideway on Dillingham to Makai Side	$50M	Very Significant

Figure 4-3: Potential Cost Reductions

ITEM	DESCRIPTION	DECISION DATE	EST SAVINGS ($Million)
Interim Opening	Eliminate Interim Opening (**per year**)	7/1/2017	$57
Eliminate GET	Eliminate GET from Project or at least from contractor mark-up	7/1/2017	$5
Rights to Transmission of 3rd Party Power Down the Guideway	Bid out rights to use guideway for power transmission	7/1/2018	$10
Rights to Fiber Optics in Guideway	Bid out rights to use fiber optics in guideway	7/1/2018	$10
Private Utilties	Utilities to pay for incremental upgrade to their facilities whether it be size, economic life remaining, etc.	9/1/2017	$50
Bus Facilities	Have other City agencies fund improvements to bus facilities at stations.	9/1/2017	$10
City	City to pay for all City Department costs	9/1/2017	$30
HDOT	HDOT to pay for all HDOT Department costs	9/1/2017	$30
HECO	HART is purchasing HECO equipment in lieu of undergrounding electic lines	7/1/2017	$125
City	City to exempt HART from GET for leased precast yard	12/1/2017	$2

5 Fulfillment of FFGA Scope (Plan A)

5.1 Project Progress and Current Status

The System is scheduled to open for passenger service on December 31, 2025, with a total cost of $8.165 billion. The total cost includes contingency but does not include financing, which currently ranges from $0.8 billion to $1.8 billion pending the decision on the GET surcharge legislation. The Master Project Schedule shows 355 days of schedule contingency.

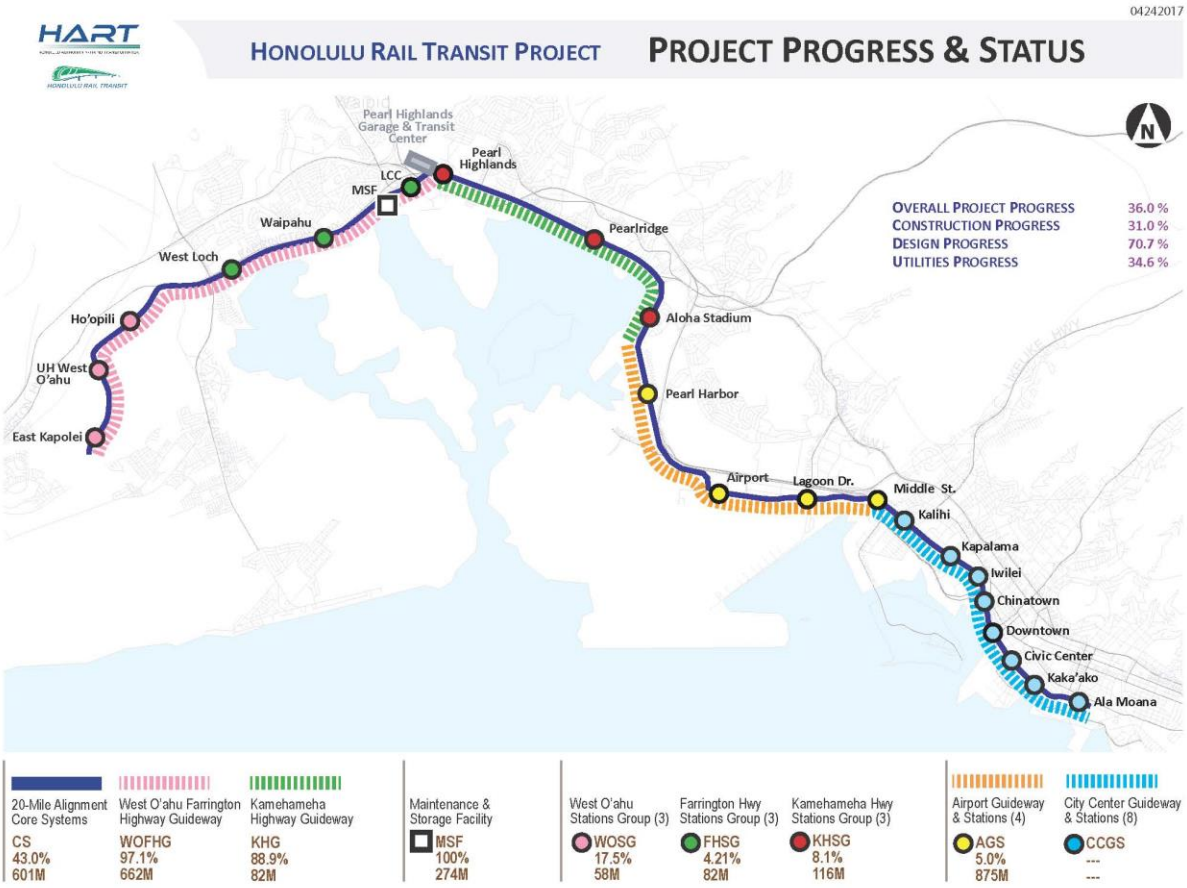
The Project is currently 36.0% complete based on the weighted value progress of the individual construction and design contracts as of March 2017, which includes completion of the ROC and 10.75 miles of elevated guideway constructed from the East Kapolei Station site to just past the Aloha Stadium Station site. The Project team is working to transition to an earned value calculation based on construction progress and not based on weighted expenditure calculation of the individual design and construction contracts.

5.2 Major Contract Status

Major contracts that have been awarded and their percentage completion are as follows: West Oahu/Farrington Highway Guideway (97.1%); Kamehameha Highway Guideway (88.9%); Maintenance and Storage Facility (100%); Core Systems (43.0%); and Airport Section Guideway and Stations Group (5.0%). With the recent award of the AGS DB contract, HART currently has over $4.27 billion either completed or under contract, which includes 15.9 of the 20.1 miles of guideway and 13 of the 21 stations. The Project plans to procure the CCGS DB package and the Pearl Highlands Garage and Transit Center (PHGT) DB package in 2018, subject to Project funding. These two contracts are discussed in more detail in Section 5.4.1 below.

The Core Systems Contractor scope includes the delivery of Vehicles, Signaling, Traction Electrification, Communications, Passenger Screen Gates, and a fully functioning Operations Control Center. The Communications System and the Passenger Screen Gate System are currently under development and are on track to meet the current Project schedule. The contractor has completed the base design development and is well into manufacturing and testing of all other subsystems. Train #1 (four-car consist) was delivered to the ROC in March 2016. The first two cars of Train #2 arrived in Honolulu in April 2017, and the remaining two cars of Train #2 are scheduled to arrive in May 2017. Dynamic testing on the guideway is expected to begin in the summer of 2017.

Figure 5-1: Project Progress and Status



5.3 Right-of-Way Update

The original ROW plan under the FFGA included the identification of 223 total parcel acquisitions and 112 total relocations. For the west-side sections, the HART ROW Branch has obtained site access for all 48 required parcels and completed all 30 required relocations. HART continues to make steady progress in obtaining the required access and completing necessary relocations for the AGS and CCGS segments.

Across all segments of the Project, HART's ROW scope of work has expanded considerably since its original conception in the FFGA. The Project will require the acquisition of approximately 500 easements, including 246 additional easements for utility relocations, and approximately 30 Temporary Construction Easements (TCEs). The HECO utility relocation and related easements are particularly complicated areas that are currently in work. Construction access is being negotiated for two parcels within AGS and 70 parcels within CCGS. Past experience has shown there can be strong resistance to ROW acquisitions,

and Project staff were instructed to proceed with eminent domain actions on those parcels considered to be problematic.

5.4 Summary of Actions to Completion

5.4.1 Major Contract Procurements

The CCGS DB and the PHGT DB contract procurements are the last major contracts yet to be awarded. The CCGS contract is the critical path for the overall Project and is the last of the major contracts to be procured. The current schedule for CCGS is estimated to be 65 months long, a significant amount of time for a 4.16-mile segment that is evidence of its complexity. Utility relocation is a significant part of the CCGS project in Honolulu's urban core, and HART is proactively performing pre-construction SUE and geotechnical work. These final contracts will also benefit from lessons learned and value engineering described in Section 4.2 above and updates to Project Controls, particularly the robust Project Master Schedule and Risk Assessment.

The sequencing of the guideway construction, which is ultimately decided by the CCGS contractor, will drive the critical path to completion. HART is dedicated to working closely with this future partner to meet the Project's cost and schedule targets.

5.4.2 HECO Coordination

HECO indicated a need in the 2019 timeframe for a new dedicated 46kV substation to feed the ROC due to requirements in HECO Rule 13 for line extensions and substations. A location near the ROC is being considered, and initial planning is ongoing with HECO and LCC. No other substations have been identified by HECO for the Project.

HECO has also informed HART that HECO will not perform utility relocation construction services for the electrical facilities within the Airport and City Center sections, including the Dillingham Temporary Utilities section. HECO had previously performed electrical utility relocation construction work for the western half of the Project at HART's request in order to help reduce and manage cost. However, HECO has indicated that it will not be self-performing any construction work for the remaining AGS and CCGS contracts. According to HECO, this is a result of its resources having become stressed, which would affect its core mission. However, HECO will continue to perform the electrical design. HART will procure the utility relocations construction services. HART will explore alternative and available options to ensure that the current 2025 schedule is not affected.

5.4.3 Casting Yard

On April 19, 2017, the FTA provided conditional approval of HART's acquisition via license agreement of the precast concrete manufacturing yard, identified as Lot 31 of Kapolei Business Park West, Phase I.

HART finalized compliance with the FTA conditional approval on April 20, 2017.

HART is now in the process of executing agreements to assume the current license and secure a new license for the casting yard through November 2022. HART intends to sublicense the casting yard to the AGS DB contractor, Shimmick/Traylor/Granite JV.

The short-term agreement has been signed by both the contractor and the property owner and is with HART for final execution.

5.5 Development of Acceptable Project Cost

5.5.1 Introduction

One of the most critical components of the HART Recovery Plan is the development of a realistic cost estimate for the completion of the full Project scope as set forth in the FFGA, referred to herein as the Estimate at Completion (EAC). In developing the EAC, HART has embraced FTA guidelines and procedures relating to risk assessment, cost mitigation, and estimates of capital cost, as well as cost estimating methodologies well accepted in the construction industry.

In particular, in developing the EAC, HART conducted a process for the identification and categorization of risks (described in Appendix D) and developed the Primary and Secondary Mitigations (described in Appendix B). The Basis of Estimate (BOE) in Appendix G describes in detail the capital cost estimate methodology and assumptions used to develop the Project EAC.

5.5.2 Cost Estimating Methodology

For awarded construction contracts, the actual values of the contracts were used in developing the EAC. This includes the WOFH, KHG, AGS, and MSF Design-Build contracts; the West O'ahu Station Group (WOSG), Farrington Highway Station Group (FHSG), and Kamehameha Highway Station Group (KHSG) Design-Bid-Build contracts; and the Core Systems Contractor (CSC) Design-Build-Operate-Maintain (DBOM) contract. All bid values were adjusted and sorted by the appropriate Standard Cost Category (SCC) for these estimates. An ICE and Validation Estimate were completed for the CCGS procurement.

Additional data sources used for factoring the EAC included staffing projections; change orders in negotiations with contractors; merit changes under evaluation; known risks with potential cost or schedule impacts; and contingency to account for unknown site conditions, unresolved design or scope issues, market fluctuations, regulatory requirements, and schedule impacts.

5.5.3 Adequacy of Contingency

One of the lessons learned by HART from the earlier stages of the Project is the critical importance of sufficient project contingency to address changing market conditions, the cost impact of schedule delays, and other project risk factors. The FTA places great importance on assuring that the project sponsor maintains adequate contingency levels for various stages of project development, as described in the FTA's Oversight Procedure 40c, Risk and Contingency Review, 11-12. Combining the FTA's guidance with the Risk Management Program described in Section 3.3.3 of this Recovery Plan, HART is confident in the current contingency of $1.1 billion (13%).

5.5.4 Updated Cost Estimate

Based on the methodologies described above, HART is confident in its development of the Project cost and contingency. The current Capital Cost Estimate is $8.165 billion, exclusive of financing costs, which includes $1.1 billion of allocated and unallocated contingency, all in Year of Expenditure (YOE) dollars. A summary of the estimated costs for the Project is provided in the table below:

Table 5-1: Updated Cost Summary

Contract Summary Status	Estimate at Completion
Active Contracts (includes allocated contingency)	$4,129,313,000
Unawarded Construction (includes allocated contingency)	$1,928,548,000
Staff and Consultants (includes allocated contingency)	$1,286,632,000
Completed Contracts	$546,950,000
Unallocated Contingency	$273,641,000
Total Capital Project (excludes finance costs)	**$8,165,084,000**

5.5.5 Range of Finance Costs

The Project financing costs will be determined by the ultimate funding solution. Financing costs will vary based on when additional funding is received, the total amount of debt required, interest rates, and bond maturity. The Project financing is detailed in Section 6.

5.6 Development of Acceptable Project Schedule

HART's success in achieving the updated RSD will depend in large part on the continued use of the MPIS as a forecasting tool rather than a status reporting tool. While this is a recent change in how the MPIS has been used, management attention will be needed in order to maintain this focus across the organization. The HART Project Controls Division has reached out to the various HART Division Directors for information to populate the MPIS and how

their activities relate to procurement, design, and/or construction. Diligent updating of this information is crucial to the success of the MPIS being a useful tool for managing the overall Project activities in order to best manage the Project as a whole rather than localized optimization of each contract.

The MPIS includes activities from HART Division Directors for procurement, environmental actions, and safety and security as well as design, construction, and core systems contracts. There are major milestones among the construction and systems contracts that provide significant points of interface, referred to as Contractor Access Milestones (CAMs), that define access and cross-contract exchange of design, construction, and operational information. Consideration was given to the constructability of utility relocations, foundations, columns, and guideway erection based on performance metrics, as well as the physical characteristics of the existing built environment. Construction sequences were developed based on a reasonable and prudent approach to construction assuming a balance and flow of crews, crew sizes, and equipment and directional headings to optimize the schedule. The selected contractor(s) may come up with equal or better schemes based on their preferred means and methods and existing operational experience as well as the availability of equipment and labor. A more detailed description of Project schedule development is found in Section 3.3.2.

5.7 Operations and Maintenance for Interim and Full Openings

The Project's O&M Team is responsible for providing safe, secure, convenient, reliable, and clean service to the general public for the 20-mile rail system from East Kapolei Station to Ala Moana Center Station. The HART O&M Division is currently developing the policies, procedures, and staffing requirements to successfully operate and maintain the HRTP system as described above in Section 3. The HART O&M Division will also manage the rail system's operations and maintenance contracts including the Core Systems Contractor, fare-collection system, and escalators and elevators.

The O&M Team will be ready to operate and maintain the system from East Kapolei Station to Aloha Stadium Station for an interim opening in 2020. The O&M Team must meet the same rigorous operational readiness standards and safety requirements for the interim opening as for any level of passenger service. Many of the major start-up costs will still apply to an interim passenger service. The FTA will also require a Transit Asset Management Plan and State of Good Repair reporting for revenue service, which does apply to an interim opening.

The rail system will operate daily from 4 a.m. to midnight and arrive approximately every five minutes during peak travel hours. The O&M Team will adjust headways and operating strategies to reflect forecasted passenger demand. The O&M Team will also coordinate rail schedules with the City bus system and modify service to accommodate special events. The O&M security team will enforce system rules and ordinances, ensure safe travel for patrons, and deter fare evasion. O&M customer service teams will provide information and help to

the general public. The O&M Team will also provide fare collection, evaluate revenue generation, and explore TOD opportunities around the system.

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6 Project Finance

6.1 Description of GET Financing Resource

6.1.1 Local GET Surcharge

The local funding source for the Project is a dedicated one-half (0.5) percent county surcharge on the State of Hawaii's GET Surcharge. In 2005, the Hawaii State Legislature authorized counties to adopt a surcharge on the GET Surcharge of 0.5% for public transportation projects. On July 14, 2015, the Governor signed legislation that allows the City to extend the GET Surcharge from December 31, 2022, to December 31, 2027. Following the passage of legislation by the City Council, the Mayor signed into law Ordinance 16-1 on February 1, 2016, to extend the GET county surcharge.

The following provides a summary of the net GET Surcharge revenues expected to be received by the City between Fiscal Year (FY) 2017 and FY 2028. It is important to note that given the changes in the global and U.S. economies, this projection will be reviewed and refined periodically over time, as more actual tax collection data are received and as the local, national, and global economic outlooks change.

6.1.2 Timing of GET Surcharge Collections

The annual GET Surcharge amounts are presented on a cash basis. This method accounts for the fact that HART does not receive its share of GET Surcharge revenues until the month after the end of each quarter. For example, revenue for April 1 through June 30, 2016, was remitted to HART in July 2016 by the state government. This delay should be noted when comparing GET Surcharge revenue as reported by the State to data presented in the HART Financial Plan. Additionally, the State of Hawaii Department of Taxation experiences delays in processing GET Surcharge returns, which can make quarterly year-over-year comparisons of historical GET Surcharge collections less meaningful.

The HART Financial Plan submitted to the FTA in 2012 used the actual revenue remitted to HART by the State Department of Taxation for the 12-month period immediately preceding the release of the June 2012 Financial Plan. Subsequent to the submittal of the original Financial Plan, the State Department of Taxation informed HART that it had made an error and had remitted to HART $9 million more than it should have. Since the error was included in the base projection period, its effect is compounded over the term of the Financial Plan. HART now has reduced the original GET Surcharge revenue by $100 million to offset the impact of the remittance error. The budget, when adjusted for the remittance error, is approximately equal to actual receipts, and receipts through October 2016 are $1.4 billion (see Figure 6-2).

6.1.3 GET Surcharge Forecast Methodology

The original Financial Plan assumes that GET Surcharge revenues will grow in line with the long-term historical growth experienced by statewide GET Surcharge revenues. The long-term Compounded Annual Growth Rate in statewide GET Surcharge revenues (FY 1981 to FY 2010) of 5% has been used to forecast GET Surcharge revenues for FY 2012 to FY 2023.

The growth rates assumed are subject to numerous risks and uncertainties, including the magnitude and timing of the economic recovery, future inflationary pressures, the strength of the U.S. dollar (especially relative to the East Asian currencies) and U.S. monetary policy. Due to these uncertainties, the combined growth rate in the updated financial plan lowers the annual revenue growth rate from 5% to 4.3%.

The table below details the impact of the recession on the growth in GET Surcharge excise revenues. At the full impact of the "Great Recession," the worst economic downturn since 1929, the compounded annual growth rate is 4.1%. However, the growth rate rebounds even after only removing one year of the "Great Recession," at 5.6% over the last 6 years.

Table 6-1: Compound Annual GET Surcharge Growth Rate

Fiscal Years	# of Years	Description	Growth Rate
FY 2008-16	8	Full Impact of "Great Recession"	4.11%
FY 2009-16	7	FY 2009 Impact "Great Recession"	5.46%

6.2 Status of GET Extension Legislation and Legislative Process and Schedule

Following the opening of the Twenty-Ninth Legislative Session on January 18, 2017, twelve GET surcharge measures were introduced. As of April 2017, only one vehicle remains and is moving through the legislative process, namely Senate Bill 1183, Senate Draft 2, House Draft 2, Relating to Taxation (SB1183, SD2, HD2). While this measure has been revised four times since its introduction, the current draft SB1183, SD2, HD2 proposes the following, as it applies to Honolulu:

- The surcharge on state tax is extended for 2 years from December 31, 2027, to December 31, 2029, if Honolulu adopts a county ordinance prior to January 1, 2018, to extend the surcharge.
- If adopted by county ordinance, all surcharges collected by the State shall continue to be paid into the state treasury quarterly. Out of the surcharge revenues, the State retains 1% (a reduction from 10%) for administrative costs.

- Surcharge revenues generated by Honolulu can be used for capital costs of a locally preferred alternative (LPA) for a mass transit project. SB1183, SD2, HD2 deletes language related to compliance with the Americans with Disabilities Act (ADA).
- Revenues derived from the county surcharge could not be used for the following uses:
  - To build or repair public roads or highways, bicycle paths, or support public transportation systems already in existence prior to July 12, 2005;
  - For operating costs of the mass transit project; or
  - For administrative or operating costs, including personnel costs, of a rapid transit authority charged with the responsibility for constructing or operating the mass transit project, or both.
- If there are any existing county ordinance that prohibit the use of county funds for the capital costs of the LPA or allow the expenditure of funds for costs other than the capital costs of the LPA, Honolulu must repeal those ordinances before December 31, 2017, and inform the State Director of Taxation of the repeal.
- The "locally preferred alternative" is defined as the minimum operable segment of the locally preferred alternative for a mass transit project that the county rapid transportation authority is constructing under the FFGA with the FTA.
- This measure takes effect upon approval. The surcharge extension is authorized if all conditions are met by December 31, 2017.

On April 11, 2017, SB1183, SD2, HD2 passed Third Reading in the House as amended, and must be returned to the Senate for final approval. On April 13, 2017, the Senate disapproved the House amendments as it is substantially different from the version the Senate approved on Third Reading.

Following the Senate's disagreement with the bill, SB1183, SD2, HD2 moved into the conference committee process, and members or "conferees" of both chambers were appointed by the Senate President and the House Speaker. The task of the conferees is to reach a compromise and agree upon a version of the bill to be submitted to both houses of the Legislature for final approval and transmittal to the Governor.

While conference committee hearings are open to the public, testimony will not be accepted, and more importantly, unrelated or new subject matter amendments are usually not inserted during these hearings. Conversely, subject matter previously discussed related to SB1183, SD2, HD2 may be discussed during conference as the conferees work to reach a compromise on this bill. Final action of the conferees must take place on or before April 28, 2017 (Final Decking deadline).

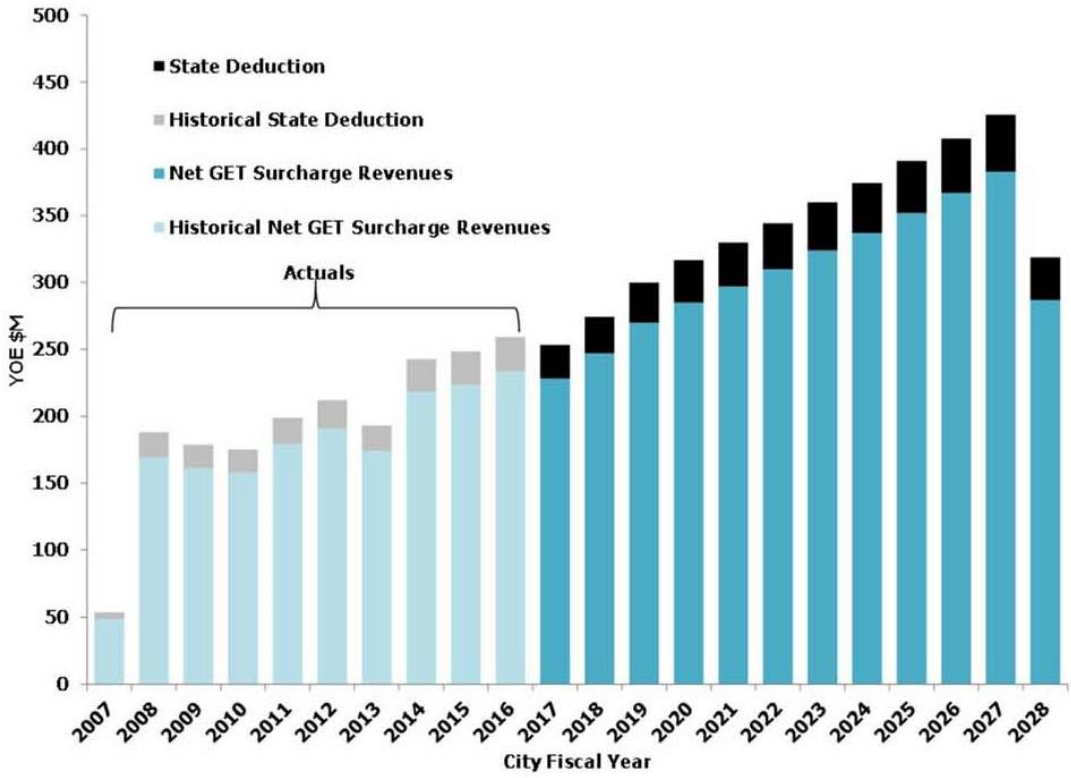
If this bill passes through both chambers of the Legislature, it will be presented to the Governor. With less than 10 days prior to adjournment on May 4, 2017, the Governor has

45 days after adjournment, or by July 11, 2017, to sign the bill into law. If the Governor does not sign or does not veto the bill by July 11, the bill becomes law without his signature. Should the Governor veto the bill, he must inform the Legislature by June 26, 2017, or the 35th day after adjournment, and deliver the veto by July 11, 2017. If the bill is vetoed, it will not become law unless the Legislature successfully overrides the veto in a special session by a two-thirds vote in each chamber. The Legislature must convene in special session at or before noon on July 11, 2017, to override the Governor's veto.

6.3 Revenue Projections

Figure 6-1 summarizes actual and projected GET surcharge revenue (4.3% growth factor) described in Section 6.1.3 with the current 90%/10% surcharge split with the State of Hawaii. The Project is expected to collect approximately $4.8 billion from the start of the FFGA grant period in October 2009 through the current surcharge sunset date of December 31, 2027. The projection totals $5.2 billion from the inception of the surcharge on January 1, 2007, through the current sunset date of December 31, 2027.

Figure 6-1: Annual Net GET Surcharge Revenues, FY2007–FY2028, YOE $ Millions



6.4 The Transportation Infrastructure Finance and Innovation Act

The Transportation Infrastructure Finance and Innovation Act (TIFIA) program provides federal credit assistance for qualified projects of regional and national significance. The HRTP is clearly a project of regional significance and is arguably a project of national significance. TIFIA's fundamental goal is to leverage federal funds by attracting substantial private and other non-federal co-investment in critical improvements to the nation's surface transportation system.

While the Project does not currently plan to utilize TIFIA credit assistance to fund or finance the 20-mile, 21-station MOS, as it could inject even further delay to the Project as the application to the United States Department of Transportation (USDOT) is reviewed, it is possible that the Project may apply for a TIFIA loan or other available federal credit assistance under the program to assist in the financing and construction of the deferred Pearl Highlands Parking Garage and associated access ramp as the potential Public-Private Partnership (P-3) approach to that deferred project develops in the months ahead.

6.5 Upcoming Supplement to Financial Plan

As stated in Section 6.2, the State Legislature is continuing to discuss multiple funding scenarios for the Project. There has been no decision at this time (April 27, 2017). The Financial Plan will be amended and transmitted to the FTA after funding decisions are made.

As a point of reference, the chart below was included in the "Draft Update of the Financial Plan for Full Funding Grant Agreement" (December 1, 2016) and details the current funding status of the Project. This chart shows that cash balance are sufficient through FY 2027. However, after the current sunset date (December 31, 2027), there are insufficient funds to pay debt service on the bonds (refer to Draft Updated Financial Plan, Table A-1, page 48). The Project budget is projected at $8.165 billion before financing costs, while projected resources to December 31, 2027, are approximately $6.8 billion.

Figure 6-2: Project Financing Requirements

($ in millions)		Fiscal Years											
	Feb-16	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Beginning Cash Balance	$298	$192	$95	$25	$25	$25	$25	$25	$25	$25	$25	$209	$141
Project Funding Sources:													
G.E.T.	$1,259	$61	$236	$246	$257	$268	$279	$291	$304	$317	$330	$344	$359
Federal Grant	$515	$54	$192	$212	$254	$323	$0	$0	$0	$0	$0	$0	$0
All Other	$6	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Revenue	$1,780	$115	$428	$458	$511	$591	$279	$291	$304	$317	$330	$344	$359
Total Project Sources	$1,780	$115	$428	$458	$511	$591	$279	$291	$304	$317	$330	$344	$359
Project Uses:													
Total Project Costs	$1,885	$213	$706	$875	$870	$1,158	$691	$773	$571	$333	$116	$89	$26
Debt Service	$0	$0	$7	$20	$34	$51	$74	$94	$112	$125	$128	$120	$112
Total Project Uses	$1,885	$213	$713	$896	$904	$1,209	$765	$868	$682	$458	$243	$209	$137
Net Current Change	($105)	($98)	($285)	($438)	($394)	($618)	($486)	($577)	($379)	($141)	$87	$136	$222
Debt Proceeds	**$0**	**$0**	**$215**	**$653**	**$660**	**$892**	**$836**	**$946**	**$777**	**$649**	**$526**	**$0**	**$0**
Less Debt Repayment	$0	$0	$0	($215)	($267)	($274)	($350)	($370)	($398)	($508)	($429)	($204)	($251)
Ending Cash Balance	**$192**	**$95**	**$25**	**$25**	**$25**	**$25**	**$25**	**$25**	**$25**	**$25**	**$209**	**$141**	**$111**

Appendix J provides discusses the financial impacts of potential scenarios currently being discussed by the State Legislature.

7 Plan B ("Fallback Project")

7.1 Description of Plan B Scope, Budget, and Schedule

"Plan B" is the build-to-budget option, describing the process the City will undertake to deliver a transit system with seeming independent utility within the Project's existing budget. Plan B necessitates the City to defer stations, defer other Project components, and only construct the alignment as far as the Downtown Station.

Plan B consists of the design and construction of an 18-mile grade separated fixed rail system from a terminus at East Kapolei Station in the west towards an eastern terminus at Downtown Station, near the Aloha Tower.

Plan B assumes a revenue service date of July 2025 with a total capital cost of $6.8 billion, which includes $84 million (1%) for contingency and $464 million in financing costs.

- The Plan B Project includes 18 miles of grade-separated fixed rail alignment, 14 stations, 80 rail vehicles, and a 43-acre Rail Operations Center.
- The Plan B net project cost is approximately $6.8 billion compared to the FFGA's Estimated Net Project Cost of $5.122 billion and is detailed in the Basis of Cost (Exhibit G-2 of Appendix G).

Figure 7-1: Plan B Project Alignment

7.2 Plan B Challenges and Issues

The Plan B terminus at Downtown Station makes it necessary to defer the Pearl Highlands Station (parking garage, transit center, and H-2 off-ramp) along with the Kalihi, Kapalama, Iwilei, and Chinatown Stations. In addition, the Plan B terminus of Downtown Station unavoidably defers the Civic Center, Kaka'ako, and Ala Moana Center Stations.

The City plans to add these Project components and stations back when funds are available in the future (at a date uncertain at this time). The current impact to the system is calculable and includes loss of ridership, loss of farebox revenues, community disengagement and disruption, negative impact to Transit-Oriented Development (TOD) opportunities including affordable housing opportunities, and the need for additional bus/paratransit service in affected communities at a higher per-mile cost. (The impact to ridership is quantified and described in detail in Appendix K.) Plan B also makes no provision for legal actions which likely would be filed against the City, HART, and the Project, as described in Section 7.2.3.

7.2.1 Lack of Contingency

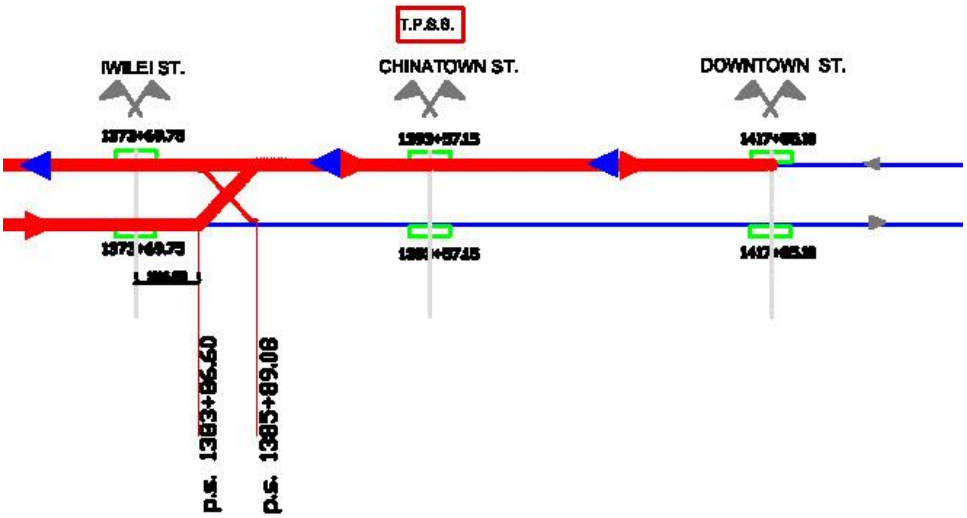
At the urging of the FTA's PMOC, HART has conducted both a Basis of Cost Estimate and a Basis of Schedule (refer to Exhibits G-2 and H-2 of Appendices G and H, respectively). These studies show that Plan B would have an estimated cost at completion of $6.8 billion including contingency and finance cost. However, Plan B would have only an approximately 1% contingency ($84 million), and even this $84 million is not additional contingency for the Project but rather is allocated in the already awarded contracts. Consequently, there are no contingency funds available for the City Center section of the system from the Middle Street Station to the Downtown Station, although the estimated cost at completion does include $465 million for finance costs as previously estimated.

We recognize that the FTA will not allow the Project to continue without a 12% to 15% total contingency amount available to Plan B. However, there are simply no funds left over or available in this current budget to make the Plan B option viable. The only other source of substantive cost reductions would be to eliminate additional stations, which are already under contract and will be subject to contractor claims should those stations be eliminated, and this would not be sufficient to supply the necessary level of contingency that the FTA is likely to require, nor deliver a transit system with independent utility.

7.2.2 Operational and Functional Issues of Downtown Station Terminus

HART will review the design of operations into Downtown Station since it was not designed to serve as a terminus station. There may be impacts to both the optimum headways achievable and limitations to the required levels of service provided by the system. More details can be found in Appendix M.

Figure 7-2: Operating Pattern into a Downtown Station Terminus



The area around Downtown Station—Honolulu harbor, in particular the piers and land adjacent to Aloha Tower—is the only realistic location for a bus transit center, but the State of Hawaii, who owns this land, has other development plans for the area and is not willing to make this area available for a bus or other surface transportation transfer facility. Moreover, placing a bus transfer at the land adjacent to Aloha Tower is likely to create significant traffic congestion at the foot of downtown, which will also be significantly exacerbated by the 6,000 to 12,000 cruise ship passengers that need to be accommodated on days when cruise ships are in port and/or are ending or beginning cruises (as Honolulu is often the destination port or origination port for many cruise ships in the region). The State has made it clear that they have their own master plan for a development in this area.

7.2.3 Litigation Risks and Environmental Risks

It is important to note that no environmental, ridership, or engineering analyses of an eastern terminus of the Project at the Downtown Station as described in Plan B have been conducted. Of concern are the environmental, air quality, pedestrian and rider safety, and traffic congestion impacts associated with establishing a surface transportation (TheBus and TheHandi-Van) transfer facility for riders to continue their journeys to and from other major employment centers in the city.

These are the very impacts that Congress sought to address when the NEPA was enacted, so that government action and the needs of people living near such projects could be balanced. Consequently, it is very possible that plaintiffs could challenge an eastern terminus of the Project at the Downtown Station (and the elimination of other stations) as being in violation of the NEPA because there has been no environmental analysis of this alternative. If such a challenge were successful in federal court, a delay would be incurred while a SEIS and a new ROD are prepared, as well as likely appeals to the Ninth Circuit.

The ridership impact of ending the Project at the Downtown Station could amount to a possible reduction of as much as 50% of the system ridership. Courts have taken cognizance of ridership reductions of significantly less impact, such as the Maryland Purple Line case still pending in the United States District Court for the District of Columbia, where the court saw total ridership variations of 1.6% to 3.2% as requiring further environmental analysis by the FTA and a resulting delay in construction (refer to Appendix K). Regardless of the outcome of the Purple Line case and whether an SEIS is required for year 2030 or 2040 ridership variations, the litigation has resulted in almost all work on that project being suspended thus far for 8 1/2 months.

In a separate case, project delays associated with a Ninth Circuit lawsuit involving Los Angeles Metro resulted in the suspension of work on the Lower Flower Segment of the Regional Connector Transit Corridor Project for 17 months. The litigation (among other claims) surrounded tunneling methods which affected plaintiffs that owned, or previously owned, certain real property near the planned subway route. The plaintiffs alleged numerous violations of the NEPA with respect to properly assessing the various impacts

including the Los Angeles Metro's mode of tunneling through the area in question. The District Court, citing the United States Court of Appeals for the Ninth Circuit, stated that:

> In deciding whether a supplemental EIS is required, a court should consider each of the following issues: (i) whether the modified portion is a primary or secondary aspect of the overall project; (ii) whether the modifications are minor; and (iii) whether the modification will have environmental impacts that the agency has not yet considered.

In applying these findings to the tunneling portion of the claims of the plaintiffs to the Lower Flower Segment, the District Court held that the FTA and Los Angeles Metro violated the NEPA because their FEIS failed to evaluate the impact that sequential excavation mining and open-face tunneling alternatives would have on the plaintiffs. On September 12, 2014, the court issued a Remedy Order, which: (1) ordered the FTA to further evaluate the sequential excavation mining and open-face tunneling alternatives; (2) partially vacated the ROD with respect to the FTA's approval of the cut-and-cover construction in the Financial District; and (3) issued an injunction enjoining cut-and-cover construction of the Lower Flower Segment between September 12, 2014, and February 5, 2016 (roughly 17 months).[1] The Ninth Circuit later upheld the District Court's decision in December 2016 but did not stay the injunction during the appeal.

Given these precedents, any projected savings projected from a Downtown Station terminus of the Project under Plan B could be substantially offset by potential litigation costs, the costs of construction delays and project cost escalation, as well as likely material financing cost increases associated with any delays.

There are estimates that producing a new SEIS for the Project will take 12 to 18 months to complete, followed by appropriate review by the PMOC, the FTA, and the federal Council on Environmental Quality (CEQ). Thus, a delay of as much as two years is reasonable to assume just for the completion of these additional SEIS reviews. Based on past experience on the Project and the case law described above, it is expected that the chances for further litigation are quite high. While the potential for injunctive relief for potential plaintiffs is unknowable at this time, the delay impacts associated just with the SEIS and the SEIS review by the FTA and CEQ are likely to be significantly compounded by the filing of expected litigation. And if an SEIS and revised ROD are prepared, it is also quite likely that plaintiffs would bring an action in federal court challenging the technical and substantive sufficiency of those environmental documents under the NEPA.

7.2.4 SEIS and Modifications to the Programmatic Agreements

There will need to be further environmental analysis of Plan B that will require the undertaking of a SEIS, additional ridership studies and, quite likely, the issuance of a revised

[1] Today's IV, Inc., et al. v. FTA, 2014 WL 3827489 (C.D. Cal. 2014)

ROD, as outlined above in Section 7.2.3. A combination of relevant FTA regulations and case law decisions make clear that such documentation will be required and that the extent of the Project modifications under Plan B are so sweeping that the time to undertake, analyze, and approve the SEIS will be as much as 18 months to two years.

Finally, the reduction in ridership and the reduction in Project benefits of Plan B are dramatic, as detailed below in Section 7.2.5. Plan B would engender a reduction in Project ridership in a range of 35% to as much as 62%. A project that may have as few as 40,000 passengers per day to a high of only 76,000 passengers per day would fall dramatically short of the transportation system envisioned by the City and supported by the FTA and may not be considered a project of true independent utility in the final analysis.

7.2.5 Reduced Ridership and Project Benefits

Over a third of all HRTP passengers are expected to arrive at a station via feeder bus; therefore, the overall system ridership is sensitive to the underlying connecting bus route structure. Since Plan B eliminates stations in densely populated neighborhoods where riders will predominately walk to or from the rail system, this alternative alignment has a significant impact on the overall performance of an integrated rail-bus transit system in meeting overall mobility needs.

In order to evaluate the potential impacts of the Plan B alternative on system ridership and mobility benefits, HART modeled two scenarios with varying levels of feeder bus services. The low scenario included an existing baseline (2012) bus network without changes to peak-period commuter express and regional routes—thus preserving one-seat rides for some customers. The high scenario included the same supporting bus network as in the FEIS, which includes a comprehensive restructuring of regional and express routes to integrate with rail.

Both high and low scenarios included three new feeder bus routes to connect the Downtown Station with Ala Moana Center, Waikiki, and the University of Hawaii, in order to replace the capacity provided by Plan A. While neither of these scenarios represented an optimized feeder bus network, they generally reflect the range of ridership outcomes that could be expected.

The Plan B scenarios were modeled using an updated regional travel demand modeling system. The TransCAD 6.1 model has been adopted by the Oahu Metropolitan Planning Organization (OahuMPO) and incorporates updated population and land use forecasts, as well as new travel behavior survey data and state-of-the-art forecasting methodologies. The new model uses the same platform developed for the regional transportation plan and also produces results which are consistent with the range of forecasts which have been produced for the Project to date.

Table 8-1: Comparison of Plans A and B, Total Rail Boardings, Year 2030

Scenario	Total Daily Rail Boardings	Change Relative to Plan A	
		Number	Percent
Plan A	121,615	–	–
Plan B – Low Scenario	49,230	(72,385)	-60%
Plan B – High Scenario	76,280	(45,335)	-37%

Most of the differences between the Plan B low and high scenarios were primarily due to changes in travel patterns associated with feeder bus usage. Plan B increases the importance of the feeder buses relative to Plan A, since it eliminates stations in the urban core which serve key employment and residential areas. Under Plan A, for example, approximately 40% of all eastbound trips (approximately 9,000 daily riders) between 6 a.m. and 9 a.m. are heading beyond downtown either on foot or via connecting bus. Under Plan B, these riders would either switch to buses or automobiles to make their trips. The Plan B alternatives also reduce the overall demand for park-and-ride, since the combined downtown rail-bus system is less effective at serving travel demand than Plan A. Overall, approximately 45% of the rail riders under Plan B would originate their trip on a bus—up from approximately 35% under Plan A.

7.3 Conclusion

Based upon the analysis of the Plan B scope, budget, and schedule; its lack of any appreciable contingency; its substantive operational and functional deficiencies at its proposed Downtown Station terminus; the need for a SEIS and the associated litigation risk resulting from the issuance of the SEIS and the potential modification to the ROD; and the reduced ridership and project benefits; Plan B entails substantive negative impacts and does not support the concept of a "system of independent utility" within FTA guidelines. While we are grateful to the FTA for urging HART to examine the possibility of building the project to budget and understand the reason for proposing the Downtown Station as the east-side terminus, it is clear that Plan B is not the preferred alternative based on this analysis.

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Appendix A: Project Maps

Exhibit A-1: HRTP Full Alignment

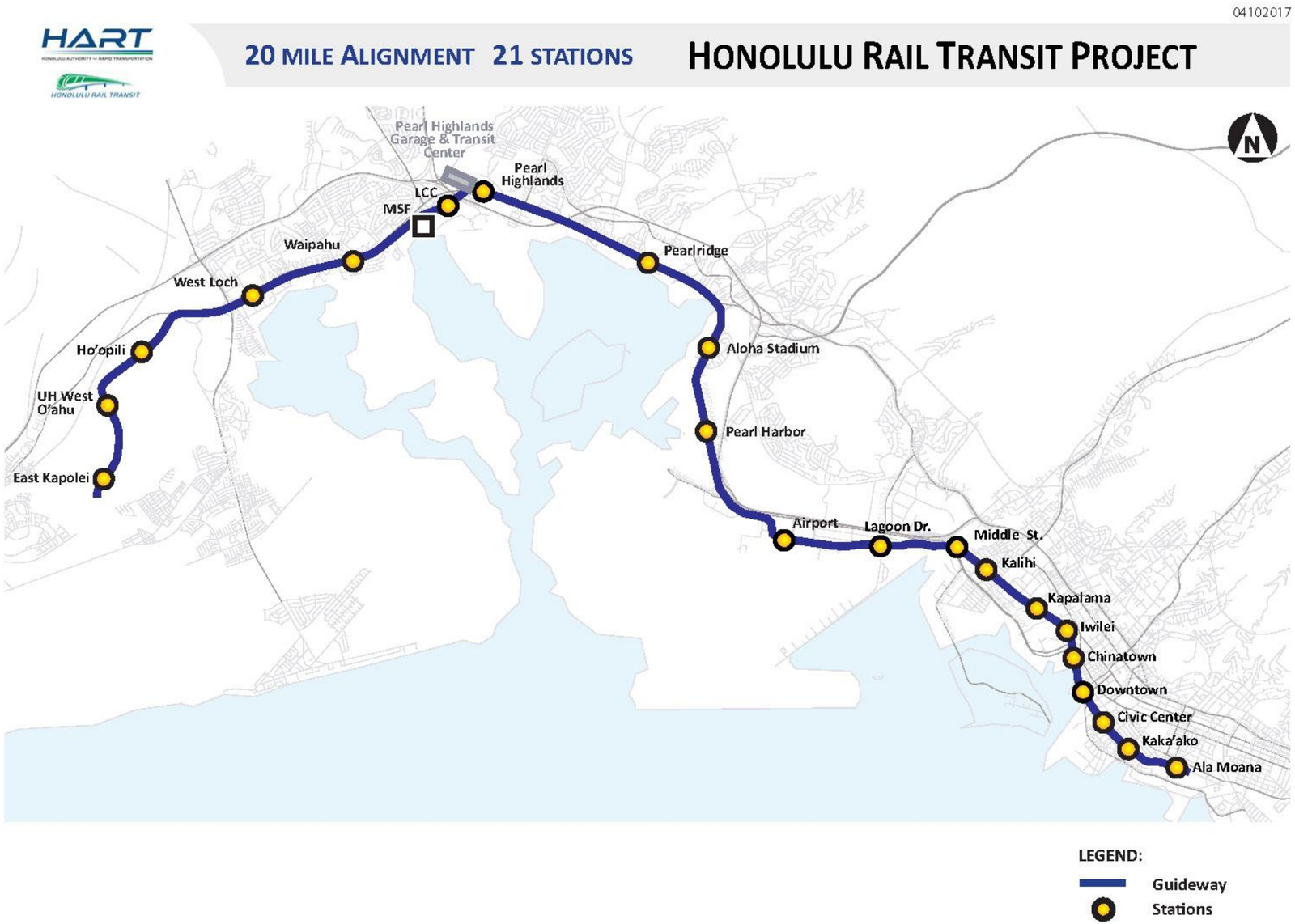


Exhibit A-2: Project Progress and Status

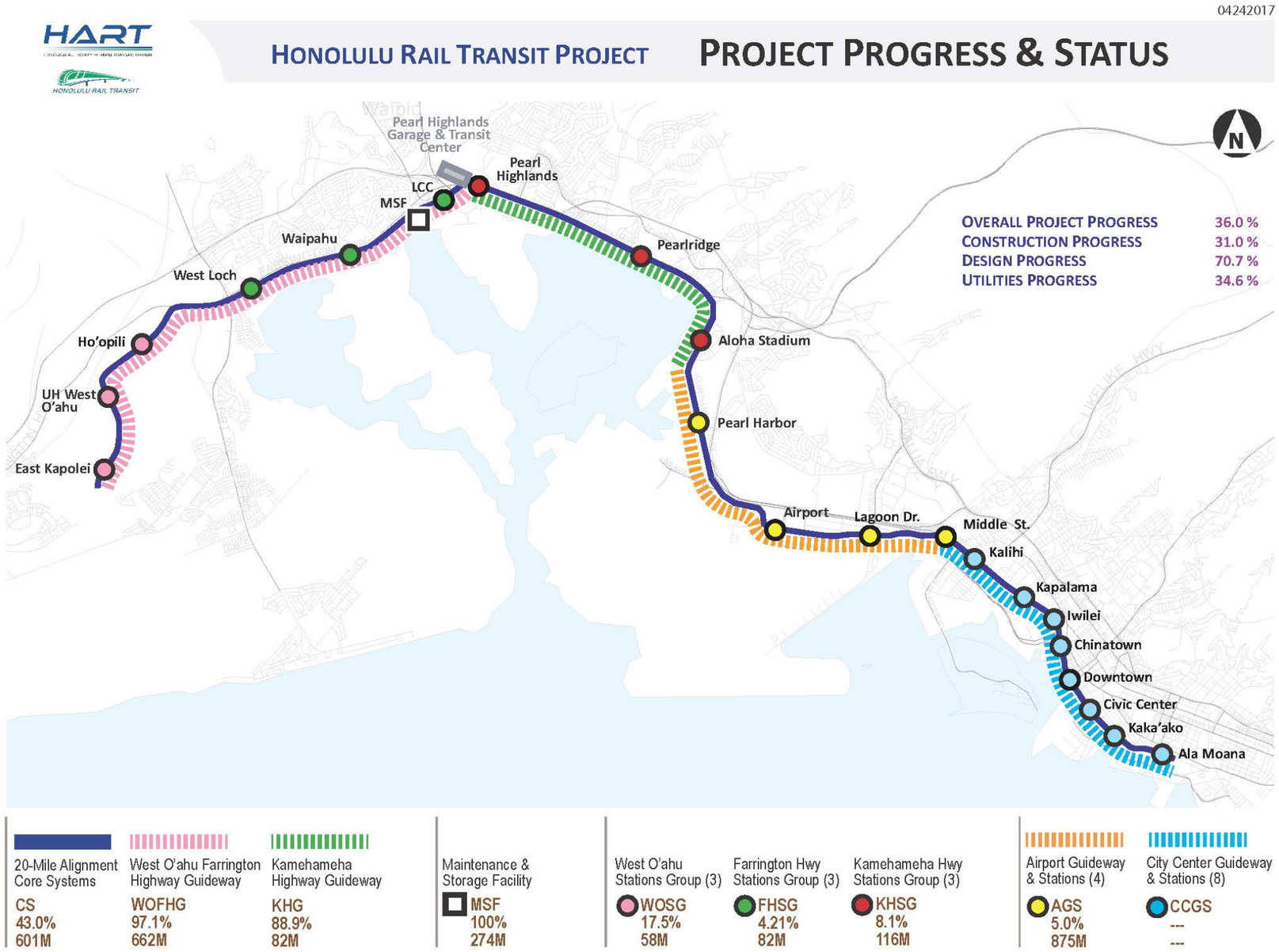


Exhibit A-3: Plan B Alignment – Overview

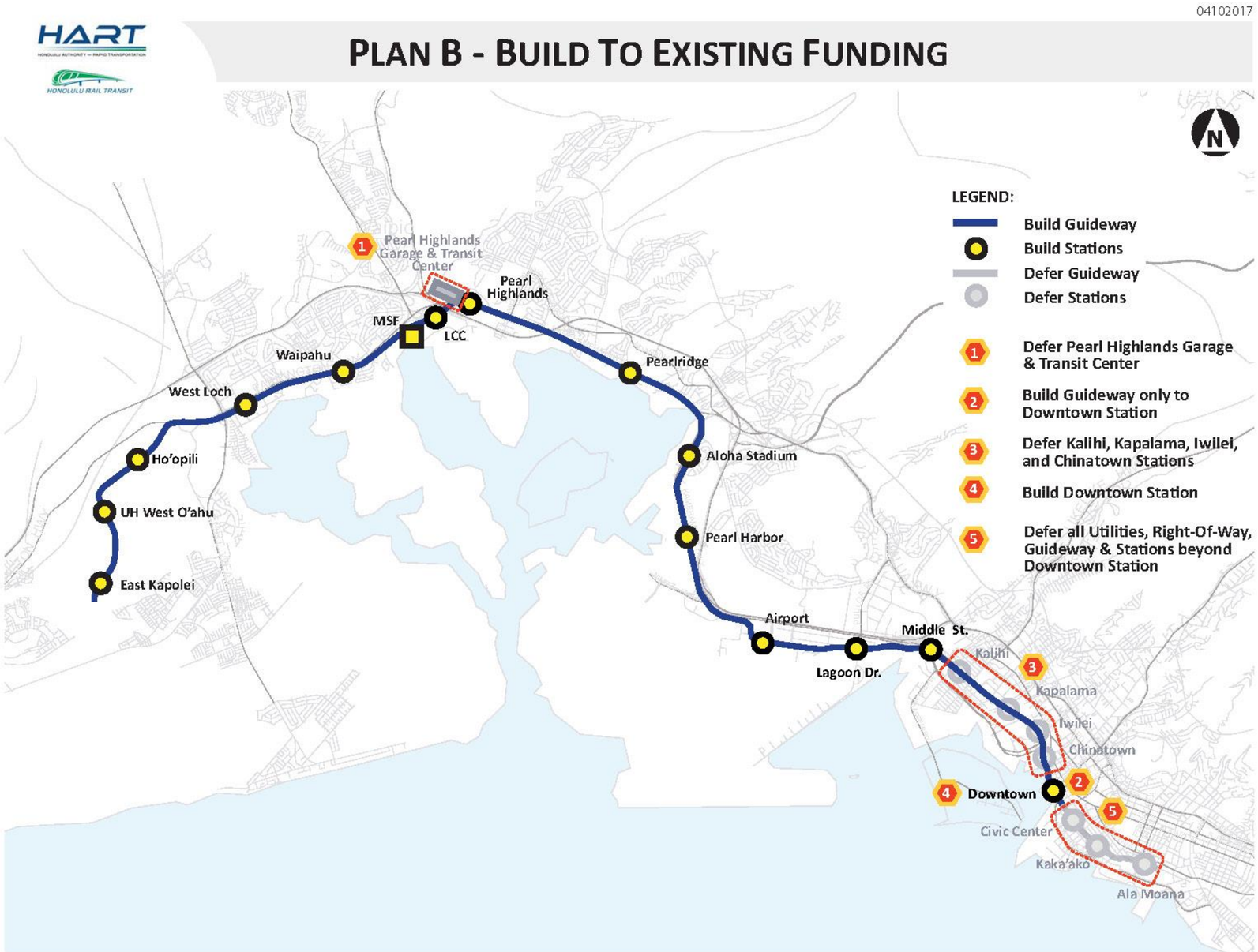


Exhibit A-4: Plan B Alignment – Detail

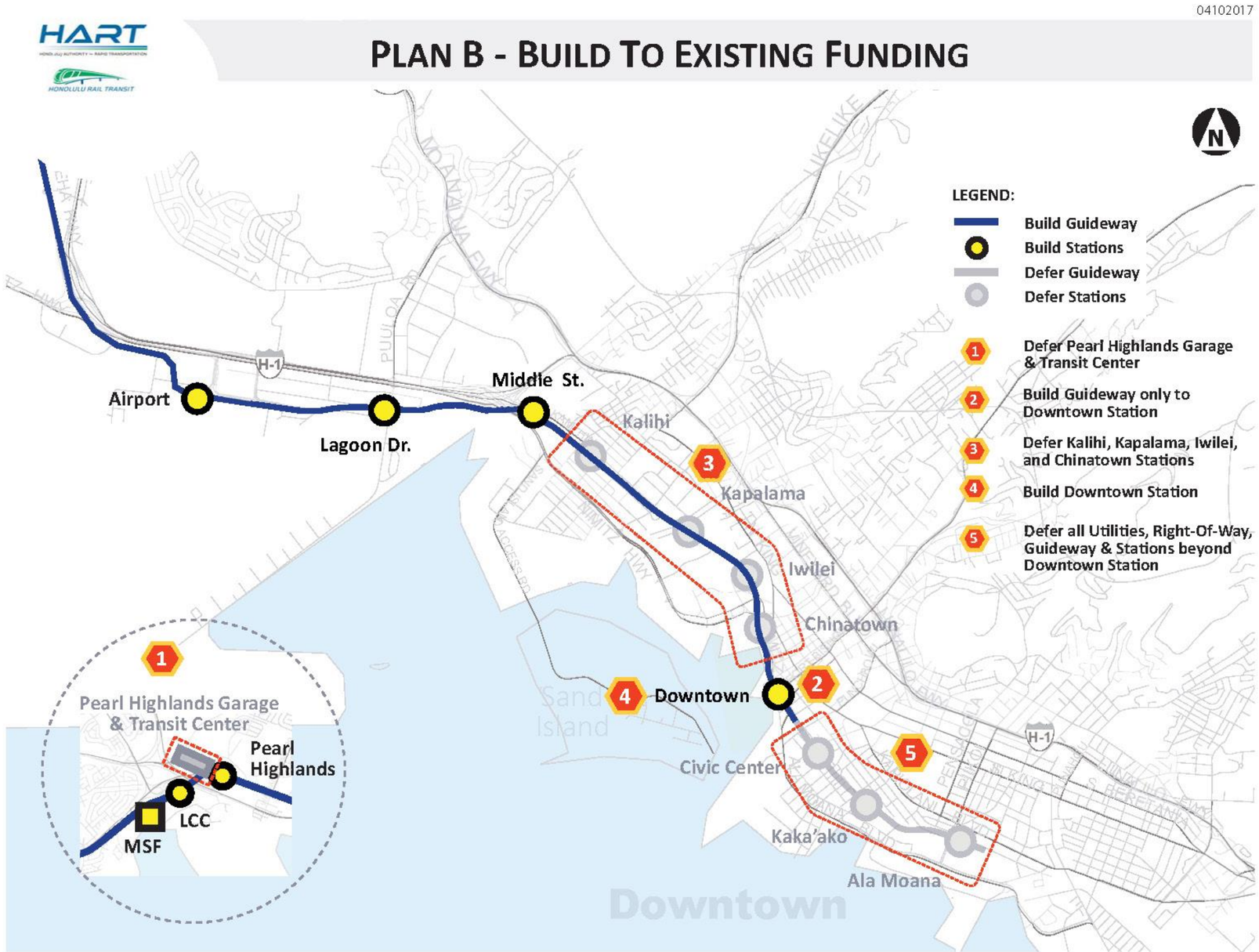
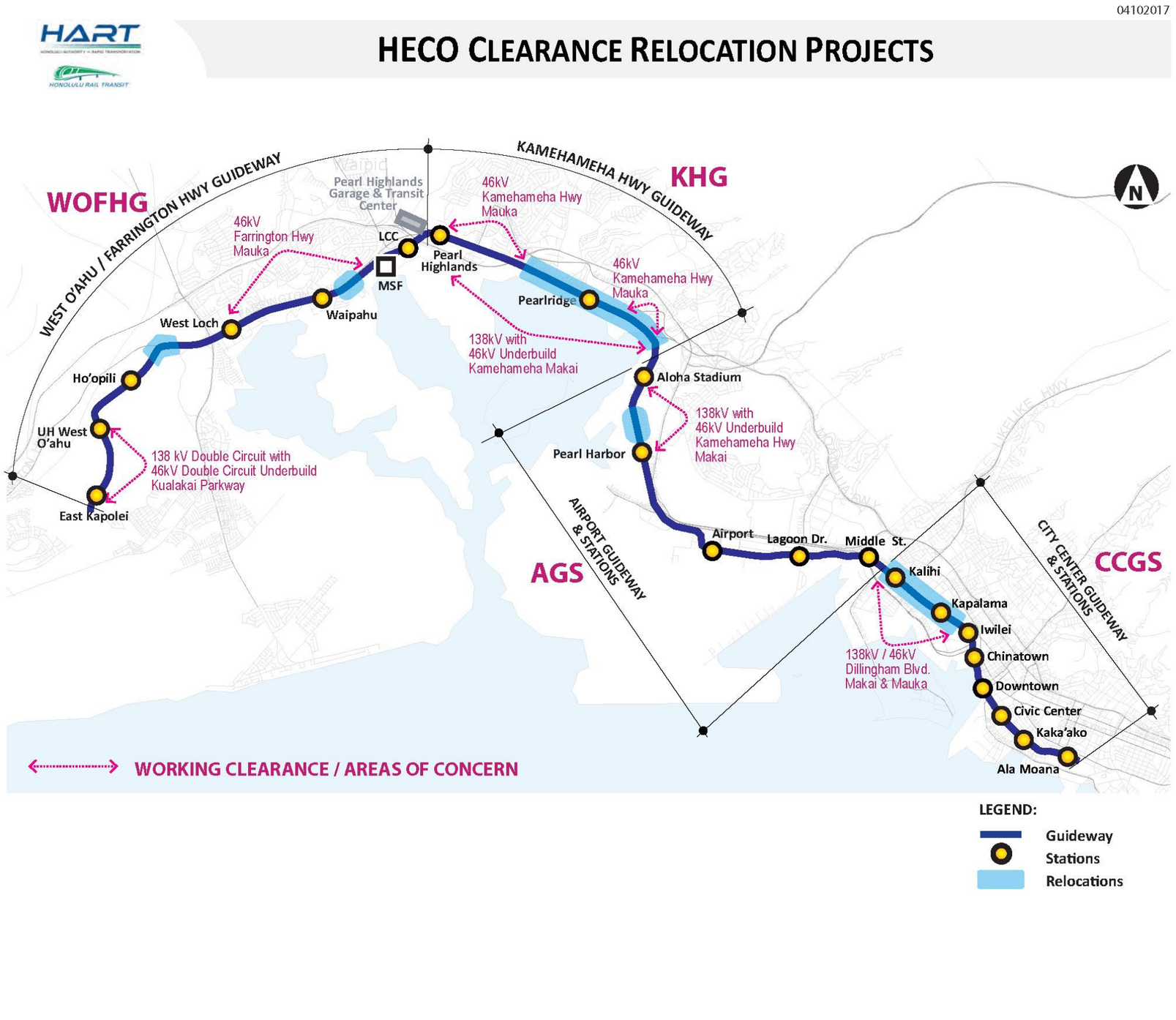


Exhibit A-5: HECO Working Clearances and Relocations



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Appendix B: Primary and Secondary Mitigation Measures

Exhibit B-1: Cost Constraints

Updated this month? (Y/N)	Primary / Secondary	Category	Scope Change Concept	Description	System wide Potential Savings	Design / Schedule Impacts	Other Considerations
	Primary	Scope - Other	Construction Camera Surveillance	Optimization or deletion of mounted cameras for "in process" construction photography	<$1M	Minor	
Y	Primary	Scope - Other	Eliminate landscaping	Revise or eliminate median landscaping and use ground cover or grass	<$1M	Minor	Implemented on AGS. In progress on CCGS.
	Primary	Implement Plan B	Defer stations and guideway to "Build to Budget"	End guideway at Downtown Station and defer all stations east of Middle Street and defer Pearl Highlands Transit Center	$0.4 - $1.0 billion	Re-procurement	Re-procure, re-design and major environmental considerations
Y	Primary	Third Party	Maintain overhead utilities wherever possible	Majority of savings would be realized on the west, on Kamehameha Hwy, and on AGS.	$30M - $200M	Very Significant	Discussions with HECO have proven very successful and agreement is being reached
Y	Secondary	Scope	Pearl Highlands Garage & Transit Center	Review foundation designs	$25-90M	Significant	
Y	Secondary	Scope - Guideway	End Guideway at Downtown	Defer guideway at the Downtown Station (about 6700 lf of guideway and 3 stations). Defer Civic Center, Kaka'ako and Ala Moana	$100M+	Very Significant	Not in conjunction with FFGA requirements. Revised title ("Scope Change Concept" column) to eliminate confusion with options in Interim Recovery Plan.
Y	Secondary	Scope - Other	Core Systems - Electrical Power Back-Up	Eliminate Generators (4)	$12M		Study underway with HECO to add energy saving devices
Y	Secondary	Scope - Stations	Station - Downtown Station	Eliminate makai entry at downtown	$5M - $10M	Very Significant	Downtown Station does have a concourse that would enable access to the makai (EB) platform.
Y	Secondary	Scope - Stations	All aesthetic treatments	Cut all aesthetic treatments beyond what was considered in the VE effort. No pavers, stained or stamped concrete, wall tile and blocks, etc.	$5M - $10M	Significant	
Y	Secondary	Scope - Stations	Defer or postpone / Eliminate a station	Do not build the station that has the lowest ridership numbers.	>$20M	Significant	Eventually this could be built under a program or tax extension. Huge public and political ramifications.
Y	Secondary	Scope - Stations	Reduce plaza areas	Provide only absolutely necessary sidewalks. Xeriscape or gravel remaining areas.	$5M - $10M	Significant	
Y	Funding	Scope - Track	Eliminate three crossovers	Review track and scheduleing to determine where savings could be made	$2M	Minor	Could potentially increase operating costs.
Y	Secondary	Scope - Other	Procure more extensive mapping of existing utilities	Existing utility data is based primarily on as-built drawings and survey of surface features. Perform more extensive utility mapping to locate other utilities and utility conflicts.	$100M	Significant	Utility mapping for City Center started in late 2016. Data will be incorporated into RFP documents by HART, and may be incorporated into utilities design by AECOM.
Y	Primary	Scope - Guideway	Shift Guideway on Dillingham to Makai Side	Shift the alignment of the guideway from the center of Dillingham Blvd to the makai side to avoid minimize utility relocations and traffic impacts.	$50M	Very Significant	Requires additional ROW, which would likely trigger a Supplemental EIS and associated program schedule delays. Therefore, this option is only worth considering if the program is significantly delayed for other reasons.

Implementing to Some Degree
Still an Option

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Appendix C: Decision-making Matrix

Exhibit C-1: Excerpt from Decision-making Matrix

Honolulu Rail Transit Project
Decision Milestone Matrix

Critical Key
= due more than two months away
= due within two months
= due within one month
= overdue

UPDATED INFORMATION IS INDICATED IN BLUE

Updated: 18-Apr-17 v 24

Line Item No.	Item	Sub-Item	Impact	Planned Completion	Actual Completion	Critical (compared to Planned Date)	Owner	Current Status
	Tier I. - Project-wide Global Decision Issues							
1	Hawaiian Electric Co. (HECO) service, connections, design, relocation issues							
	a	Overall relationship management	Develop proactive strategies for handling multiple HECO challenges. Include the need for dedicated HECO resources (design, installation crews, etc.) assigned to HART program.	Complete	01-Jul-15		Morioka / Chung	Complete, but this item will remain to track all issues related to HECO. HECO Coordinator (J. Chung) is coordinating all issues. Developed Task Force Committee to address all clearance issues. Weekly and bi-weekly project specific meetings continue to address clearance issues. Executive management meetings continue to address global concerns.
	b	On-going overall relationship management	Continue to react to HECO changes in process and procedures where HART design and/or construction may be impacted	01-Dec-25			Morioka	Issues and continued changes in HECO's processes and procedures are occurring and there is a need to maintain continued communications at the Executive level to minimize the impacts to HART
	c	HECO - Horizontal offset requirements to 138kv (50' offset), 46kv (40' offset) and 12kv (30' offset)	HECO has reaffirmed the issue that they are requiring minimum offsets for 138kv as well as 46kv and 12kv.	01-Oct-17			Chung	HECO and HART agreement has been reached for 138 kV and 46 kV from East Kapolei to Aloha Statium. 138 kV will be relocated from the Waiau Power plant to Aloha Stadium. The 46 kV does not need to be relocated. HART will provide an equipment package as part of this agreement. The 138 kV in the area of the Airport Guideway/Station project is being studied to remain on the existing poles with a reconfiguration of the power lines. The 138 kV on City Center is planned for undergrounding along Dillingham Boulevard. Final agreements are in progress
2	Project Management Plan, including all sub-Plans and procedures (RCMP, CPP, etc.)							
	a	Project Management Plan	Tracking the completion of the PMP and all associated plans and procedure updates.	01-Jul-17			Carnaggio	
	b	Sub Plans (RCMP, CPP, CMP, Safety, Quality, etc.)	Item to track the completion of all associated plans and procedure updates. On going - see Project Plan Matrix.	01-Jul-17			Carnaggio	
3	On-going Development and Responses on Recovery Plan			30-Apr-17			Carnaggio	
4	On-going Development and Responses on Financial Plan Update		Prepare updates to the Financial Plan	30-Apr-17			Yu	

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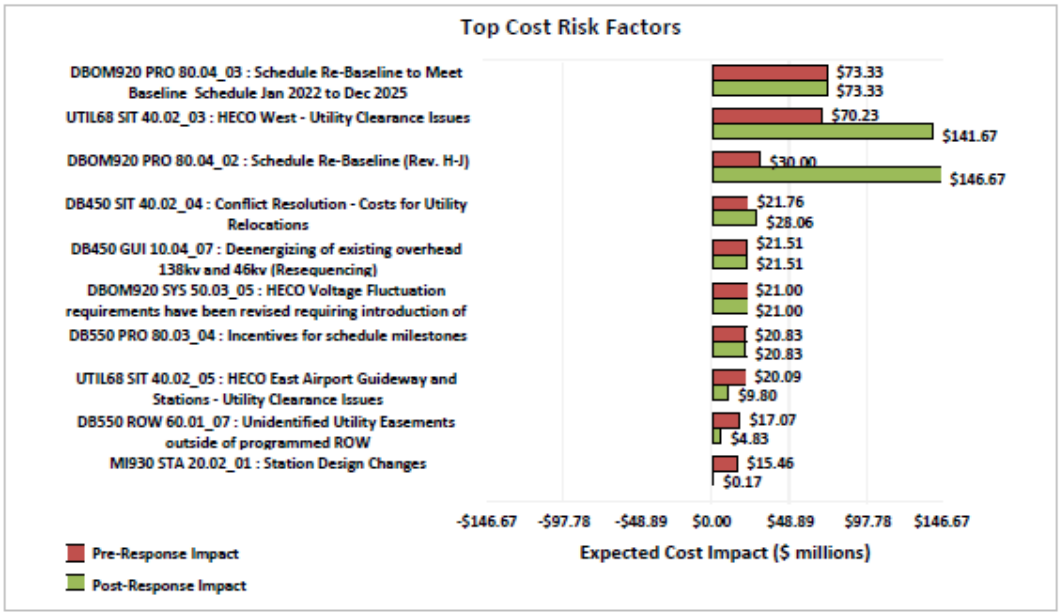
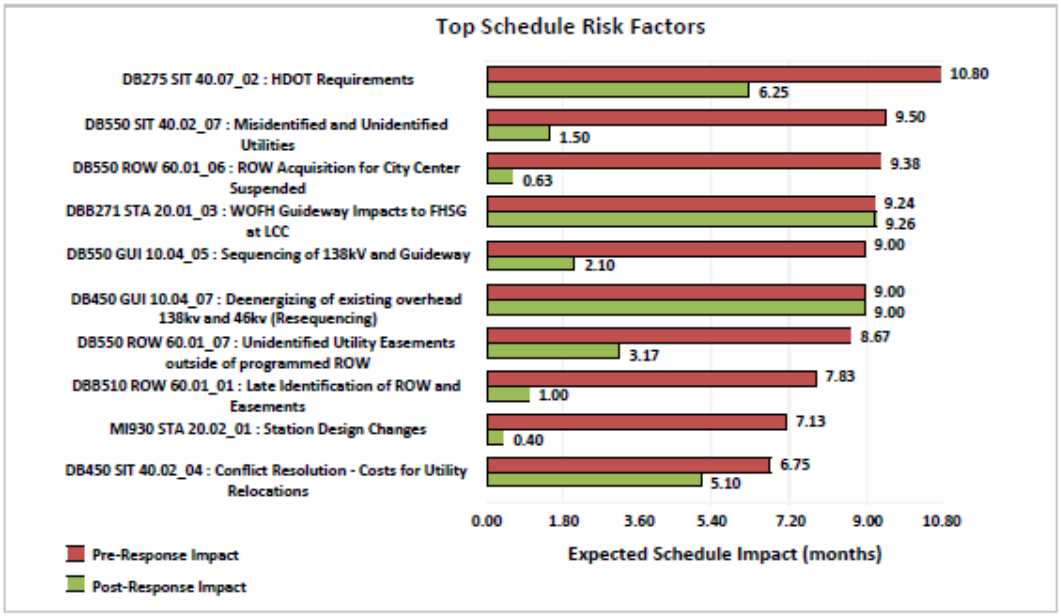
Appendix D: Program Risks

Exhibit D-1: Excerpt from Risk Tractability Log

Total Count	
Active Risks	213
Inactive Risks	18
Pending CO Risks	15
Retired Risks	90

	Pre-Response Cost	Pre-Response Schedule	Post-Response Cost	Post-Response Schedule
Total Expected Value Threats	$683.9	280.0	$961.6	216.0
Total Expected Value Opportunities	($15.7)	-5.9	($15.5)	-6.3
Total EV Impact	$668.2	274.1	$946.1	209.7





Risk Summary Sheet

Status: Active

Project: Pearl Highland Garage, Bus Terminal

Risk ID: DB275 SIT 40.07_02

FTA Risk Category Requirements

HDOT Requirements

Risk Trigger:
HDOT Requests Changes

Flowchart Activity Number (s):
275

Issue Number:
<Blank>

Modeling Notes:

Pre-Response Quantification

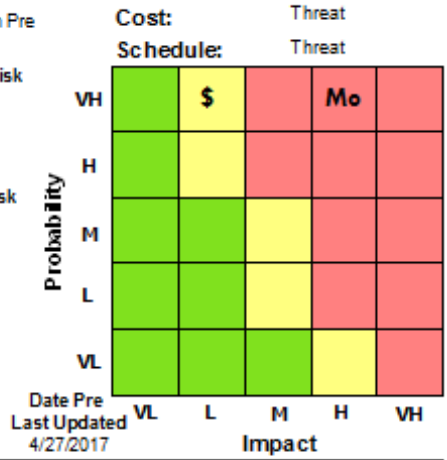
Probability 90%

☑ Critical Path Pre

Min ($M)	Most Likely ($M)	Max ($M)	Event Cost Expected Value Impact ($M)	Total Cost Expected Value Impact ($M)	Program Risk Rank
$1.000	$2.000	$4.000	**$1.950**	**$9.402**	20

Min (MO)	Most Likely (MO)	Max (MO)	Schedule Expected Value Impact (MO)	Delay Cost* Calculated EV Impact ($M)	Project Risk Rank
6.00	12.00	18.00	**10.80**	**$7.452**	2

HDOT does not approve of the Design Builders design and requires revisions that add costs. This risk has occurred on other project that interface HDOT and include items such as structures, traffic signals, street lights, guard rails, drainage, and etc.



Date Pre Last Updated 4/27/2017

Post-Response Quantification

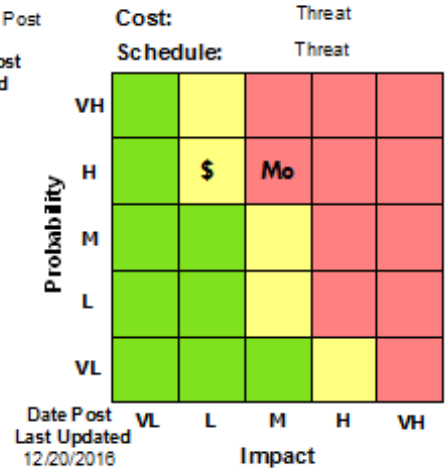
Probability 75%

☑ Critical Path Post

Min ($M)	Most Likely ($M)	Max ($M)	Event Cost Expected Value Impact ($M)	Total Cost Expected Value Impact ($M)	Additional Cost to Respond
$1.000	$2.000	$4.000	**$1.625**	**$5.938**	$0.000

Min (MO)	Most Likely (MO)	Max (MO)	Schedule Expected Value Impact (MO)	Delay Cost* Calculated EV Impact ($M)	Strategy
6.00	8.00	12.00	**6.25**	**$4.313**	Mitigate

Prior to release of RFP, work with HDOT to an agreeable solution that may require revisions to the conceptual design. Define an order of work for the signal review and approval process by HDOT and DTS to be an initial deliverable of the contract. Include a specific date that the Design Builder will be required to meet. Continue Executive level pressure for timely approvals.



Date Post Last Updated 12/20/2016

Monitoring & Control

Risk Owner: John Moore

Review Comments:

Risk Aging

From Date	To Date
	11/1/2018

Status Interval
Monthly

Risk Assignment
Owner

Last Review

Date MC Last Updated 12/21/2016

Next Review

**fixed monthly calculated delay cost impacts*

Honolulu Rail Transit Project

Appendix E: Ryder Levett Bucknall USA Quarterly Construction Cost Report, Fourth Quarter 2016

RLB Rider Levett Bucknall

USA REPORT

AT A GLANCE

2016 was another successful year for the US construction industry. Construction Put-in-Place increased (again), construction unemployment was down and the AIA's Architecture Billing Index clung to positive territory (in November).

As 2017 kicks off, the United States awaits the inauguration of Donald J. Trump as President. While one might speculate on what might happen under a Trump Administration, one can at least look at Trump's Contract with the American Voter for general direction.

On the plus side for construction are promises for less regulation, removing roadblocks from energy infrastructure projects, the introduction of the American Energy & Infrastructure Act and the end to the sequester on defense spending.

On the negative side for construction are the potential fall-outs from cracking down on immigration and suspending Federal funding for 'sanctuary cities'.

In the 'unknown' category are the medium term effects of the proposed Middle Class Tax Relief and Simplification Act (short term the proposed tax cuts will likely be good for construction), the repeal and replacement of the Affordable Healthcare Act, the labeling of China as a 'currency manipulator' and the renegotiation of NAFTA or withdrawal from it.

On balance, Rider Levett Bucknall expects that, barring some external shock to the economy, 2017 should be another positive year for construction generally.

NLAND SURF PARK
AUSTIN, TX

NLand is North America's first surf park and resort featuring waves for pros and novices alike in a lagoon the size of nine football fields. With a deep commitment to sustainability, a state-of-the art water catchment system was designed to ensure guests only surf on raindrops. Rain is channeled through s system of pipes and trenches into a wet pond where it is bio-filtered before it moves to a deep reservoir for storage and eventually through a filtration system to replenish the lagoon. NLand partnered with Spanish engineering firm Wavegarden, widely considered the world leader in wave technology.

RLB acted as Owner's Representative and Project Manager in all stages of the project, leading the teams responsible for NLand's design and construction. Responsibilities included providing tailored and flexible strategic cost planning during pre-construction and project milestones, as well as project management throughout construction and close-out. RLB's role included advising on construction contracts, preparation of construction bid packages, analysis and recommendation of contractors and collaboration with the design team.

USA REPORT

NATIONAL CONSTRUCTION COST INDEX

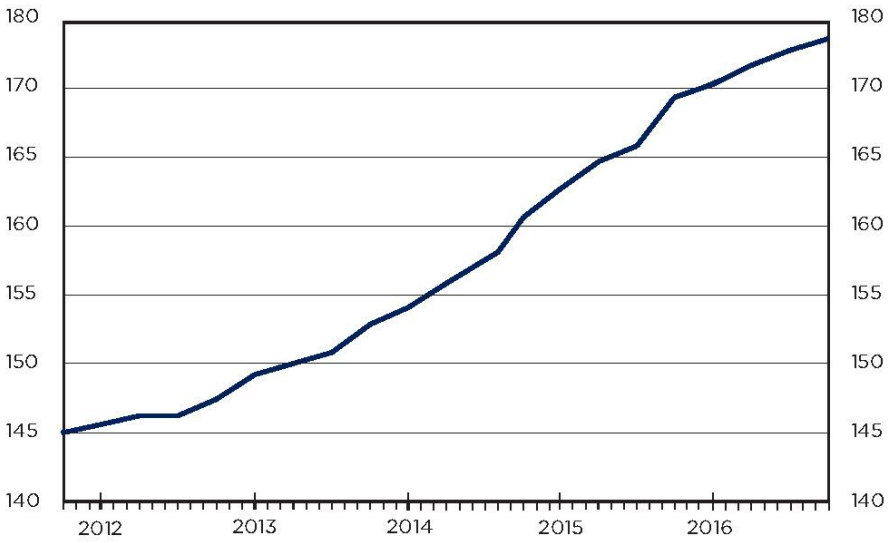
The National Construction Cost Index shows the changing cost of construction between October 2011 and October 2016, relative to a base of 100 in April 2001. Index recalibrated as of April 2011.

Date	Cost Index
October 2011	145.29
January 2012	145.73
April 2012	146.35
July 2012	146.67
October 2012	147.74
January 2013	149.19
April 2013	150.75
July 2013	151.89
October 2013	153.09
January 2014	154.56
April 2014	156.33
July 2014	158.48
October 2014	161.11
January 2015	162.98
April 2015	164.96
July 2015	166.85
October 2015	169.05
January 2016	171.38
April 2016	173.84
July 2016	176.48
October 2016	178.34

Welcome to the fourth quarter 2016 issue of Rider Levett Bucknall's Quarterly Cost Reports! This issue contains data current to October 1, 2016.

According to the U.S. Department of Commerce, construction put-in-place during October 2016 was estimated at a seasonally adjusted annual rate of $1,150.0 billion, which is 0.4% below the revised August estimate of $1,154.4 billion. The September 2016 figure is 0.2% below the September 2015 estimate of $1,152.1 billion. The value of construction for the first nine months of this year was $863.2 billion, 4.4% above the same period in 2015.

NATIONAL CONSTRUCTION COST INDEX



KEY UNITED STATES STATISTICS

	Q4 2015	Q1 2016	Q2 2016	Q3 2016
Gross Domestic Product (GDP)*	1.4%	0.8%	1.1%	3.2%
Consumer Price Index (CPI)	236.5	238.1	241.0	241.4
Inflation (Quarter)	-0.60%	0.68%	1.22%	0.16%
Architectural Billings Index (ABI)	50.9	51.9	52.6	48.4
Construction Put-in-Place (B)	$1,116.6	$1,133.9	$1,133.5	$1,150.0
Unemployment	5.0%	4.9%	4.9%	4.5%
Construction Unemployment	7.5%	8.7%	4.6%	5.2%

GDP represented in percent change from the preceding quarter, seasonally adjusted at annual rates. CPI quarterly figures represent the monthly value at the end of the quarter. Inflation rates represent the total price of inflation from the previous quarter, based on the change in the Consumer Price Index. ABI is derived from a monthly American Institute of Architects survey of architectural firms of their work on the boards, reported at the end of the period. Construction Put-in-Place figures represent total value of construction dollars in billions spent at a seasonally adjusted annual rate taken at the end of each quarter. General Unemployment rates are based on the total population 16 years and older. Construction Unemployment rates represent only the percent of experienced private wage and salary workers in the construction industry 16 years and older. Unemployment rates are seasonally adjusted, reported at the end of the period.

Sources: U.S. Bureau of Labor Statistics, Bureau of Economic Analysis, American Institute of Architects

** Adjustments made to GDP based on amended changes from the Bureau of Economic Analysis.*

USA REPORT

INDICATIVE CONSTRUCTION COSTS

The data in the chart below represents estimates of current building costs in each respective market. Costs may vary as a consequence of factors such as site conditions, climatic conditions, standards of specification, market conditions, etc. Values represent hard construction costs based on U.S. dollars per square foot of gross floor area.

	OFFICES				RETAIL SHOPPING				HOTELS				HOSPITAL		INDUSTRIAL		PARKING				RESIDENTIAL				EDUCATION					
	PRIME		SECONDARY		CENTER		STRIP		5 STAR		3 STAR		GENERAL		WAREHOUSE		GROUND		BASEMENT		MULTI-FAMILY		SINGLE-FAMILY		ELEMENTARY		HIGH SCHOOL		UNIVERSITY	
LOCATION	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
Boston	300	475	200	300	175	275	125	200	375	550	250	375	400	650	100	175	75	125	90	150	175	300	250	350	275	375	285	400	325	475
Chicago	230	360	165	240	135	225	115	165	290	485	190	240	360	595	100	140	70	110	90	140	130	320	150	325	220	360	220	380	250	385
Denver	160	255	115	175	90	145	70	135	200	310	150	185	370	455	90	150	50	70	90	120	85	190	90	400	245	300	260	310	285	400
Honolulu	285	530	245	400	210	495	175	435	515	745	325	545	475	760	145	225	100	145	140	265	195	445	280	760	340	475	405	610	445	720
Las Vegas	140	295	105	190	115	480	65	145	350	500	150	300	285	455	50	100	50	85	60	150	70	405	90	350	180	315	200	455	235	455
Los Angeles	210	315	145	220	130	295	105	170	315	470	210	290	420	630	100	170	100	120	115	165	160	260	160	325	325	430	340	470	360	515
New York	375	575	300	400	275	425	175	300	400	600	300	400	475	700	115	200	95	175	125	200	200	375	275	400	290	400	300	450	325	475
Phoenix	160	275	110	175	110	170	80	140	300	475	150	250	300	450	55	100	45	70	60	110	90	185	100	400	170	250	200	300	250	400
Portland	180	250	130	180	140	240	120	180	190	275	150	190	380	525	90	150	85	105	110	150	150	240	125	280	235	295	250	310	280	400
San Francisco	200	350	180	275	195	325	225	325	300	500	250	350	400	525	140	190	100	130	165	190	280	425	200	400	320	400	300	375	250	375
Seattle	195	240	130	190	135	305	110	155	225	325	215	230	370	525	90	125	80	100	120	155	145	250	150	270	240	295	265	455	310	460
Washington, D.C.	275	425	200	300	150	275	125	175	350	525	250	350	400	650	90	150	70	125	80	125	175	300	250	350	275	350	275	375	325	475

ECONOMIC INDICATOR - BALTIC DRY INDEX

WHAT IS THE BALTIC DRY INDEX?

The Baltic Dry Index ("BDI") is a weighted index, calculated daily, measuring the supply of bulk dry carriers and considers shipping routes and volumes for four different categories of cargo ships. It does not consider ships carrying containers or ships carrying "energy liquids".

BDI is considered to be a 'leading' economic indicator because it measures the transportation cost of materials used in finished goods and is therefore a gauge of short-term economic activity.

WHAT DOES BDI TELL US?

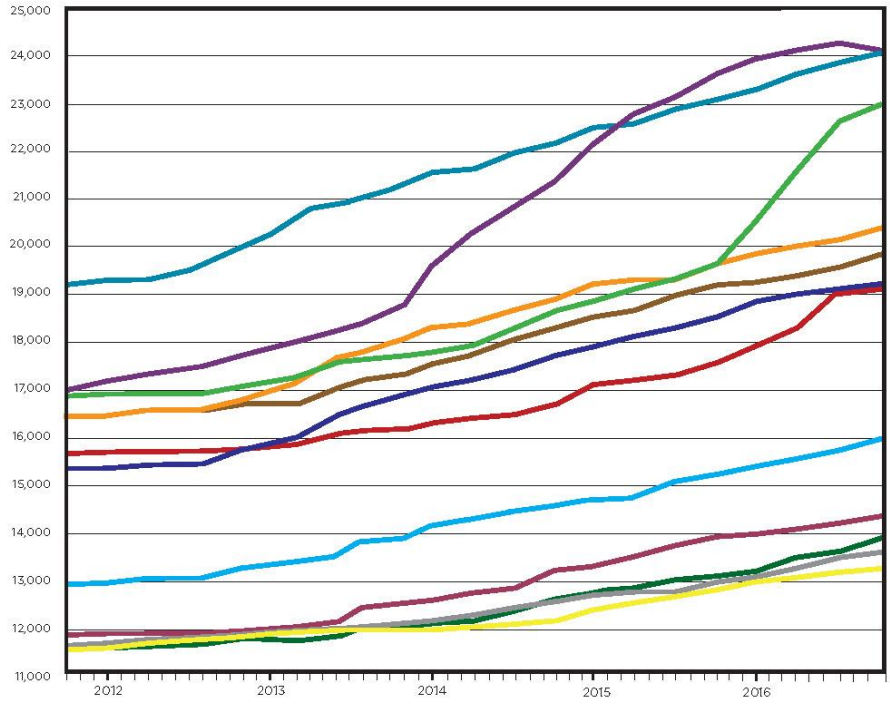
The BDI is seasonal and has well observed annual peaks and troughs so short term trends can be hard to interpret. Nevertheless, over the medium and longer term, BDI does provide a useful insight into global demand for commodities and it is fair to say that it continues to reflect the bull market for commodities without signs (yet) of an upturn.

BALTIC DRY INDEX 2009-2016

Source: Lloyd's List

USA REPORT

COMPARATIVE COST INDEX



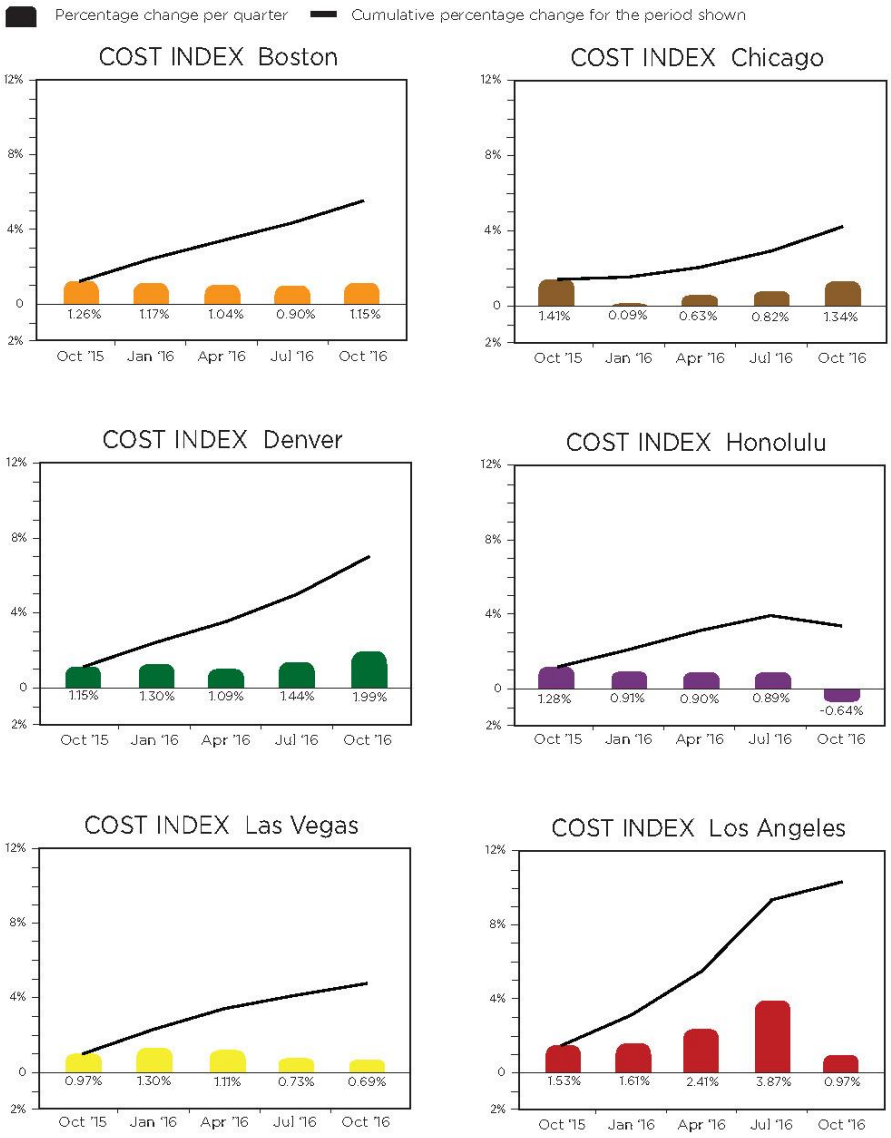
Each quarter we look at the comparative cost of construction in 12 US cities, indexing them to show how costs are changing in each city in particular, and against the costs in the other 11 locations. You will be able to find this information in the graph titled *Comparative Cost Index (above)* and in the *Cost and Change Summary (right)*.

Our Comparative Cost Index tracks the 'true' bid cost of construction, which includes, in addition to costs of labor and materials, general contractor and sub-contractor overhead costs and fees (profit). The index also includes applicable sales/use taxes that 'standard' construction contracts attract. In a 'boom,' construction costs typically increase more rapidly than the net cost of labor and materials. This happens as the overhead levels and profit margins are increased in response to the increasing demand. Similarly, in a 'bust', construction cost increases are dampened (or may even be reversed) due to reductions in overheads and profit margins.

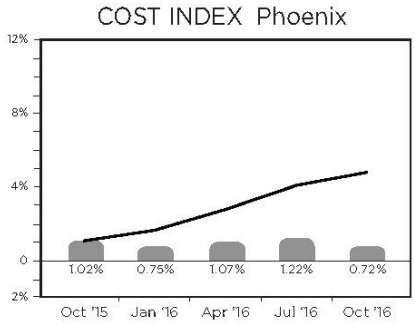
City	July 2016	October 2016	% Change
Boston	20,257	20,489	1.15%
Chicago	19,547	19,809	1.34%
Denver	13,660	13,932	1.99%
Honolulu	24,338	24,181	-0.64%
Las Vegas	13,251	13,342	0.69%
Los Angeles	19,041	19,225	0.97%
New York	23,837	24,101	1.10%
Phoenix	13,481	13,578	0.72%
Portland	14,287	14,469	1.28%
San Francisco	22,625	23,005	1.68%
Seattle	15,774	15,972	1.26%
Washington, DC	19,163	19,376	1.11%

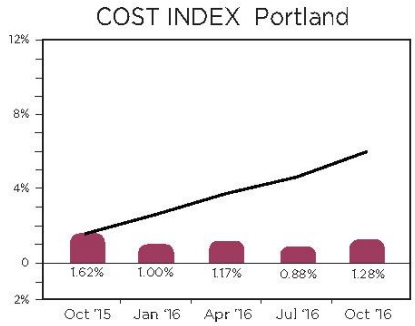
Our research suggests that between July 1, 2016 and October 1, 2016 the national average increase in construction cost was approximately 1.0%. Several locations saw increases over 1% in the quarter however Las Vegas, Los Angeles and Phoenix all experienced increases below 1% and Honolulu, for the first time in over six years, saw a slight decrease.

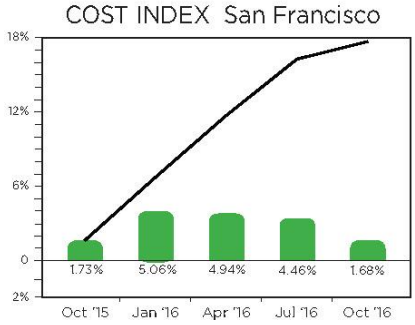
The following escalation charts track changes in the cost of construction each quarter in many of the cities where Rider Levett Bucknall offices are located. Each chart illustrates the percentage change per period and the cumulative percentage change throughout the charted timeline.

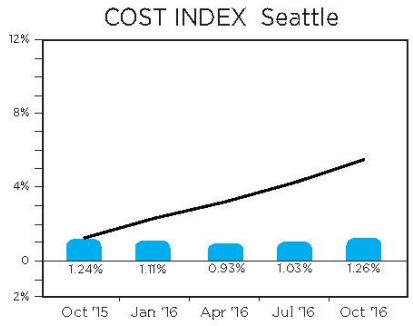


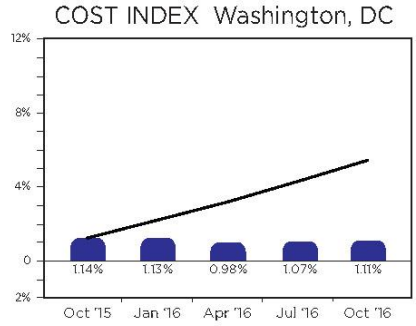
USA REPORT











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Appendix F: HART CEO Recruitment Announcement

HART Honolulu Authority for Rapid Transportation

Chief Executive Officer

Recruitment Announcement

ABOUT THE HONOLULU AUTHORITY FOR RAPID TRANSPORTATION

The Honolulu Authority for Rapid Transportation (HART) is a semi-autonomous public transit authority responsible for the planning, construction and expansion of the city's fixed guideway system.

To provide an efficient and reliable transportation alternative for Honolulu's congested urban corridor, the Honolulu Rail Transit Project was established in 2005. The project provides for a rail transit route running from East Kapolei to Ala Moana Center, with stations at key commuter and visitor destinations, including Aloha Stadium, Pearl Harbor, Honolulu International Airport and downtown Honolulu, Oahu's core commercial and business center.

Honolulu's modern, fully automated electrically powered rail system will take more than 40,000 vehicles off the roads every week day by 2030. Because the train will be electrically powered, it will use renewable energy sources, thereby reducing Hawaii's dependence on fossil fuels. Rail transit will deliver reliable and affordable transportation service, enhancing the quality of life for Oahu's residents by freeing them from time spent in traffic congestion. The first section of the rail system, from Kapolei to Aloha Stadium, is slated to begin operating in 2020, and the entire route will be operational in 2025 when the remaining segment to Ala Moana Center is completed.

By 2030, nearly 70 percent of Oahu's population and more than 80 percent of the island's jobs will be located along the 20-mile rail corridor. Rail will connect major residential areas with primary job centers. There will be stops downtown, at three University of Hawaii system campuses, Aloha Stadium, the Honolulu International Airport and several shopping centers. Rail will offer a convenient way to get to work, school or home. In addition, rail will provide a way to attend special events at Aloha Stadium, catch flights at the airport, or enjoy concerts at the Blaisdell Center, without the challenges of parking and traffic.

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All parts of the guideway will be elevated, except near Leeward Community College where it will be at-grade. The system will incorporate steel wheel on steel rail technology. The HRTP includes 21 stations, one Maintenance and Storage Facility (MSF), and 80 light metro vehicles and associated core systems.

The status of the construction of the HRTP is as follows:

- The MSF substantial completion was issued July 2, 2016.
- The two guideway sections, West Oahu Farrington Highway section and Kamehameha Highway section, are nearly complete. More than 10 miles of guideway have been built – over 450 columns and 425 spans stressed.
- HART has contracted with a Design-Builder to construct the Airport section of the guideway and attendant stations. The Notice to Proceed was issued on December 1, 2016.
- The Notices to Proceed for the 9 stations of the guideway west of and including Aloha Stadium station have been issued and construction is underway.
- HART has also contracted with a Design-Build-Operate-Maintain Core Systems Contractor, who is currently engaged in the manufacturing of the light metro vehicles, and the design and installation of traction power, train control, communications and other systems-related components.
- HART has also contracted with a Design-Furnish-Install-Maintain Elevators and Escalator Contractor, who is currently, engaged in the design and manufacture of elevator and escalator systems.

HONOLULU RAIL TRANSIT PROJECT
FACTS AND FIGURES

SYSTEM
- Rail will be fully integrated with the city bus system, with a system wide fare program that allows the same pass to be used for both rail and the bus
- The rail transit system links the growing region of West Oahu with Honolulu International Airport, downtown Honolulu and Ala Moana Center
- Modern steel-wheel-on-steel-rail technology is powered by a third rail
- Rail transit will be powered by electricity and benefit from the most promising advances in alternative energy sources, such as solar, wind and biofuels
- As Hawai'i relies more on renewable energy sources, so will Oahu rail system. This will enable our island residents to reduce their carbon footprint and their dependence on imported oil

STATIONS
- The rail system will have 21 stations located at the key destinations, including Aloha Stadium, Pearl Harbor, Honolulu International Airport, Aloha Tower, UH-West Oahu, Leeward Community College, and Honolulu Community College
- Stairs, escalators and elevators
- Attendants in stations
- Restrooms in paid fare areas
- Bicycle and surfboard racks
- Ticket vending machines
- Fully compliant with the Americans with Disabilities Act of 1990 (ADA)
- Stations will feature closed-circuit security cameras and interior/exterior safety lighting
- Platform safety gates
- Four new bus transit centers located at the UH-West Oahu, West Loch, Pearl Highlands, and Aloha Stadium stations, with the potential for additional sites in the future
- A dedicated access ramp from the H-2 freeway directly into the Pearl Highlands station's park-and-ride and bus transit center

STATION ACCESS
- Walk, bicycle, TheBus, private bus/shuttle, TheHandi-Van, and automobile drop-off and pick-up, as well as park-and-ride facilities

OPERATING SCHEDULE
- Trains will operate daily from 4 a.m. to midnight
- Trains will arrive about every 5 minutes during peak travel times and about every 11 minutes during non-peak hours

RIDERSHIP
- Estimated at 119,600 weekday rider trips by year 2030

FARE
- Integrated smart card fare payment system; one-pass system between TheBus and the rail system
- Ticket vending machines available at all stations

RAIL VEHICLES
- Fully automated (driverless)
- A four-car train has an 800-passenger capacity
- Air-conditioned vehicles
- Total fleet of 20 four-car trains, with 17 trains in operation during peak periods
- Bicycle, surfboards, wheel chairs, strollers, coolers, and luggage will be allowed on trains
- Closed-circuit security cameras and call boxes will be installed on board all train vehicles in the event of an emergency
- Average vehicle speed (including time stopped at stations): 30 mph; Top speed: 55 mph
- Free Wi-fi

HART Chief Executive Officer *Recruitment Announcement*

THE AUTHORITY

With the elevated rail transit project underway, voters in November 2010 overwhelmingly approved a charter amendment to create a semi-autonomous public transit authority to oversee the planning, construction, operation and extension of the rail system. The Honolulu Authority for Rapid Transportation (HART) began operations July 1, 2011, with existing rail transit staff, contracts and resources. HART consists of a Board of Directors, Executive Director and the necessary staff.

BOARD OF DIRECTORS

HART is governed by a 10-member board composed of the state Department of Transportation Director; the City Department of Transportation Services Director; and six volunteers from the community: three appointed by the Mayor, three by the City Council. The director of the City Department of Planning and Permitting also serves as a non-voting member. The voting members appoint the tenth member to the board.

The Board is the policy making body of the authority and appoints and evaluates the CEO. The Board adopts HART's annual operating and capital budgets, adopts a six-year capital program, adopts rules and regulations, and carries out other duties as authorized by law. The Board's powers are primarily stated in the City Charter Section 17-104.

In November 2016, voters approved a charter amendment clarifying the responsibility of the HART Board to establish policies and regulations regarding the development of the rail system, the internal management and organization of HART, and the allocation of decision-making authority between the Board and the agency's executive director and staff. In addition, the charter amendment additionally provides for the establishment of a rate commission and placed the operations and maintenance responsibilities for bus, paratransit and rail with the Department of Transportation Services.

ABOUT THE POSITION

The CEO is responsible for leading the development of the rail transit fixed guideway system in accordance with the Full Funding Grant Agreement with the Federal Transit Administration. The CEO provides strategic and visionary leadership and is responsible for the overall performance and organizational effectiveness of HART in carrying out its mission.

The CEO is also responsible for HART's robust capital program. The CEO is charged with leading the Authority into the future and fostering a collaborative, innovative, and high-performing organizational culture to ensure successful implementation of the Authority's programs.

The new CEO will be integral to the continued planning and design of HART's system as it strives to construct a high quality rail system that will serve its customers, including persons from the City and County of Honolulu, residents of the State of Hawaii and visitors.

ESSENTIAL FUNCTIONS:

- Assumes full management and administrative responsibility over HART to ensure the achievement of HART's mission to build a fixed guideway rail transit system integral to the City's multi-modal municipal transit system.
- Provides support to the Board and the Authority on key strategic, policy, and legislative issues; identifies key challenges, risks, and opportunities; engages the Board of Directors in collaborative development of solutions.
- Fosters effective mission-critical working relationships with Legislators, Councilmembers, the Mayor, congressional representatives, media, labor, businesses, advisory groups, advocacy groups, and regulatory and oversight agencies to advocate HART's policy positions as recommended by the Board of Directors.
- Manages the current and trending conditions of programs, including financial and construction; develops innovative approaches, as well as effective and responsive solutions to transit funding challenges.
- Leads HART's strategic planning processes and ensures effective alignment of all resources including talent, infrastructure, and funding HART's mission, and the strategic business plan; leads the Authority in continuous enhancement of business practices, leveraging efficiencies, and maximizing financial and environmental sustainability.
- Promotes a consistent, equitable, and inclusive culture to maximize the Authority's talent potential, coaches, develops, motivates, and retains high–performing team members, and addresses performance challenges as appropriate, in a time-sensitive environment.
- Oversees and participates in the development and administration of the Authority's budget; directs, monitors, and evaluates all aspects of the Authority's fiduciary responsibilities; approves the forecast of funds needed for staffing, equipment, materials, and supplies; approves expenditures and implements budgetary adjustments as appropriate and necessary.
- Responds to and resolves difficult and sensitive citizen inquiries and complaints; explains Authority programs, policies, and activities; negotiates and resolves sensitive and controversial issues.

CANDIDATE PROFILE

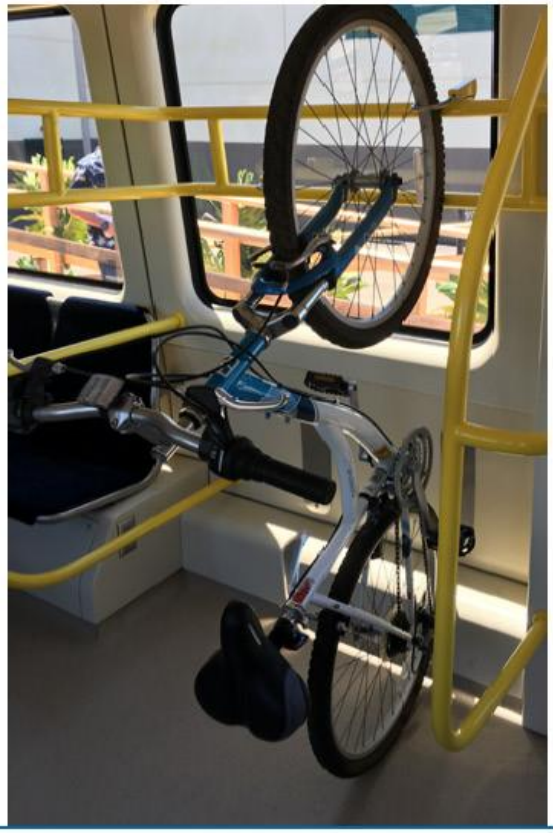
The ideal CEO candidate will have extensive executive-level rail transit construction experience and a record of proven, effective leadership in managing the successful construction of a rail transit project of this magnitude with its significant financial and technical complexities. The CEO must be a passionate transit advocate; exceptional negotiator and balanced leader; comfortable with managing and leading in a highly political, complex, and transparent environment; and someone who is capable of building bridges internally and externally to create opportunities for advancement of the Authority's strategic objectives.

The CEO will provide leadership and support to the HART Board and the Authority on key strategic, policy, and legislative issues. The new CEO will have a successful track record of managing capital programs of considerable scale, overseeing public transit projects, and working with local, state, and federal elected and appointed officials.

HART values workplace diversity and seeks to create an environment and culture that embraces employee differences. You will find an exceptionally diverse group of people at HART with regard to culture, beliefs, communication styles, and life and work experiences. The new CEO will be expected to continue to support and build upon a diverse and inclusive workplace culture.

DESIRABLE QUALIFICATIONS:

The successful candidate will have substantial executive transportation management experience within a large and complex publicly accountable organization that involves leading a diverse staff and management of significant funds. The preferred candidate will have experience leading a department or organization responsible for delivery of complex infrastructure projects, on-time and within budget as well as experience with a fixed guideway system and commitment to a multi-modal transportation system in a metropolitan setting. An advanced degree is preferred.



KNOWLEDGE OF:

- Advanced principles and standards of engineering and construction management necessary for successful construction of a rail transit system of this magnitude.
- FTA's New Start project development process and associated requirements for project management and grant administration.
- Advanced principles and practices of large-scale project management.
- Advanced principles and practices of government and legislative processes, public administration and local government administration.
- Best practices in working with city, county, state, and federal government officials including appointed and elected office holders.
- The local cultural and political landscape for the Authority's public transportation planning and operations.
- Economic, political, social and environmental factors related to the provision and use of public transit.
- Planning, designing, and management of public transit projects; campaign procedures for public approval of bonding and taxation.
- Principles and practices of governmental budget preparation and administration.
- Principles of management, human development, continuous improvement and performance evaluation using modern metrics

SKILL IN:

- Commitment to cultural competency that enables effective outcomes and maintains working relationships in cross-cultural situations.
- Identifying and responding to Board of Directors, elected officials, community representatives, customers, and organizational issues, concerns, and needs.
- Managing and directing a comprehensive regional transit authority in coordination with the Board of Directors, departments, divisions, consultants, and associated staff.
- Leading high-level exceptional negotiations and effectively partnering with local jurisdictions and agencies, utilities, contractors, and community groups.
- Leading, motivating and influencing staff using superior interpersonal and management techniques and demonstrating a consistent commitment and ability to working with diverse work groups and individuals.
- Preparing and administering large capital projects and associated complex budgets.
- Working effectively under pressure, meeting deadlines, and adjusting to changing priorities.

APPLICATION PROCESS

Persons interested in this job must submit a cover letter, salary history, and current resume to marissa@karrasconsulting.net.

If you have questions regarding this announcement, please call Marissa Karras at 360-956-1336. The position will remain open until filled; however the screening process will move quickly. **In order to be considered for the first round of interviews please submit your application materials as soon as possible but no later than April 10, 2017.**

TOTAL COMPENSATION

The total compensation for this position is competitive. Benefits include comprehensive medical, dental, vision, life insurance, and long-term disability insurance; a deferred compensation program; a retirement plan; holiday, vacation, and sick leave; and employee assistance program.

HART is an equal opportunity employer. All qualified applicants are considered in accordance with applicable laws prohibiting discrimination on the basis of race, religion, color, gender, age, national origin, sexual orientation, physical or mental disability, marital status, or veteran status or any other legally protected status.

LIVING ON OAHU

Spectacular natural surroundings, thriving urban centers, vibrant neighborhoods, and a lively arts and cultural scene are just some of what makes Oahu a great place to live and work. Sometimes called "The Gathering Place," Oahu certainly lives up to its name. The third largest Hawaiian island is home to the majority of Hawaii's diverse population, a fusion of east and west cultures rooted in the values and traditions of the Native Hawaiian people. It's this fundamental contrast between the ancient and the modern that makes living on Oahu so enjoyable. The clear blue waters of Kailua Beach meet the metropolitan cityscapes of Honolulu. The historic architecture of Iolani Palace meets the timeless memorials of Pearl Harbor. The big city of Waikiki meets the small town of Haleiwa on the North Shore. Outdoor activities are especially plentiful given the area's natural beauty and mild climate. Hiking atop iconic Leahi (Diamond Head), enjoying some of Hawaii's best shopping, or simply unwinding on the sands of the island's beautiful beaches are just a few of the options available. Hawaii is viewed as a progressive and innovative state where people are outgoing and friendly.

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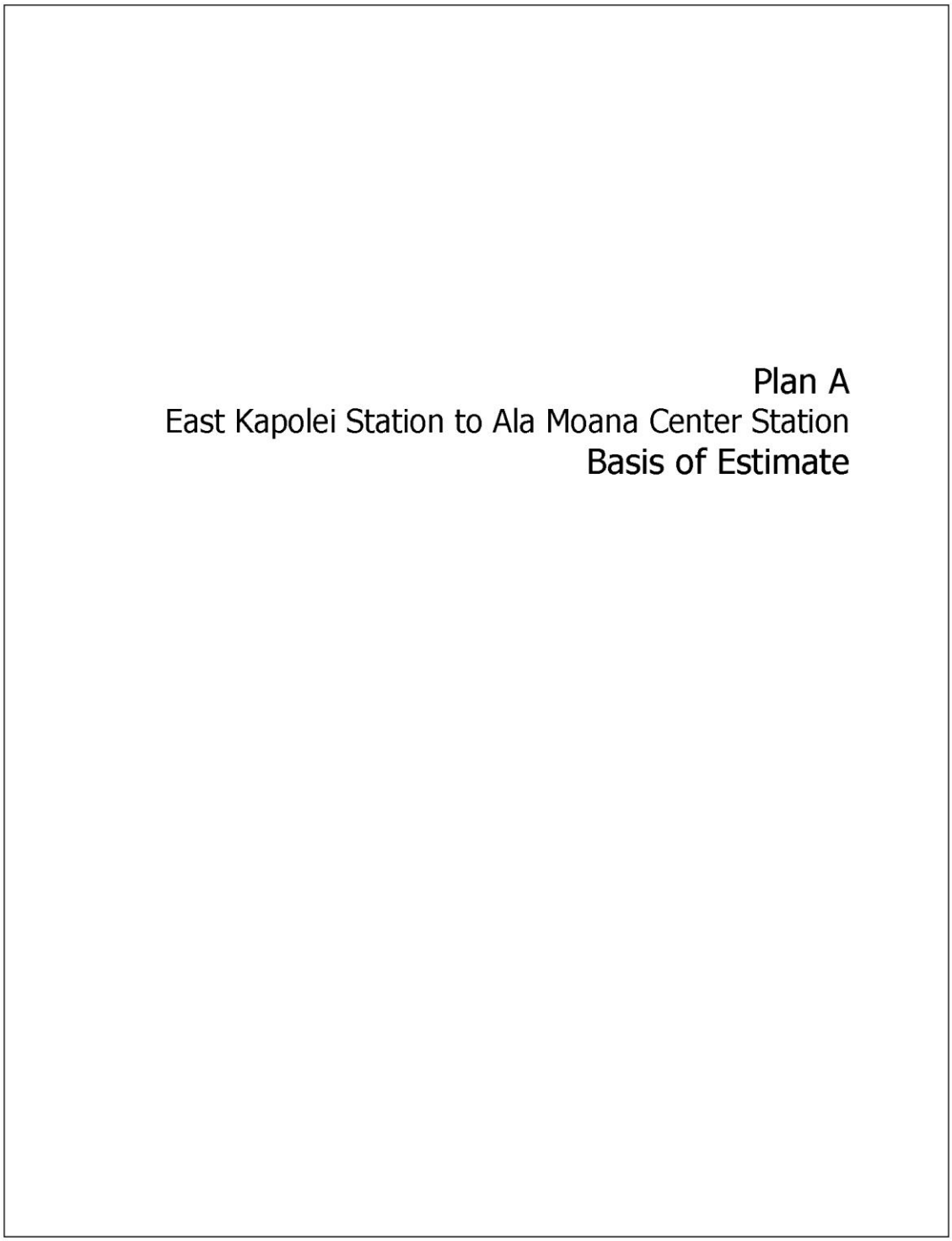
Appendix G: Basis of Cost Estimate

Exhibit G-1: Plan A (Preferred Project)



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Appendices

Acronyms and Abbreviations

AGS	Airport Guideway and Stations
BOE	Basis of Estimate
CCGS	City Center Guideway and Stations
CSC	Core Systems Contractor
DB	Design-Build
DBB	Design-Bid-Build
DPP	City and County of Honolulu, Department of Planning and Permitting
EAC	Estimate at Completion
FFGA	Full Funding Grant Agreement
FHSG	Farrington Highway Station Group
FTA	Federal Transit Administration
HART	Honolulu Authority for Rapid Transportation
HRTP	Honolulu Rail Transit Project
ICE	Independent Cost Estimate
KHG	Kamehameha Highway Guideway
KHSG	Kamehameha Highway Station Group
MOS	Minimum Operable Segment
MSF	Maintenance and Storage Facility
PHGT	Pearl Highlands Garage and Transit Center
PM	Project Manager
ROC	Rail Operations Center
ROM	Rough Order of Magnitude
ROW	Right-of-Way
RSD	Revenue Service Date
SCC	Standard Cost Category
WOFH	West O'ahu/Farrington Highway Guideway
WOSG	West O'ahu Stations Group
YOE	Year of Expenditure

1 Introduction

This Basis of Estimate (BOE) document describes the capital cost estimate methodology and assumptions used to develop the Honolulu Rail Transit Project (HRTP or the Project) Estimate at Completion (EAC) as approved by the executed Full Funding Grant Agreement (FFGA) dated December 12, 2012.

The HRTP consists of a 20.1-mile fixed rail system on elevated guideway structure from East Kapolei to Ala Moana Center, 20 elevated stations, 1 at-grade station, a Rail Operations Center (ROC, formerly known as the Maintenance and Storage Facility [MSF]) and service yard, parking facilities, intermodal facilities, utilities, roadway improvements, all system work, right-of-way (ROW) acquisition, relocations, 80 driverless rail vehicles, and complete professional services, including design, construction management, and owner costs. The Project is divided in multiple contracts.

The Project is approximately 36% complete, which includes completion of the ROC and 10.75 miles of elevated guideway constructed from the East Kapolei Station site to just past the Aloha Stadium Station site. It should be noted that the reported percentages complete are based on the current EAC and estimated Revenue Service Date (RSD) of December 2025.

With the recent award of the Airport Guideway and Stations (AGS) Design-Build contract, the Honolulu Authority for Rapid Transportation (HART) currently has over $4.3 billion either completed or under contract, which includes 15.9 of the 20.1 miles of guideway and 13 of the 21 stations. The two most significant contract packages yet to be awarded are the City Center Guideway and Stations (CCGS) Design-Build package and the Pearl Highlands Garage and Transit Center (PHGT) Design-Build package; both are scheduled to be procured in 2018.

2 HRTP Minimum Operable Segment

The Capital Cost Estimate reflects the cost for the HRTP 20.1-mile rail transit system extending from East Kapolei at the west terminus to Ala Moana Center at the east terminus via Pearl Harbor, the Honolulu International Airport, and downtown Honolulu, otherwise referred to as the Minimum Operable Segment (MOS). Revenue service for the MOS is expected to be December 2025.

3 Estimate Overview

3.1 Summary of Cost

The current Capital Cost Estimate is $8.165 billion which includes $1.1 billion of allocated and unallocated contingency, all in Year of Expenditure (YOE) dollars. A summary of the estimated costs for the Project is provided in the table below:

Table 3-1 Cost Summary

Contract Summary Status	Estimate at Completion
Active Contracts (includes allocated contingency)	$4,129,313,000
Unawarded Contracts (includes allocated contingency)	$1,928,548,000
Staff and Consultants (includes allocated contingency)	$1,286,632,000
Completed Contracts	$546,950,000
Unallocated Contingency	$273,641,000
Total Capital Project (excludes finance costs)	**$8,165,084,000**

3.2 Cost Estimating Methodologies

The cost estimating methodologies used to estimate future costs in the EAC vary from contract to contract, depending on level of design and its intended budgetary use. The following provides a general description of the different estimating methodologies for cost estimates used in the various cost models and updates in the Capital Cost Estimate:

- Independent Cost Estimate (ICE): A cost estimate that is developed by one or more estimators, or estimating teams, not directly associated with the subject task or project to serve as a tool for an independent cost analysis. An ICE is often prepared to create budgets for future projects, develop negotiation strategies for change orders, and establish engineer's estimate ranges prior to advertisement.

- Rough Order of Magnitude (ROM) Estimate: An estimate developed to facilitate project budgetary and feasibility determinations. Quantity information for a ROM estimate is often based on parametric units (for example, route feet, lane miles, gross square feet, number of parking stalls). Pricing is based on historical costs with adjustments made for project location, size, or capacity differences, and cost escalation.

- Validation Estimate: A Validation Estimate is a review of an ICE in order to check the ICE for validity and accuracy. A Validation Estimate will often be performed in a much shorter timeframe, utilizing the quantity takeoffs and format that the ICE has established. A Validation Estimate will often focus on the 20% of the bid items that make up 80% of the costs.

- Bottom-up Risk Assessment: HART's Risk Manager has performed several bottom-up risk assessments for the HRTP. This process evaluated all base costs and schedules for each of the projects in the program. A network risk model was created to define how a risk on one project in the program affects other projects. Multiple probability outcomes are generated from the assessment for each contract package and for the overall Project.

3.3 Capital Cost Estimate Development

Multiple methodologies were also applied to determine the basis of current estimates for awarded and future contracts. Methodologies differ depending on whether a project is an awarded contract, unawarded contract, professional services contract, or other soft cost.

Actual values of awarded construction contracts were used for the West O'ahu/Farrington Highway (WOFH), Kamehameha Highway Guideway (KHG), AGS, and MSF Design-Build contracts; the West O'ahu Station Group (WOSG), Farrington Highway Station Group (FHSG), and Kamehameha Highway Station Group (KHSG) Design-Bid-Build contracts; and the Core Systems Contractor (CSC) Design-Build-Operate-Maintain contract. All bid values were adjusted and sorted by the appropriate Standard Cost Category (SCC) for these estimates.

Additional data sources used for factoring the EAC includes staffing projections, change orders in negotiations with contractors, merit changes under evaluation, known risks with potential cost or schedule impacts, and contingency to account for unknown site conditions, unresolved design or scope issues, market fluctuations, regulatory requirements and schedule impacts.

The methodology and source data for each category of cost basis are identified below:

- Active Construction Contracts: The development of the base cost updates for active contracts reflects Current Contract Value as of December 30, 2016. The Current Contract Value reflects any executed binding obligations entered into for goods and services by HART. This includes the total of actual contracts awarded, and executed change orders or amendments; third-party commitments, offers accepted for purchase of real estate, and other HART actions which have been spent or result in the obligation of specific expenditures at a future time.

- Unawarded Construction: An ICE was developed for the PHGT; Park-and-Ride Lots Construction; and City and County of Honolulu Department of Planning and Permitting (DPP) Design Review. For the CCGS contract, an ICE was completed, and a Validation Estimate was developed for the completed ICE. The remaining unawarded contracts are quantified by various levels of ROM estimates provided by HART estimators or Project Managers (PMs).

- Professional Services and Other Contracts: Staffing plan estimates have been provided by HART estimators and PMs based on the assumed substantial completion dates of each associated contract package.

3.4 FTA Standard Cost Categories (SCCs)

As required by the Federal Transit Administration (FTA), HART uses the FTA's Standard Cost Categories (SCCs) to summarize the individual contract packages into a comprehensive Total Project estimate. A description of the major cost components includes the following:

3.4.1 SCC 10 through SCC 80

The HRTP estimated base scope is summarized in codes SCC 10 through SCC 80. These elements include Guideway, Stations, Support Facilities, Systems, Vehicles, ROW, Utilities, Art, and Professional Services. As previously referenced, the Project cost estimate is comprised of both active awarded base scope cost and unawarded base scope. Change work or extended services for professional services that is determined to be an imminent change order, but not yet committed under contract, has been included as base cost in the Project cost estimate.

3.4.2 SCC 90: Contingency

This Project cost estimate includes allocated contingency for active contract packages and unawarded contract packages, as well as unallocated contingency reserve for the entirety of the HRTP. Contingency in this Project cost estimate is informed by the outcome of a bottom-up risk assessment completed by utilizing HART's internal risk model and a comprehensive validation of the model's output from the respective PMs. The allocated contingency varies from contract to contract. Unallocated contingency is based on 3% of the total of codes SCC 10 through SCC 80.

HART's Risk Manager performed a bottom-up risk assessment in August 2016 for every project in the program. This process evaluated every base cost and schedule for each of the contract packages in the program. This resulted in a variety of probability outcomes for the HRTP EAC and identified the level of contingency associated with each EAC. The risk program ultimately modeled for an EAC at a P80, which was used as a basis for the overall program contingency. Each respective contract package took what was modeled at a P65 to assist in informing the appropriate value of allocated contingency. The difference between the P80 and P65 values helped to determine the unallocated contingency.

In January 2017, HART undertook a validation of the EAC. This validation built upon what was modeled in August 2016 by reflecting updated cost estimates and adjusted risks where applicable. Contingencies were redistributed or added based on current information provided by the respective project teams either through updated forecast projections and/or updated risk information identified in the risk model.

3.4.3 SCC 100: Finance Charges

This SCC code is reserved for finance charges that will be incurred due to borrowing required to complete the MOS. Estimated finance costs, and the method by which it was derived, are detailed in the revised Financial Plan.

4 Estimate Assumptions

The following is a list of key assumptions/qualifications:

- Labor rates are current Davis-Bacon Wages with fringes, prevailing wage rates for the State of Hawai'i.
- Buy America requirements apply.
- Costs for unawarded contracts are based on a competitive bid environment, with a minimum of three proposers/bidders anticipated.
- There are sufficient experienced contractors available to perform the future work in the Honolulu construction marketplace.
- All costs are in YOE dollars.
- The anticipated RSD is December 2025.
- Risks for market conditions were included in the risk profiles to account for unique escalation for materials and labor.

5 Sources of Data

The costs included in the overall Project estimate are derived from multiple sources, including the following:

- Current contract values on active HRTP contracts as of December 2016
- Forecast Cost Report with Details as of December 2016
- HART internal Risk Model output, updated in January 2017
- Local vendor quotations
- Historical HART Bid Data
- RS Means database
- State of Hawai'i Davis-Bacon Wage Rates
- Blue Book equipment rates

Appendix A: Base Cost Estimate by Standard Cost Category

City and County of Honolulu
Honolulu Rail Transit Project
Plan A (East Kapolei to Ala Moana Center)

Estimate at Completion by Standard Cost Category

Applicable Line Items Only		YOE Dollars Total
10 GUIDEWAY & TRACK ELEMENTS		**$1,695,619,976**
10.02	Guideway: At-grade semi-exclusive (allows cross-traffic)	$17,378
10.04	Guideway: Aerial structure	$1,542,893,392
10.05	Guideway: Built-up fill	$4,687,196
10.09	Track: Direct fixation	$124,024,234
10.12	Track: Special (switches, turnouts)	$2,506,181
10.13	Track: Vibration and noise dampening	$21,491,594
20 STATIONS, STOPS, TERMINALS, INTERMODAL		**$916,959,112**
20.01	At-grade station, stop, shelter, mall, terminal, platform	$13,461,505
20.02	Aerial station, stop, shelter, mall, terminal, platform	$644,188,960
20.04	Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	$42,838,547
20.06	Automobile parking multi-story structure	$149,186,940
20.07	Elevators, escalators	$67,283,159
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		**$120,015,787**
30.01	Administration Building: Office, sales, storage, revenue counting	$231,250
30.02	Light Maintenance Facility	$7,582,704
30.03	Heavy Maintenance Facility	$46,317,810
30.04	Storage or Maintenance of Way Building	$8,892,739
30.05	Yard and Yard Track	$56,991,284
40 SITEWORK & SPECIAL CONDITIONS		**$2,181,062,067**
40.01	Demolition, Clearing, Earthwork	$54,634,798
40.02	Site Utilities, Utility Relocation	$765,966,674
40.03	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	$9,006,406
40.04	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	$12,570,587
40.05	Site structures including retaining walls, sound walls	$107,183,053
40.06	Pedestrian / bike access and accommodation, landscaping	$18,838,502
40.07	Automobile, bus, van accessways including roads, parking lots	$154,229,177
40.08	Temporary Facilities and other indirect costs during construction	$1,058,632,870
50 SYSTEMS		**$324,419,317**
50.01	Train control and signals	$163,651,692
50.03	Traction power supply: substations	$34,942,281
50.04	Traction power distribution: catenary and third rail	$32,475,378
50.05	Communications	$66,793,234
50.06	Fare collection system and equipment	$22,746,390
50.07	Central Control	$3,810,343
Construction Subtotal (10 - 50)		**$5,238,076,258**
60 ROW, LAND, EXISTING IMPROVEMENTS		**$263,522,643**
60.01	Purchase or lease of real estate	$230,708,269
60.02	Relocation of existing households and businesses	$32,814,374
70 VEHICLES (80)		**$211,661,870**
70.01	Light Rail	$190,383,694
70.05	Other	$400,619
70.06	Non-revenue vehicles	$14,371,344
70.07	Spare parts	$6,506,214
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		**$2,178,152,556**
80.01	Preliminary Engineering	$112,241,243
80.02	Final Design	$512,666,204
80.03	Project Management for Design and Construction	$799,920,682
80.04	Construction Administration & Management	$298,287,774
80.05	Professional Liability and other Non-Construction Insurance	$139,139,859
80.06	Legal; Permits; Review Fees by other agencies, cities, etc.	$101,873,981
80.07	Surveys, Testing, Investigation, Inspection	$143,151,889
80.08	Start up	$70,870,924
Subtotal (10 - 80)		**$7,891,413,327**
90 UNALLOCATED CONTINGENCY		**$273,640,866**
Subtotal (10 - 90)		**$8,165,054,193**
100 FINANCE CHARGES		**$464,897,000**
Total Project Cost (10 - 100)		**$8,629,951,193**

City and County of Honolulu
Honolulu Rail Transit Project
Plan A (East Kapolei to Ala Moana)

Inflated Cost to Year of Expenditure

STANDARD COST CATEGORY DESCRIPTION	Base Year Dollars w/o Contingency	Base Year Dollars Allocated Contingency	Base Year Dollars TOTAL	Inflation Factor	YOE Dollars TOTAL
10 GUIDEWAY & TRACK ELEMENTS	$1,461,802,684	$198,562,608	$1,659,460,074	1.0218	$1,695,619,976
20 STATIONS, STOPS, TERMINALS, INTERMODAL	$718,997,493	$154,231,209	$882,774,435	1.0387	$916,959,112
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	$119,400,067		$120,015,787	1.0000	$120,015,787
40 SITEWORK & SPECIAL CONDITIONS	$1,497,835,066	$206,688,898	$2,133,924,890	1.0221	$2,181,062,067
50 SYSTEMS	$289,355,816	$33,348,501	$324,419,317	1.0000	$324,419,317
60 ROW, LAND, EXISTING IMPROVEMENTS	$210,311,604	$32,093,130	$263,522,643	1.0000	$263,522,643
70 VEHICLES	$191,882,721	$19,779,149	$211,661,870	1.0000	$211,661,870
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	$1,514,775,728	$144,939,061	$2,166,206,311	1.0055	$2,178,152,556
90 UNALLOCATED CONTINGENCY			$260,132,552	1.0519	$273,640,866
100 FINANCE CHARGES*			$464,897,000	1.0000	$464,897,000
Total Project Cost (10 - 100)			**$8,487,014,880**	**1.0168**	**$8,629,951,193**

*Preliminary Finance Costs of $465 Million could significantly increase depending on action taken by the State Legislature regarding the possible extension of the GET Surcharge as well the terms upon which the extension is based.

MAIN WORKSHEET-BUILD ALTERNATIVE

City and County of Honolulu — Today's Date: **Jan 2017**

Honolulu Rail Transit Project, East Kapolei to Ala Moana Center — Yr of Base Year $: Jan 2017

Full Funding Grant Agreement — Yr of Revenue Ops: FY 2026

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**20.09**	1,461,802,684	198,562,808	**1,659,460,074**	**$ 82,585,882**	**32%**	**20%**	**1,695,619,976**
10.01 Guideway: At-grade exclusive right-of-way		0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)		17,378	0	17,378				17,378
10.03 Guideway: At-grade in mixed traffic		0	0	0				0
10.04 Guideway: Aerial structure	19.75	1,328,434,151	185,220,716	1,512,426,867	$ 76,578,576			1,542,893,392
10.05 Guideway: Built-up fill		4,588,992	98,204	4,687,196				4,687,196
10.06 Guideway: Underground cut & cover		0	0	0				0
10.07 Guideway: Underground tunnel		0	0	0				0
10.08 Guideway: Retained cut or fill	0.34	0	0	0	$ -			0
10.09 Track: Direct fixation		110,567,700	9,278,355	120,168,837				124,024,234
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		2,143,360	295,276	2,438,626				2,506,181
10.13 Track: Vibration and noise dampening		16,051,113	3,670,056	19,721,169				21,491,594
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**21**	718,997,493	154,231,209	**882,774,435**	**$ 42,036,878**	**17%**	**10%**	**916,959,112**
20.01 At-grade station, stop, shelter, mall, terminal, platform	1	11,312,189	2,149,316	13,461,505	$ 13,461,505			13,461,505
20.02 Aerial station, stop, shelter, mall, terminal, platform	20	510,846,856	102,273,467	622,666,056	$ 31,133,303			644,188,960
20.03 Underground station, stop, shelter, mall, terminal, platform		0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.		32,300,110	7,713,750	40,013,860				42,838,547
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		112,486,416	26,863,439	139,349,855				149,186,940
20.07 Elevators, escalators		52,051,922	15,231,237	67,283,159				67,283,159
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		119,400,067	0	**120,015,787**	**$ 5,972,792**	**2%**	**1%**	**120,015,787**
30.01 Administration Building: Office, sales, storage, revenue counting		231,250	0	231,250				231,250
30.02 Light Maintenance Facility		7,582,704	0	7,582,704				7,582,704
30.03 Heavy Maintenance Facility		45,702,090	0	46,317,810				46,317,810
30.04 Storage or Maintenance of Way Building		8,892,739	0	8,892,739				8,892,739
30.05 Yard and Yard Track		56,991,284	0	56,991,284				56,991,284
40 SITEWORK & SPECIAL CONDITIONS		1,497,835,066	206,688,898	**2,133,924,890**	**$ 106,198,439**	**42%**	**25%**	**2,181,062,067**
40.01 Demolition, Clearing, Earthwork		45,627,734	8,094,729	53,722,463				54,634,798
40.02 Site Utilities, Utility Relocation		535,135,092	84,679,082	751,833,523				765,966,674
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		8,090,543	615,863	9,006,406				9,006,406
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		11,391,864	1,178,723	12,570,587				12,570,587
40.05 Site structures including retaining walls, sound walls		85,712,643	16,917,020	102,629,663				107,183,053
40.06 Pedestrian / bike access and accommodation, landscaping		16,282,654	2,041,630	18,324,284				18,838,502
40.07 Automobile, bus, van accessways including roads, parking lots		126,477,577	20,421,209	146,898,786				154,229,177
40.08 Temporary Facilities and other indirect costs during construction		669,116,959	72,740,643	1,038,939,178				1,058,632,870
50 SYSTEMS		289,355,816	33,348,501	**324,419,317**	**$ 16,145,285**	**6%**	**4%**	**324,419,317**
50.01 Train control and signals		144,960,783	18,690,909	163,651,692				163,651,692
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		31,708,553	3,233,728	34,942,281				34,942,281
50.04 Traction power distribution: catenary and third rail		31,333,630	1,141,748	32,475,378				32,475,378
50.05 Communications		61,256,561	5,536,673	66,793,234				66,793,234
50.06 Fare collection system and equipment		16,642,498	4,388,892	22,746,390				22,746,390
50.07 Central Control		3,453,791	356,552	3,810,343				3,810,343
Construction Subtotal (10-50)		4,087,391,127	592,831,216	**5,120,594,503**	**$ 254,835,185**	**100%**	**60%**	**5,238,076,258**
60 ROW, LAND, EXISTING IMPROVEMENTS		210,311,604	32,093,130	**263,522,643**	**$ 13,114,657**		**3%**	**263,522,643**
60.01 Purchase or lease of real estate		181,530,966	29,177,303	230,708,269				230,708,269
60.02 Relocation of existing households and businesses		28,780,638	2,915,827	32,814,374				32,814,374
70 VEHICLES (number)	**80**	191,882,721	19,779,149	**211,661,870**	**$ 2,645,773**		**2%**	**211,661,870**
70.01 Light Rail	80	172,568,577	17,815,117	190,383,694	$ 2,379,796			190,383,694
70.02 Heavy Rail		0	0	0				0
70.03 Commuter Rail		0	0	0				0
70.04 Bus		0	0	0				0
70.05 Other		390,200	10,419	400,619				400,619
70.06 Non-revenue vehicles		13,026,548	1,344,796	14,371,344				14,371,344
70.07 Spare parts		5,897,396	608,818	6,506,214				6,506,214
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		1,514,775,728	144,939,061	**2,166,206,311**	**$ 107,804,980**	**42%**	**26%**	**2,178,152,556**
80.01 Preliminary Engineering		107,040,130	5,201,113	112,241,243				112,241,243
80.02 Final Design		441,749,718	52,351,911	501,312,550				512,666,204
80.03 Project Management for Design and Construction		544,663,797	33,983,529	799,920,682				799,920,682
80.04 Construction Administration & Management		167,963,353	12,642,151	297,695,183				298,287,774
80.05 Professional Liability and other Non-Construction Insurance		59,295,742	24,844,117	139,139,859				139,139,859
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		51,747,608	3,842,042	101,873,981				101,873,981
80.07 Surveys, Testing, Investigation, Inspection		77,710,753	5,807,902	143,151,889				143,151,889
80.08 Start up		64,604,627	6,266,297	70,870,924				70,870,924
Subtotal (10 - 80)		6,004,361,180	789,642,557	**7,761,985,327**	**$ 386,288,539**		**91%**	**7,891,413,327**
90 UNALLOCATED CONTINGENCY				**260,132,552**			**3%**	**273,640,866**
Subtotal (10 - 90)				**8,022,117,880**	**$ 399,234,482**		**95%**	**8,165,054,193**
100 FINANCE CHARGES*				**464,897,000**			**5%**	**464,897,000**
Total Project Cost (10 - 100)				**8,487,014,880**	**$ 422,370,880**		**100%**	**8,629,951,193**

*** Finance costs, including interest and bond issuance charges will be dependent on an extension of the General Excise and Use Tax Surcharge as well as the terms upon which the extension is based.**

Appendix B: Base Cost Estimate by Source of Funding

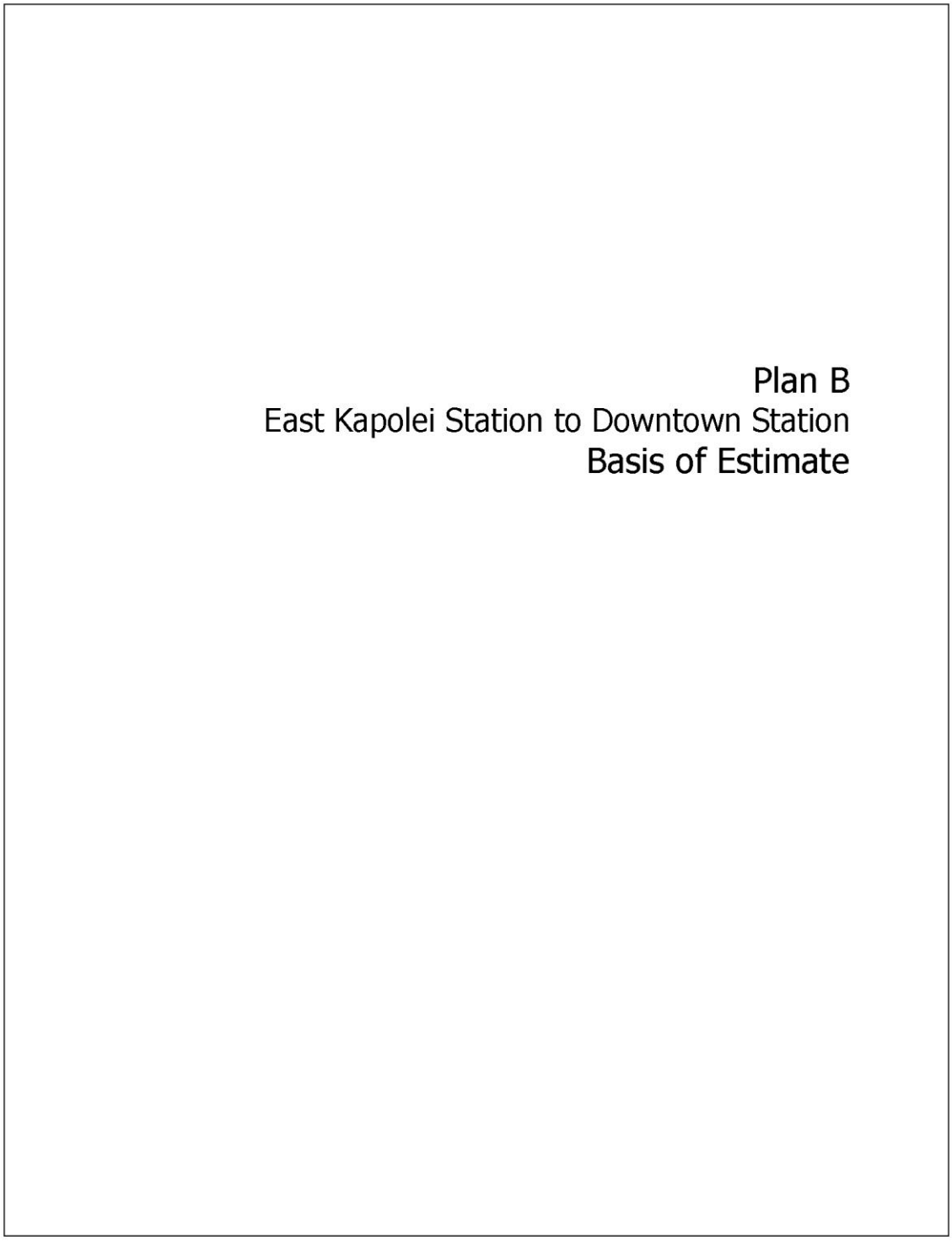
City and County of Honolulu
Honolulu Rail Transit Project
Plan A (East Kapolei to Ala Moana)

BCE by Source of Funding

STANDARD COST CATEGORY DESCRIPTION	YOE Dollars TOTAL	Federal 5309 New Starts	Federal Other (Section 5307)	Federal Other (ARRA)	Local
10 GUIDEWAY & TRACK ELEMENTS	$1,695,619,976	$304,545,287	$0	$0	$1,391,074,689
20 STATIONS, STOPS, TERMINALS, INTERMODAL	$916,959,112	$164,692,313	$0	$0	$752,266,799
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	$120,015,787	$21,555,680	$0	$0	$98,460,107
40 SITEWORK & SPECIAL CONDITIONS	$2,181,062,067	$391,734,105	$0	$0	$1,789,327,962
50 SYSTEMS	$324,419,317	$58,267,994	$0	$0	$266,151,323
60 ROW, LAND, EXISTING IMPROVEMENTS	$263,522,643	$47,330,522	$0	$0	$216,192,121
70 VEHICLES	$211,661,870	$38,015,962	$0	$0	$173,645,908
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	$2,178,152,556	$390,493,108	$0	$4,000,000	$1,783,659,448
90 UNALLOCATED CONTINGENCY	$273,640,866	$49,147,826	$0	$0	$224,493,040
100 FINANCE CHARGES	$464,897,000	$84,217,203	$0	$0	$380,679,797
Total Project Cost (10 - 100)	**$8,629,951,193**	**$1,550,000,000**	**$0**	**$4,000,000**	**$7,075,951,193**

Sources of Federal Funding and Matching Share Ratios	Costs Attributed to Source of Funds	All Federal Funds	Federal/ Local Matching Ratio within Source	Local Funds
Federal 5309 New Starts	$8,625,951,193	$1,550,000,000	23/77	$7,075,951,193
Federal Other (Section 5307)	$0	$0	N/A	$0
Federal Other (ARRA)	$4,000,000	$4,000,000	100/0	$0
Total	$8,629,951,193	$1,554,000,000		$7,075,951,193
Overall Federal Share of Project		**18%**		
New Starts Share of Project		**18%**		

Exhibit G-2: Plan B



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Appendices

Acronyms and Abbreviations

AGS	Airport Guideway and Stations
BOE	Basis of Estimate
CCGS	City Center Guideway and Stations
CSC	Core Systems Contractor
DB	Design-Build
DBB	Design-Bid-Build
EAC	Estimate at Completion
FHSG	Farrington Highway Station Group
FTA	Federal Transit Administration
HART	Honolulu Authority for Rapid Transportation
HRTP	Honolulu Rail Transit Project
ICE	Independent Cost Estimate
KHG	Kamehameha Highway Guideway
KHSG	Kamehameha Highway Station Group
MOS	Minimum Operable Segment
MSF	Maintenance and Storage Facility
PHGT	Pearl Highlands Garage and Transit Center
PM	Project Manager
ROC	Rail Operations Center
ROM	Rough Order of Magnitude
ROW	Right-of-Way
RSD	Revenue Service Date
SCC	Standard Cost Category
WOFH	West O'ahu/Farrington Highway Guideway
WOSG	West O'ahu Stations Group
YOE	Year of Expenditure

1 Introduction

This Basis of Estimate (BOE) document describes the methodology and assumptions used to develop the Estimate at Completion (EAC) for the Honolulu Rail Transit Project (HRTP or the Project) scope identified as Plan B.

The Project scope for Plan B includes an approximately 18-mile fixed rail system on elevated guideway structure from East Kapolei to the Downtown Station, 13 elevated stations, 1 at-grade station, a Rail Operations Center (ROC, formerly known as the Maintenance and Storage Facility [MSF]) and service yard, 1 temporary park-and-ride facility at the University of Hawaii–West O'ahu, utilities, roadway improvements, all system work, right-of-way (ROW) acquisition, relocations, 80 driverless rail cars, and complete professional services, including design, construction management, and owner costs. The Project is divided in multiple contracts.

The Project scope for Plan B is approximately 36% complete, which includes completion of the ROC and 10.75 miles of elevated guideway constructed from the East Kapolei Station site to just past the Aloha Stadium Station site. It should be noted that the reported percentages complete are based on the current EAC and estimated Revenue Service Date (RSD) of July 2025.

With the recent award of the Airport Guideway and Stations (AGS) Design-Build contract, the Honolulu Authority for Rapid Transportation (HART) currently has over $4.3 billion either completed or under contract, which includes 15.8 of the 18 miles of guideway and 13 of the 14 stations. The most significant contract package yet to be awarded is the City Center Guideway and Stations (CCGS) Design-Build package scheduled to be procured in 2018.

2 HRTP Minimum Operable Segment

The Capital Cost Estimate reflects the cost for the HRTP Plan B reduced scope including an 18-mile rail transit system extending from East Kapolei at the west terminus to Downtown Station at the east terminus via Pearl Harbor and the Honolulu International Airport. Revenue service for the Plan B Minimum Operable Segment (MOS) is estimated to be July 2025.

3 Estimate Overview

3.1 Summary of Cost

The current Capital Cost Estimate is $6.4 billion which includes $0.1 billion of allocated contingency, excluding finance costs are all in Year of Expenditure (YOE) dollars. A summary of the estimated costs for the Project is provided in the table below:

Table 3-1 Cost Summary

Contract Summary Status	Estimate at Completion
Active Contracts (includes allocated contingency)	$3,916,637,000
Unawarded Construction	$866,912,000
Staff and Consultants	$1,025,936,000
Completed Contracts	$552,778,000
Unallocated Contingency	$0
Total Capital Project (excludes finance costs)	**$6,362,263,000**

3.2 Cost Estimating Methodologies

The cost estimating methodologies used to estimate future costs in the EAC vary from contract to contract, depending on level of design and its intended budgetary use. The following provides a general description of the different estimating methodologies for cost estimates used in the various cost models and updates in the Capital Cost Estimate:

- Independent Cost Estimate (ICE): A cost estimate that is developed by one or more estimators, or estimating teams, not directly associated with the subject task or project to serve as a tool for an independent cost analysis. An ICE is often prepared to create budgets for future projects, develop negotiation strategies for change orders, and establish engineer's estimate ranges prior to advertisement.

- Rough Order of Magnitude (ROM) Estimate: An estimate developed to facilitate project budgetary and feasibility determinations. Quantity information for a ROM estimate is often based on parametric units (for example, route feet, lane miles, gross square feet, number of parking stalls). Pricing is based on historical costs with adjustments made for project location, size, or capacity differences, and cost escalation.

- Validation Estimate: A Validation Estimate is a review of an ICE in order to check the ICE for validity and accuracy. A Validation Estimate will often be performed in a much shorter timeframe, utilizing the quantity takeoffs and format that the ICE has established. A Validation Estimate will often focus on the 20% of the bid items that make up 80% of the costs.

- Bottom-up Risk Assessment: HART's Risk Manager has performed several bottom-up risk assessments for the HRTP. This process evaluated all base costs and schedules for each of the projects in the program. A network risk model was created to define how a risk on one project in the program affects other projects. Multiple probability outcomes are generated from the assessment for each contract package and for the overall Project.

3.3 Capital Cost Estimate Development

Multiple methodologies were also applied to determine the basis of current estimates for awarded and future contracts. Methodologies differ depending on whether a project is an awarded contract, unawarded contract, professional services contract, or other soft cost.

Actual values of awarded construction contracts were used for the West O'ahu/Farrington Highway (WOFH), Kamehameha Highway Guideway (KHG), AGS, and MSF Design-Build contracts; the West O'ahu Station Group (WOSG), Farrington Highway Station Group (FHSG), and Kamehameha Highway Station Group (KHSG) Design-Bid-Build contracts; and the Core Systems Contractor (CSC) Design-Build-Operate-Maintain contract. All bid values were adjusted and sorted by the appropriate Standard Cost Category (SCC) for these estimates.

Additional data sources used for factoring the EAC includes staffing projections, change orders in negotiations with contractors, merit changes under evaluation, known risks with potential cost or schedule impacts, and contingency to account for unknown site conditions, unresolved design or scope issues, market fluctuations, regulatory requirements and schedule impacts.

The methodology and source data for each category of cost basis are identified below:

- Active Construction Contracts: The development of the base cost updates for active contracts reflects Current Contract Value as of December 30, 2016. The Current Contract Value reflects any executed binding obligations entered into for goods and services by HART. This includes the total of actual contracts awarded, and executed change orders or amendments; third-party commitments, offers accepted for purchase of real estate, and other HART actions which have been spent or result in the obligation of specific expenditures at a future time.

- Unawarded Construction: For the CCGS contract, an ICE was completed, and a Validation Estimate was developed for the completed ICE. The remaining unawarded contracts are quantified by various levels of ROM estimates provided by HART estimators or Project Managers (PMs).

- Professional Services and Other Contracts: Staffing plan estimates have been provided by HART estimators and PMs based on the assumed substantial completion dates of each associated contract package.

3.4 Standard Cost Categories (SCCs)

As required by the Federal Transit Administration (FTA), HART uses the FTA's Standard Cost Categories (SCCs) to summarize the individual contract packages into a comprehensive Total Project estimate. A description of the major cost components included the following:

3.4.1 SCC 10 through SCC 80

The HRTP estimated base scope is summarized in codes SCC 10 through SCC 80. These elements include Guideway, Stations, Support Facilities, Systems, Vehicles, ROW, Utilities, Art, and Professional Services. As previously referenced, the Project cost estimate is comprised of both active awarded base scope and unawarded base scope.

Where applicable, scope was removed from the MOS to meet the minimum requirements for a system of independent utility but can be built with the current funding capacity of $6.8 billion. This process consisted of producing an ICE of the revised CCGS scope with a supplemental validation and removal and/or reduction applicable elements such as ROW, elevators and escalators, fare systems, and soft costs. Change work or extended services for professional services that is determined to be an imminent change order, but not yet committed under contract, has been included as base cost in the Project cost estimate.

3.4.2 SCC 90: Contingency

This Project cost estimate includes only allocated contingency for active contract packages and unawarded contract packages. The allocated contingency varies from contract to contract and totals $84.4 million, or 1.3% of the total of codes SCC 10 through SCC 80. The unallocated contingency is $101.9 million, or 1.6% of the total of codes SCC 10 through SCC 80.

In January 2017, HART performed a validation of the EAC. This validation took what was modeled in August 2016 for the MOS and updated cost estimates and adjusted risks where applicable. Contingencies were reduced and in most cases removed throughout the budget. Active construction contracts, primarily on the western section of the alignment, were left with a minimal level of contingency to complete those contracts.

3.4.3 SCC 100: Finance Charges

This SCC code is reserved for finance charges that will be incurred due to borrowing required to complete the MOS. Estimated finance costs, and the method by which it was derived, are detailed in the revised Financial Plan.

4 Estimate Assumptions

The following is a list of key assumptions/qualifications:

- Labor rates are current Davis-Bacon Wages with fringes, prevailing wage rates for the State of Hawai'i.
- Buy America requirements apply.
- Costs for unawarded contracts are based on a competitive bid environment, with a minimum of three proposers/bidders anticipated.
- There are sufficient experienced contractors available to perform the future work in the Honolulu construction marketplace.
- All costs are in YOE dollars.
- The anticipated RSD is July 2025.
- Risks for market conditions were included in the risk profiles to account for unique escalation for materials and labor.

5 Sources of Data

The costs included in the overall Project estimate are derived from multiple sources, including the following:

- Current contract values on active HRTP contracts as of December 2016
- Forecast Cost Report with Details as of December 2016
- HART internal Risk Model output, updated in January 2017
- Local vendor quotations
- Historical HART Bid Data
- RS Means database
- State of Hawai'i Davis-Bacon Wage Rates
- Blue Book equipment rates

Appendix A: Base Cost Estimate by Standard Cost Category

City and County of Honolulu
Honolulu Rail Transit Project
Plan B (East Kapolei to Downtown)

Estimate at Completion by Standard Cost Category

Applicable Line Items Only		YOE Dollars Total
10 GUIDEWAY & TRACK ELEMENTS		**$1,396,840,788**
10.02	Guideway: At-grade semi-exclusive (allows cross-traffic)	$17,378
10.04	Guideway: Aerial structure	$1,275,137,914
10.05	Guideway: Built-up fill	$4,687,196
10.09	Track: Direct fixation	$104,665,135
10.12	Track: Special (switches, turnouts)	$2,204,578
10.13	Track: Vibration and noise dampening	$10,128,587
20 STATIONS, STOPS, TERMINALS, INTERMODAL		**$447,760,865**
20.01	At-grade station, stop, shelter, mall, terminal, platform	$12,350,419
20.02	Aerial station, stop, shelter, mall, terminal, platform	$383,358,523
20.07	Elevators, escalators	$52,051,922
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		**$120,015,787**
30.01	Administration Building: Office, sales, storage, revenue counting	$231,250
30.02	Light Maintenance Facility	$7,582,704
30.03	Heavy Maintenance Facility	$46,317,810
30.04	Storage or Maintenance of Way Building	$8,892,739
30.05	Yard and Yard Track	$56,991,284
40 SITEWORK & SPECIAL CONDITIONS		**$1,779,053,209**
40.01	Demolition, Clearing, Earthwork	$37,642,653
40.02	Site Utilities, Utility Relocation	$639,434,101
40.03	Haz. mat'l, contam'd soil removal/mitigation, ground water treatme	$8,456,073
40.04	Environmental mitigation, e.g. wetlands, historic/archeologic, parl	$12,006,915
40.05	Site structures including retaining walls, sound walls	$21,355,425
40.06	Pedestrian / bike access and accommodation, landscaping	$14,955,857
40.07	Automobile, bus, van accessways including roads, parking lots	$108,935,829
40.08	Temporary Facilities and other indirect costs during construction	$936,266,356
50 SYSTEMS		**$298,369,347**
50.01	Train control and signals	$148,646,622
50.03	Traction power supply: substations	$32,866,176
50.04	Traction power distribution: catenary and third rail	$31,729,292
50.05	Communications	$63,192,408
50.06	Fare collection system and equipment	$18,357,498
50.07	Central Control	$3,577,351
Construction Subtotal (10 - 50)		**$4,042,039,995**
60 ROW, LAND, EXISTING IMPROVEMENTS		**$211,435,458**
60.01	Purchase or lease of real estate	$181,530,966
60.02	Relocation of existing households and businesses	$29,904,492
70 VEHICLES (80)		**$198,742,570**
70.01	Light Rail	$178,742,247
70.05	Other	$399,372
70.06	Non-revenue vehicles	$13,492,575
70.07	Spare parts	$6,108,376
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		**$1,910,044,823**
80.01	Preliminary Engineering	$110,117,512
80.02	Final Design	$391,750,550
80.03	Project Management for Design and Construction	$750,756,095
80.04	Construction Administration & Management	$268,318,017
80.05	Professional Liability and other Non-Construction Insurance	$114,295,742
80.06	Legal; Permits; Review Fees by other agencies, cities, etc.	$86,677,646
80.07	Surveys, Testing, Investigation, Inspection	$121,487,753
80.08	Start up	$66,641,507
Subtotal (10 - 80)		**$6,362,262,846**
90 UNALLOCATED CONTINGENCY		**$0**
Subtotal (10 - 90)		**$6,362,262,846**
100 FINANCE CHARGES		**$464,897,000**
Total Project Cost (10 - 100)		**$6,827,159,846**

City and County of Honolulu
Honolulu Rail Transit Project
Plan B (East Kapolei to Downtown)

Inflated Cost to Year of Expenditure

STANDARD COST CATEGORY DESCRIPTION	Base Year Dollars w/o Contingency	Base Year Dollars Allocated Contingency	Base Year Dollars TOTAL	Inflation Factor	YOE Dollars TOTAL
10 GUIDEWAY & TRACK ELEMENTS	$1,359,270,824	$16,440,283	$1,374,805,889	1.0160	$1,396,840,788
20 STATIONS, STOPS, TERMINALS, INTERMODAL	$416,036,113	$18,564,562	$444,146,408	1.0081	$447,760,865
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	$119,400,067	$0	$120,015,787	1.0000	$120,015,787
40 SITEWORK & SPECIAL CONDITIONS	$1,307,780,411	$24,652,016	$1,751,913,892	1.0155	$1,779,053,209
50 SYSTEMS	$289,251,468	$7,402,879	$298,369,347	1.0000	$298,369,347
60 ROW, LAND, EXISTING IMPROVEMENTS	$210,311,604	$5,945	$211,435,458	1.0000	$211,435,458
70 VEHICLES	$191,882,721	$6,859,849	$198,742,570	1.0000	$198,742,570
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	$1,449,996,627	$8,429,780	$1,905,053,494	1.0026	$1,910,044,823
90 UNALLOCATED CONTINGENCY			$0		$0
100 FINANCE CHARGES*			$464,897,000	1.0000	$464,897,000
Total Project Cost (10 - 100)			**$6,769,379,845**	**1.0085**	**$6,827,159,846**

*Preliminary Finance Costs of $465 Million could significantly increase depending on action taken by the State Legislature regarding the possible extension of the GET Surcharge as well the terms upon which the extension is based.

MAIN WORKSHEET-BUILD ALTERNATIVE

City and County of Honolulu — Today's Date: **Jan 2017**

Honolulu Rail Transit Project, East Kapolei to Downtown — Yr of Base Year $: Jan 2017

Full Funding Grant Agreement — Yr of Revenue Ops: FY 2026

	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	**20.09**	1,359,270,824	16,440,283	**1,374,805,889**	**$ 68,419,578**	**34%**	**20%**	**1,396,840,788**
10.01 Guideway: At-grade exclusive right-of-way		0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)		17,378	0	17,378				17,378
10.03 Guideway: At-grade in mixed traffic		0	0	0				0
10.04 Guideway: Aerial structure	19.75	1,242,360,062	15,409,627	1,256,541,688	$ 63,622,364			1,275,137,914
10.05 Guideway: Built-up fill		4,588,992	98,204	4,687,196				4,687,196
10.06 Guideway: Underground cut & cover		0	0	0				0
10.07 Guideway: Underground tunnel		0	0	0				0
10.08 Guideway: Retained cut or fill	0.34	0	0	0	$ -			0
10.09 Track: Direct fixation		101,007,366	851,455	102,181,604				104,665,135
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		2,070,778	80,997	2,151,775				2,204,578
10.13 Track: Vibration and noise dampening		9,226,248	0	9,226,248				10,128,587
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	**21**	416,036,113	18,564,562	**444,146,408**	**$ 21,149,829**	**11%**	**7%**	**447,760,865**
20.01 At-grade station, stop, shelter, mall, terminal, platform	1	11,312,189	1,038,230	12,350,419	$ 12,350,419			12,350,419
20.02 Aerial station, stop, shelter, mall, terminal, platform	20	352,672,002	17,526,331	379,744,066	$ 18,987,203			383,358,523
20.03 Underground station, stop, shelter, mall, terminal, platform		0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.		0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		0	0	0				0
20.07 Elevators, escalators		52,051,922	0	52,051,922				52,051,922
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		119,400,067	0	**120,015,787**	**$ 5,972,792**	**3%**	**2%**	**120,015,787**
30.01 Administration Building: Office, sales, storage, revenue counting		231,250	0	231,250				231,250
30.02 Light Maintenance Facility		7,582,704	0	7,582,704				7,582,704
30.03 Heavy Maintenance Facility		45,702,090	0	46,317,810				46,317,810
30.04 Storage or Maintenance of Way Building		8,892,739	0	8,892,739				8,892,739
30.05 Yard and Yard Track		56,991,284	0	56,991,284				56,991,284
40 SITEWORK & SPECIAL CONDITIONS		1,307,780,411	24,652,016	**1,751,913,892**	**$ 87,187,006**	**44%**	**26%**	**1,779,053,209**
40.01 Demolition, Clearing, Earthwork		35,110,810	2,169,792	37,280,602				37,642,653
40.02 Site Utilities, Utility Relocation		604,089,942	3,976,814	629,926,029				639,434,101
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		8,090,543	65,530	8,456,073				8,456,073
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		11,391,864	615,051	12,006,915				12,006,915
40.05 Site structures including retaining walls, sound walls		20,669,928	444,880	21,355,425				21,355,425
40.06 Pedestrian / bike access and accommodation, landscaping		14,442,427	211,681	14,654,108				14,955,857
40.07 Automobile, bus, van accessways including roads, parking lots		102,258,054	1,875,726	104,133,780				108,935,829
40.08 Temporary Facilities and other indirect costs during construction		611,726,843	15,292,544	924,100,961				936,266,356
50 SYSTEMS		289,251,468	7,402,879	**298,369,347**	**$ 14,848,863**	**7%**	**4%**	**298,369,347**
50.01 Train control and signals		144,956,435	3,790,187	148,646,622				148,646,622
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		31,708,553	1,157,623	32,866,176				32,866,176
50.04 Traction power distribution: catenary and third rail		31,333,630	395,662	31,729,292				31,729,292
50.05 Communications		61,256,561	1,935,847	63,192,408				63,192,408
50.06 Fare collection system and equipment		16,642,498	0	18,357,498				18,357,498
50.07 Central Control		3,453,791	123,560	3,577,351				3,577,351
Construction Subtotal (10-50)		3,491,738,884	67,059,740	**3,989,251,323**	**$ 198,531,948**	**100%**	**59%**	**4,042,039,995**
60 ROW, LAND, EXISTING IMPROVEMENTS		210,311,604	5,945	**211,435,458**	**$ 10,522,449**		**3%**	**211,435,458**
60.01 Purchase or lease of real estate		181,530,966	0	181,530,966				181,530,966
60.02 Relocation of existing households and businesses		28,780,638	5,945	29,904,492				29,904,492
70 VEHICLES (number)	**80**	191,882,721	6,859,849	**198,742,570**	**$ 2,484,282**		**3%**	**198,742,570**
70.01 Light Rail	80	172,568,577	6,173,670	178,742,247	$ 2,234,278			178,742,247
70.02 Heavy Rail		0	0	0				0
70.03 Commuter Rail		0	0	0				0
70.04 Bus		0	0	0				0
70.05 Other		390,200	9,172	399,372				399,372
70.06 Non-revenue vehicles		13,026,548	466,027	13,492,575				13,492,575
70.07 Spare parts		5,897,396	210,980	6,108,376				6,108,376
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		1,449,996,627	8,429,780	**1,905,053,494**	**$ 94,808,261**	**48%**	**28%**	**1,910,044,823**
80.01 Preliminary Engineering		107,040,130	3,077,382	110,117,512				110,117,512
80.02 Final Design		377,290,828	2,789,729	387,291,511				391,750,550
80.03 Project Management for Design and Construction		544,648,090	388,860	750,756,095				750,756,095
80.04 Construction Administration & Management		168,033,336	101,646	267,785,728				268,318,017
80.05 Professional Liability and other Non-Construction Insurance		59,295,742	0	114,295,742				114,295,742
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		51,763,315	0	86,677,646				86,677,646
80.07 Surveys, Testing, Investigation, Inspection		77,320,558	35,284	121,487,753				121,487,753
80.08 Start up		64,604,627	2,036,880	66,641,507				66,641,507
Subtotal (10 - 80)		5,343,929,836	82,355,314	**6,304,462,845**	**$ 313,753,423**		**93%**	**6,362,262,846**
90 UNALLOCATED CONTINGENCY				**0**			**0%**	**0**
Subtotal (10 - 90)				**6,304,462,845**	**$ 313,753,423**		**93%**	**6,362,262,846**
100 FINANCE CHARGES				**464,897,000**			**7%**	**464,897,000**
Total Project Cost (10 - 100)				**6,769,379,845**	**$ 336,889,821**		**100%**	**6,827,159,846**

Appendix B: Base Cost Estimate by Source of Funding

City and County of Honolulu
Honolulu Rail Transit Project
Plan B (East Kapolei to Downtown)

BCE by Source of Funding

STANDARD COST CATEGORY DESCRIPTION	YOE Dollars TOTAL	Federal 5309 New Starts	Federal Other (Section 5307)	Federal Other (ARRA)	Local
10 GUIDEWAY & TRACK ELEMENTS	$1,396,840,788	$317,316,796	$0	$0	$1,079,523,992
20 STATIONS, STOPS, TERMINALS, INTERMODAL	$447,760,865	$101,716,705	$0	$0	$346,044,160
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	$120,015,787	$27,263,683	$0	$0	$92,752,104
40 SITEWORK & SPECIAL CONDITIONS	$1,779,053,209	$404,143,027	$0	$0	$1,374,910,182
50 SYSTEMS	$298,369,347	$67,779,811	$0	$0	$230,589,536
60 ROW, LAND, EXISTING IMPROVEMENTS	$211,435,458	$48,031,259	$0	$0	$163,404,199
70 VEHICLES	$198,742,570	$45,147,848	$0	$0	$153,594,722
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	$1,910,044,823	$433,900,061	$0	$4,000,000	$1,472,144,762
90 UNALLOCATED CONTINGENCY	$0	$0	$0	$0	$0
100 FINANCE CHARGES	$464,897,000	$104,700,810	$0	$0	$360,196,190
Total Project Cost (10 - 100)	**$6,827,159,846**	**$1,550,000,000**	**$0**	**$4,000,000**	**$5,273,159,846**

Sources of Federal Funding and Matching Share Ratios	Costs Attributed to Source of Funds	All Federal Funds	Federal/ Local Matching Ratio within Source	Local Funds
Federal 5309 New Starts	$6,823,159,846	$1,550,000,000	23/77	$5,273,159,846
Federal Other (Section 5307)	$0	$0	N/A	$0
Federal Other (ARRA)	$4,000,000	$4,000,000	100/0	$0
Total	$6,827,159,846	$1,554,000,000		$5,273,159,846
Overall Federal Share of Project	**23%**			
New Starts Share of Project	**23%**			

Appendix H: Basis of Schedule

Exhibit H-1: Plan A (Preferred Project)

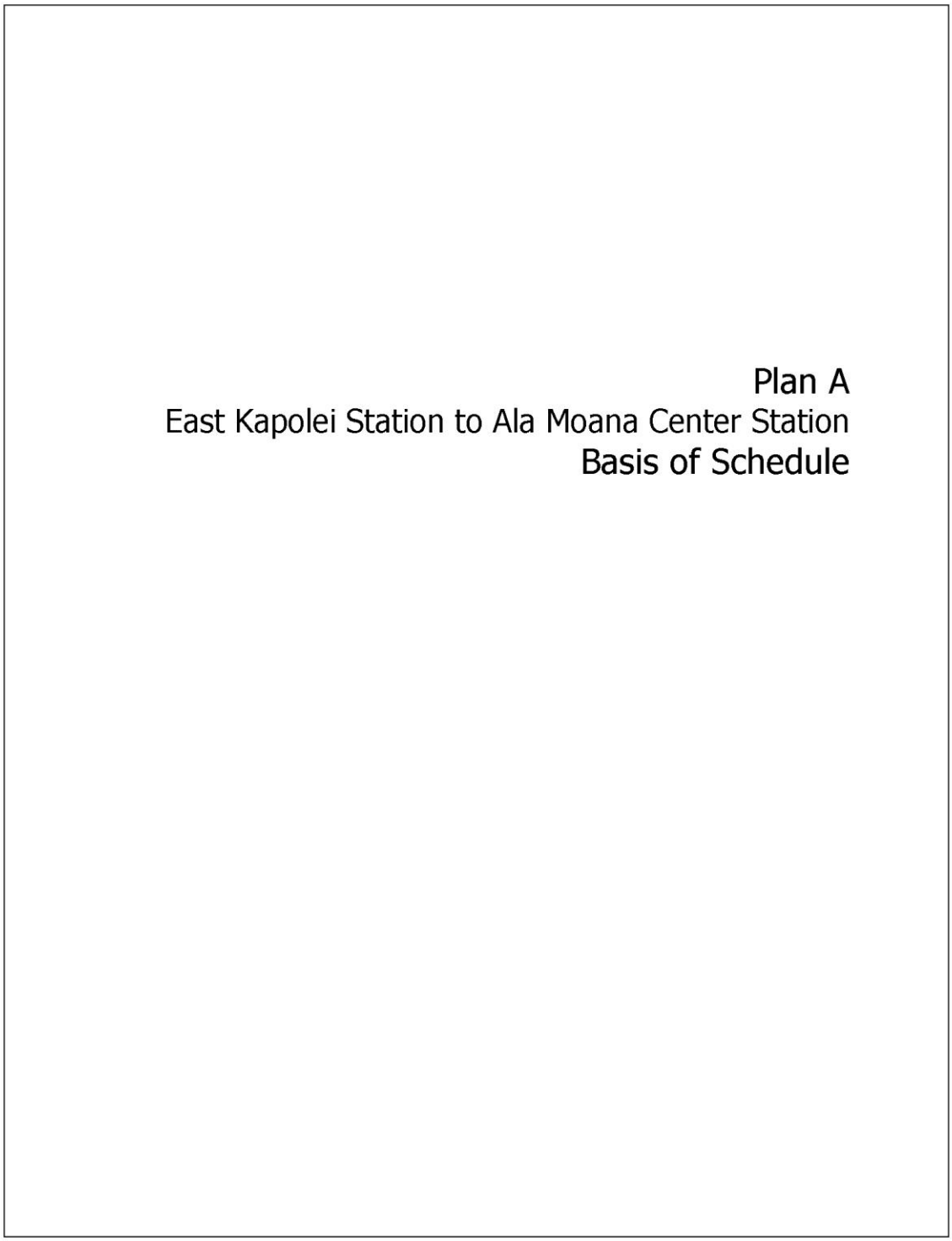


Table of Contents

Acronyms and Abbreviations

AGS	Airport Guideway and Stations
BOE	Basis of Estimate
CCGS	City Center Guideway and Stations
CSC	Core Systems Contractor
DB	Design-Build
DBB	Design-Bid-Build
EAC	Estimate at Completion
FHSG	Farrington Highway Station Group
FTA	Federal Transit Administration
HART	Honolulu Authority for Rapid Transportation
HRTP	Honolulu Rail Transit Project
ICE	Independent Cost Estimate
KHG	Kamehameha Highway Guideway
KHSG	Kamehameha Highway Station Group
MOS	Minimum Operable Segment
MSF	Maintenance and Storage Facility
PHGT	Pearl Highlands Garage and Transit Center
PM	Project Manager
ROC	Rail Operations Center
ROM	Rough Order of Magnitude
ROW	Right-of-Way
RSD	Revenue Service Date
SCC	Standard Cost Category
WOFH	West O'ahu/Farrington Highway Guideway
WOSG	West O'ahu Stations Group
YOE	Year of Expenditure

Acronyms and Abbreviations

AGS	Airport Guideway and Stations
BCS	Balanced Cantilevered Spans
BFS	City and County of Honolulu, Department of Budget and Fiscal Services
BOS	Basis of Schedule
CAM	Construction Access Milestone
CCGS	City Center Guideway and Stations
CEI	Construction Engineering and Inspection
CFCG	Configuration Control Group
CPM	Critical Path Methodology
CSC	Core Systems Contractor
DB	Design-Build
DBB	Design-Bid-Build
DBOM	Design-Build-Operate-Maintain
DFIM	Design-Furnish-Install-Maintain
DTU	Dillingham Temporary Utilities
E&E	Elevators and Escalators
EV	Earned Value
FEIS	Final Environmental Impact Statement
FHSG	Farrington Highway Station Group
FTA	Federal Transit Administration
GET	General Excise Tax
HART	Honolulu Authority for Rapid Transportation
HRTP	Honolulu Rail Transit Project
KHG	Kamehameha Highway Guideway
KHSG	Kamehameha Highway Station Group
kV	Kilovolt
LCC	Leeward Community College
MOT	Maintenance of Traffic
MPIS	Master Project Integrated Schedule
MPS	Master Project Schedule
MSF	Maintenance and Storage Facility
NTP	Notice to Proceed
PHGT	Pearl Highlands Garage and Transit Center
ROC	Rail Operations Center
ROW	Right-of-Way
SOM	Schedule of Milestones
SOV	Schedule of Values
SPI	Schedule Performance Index
SV	Schedule Variance
TPSS	Traction Power Substation
UHWO	University of Hawai‘i–West O‘ahu
WBS	Work Breakdown Structure
WOFH	West O‘ahu/Farrington Highway Guideway
WOSG	West O‘ahu Stations Group

1 Introduction

This Basis of Schedule (BOS) is intended to describe the methodology and assumptions used to develop and provide updates to the Master Project Integrated Schedule (MPIS). This document was previously updated on June 17, 2012, with a supplemental document provided in November 2015 (*Basis of Schedule Update*, dated November 05, 2015) which described changes in the anticipated contracting methodology and provided schedule details for the easternmost portion of the corridor.

The Honolulu Rail Transit Project (HRTP or the Project) consists of a 20.1-mile fixed rail system on elevated guideway structure from East Kapolei to Ala Moana Center, 20 elevated stations, 1 at-grade station, a Rail Operations Center (ROC, formerly known as the Maintenance and Storage Facility [MSF]) and service yard, parking facilities, intermodal facilities, utilities, roadway improvements, all system work, right-of-way (ROW) acquisition, relocations, 80 driverless rail vehicles, and complete professional services, including design, construction management, and owner costs.

The Project is approximately 36% complete, which includes completion of the ROC and 10.75 miles of elevated guideway constructed from the East Kapolei Station site to just past the Aloha Stadium Station site. It should be noted that the reported percentages complete are based on the current Estimate at Completion (EAC) and estimated Revenue Service Date (RSD) of December 2025.

With the recent award of the Airport Guideway and Stations (AGS) Design-Build contract, the Honolulu Authority for Rapid Transportation (HART) currently has over $4.27 billion either completed or under contract, which includes 15.9 of the 20.1 miles of guideway and 13 of the 21 stations. The two most significant contract packages yet to be awarded are the City Center Guideway and Stations (CCGS) Design-Build package and the Pearl Highlands Garage and Transit Center (PHGT) Design-Build package; both are scheduled to be procured in 2018.

The upcoming contract packages will require a Baseline Schedule that will utilize the Critical Path Methodology (CPM) to depict the necessary detail of activities, durations, interim milestones, and logic necessary to achieve the contract-defined milestone requirements. In addition, interdependency logic ties by way of Contract Access Milestones (CAMs) will be included in order to define crucial access and cross-contract exchange of design, construction, and operational status information.

The MPIS shall be cost-loaded, to enable cost disbursement charts and trending histograms to be created from current actual costs. A Schedule of Milestones (SOM) will enable the MPIS to also be structured with earned value measurement gauges with assigned payment amounts upon accomplishment; Schedule Performance Index (SPI) indicators can then be charted and monitored at both the contract level and at the overall MPIS level. Each monthly update of the individual contracts' baseline CPM schedules will be summarized into the overall MPIS and will include CAM interfaces, coordination with third-party entities, and contract milestones. Each monthly update is reviewed and compared against the approved baseline, with any variances noted and reported with recommended corrective actions.

2 Project Goals

The Project has the following goals:

- Improve mobility within the corridor
- Improve travel reliability within the corridor
- Improve access to planned development in support of the City and County of Honolulu (City) policy to develop a Second Urban Center
- Improve transportation equity within the corridor

3 Project Calendars

The standard global Project calendar used for work days is 5 days per week, 8 hours per day, with 10 holidays, as indicated below.

The following ten holidays are incorporated as non-work periods in the global calendar.

Table 3-1 Global Project Calendar Holidays

Holiday	Time of Event
New Year's Day	1st work day in January
Martin Luther King, Jr., Day	2nd Monday in January
President's Day	3rd Monday in February
Memorial Day	Last Monday in May
King Kamehameha Day	11th day in June
Independence Day	4th day in July
Labor Day	1st Monday in September
Thanksgiving	4th Thursday in November
Day after Thanksgiving	4th Friday in November
Christmas	25th day in December

The global Project calendar to be used for contractor and subcontractor procurement activities for calendar days is 7 days per week, 8 hours per day (without holidays).

4 FTA Milestones

The following table details dates upon which the Project has achieved or is projected to achieve certain FTA milestones:

Table 4-1 Project FTA Milestones

Milestone	Date
Approval to Enter Preliminary Engineering	October 29, 2010 (Actual)
Final Environmental Impact Statement (FEIS) Record of Decision Issued	January 18, 2011 (Actual)
Approval to Enter Final Engineering	December 29, 2011 (Actual)
Full Funding Grant Agreement	December 19, 2012 (Actual)
FTA Recovery Plan A Submittal	April 30, 2017 (Projected)
Current FTA Revenue Service Date	January 31, 2020 (Projected)
Recovery Plan – Plan A Revenue Service Date	December 31, 2025 (Projected)

The following are awarded construction contracts with Substantial Completion dates:

Table 4-2 Awarded Construction Contract Substantial Completion Dates

Construction Contract	Substantial Completion Date
West O'ahu/Farrington Highway Guideway (WOFH) Design-Build (DB)	March 3, 2017*
Kamehameha Highway Guideway (KHG) DB	May 12, 2017
MSF DB	July 2, 2016 (actual)
West O'ahu Stations Group (WOSG) Design-Bid-Build (DBB)	March 12, 2018*
Farrington Highway Station Group (FHSG) DBB	December 17, 2017*
Kamehameha Highway Station Group (KHSG) DBB	May 17, 2019*
AGS DB	April 30, 2021
Core Systems Contractor (CSC) Design-Build-Operate-Maintain (DBOM)	March 15, 2019*
Fare Collection System Design-Furnish-Install-Maintain (DFIM)	January 15, 2029
Elevators and Escalators (E&E) DFIM	July 12, 2018*

*Change Orders are expected, or are in process, that may amend the Substantial Completion date.

During the last four years, and since the BOS Revision 3 was completed, there was a change in the expected contracting methodology and re-packaging of several construction contracts. This resulted in two large construction contract packages remaining to be awarded: the CCGS DB contract and the PHGT DB contract.

Passenger Service has been planned to support a uniform startup process and is broken into two passenger service opening dates:

- December 2020 for the nine west-side stations and guideway through Aloha Stadium Station, to be completed and opened as an Interim Opening Service date.
- December 2025 for the balance of the system including all 21 stations.

This BOS assumes the current General Excise Tax (GET) extension request will be approved by the State Legislature, Governor, and City Council, permitting the full build-out of the originally planned Minimum Operating Segment from East Kapolei to Ala Moana Center.

5 Schedule Control and Reporting

The original assumption of the June 2012 BOS was to have a MPS consisting of summarized dates from a series of project-wide network activities (ROW, Utilities by Utility Companies, Environmental Permits, etc., as well as unawarded construction or DB projects). These summarized dates and activities were to be updated on a monthly basis by HART personnel utilizing the final design and construction contract milestone dates. Over time, this translated into HART Project Controls staff updating the MPIS feeder schedules based on progress schedules from the construction contractors. The HART personnel, starting with the WOFH contract, were not able to receive timely progress schedules from the contractors, resulting in HART's delayed ability to keep the MPIS current.

As of the writing of this BOS (April 2017), the CPM schedule update process is being revised. The MPIS will consist of Control Level Schedules (Level 3) with summary activities or Level of Effort activities (with status taken from the contractors' schedule) and include the contract milestones for the overall Project. Included in the detailed Baseline CPM Schedule updates are the CAM dates that are used to monitor and control "cross-contract" interfaces. The MPIS will include milestones and activities that depict schedule activity that may potentially affect progress not detailed in the contractor schedules, or include information of pending contract awards. The primary guideline of MPIS content is that the information at a summary level contained within the MPIS is available and may be appropriate for public knowledge. The MPIS will be updated by the HART Project Controls team on a monthly basis.

The contractors' CPM monthly progress schedules will be used to provide monthly updates to the Control Level Schedules that feed input to the MPIS. If contractors do not provide timely progress schedules (as was routine through 2016), the HART Project Controls staff will update the Control Level Schedule based on field staff daily reports, weekly reports, monthly reports, and discussions with the Construction Engineering and Inspection (CEI) field staff and/or CEI schedulers.

The contractors' progress schedules are to be cost loaded according to the Schedule of Milestones (SOM) or Schedule of Values (SOV) as appropriate. With the SOM/SOV included in the Baseline Schedule, the detailed schedules will also provide a cash flow projection (Planned Value or Budgeted Cost of Work Scheduled) and actual scope accomplishment (Earned Value or Budgeted Cost of Work Performed), allowing for an evaluation of schedule performance.

6 Network of Schedules

6.1 Master Project Schedule

The Master Project Schedule (MPS) is a feeder schedule to the MPIS that includes the following:

- Environmental Actions
- Professional Services contracts (that is, Final Design, General Engineering Consultant, and CEI)
- Summary Levels of Effort for presentation purposes
- Procurement activities
- On-Call Contractor durations
- Airport Guideway and Stations construction planning activities
- Agreements/Memoranda of Understanding
- Major milestone dates such as Interim Opening and Revenue Service Date

The purpose of the MPS has been to act as the backbone of the MPIS. The construction contracts and the Core Systems Contract started out as a set of summary activities embedded in the MPS. As the Project specifics were developed, the activities were expanded and eventually became a separate feeder schedule with external logic ties to the MPIS. There are only two remaining construction schedules remaining in the MPS at the time of this writing: AGS and PHGT. For the purposes of Plan A, the PHGT activity durations have been zeroed out. As the baseline schedule for AGS is submitted and eventually accepted by HART, the AGS activities in the MPS schedule will be deleted and replaced with a summarized schedule developed from the contractor's schedule, and external logic ties will be made in order to integrate it with the other related contracts.

The CSC schedule is currently presented as two separate feeder schedules. The schedule portraying the western segment (Segment 1), leading to the Interim Opening at Aloha Stadium Station, summarizes the CSC schedule into a manner against which HART can properly track and forecast the impact of other contracts. The schedule portraying the eastern segment (Segment 2), leading to the Revenue Service Date, is more conceptual but still provides the necessary activities, durations, and milestones in order to portray the CSC time required to complete the systems work upon the completion of the construction. The CSC Segment 2 schedule will be expanded upon within the next year in order to provide a higher level of detail for tracking impacts to specific systems work leading to the RSD.

6.2 Guideway Segments

Each guideway section contains utility relocations, cast-in-place drilled shaft foundations, cast-in-place columns, pre-cast structural guideway bridge segments, trackwork, and roadway/site restoration work. The 20.1-mile corridor is broken down into the following segments:

- WOFH: 6.87 miles
- KHG: 3.88 miles
- AGS: 5.15 miles
- CCGS: 4.16 miles

Table 6-1 Guideway Segment Elements Breakdown

Segment	Foundation Shafts (Piers)	Columns	Pre-cast Segments	Aerial Stations	At-Grade Stations
West O'ahu/ Farrington Highway	309 completed	283 completed	3,209 – completed 84 – Balanced Cantilevered Spans (BCS) completed	5	1
Kamehameha Highway	186 completed	169 completed	2,029 – completed 43 – BCS completed	3	0
Airport	239	232	2,780	4	0
City Center	195	176	1,892 segments (172 spans)	8	0
Project Totals	**929**	**860**	**10,037**	**20**	**1**

Foundation shafts and columns that are not yet designed as part of a DB contract are based on typical 125-foot spacing. Pre-cast segments are based on normal 11-foot lengths. Some foundations have multiple piers (drilled shafts) supporting a single column, thus the difference in quantities.

Utility Relocations are performed by DB contractors, utility relocation contractors, and utility owners (based on Utility Agreements).

6.3 West-side Stations

The station groups on the WOFH and KHG segments, from East Kapolei to Aloha Stadium, are currently under construction as separate DBB contracts as indicated below. CAM dates are established within each of the three station contracts that correlate to milestone start activities in the CSC and E&E contracts.

The FHSG consists of West Loch Station, Waipahu Transit Center Station, and Leeward Community College (LCC) Station. LCC Station is the only at-grade station in the corridor, with the other facilities built alongside and over/under the WOFH guideway segment.

The WOSG consists of Ho'opili Station, University of Hawai'i–West O'ahu (UHWO) Station, and East Kapolei Station. All stations are built alongside and over/under the WOFH guideway segment.

The KHSG consists of Pearl Highlands Station, Pearlridge Station, and Aloha Stadium Station. Pearl Highlands Station is built alongside and over WOFH. Aloha Stadium Station and Pearlridge Station are built alongside and over/under the KHG segment.

6.4 East-side Guideway and Stations

The AGS DB contract is underway and consists of 171 spans of guideway and four stations, namely Pearl Harbor Naval Base Station, Honolulu International Airport Station, Lagoon Drive Station, and Middle Street Transit Center Station.

Dillingham Temporary Utilities (DTU) is an advanced utility relocation contract with the goal of temporarily relocating existing underground dry utilities (electrical, communications, telephone, cable, etc.) to newly installed utility poles along the Makai side of Dillingham Boulevard. It is anticipated that HART's On-Call Construction Contractor will be performing this work with the respective public utility companies.

The CCGS DB contract has yet to be awarded, and the scope of work involves 4.2 miles of elevated guideway and eight elevated stations. This contract is planned for award in May 2018 with Notice to Proceed (NTP) in August 2018. The CCGS guideway segment begins along Kamehameha Highway/Dillingham Boulevard, just east of the Middle Street Transit Center Station, and ends on Kona Street at Kona Iki Street, adjacent to Ala Moana Center. The eight stations within this segment consist of Kalihi Station, Kapālama Station, Iwilei Station, Chinatown Station, Downtown Station, Civic Center Station, Kaka'ako Station, and Ala Moana Center Station.

The details of the current contracting strategy for the CCGS schedule were initially developed in June 2015, with the Basis of Schedule contained in Appendix B of the "White Paper on Remaining Schedule and Expected Revenue Service Date" prepared by the HART Project Controls Division. In the months that followed, the schedule underwent an iterative process between HART Project Controls and the East CEI team. This process added more detailed activities/logic and considered topics such as productivity and work sequencing. Several meetings and discussions took place during this time.

With the AGS contract now awarded, the primary focus on the remaining CCGS segment is provided herein. The CGGS guideway segments are broken down into the following work areas for HART scheduling purposes only and are likely to be modified by the selected DB contractor in 2018.

- Area 1A: Track Stationing 1275 to Stationing 1295, (Span 636 to Span 655), which includes Kalihi Station.
- Area 1B: Track Stationing 1295 to Stationing 1333, (Span 656 to Span 680).

- Area 1C: Track Stationing 1333 to Stationing 1356, (Span 681 to Span 697), which includes Kapālama Station.
- Area 2: Track Stationing 1356 to Stationing 1374, (Span 698 to Span 711), which includes Iwilei Station.
- Area 3: Track Stationing 1374 to Stationing 1407, (Span 712 to Span 739), which includes Chinatown Station and Downtown Station.
- Area 4: Track Stationing 1407 to Stationing 1445, (Span 740 to Span 767), which includes Civic Center Station.
- Area 5: Track Stationing 1445 to Stationing 1471, (Span 768 to Span 788), which includes Kaka'ako Station.
- Area 6: Track Stationing 1471 to Stationing 1493, (Span 789 to Span 807), which includes Systems Site #23 and Ala Moana Center Station.

6.5 Rail Operations Center (ROC)

The ROC reached Substantial Completion on July 2, 2016. The CSC is now in control of the ROC facilities. Installation of facility equipment and rail yard track power and communications is ongoing.

6.6 Core Systems Contractor (CSC)

The CSC has partial/shared access to the guideway and stations during fixed facility construction to install cable and equipment until Substantial Completion of a fixed facility. CSC then has full access to complete systems installation and to perform integrated testing and pre-operations demonstrations that lead to the passenger opening. In general, each guideway and station contract has been scheduled such that the CSC will have a period of 4 to 6 months for installation prior to Substantial Completion of the fixed facility. The partial/shared access will require coordination and site control by the associated fixed facility contractor. Following Substantial Completion of the fixed facilities, the CSC has up to 9 months to complete installation, testing, and commissioning activities with full site control.

Remaining Access Criteria for CSC:

- Partial/shared access at-grade or on-deck of the guideway:
  - Guideway site remains under the control of the guideway contractor.
  - Specified civil interface points are complete and validated.
  - The Traction Power Substation (TPSS) sites have been prepared by the civil contractor and are free and clear and available for the installation of the TPSS equipment.

  - A reasonable section of at-grade system-wide duct bank is available to allow the commencement of CSC cable pulling activities.
  - On-deck access is available into the viaduct for installation of main cable ways.
  - On-deck access is available to a reasonable length of installed track to allow commencement of wayside equipment installation.

- Full access work-site control at-grade or on-deck of the guideway:
  - The site is handed over from the guideway contractor to the CSC.
  - All civil activities are complete to enable the electrical and mechanical systems to be powered and tested.
  - At-grade, all system-wide duct banks are installed.
  - On-deck, all track and third-rail equipment is fully installed.

- Shared access to equipment rooms in stations:
  - Equipment rooms within a station are complete including the first coat of paint.
  - The rooms and adjacent areas are clean and free of dust.
  - Doors are mounted and lockable.
  - Hanging ceilings and raised floors (if applicable) have not necessarily been installed, but all mounting positions are marked.
  - Temporary power and lighting is available.
  - All specified civil interface points are complete and validated.

- Balance of partial/shared access in stations:
  - Access is provided to passenger circulation and platform areas for installation of the balance of electrical and mechanical systems.
  - All areas are clean and free of dust or dust-producing activities.
  - Hanging ceilings have not necessarily been installed, but mounting brackets or locations are marked.
  - All specified civil interface points are complete and validated.

- For fare vending machine installation (by the separate Fare Collection System Contractor), passenger concourse areas must have final floor finishing complete.

- Full access work-site control in stations:
  - Work site control is handed over from the station contractor to the CSC.
  - With the exception of minor finishing activities, all civil and facility works are complete including station auxiliary equipment such as fire control and air conditioning, enabling all electrical and mechanical work to be completed and tested.
  - The station is clean and free of dust.
  - Subject to the CSC processes, the station is able to be powered and functionally tested.

Due to delays to the CSC contract, from the original contract award, the CSC is planning to incorporate a "pause" of the systems installation from April 25, 2019, to October 8, 2021, and a "pause" of all work not related to the operation and maintenance activities in the CSC contract from January 20, 2020, to October 9, 2021. With this scenario, the CSC will have approximately three years to complete systems installation and testing prior to the full RSD.

6.7 Other Project-wide Contracts

The E&E Contract has been established wherein each station will be designed to standard dimensions and envelopes so that the E&E Contractor can furnish, install, test, and maintain the elevators and escalators in concert with the CSC and fixed facility operations. The E&E Contractor will work closely with each station designer and contractor to interface and integrate associated supporting systems installation.

7 Contract Status

The status of each HRTP contract and its impact on the Interim Opening Date and the Revenue Service Date is shown below.

Table 7-1 Contract Status and Impact

Contract	Impacts	Status
WOFH	Interim Opening	Nearing Substantial Completion
KHG	Interim Opening	Nearing Substantial Completion
WOSG	Interim Opening	Early Construction – Not Critical Path
FHSG	Interim Opening	Early Construction – Not Critical Path
KHSG	Interim Opening	Early Construction – **Critical Path**
MSF	Interim Opening	Substantially Complete
AGS	Revenue Service	Early Design – Not Critical Path
DTU	Revenue Service	Design planned completion in April 2017
CCGS	Revenue Service	Planned solicitation for NTP on August 31, 2018 – **Critical Path**
CSC	Both	**Critical Path** upon KHSG completion for Interim Opening **Critical Path** upon CCGS completion for Revenue Service

8 Production Rate Assumptions

Table 8-1 Production Rate Assumptions

Type of Work	Production Rate (per crew)
Foundations (drilled shafts 7 to 8 feet in diameter)	6 days per shaft (drilling, cleaning, inspection, install rebar cage, monitoring ducts, place concrete, and complete transition zone)
Columns (20 to 50 feet in length)	6 days per column (install rebar, install formwork, place concrete, and remove formwork for standard piers and L-type piers)
Precast Segment Structure (each truss for supporting 11 segments per span)	4.6 days per span (launch, initial set, epoxy, align, post-tension, and grout)
Utilities Relocation	
Water Line (Trenching and Installation)	9 to 16 linear feet per day
Sewer Line (Trenching and Installation)	8 to 13 linear feet per day
Duct Bank, 18 inches wide x 4 feet deep	14 linear feet per day
Duct Bank, 24 inches wide x 5 feet deep	10 linear feet per day
Duct Bank, 36 inches wide x 5 feet deep	4 to 9 linear feet per day

9 Schedule Contingency

Given the critical path described below, the current schedule (Plan A) contains 355 days of contingency leading to a Revenue Service Date of December 31, 2025. Contingency is tracked as a separate activity at the end of the Project.

10 Assumptions (CCGS Plan A)

The following assumptions have been considered in Plan A regarding CCGS:

- The CSC will incorporate a "pause" of the systems installation from April 25, 2019, to October 8, 2021, and a "pause" of all work not related to the operation and maintenance activities in the CSC contract from January 20, 2020, to October 9, 2021.
- NTP provided to CCGS Contractor by or on August 31, 2018.
- ROW acquisition by HART is assumed to be completed before August 31, 2018.
- The MPIS assumes the HART On-Call Contractor will complete the DTU Contract relocations prior to the CCGS Contactor widening Dillingham Boulevard.
- The CCGS schedule assumes wet utility relocation work will be concurrent with the interim road widening activities.
- The 138 kilovolt (kV) work on Dillingham Boulevard can be performed concurrently with dry utility work, but must be completed prior to the drill shaft operation beginning in the area. The schedule assumes the 138 kV line must be energized prior to segment erection in Areas 1A, 1B, and 1C.
- It is assumed the interim road widening activity must be complete prior to commencing permanent dry utility relocation work in each given Work Area.
- AECOM is preparing final design drawings for the utility relocation and roadway realignment along the entire guideway alignment. The "Signed and Sealed" and utility coordinated drawings provided at the end of the AECOM design contract will be provided to the CCGS bidders as they become available.
    - The intention is for HART to provide Signed and Sealed Drawings for utility relocation and roadworks construction, making the utility relocation a DBB component to the full CCGS DB contract.
    - It is assumed and anticipated that providing utility designs to the selected DB contractor will avoid the large delays experienced on the west-side contracts, due to third-party coordination and review occurring prior to the DB construction contract.
- The Utility Relocations sequencing generally starts with relocating wet utilities, then removal of pre-existing lines with a concurrent effort to relocate dry utilities, followed by guideway drainage and site drainage.

- It is assumed that the relocation of utilities (especially trenching, laying, and backfill of underground power and telecommunication lines) in the median does not overlap with the commencement of drilled shaft construction, except for approximately 100 days in Area 1B.

- The maximum number of crews working in each area is tabulated below. Areas 1B and 6 are on the Critical Path.

Table 10-1 CCGS Work Crew Breakdown

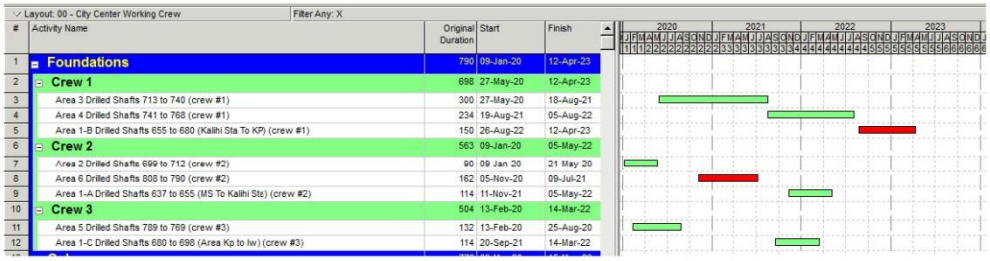
Work Area	Length (Feet)	Maximum Number of Crews	Total Float (months)
Area 1A	2,100	3	2
Area 1B	3,700	5	0
Area 1C	2,400	4	2
Area 2	1,700	3	3
Area 3	3,400	3	0.7
Area 4	3,600	4	4
Area 5	2,700	3	1.5
Area 6	2,300	5	0

- The drilled shaft productivity rate used is 6 days per drilled shaft (drilling, installing rebar cage, placing concrete, and complete transition zone). Typical dimensions are 7 to 8 feet in diameter, and depths range from 40 to 150 feet. A particular area in Area 3, over Nuuanu Stream in the Chinatown area, has a lower productivity of 10 days per drilled shaft to accommodate for the deeper shafts and the difficulty of wet drilling in and near the stream. The productivity is based on historical data from the KHG and WOFH Contracts as well as data drawn from AGS proposals.

- The cast-in-place column/pier productivity rate used is 6 days per column. This is also consistent with the durations on WOFH and KHG, adjusting for specific columns where issues were experienced.

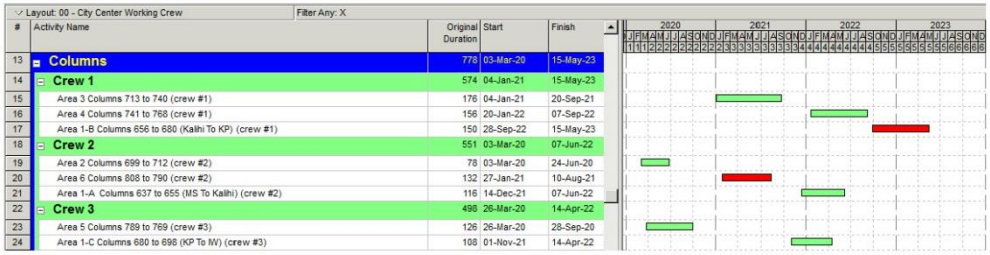
- Three sets of drilled shaft/piling rigs (three work crews) are used to construct the drilled shafts. The sequence of each crew is shown below:

Figure 10-1 CCGS Drilled Shaft/Piling Rig Sequence of Work



- Three sets of formworks (three work crews) are used to construct the columns/piers. The sequence of each crew is shown below:

Figure 10-2 CCGS Formwork Sequence of Work



- Two sets of guideway segment erection trusses (two work crews) are used to construct the guideway bridge segments. The sequence of each crew is shown below:

Figure 10-3 CCGS Guideway Segment Erection Truss Sequence of Work

11 Critical Path

The MPIS is being managed using the CPM, which is managing the longest sequence of activities that must be completed on time for the Project to complete on or by the due date. It identifies critical (versus non-critical) activities that, if one is delayed for a day, the entire Project will be delayed for a day unless a successor Critical Path activity is completed a day earlier. The Critical Path may potentially change each month the MPIS is updated. At the time of this writing, the Critical Path shows the following:

- The DTU Contract removes all of the underground dry utilities from beneath the existing roadway and has the utility companies installing their respective utility lines on temporary joint-use poles. The HART On-Call Contractor will provide assistance to pole installation by removing trees, repairing sidewalks, and providing other support types of construction work.

- Utility relocation is a significant part of the CCGS DB project. The first action envisioned for the CCGS Contractor is to temporarily widen Dillingham Boulevard in order to provide sufficient room for Maintenance of Traffic (MOT). Wet and dry utility relocation work will occur immediately following roadway widening. Installation of dry utility infrastructure, such as duct banks, manholes, handholes, etc., that support the various utilities (Oceanic-Time Warner, Hawaiian Electric Company, Hawaiian Telcom, AT&T), is planned to be completed prior to the utility companies installing conductors and prior to removal from the joint-use poles installed during the DTU project.

- The CCGS Station driving the Critical Path depends upon the sequencing of the guideway construction, which is ultimately decided by the selected CCGS Contractor. The last station to provide partial access to the guideway to CSC will fall on the Critical Path toward the end of the CCGS construction contract.

- The completion of Core Systems installation, final testing, and performance of the demonstration test is tied to station Substantial Completion. This logic provides the CSC 12 months to complete its work, test, certify, and start Revenue Service. There is also 355 days of float (contingency) included leading to Revenue Service on December 31, 2025.

The duration of the CCGS DB Contract is planned to be 65 months. The CCGS Critical Path (longest path) is found to run through two distinct, yet concurrent logic paths.

11.1 Longest Path 1

After NTP and mobilization, the Critical Path runs through Area 1B, interim road widening, utility relocation (trenching, laying of telecommunication lines, and backfilling), drilled shaft construction, column construction, and segment erection, ending with trackwork installations (Area 1B to Area 1C), which leads to CCGS Substantial Completion on January 12, 2024.

11.2 Longest Path 2

After NTP and mobilization, the Critical Path runs through Area 6 utility relocation, drilled shaft construction, column and straddle bent construction, and segment erection from Area 6 to Area 1C, which continues to Kapālama station construction, which ends in CCGS Substantial Completion on January 12, 2024.

12 Price Allocation

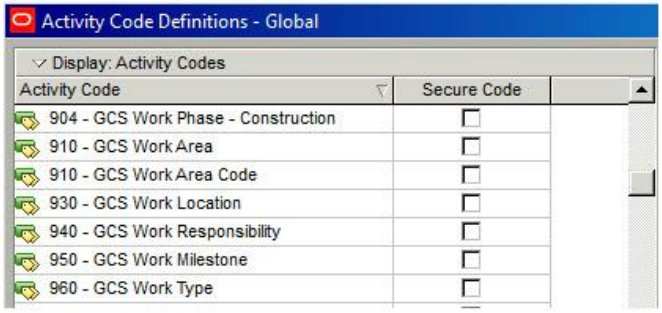
Each contract baseline schedule will be cost loaded and contain cost (price) allocation to activities and/or milestones according to bid/proposal items. These allocations come from the SOM/SOV Pay Items and provide a cash flow based on scope accomplishment and the payment disbursement planned and actual as the contract progresses. The monthly plan versus actual accomplishment will provide a progress indicator that tracks and reports Earned Value (EV), SPI, as well as the Schedule Variance (SV) and financial percent complete.

13 Activity Coding

Based on the HART-furnished Work Breakdown Structure (WBS), the coding system will enable common framework for contracts to be summarized to the MPIS level.

The Global Activity Codes used are as follow:

Figure 13-1 Global Activity Codes



There are three types of milestones used on the contract and MPIS schedules: Pay Milestones, Interface/Coordination Milestones, and Contract Access Milestones. These have unique codes that enable filtering and reporting as well as summarizing to the MPIS level from the contract level. Refer to Appendix A for the WBS established for the HRTP.

14 Constraints and Interfaces

Minimum constraints are used in the MPIS to enable the longest path or Critical Path to be tracked. Constraints are classified as hard constraints or soft constraints. Any constraints other than the start, Interim Opening, and RSD will contain a justification for use.

14.1 Constraints

Each contract contains a list of HART-furnished dates for facility access, environmental permits, materials, and interface milestones (work by others). In addition, a contract may have other site constraints that would be identified with dates (ROW/easements and/or utility relocations by others) or work conditions (for example, the corridor's MOT requirements). It is expected that each contract will contain logic, milestones, and activities that reflect these constraints and interfaces and will be summarized with plans, updates, and progress to the MPIS on a monthly basis. Any interface or impact to other contracts identified at the contract level will be immediately reported through the HART Project Controls Manager to the Configuration Control Group (CFCG) for disposition. The impacting contract status will provide corrective action and/or recommendations for the CFCG to consider.

Core Systems installation access is planned to occur at each station's equipment room approximately 4 months prior to that station's Substantial Completion. Guideway access is first at grade on the completed System Site slabs and duct banks and on deck approximately 6 months prior to Guideway Substantial Completion. At Substantial Completion, full access (and site control) is transferred over to the CSC to complete installation and make ready for Integrated Testing and Demonstration prior to passenger service. This requires that each operating section be Substantially Complete at least 9 months prior to passenger service (Guideway, Stations, and ROC).

14.2 Interface Table

An Interface Table has been generated which lists milestones that are provided ("pitched") by the contractor to others and those received ("caught") by the contractor from others to perform its work. The Interface Manager has the responsibility to conduct meetings to address these interactions of the contractors and maintain/circulate the Interface Table and accompanying status documentation. The contractor-assigned coordinators must participate in these meetings and may identify other key interfaces that could affect schedule performance, which will be monitored by the Interface Manager. Should a contract interface impact progress or productivity or threaten the attainment of key MPIS milestones, the interface is reported with recommended actions to the CFCG.

Please see Appendix B for the Interface Table with CAM dates.

15 Measurement of Scope Accomplishment

The following are typical metrics used to measure progress of scope items:

- Number of design deliverables submitted or approved
- Schedule of Value or Schedule of Milestone items completed
- Linear feet of utilities relocated or installed
- Linear feet of roadworks completed
- Number of drilled shafts/foundations completed
- Number of columns completed
- Number of precast segments casted
- Number of precast segments erected, post-tensioned, and grouted
- Quantity of earthworks excavated or backfilled
- Square feet of slab erected

16 Schedule of Milestones and Schedule of Values

The SOM consists of a number of Pay Items that detail the contract's Schedule of Prices (Price Items) into manageable and verifiable scope items. For example, a Guideway contractor may break their foundations into work areas, and each associated foundation has a SOM Pay Item. When that Pay Item is accomplished and verified by HART staff, payment is made on the agreed-upon portion of the firm price assigned to that item. Pay Items must summarize to and cannot exceed the contract's Price Item and their contract value (lump sum). With payment on completed (accomplished) scope items, the contractors have the freedom to identify discrete elements for payment as long as their accomplishment can be verified by HART. Another example may be the Quality Management Plan (QMP) being broken down into (1) QMP outline, (2) QMP draft, and (3) QMP final, where each has an allocated payment value when submitted.

The SOV is a list furnished by contractors outlining the breakdown of the contract sum by schedule activity. It allocates values for the various parts of the work and is also used as the basis for submitting and reviewing Pay Requests. The SOV is intended to provide linkage between the contractor's baseline schedule and the planned payment request details. Once approved by HART, the SOV serves as the basis for contractor pay requests/invoices, subject to review and confirmation that the amount of work associated with the requested Pay Item values has been satisfactorily performed.

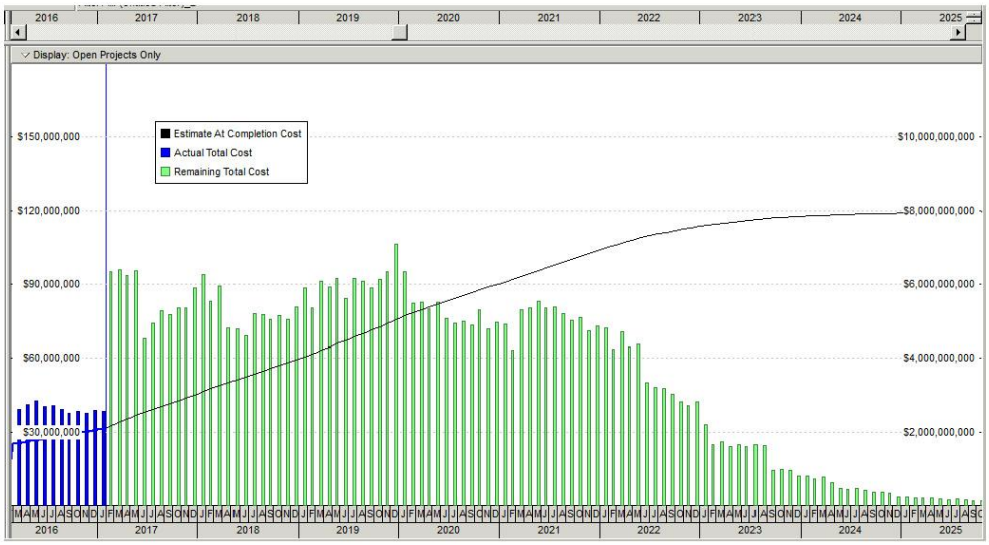
17 Cash Flow Forecast

The revised cost-loaded MPIS Baseline uses a data date of January 31, 2017, which is a re-baseline of the previous MPIS. The target completion date is December 31, 2025, which is the projected Revenue Service Date. The EAC Cost Curve and Remaining Early Cost Histograms will be plotted and used as a baseline for comparison against monthly achievement (Earned Value). The Cash Flow Forecast will be reported in the HART Monthly Progress Report.

For each contract package, the EAC cost curve and Remaining Early Cost Histograms (as of January 31, 2017) will be used to measure the monthly progress.

An example EAC cost curve and Remaining Early Cost Histogram is shown below:

Figure 17-1 EAC Cost Curve and Remaining Early Cost Histogram Example



18 Monthly Pay Request

Each month, contractors submit a Pay Request based on the last Friday of the month, which includes the following: the updated SOV or SOM with items accomplished during that period, planned for next period, and supported by the progressed schedule update; and identification of variances or changes to planned (if any). The HART staff reviews and confirms the contractors' Pay Requests, by verifying the reported monthly accomplishments based on field daily reports, weekly reports, monthly progress reports, the Primavera P6 progress schedule, and progress measurements recorded by the CEI team, and recommends payment by the City Department of Budget and Fiscal Services (BFS). Contract schedules are updated and summarized to the MPIS as well as variances analyzed with corrective actions. Any variances that impact the MPIS or the Project Budget are immediately identified with recommended corrective actions.

19 Professional Services Availability

This BOS assumes that the required professional services are adequately available for existing design and project management activities, upcoming DB contracts, and other such services.

20 Construction Labor, Material, and Equipment Availability

This BOS assumes that an adequate pool of construction labor, material, and equipment is readily available in the Hawai'i marketplace to effectively support the requirements of the upcoming large DB contracts without competing or placing stress on other ongoing work.

21 ROW Acquisition, Easements, and Permits

The HRTP has identified parcels that require acquisition and/or easements to deliver the MPIS as developed for this update. The HART ROW team has developed a detailed sub-schedule that is part of the MPIS's feeder schedules. Environmental permits are provided by HART to contractors, while the contractors are tasked with securing construction permits. Environmental compliance is monitored by HART.

Appendix A Work Breakdown Structure (Levels 1-3)

Exhibit A-1 Work Breakdown Structure, Level 1

Level 1 Code	Segment	WBS Level
A	Project Wide	WBS Level 1
B	West Oahu/Farrington	WBS Level 1
C	Maintenance Storage Facility	WBS Level 1
D	Kamehameha	WBS Level 1
E	West	WBS Level 1
F	Airport	WBS Level 1
G	City Center	WBS Level 1
L	East	WBS Level 1

Exhibit A-2 Work Breakdown Structure, Level 2

Level 2 Code	Location	WBS Level
B	Other	WBS Level 2
G	Guideway	WBS Level 2
P	Project Wide	WBS Level 2
S	Station	WBS Level 2

Exhibit A-3 Work Breakdown Structure, Level 3

Level 3 Code	Specific Location	WBS Level
00	Project Wide	WBS Level 3
50	HDOT Signals	WBS Level 3
70	OMPO Transit Fares	WBS Level 3
80	EPA	WBS Level 3
M0	CSC - All	WBS Level 3
M1	CSC - Opening 1	WBS Level 3
M2	CSC - Opening 2	WBS Level 3
M3	CSC - Opening 3	WBS Level 3
VG	CSC - Vehicles	WBS Level 3
R01	Core Systems Milestones	WBS Level 3
R02	Core Systems Hold Points	WBS Level 3
R03	Core Systems Manual Train Testing	WBS Level 3
R04	Core Systems Functional Train Testing	WBS Level 3
R05	Core Systems Activation	WBS Level 3
11	Park & Ride Areas	WBS Level 3
01	WOFH - Span 393 to 592	WBS Level 3
02	WOFH - Span 529 to 698	WBS Level 3
03	WOFH - Span 628 to 680	WBS Level 3
04	WOFH - Span 680 to 700	WBS Level 3

Level 3 Code	Specific Location	WBS Level
05	WOFH - Span 700 to 730	WBS Level 3
06	WOFH - Span7 30 to 745	WBS Level 3
07	WOFH - Span 745 to 755	WBS Level 3
BB	West Oahu Stations	WBS Level 3
B1	East Kapolei Station	WBS Level 3
B2	UH West Oahu Station	WBS Level 3
B3	Ho'opili Station	WBS Level 3
CC	All FHSG Stations	WBS Level 3
C1	West Loch Station	WBS Level 3
C2	Waipahu Station	WBS Level 3
C3	Leeward Community College Station	WBS Level 3
01	MSF - Maintenance Support Fac.	WBS Level 3
03	MSF - Yard and Track	WBS Level 3
04	MSF - MOW	WBS Level 3
05	MSF - Train Wash Facility	WBS Level 3
06	MSF - Wheel Truing Facility	WBS Level 3
07	MSF - Track Procurement	WBS Level 3
08	MSF - OSB	WBS Level 3
09	PHPS Pearl Highlands Parking Structure	WBS Level 3
10	H2R2 - Pearl Highlands H2 Ramps	WBS Level 3
21	KHG - Sta 755 - 886	WBS Level 3
22	KHG - Sta 886 - 961	WBS Level 3
31	KHG - Sta 961 - 975	WBS Level 3
C4	Pearl Highlands Station	WBS Level 3
D1	Pearl Ridge Station	WBS Level 3
J1	Aloha Stadium Station	WBS Level 3
EE	West Stations	WBS Level 3
32	A7 - Pearl Harbor to Airport Segment	WBS Level 3
33	A7 - Airport to Lagoon Drive	WBS Level 3
AP	ASU - Pre Pre-Construction	WBS Level 3
BN	ASU - Nimitz Highway	WBS Level 3
CK	ASU - Kamehameha Highway	WBS Level 3
DD	ASU - Airport Area	WBS Level 3
EA	ASU - Aolele	WBS Level 3
FP	ASU - Lagoon Park	WBS Level 3
GN	ASU - Nimitz East End	WBS Level 3
HO	ASU - Other Dillingham	WBS Level 3
KO	ASU - Post Construction	WBS Level 3
PP	A7 - Project Wide	WBS Level 3
P1	A7 - Pier 552R	WBS Level 3
P2	A7 - Pier 551R	WBS Level 3
P3	A7 - Pier 550	WBS Level 3
P4	A7 - Pier 549	WBS Level 3
P5	A7 - Pier 546	WBS Level 3
P6	A7 - Pier 548	WBS Level 3
34	AGS RA - Span 425 to Span 473	WBS Level 3
35	AGS RB - Span 474 to Span 510	WBS Level 3
36	AGS RC - Span 511 to Span 583	WBS Level 3
37	AGS RD - Span 784 to Span 597	WBS Level 3

Level 3 Code	Specific Location	WBS Level
38	AGS RE - Span 597 to Span 636	WBS Level 3
JJ	Airport Stations	WBS Level 3
J3	Pearl Harbor Station	WBS Level 3
J4	Airport Station	WBS Level 3
J5	Lagoon Drive Station	WBS Level 3
E3	Middle Street Transit Center Sta.	WBS Level 3
41	CCGS - Area 1A - Span 636 to Span 655	WBS Level 3
42	CCGS - Area 1B - Span 656 to Span 680	WBS Level 3
43	CCGS - Area 1C - Span 681 to Span 697	WBS Level 3
44	CCGS - Area 2 - Span 698 to Span 711	WBS Level 3
45	CCGS - Area 3 - Span 712 to Span 739	WBS Level 3
46	CCGS - Area 4 - Span 740 to Span 767	WBS Level 3
47	CCGS - Area 5 - Span 768 to Span 788	WBS Level 3
48	CCGS - Area 6 - Span 789 to Span 807	WBS Level 3
E4	Kalihi Station	WBS Level 3
E5	Kapalama Station	WBS Level 3
G1	Iwilei Station	WBS Level 3
G2	Chinatown Station	WBS Level 3
G3	Downtown Station	WBS Level 3
G4	Civic Center Station	WBS Level 3
G5	Kaka'ako Station	WBS Level 3
G6	Ala Moana Station	WBS Level 3
GG	Kaka'ako Stations	WBS Level 3
LL	East Stations	WBS Level 3

Appendix B Interface Table with Contract Access Milestone Dates

Activity ID	Activity Name	Early Start	Early Finish
CCGS	Core Systems Stations Install		
ST15KP1480	CSC Access at AUX Equip Bldg/TCCR-3A at KLM		5-Jun-20
ST16IW1480	CSC Access at AUX Equip Bldg/TCCR-8A at IWL		22-Jun-20
ST16IW1740	CSC Partial Access Balance of Station Structure-8B at IWL		3-Nov-20
ST17CH1480	CSC Access at AUX Equip Bldg/TCCR-3A at CTN		3-Mar-21
ST19CV1480	CSC Access at AUX Equip Bldg/TCCR-3A at CVC		26-Mar-21
ST21AM1480	CSC Access at AUX Equip Bldg/TCCR-6A at ALM		7-Apr-21
ST16IW1840	CSC Partial Platform Access for CSC Install-8E at IWL		19-Apr-21
ST20KK1480	CSC Access at AUX Equip Bldg/TCCR-8A at KAK		9-Jun-21
ST20KK1840	CSC Partial Platform Access for CSC Install-8E at Kaka'ako		26-Aug-21
ST20KK1740	CSC Partial Access Balance of Station Structure-8B at Kaka'ako		5-Oct-21
ST18DW1480	CSC Access at AUX Equip Bldg/TCCR-3A at DNT		8-Oct-21
ST16IW1950	Iwilei Station - CSC FULL ACCESS IN STA-8H		12-Oct-21
ST14KL1480	CSC Access at AUX Equip Bldg/TCCR-3A at KLH		27-Oct-21
ST17CH1740	CSC Partial Access Balance of Station Structure-3B at CTN		21-Dec-21
ST19CV1740	CSC Partial Access Balance of Station Structure-3B at CVC		23-Dec-21
ST18DW1740	CSC Partial Access Balance of Station Structure-3B at DNT		19-Jan-22
ST17CH1840	CSC Partial Platform Access for CSC Install-3E at CTN		25-Apr-22
ST18DW1840	CSC Partial Platform Access for CSC Install-3E at DNT		25-Apr-22
ST18DW1950	Downtown Station - CSC Full Access in Sta-3H		24-May-22
ST17CH1950	Chinatown Station - CSC FULL ACCESS IN STA-3H		24-May-22
ST20KK1950	Kaka'ako Station - CSC Full Access in Sta-8H		11-Oct-22
ST21AM1740	CSC Partial Access Balance of Station Structure-6B at ALM		5-Dec-22
ST14KL1740	CSC Partial Access Balance of Station Structure-3B at KLH		6-Jan-23
ST14KL1840	CSC Partial Platform Access for CSC Install-3E at KLH		6-Mar-23
ST21AM1840	CSC Partial Platform Access for CSC Install-6E at ALM		20-Apr-23
ST14KL1950	Kalihi Station - CSC FULL ACCESS IN STA-3H)		8-May-23
ST15KP1840	CSC Partial Platform Access for CSC Install-3E at KLM		14-Aug-23
ST15KP1740	CSC Partial Access Balance of Station Structure-3B at KLM		28-Aug-23
ST19CV1950	Civic Center Station- CSC Full Access in Sta-3H		18-Sep-23
ST19CV1840	CSC Partial Platform Access for CSC Install-3E at CVC		18-Sep-23
ST21AM1950	Ala Moana - CSC Full Access in Sta-6H		29-Nov-23
ST15KP1950	Kapalama Station - CSC FULL ACCESS IN STA-3H		12-Jan-24
	City Center Guideway and Dillingham Kakaako Stations		
ST17CHEE10	E&E Contractor Partial Access to Install Elev/Escalators	17-May-21	
ST16IW1EE10	E&E Contractor Partial Access to Install Elev/Escalators	19-Jul-21	
ST20KKEE10	E&E Contractor Partial Access to Install Elev/Escalators	7-Sep-21	
ST19CVEE10	E&E Contractor Partial Access to Install Elev/Escalators	2-Nov-21	
ST18DWEE10	E&E Contractor Partial Access to Install Elev/Escalators	23-Nov-21	
ST14KLEE10	E&E Contractor Partial Access to Install Elev/Escalators	18-Apr-22	
ST21AMEE10	E&E Contractor Partial Access to Install Elev/Escalators	6-Dec-22	
ST15KPEE10	E&E Contractor Partial Access to Install Elev/Escalators	18-May-23	
EGRW1110	Right of Way to Properties Obtained (sta. 1275 to sta. 1295) Contractor Access		29-Dec-17

Activity ID	Activity Name	Early Start	Early Finish
EGRW1210	Right of Way to Properties Obtained (sta. 1295 to sta. 1333) Contractor Access		29-Dec-17
EGRW1310	Right of Way to Properties Obtained (sta. 1334 to sta. 1356) Contractor Access		29-Dec-17
EGRE5010	Right of Entry to Properties Obtained (sta. 1448 to sta. 1459) Contractor Access		29-Dec-17
EGRE6020	Right of Entry to Properties Obtained (sta. 1472 to sta. 1479) Contractor Access		29-Dec-17
HART - FHSG			
	West Oahu/Farrington Highway Segment		
WTC-1315	Waipahu Platform Site Access Received	3-Mar-17	
WTC-03	Platform Construction, Partial Access for FHSG to Construct Platform	3-Mar-17	
LCC-2270	LCC HDCC Platform Access Turnover	10-Mar-17	
LCC-03	Platform Construction, Partial Access for FHSG to Construct Platform	16-Mar-17	
LCC-1500	Leeward CC Station General Site Access	16-Mar-17	
LCC-2165	Platform Access Received	16-Mar-17	
LCC-2265	Access to Tunnel - LCC Ped Tunnel	1-May-17	
WLO-01	Auxiliary Equipment Building/TCCR, Partial Access for Systems Installation	19-Sep-17	
WLO-04	Elevator & Escalators Installation, Partial Access for E&E	5-Oct-17	
WLO-05	Station Platform, Partial Access Systems Installation	7-Oct-17	
WLO-02	Balance of Building and Structures, Partial Access for Systems Installation	29-Dec-17	
WTC-01	Auxiliary Equipment Building/TCCR, Partial Access for Systems Installation	9-Jan-18	
WTC-05	Station Platform, Partial Access Systems Installation	14-Feb-18	
WTC-04	Elevator & Escalators Installation, Partial Access for E&E	30-Mar-18	
WTC-02	Balance of Building and Structures, Partial Access for Systems Installation	7-Apr-18	
LCC-01	Auxiliary Equipment Building/TCCR, Partial Access for Systems Installation	2-May-18	
LCC-04	Elevator & Escalators Installation, Partial Access for E&E	5-May-18	
LCC-05	Station Platform, Partial Access Systems Installation	5-May-18	
LCC-02	Balance of Building and Structures, Partial Access for Systems Installation	20-Jun-18	
WLO-08	CSC provided Full Access @ Station Construction Completion		6-Nov-18
LCC-08	CSC provided Full Access @ Station Construction Completion		30-Jan-19
WTC-08	CSC provided Full Access @ Station Construction Completion		26-Feb-19
	Kamehameha Highway Segment		
X0100031-AS	3.1 (KHG -> KHSG) Access for to ALS Site (Except Station Footprint) (6/19/17) - AS	19-Jun-17	
X010002c-PR	2c (KHG -> KHSG) Access to Guideway Platform Deck Construction (11/15/17) - PR	13-Nov-17	
X0100032-AS	3.2 (KHG -> KHSG) Access to Balance of ALS Site (Includes Station Footprint) (11/15/17) - AS	15-Nov-17	
X010003c-AS	3c (KHG -> KHSG) Access to Guideway Platform Deck Construction (12/18/17) - AS	18-Dec-17	
X010001a-PH	1a (KHSG -> CSC) Access to TCCR & UPS (11/29/17) - PH	30-Jan-18	

Activity ID	Activity Name	Early Start	Early Finish
X010002a-PR	2a (KHSG -> CSC) Access to TCCR & UPS (2/15/18) - PR	1-Mar-18	
X010001b-PH	1b (KHSG -> CSC) Access to Balance of Building & Structure (2/15/18) - PH	13-Apr-18	
X010002b-PR	2b (KHSG -> CSC) Access to Balance of Building & Structure (5/18/18) - PR	16-Apr-18	
X010001e-PH	1e (KHSG -> CSC) Access to Station Platform (4/17/18) - PH	8-Jun-18	
X010002d-PR	2d (KHSG -> E&E) Access to Install E&E (8/17/18) - PR	26-Jun-18	
X010002e-PR	2e (KHSG -> CSC) Access to Station Platform (6/18/18) - PR	29-Jun-18	
X010001d-PH	1d (KHSG -> E&E) Access to Install E&E (5/18/18) - PH	16-Jul-18	
X010003a-AS	3a (KHSG -> CSC) Access to TCCR & UPS (5/18/18) - AS	25-Jul-18	
X010003b-AS	3b (KHSG-> CSC) Access to Balance of Building & Structure (7/18/18) - AS	7-Sep-18	
X010003d-AS	3d (KHSG -> E&E) Access to Install E&E (10/18/18) - AS	7-Sep-18	
X010003e-AS	3e (KHSG -> CSC) Access to Station Platform (8/17/18) - AS	12-Oct-18	
KHG			
MIL 7	CSC Partial Access on Deck to Install Cabling		30-Dec-16
MIL 4	Station Contractor Access to Deck @ Aloha Stadium Station for Platform Erection		25-Jan-17
MIL 3	Station Contractor Access to Deck @ Pearlridge Station for Platform Erection		30-Mar-17
MIL 6	CSC Partial Access to At Grade Ductbanks/TPSS Pads (SS#10 and 24)		26-Apr-17
WOSG	West Oahu/Farrington Highway Segment		
X010000H03	ID Number 3a: HOP-TCCR/UPS rooms, Partial Access for Systems Installation (6/6/16)	10-Mar-17	
X010000H11	ID Number 3e: HOP-Station Platform, Partial Access for Systems Installation (9/6/16)	6-May-17	
X010000H05	ID Number 3b: HOP-Balance of Building and Structures, Partial Access for Systems Installation (8/6/16)	15-Jun-17	
X010000W03	ID Number 2a: UHWO-TCCR/UPS Building, Partial Access for Systems Installation (9/6/16)	7-Sep-17	
X010000E05	ID Number 1a: EKP-TCCR and UPS rooms, Partial Access for Systems Installation (1/6/17)	23-Sep-17	
X010000W11	ID Number 2e: UHWO-Station Platform, Partial Access for Systems Installation (12/7/16)	30-Sep-17	
X010000H19	ID Number 3d: HOP-Elevator (#2) & Escalators Installation, Partial Access for E&E (12/7/16)	31-Oct-17	
X010000H21	ID Number 3d: HOP-Elevator (#1) & Escalators Installation, Partial Access for E&E (12/7/16)	31-Oct-17	
X010000H17	ID Number 3h: HOP-CSC provided Full Access @ Station Construction Completion (6/5/17)	22-Nov-17	
X010000E07	ID Number 1b: EKP-Balance of Building and Structures, Partial Access for System Installation (3/8/17)	20-Dec-17	
X010000E13	ID Number 1e: EKP-Station Platform, Partial Access for Systems Installation (4/8/17)	4-Jan-18	
X010000W05	ID Number 2b: UHWO-Balance of Building and Structures, Partial Access for Systems Installation (1/6/17)	5-Jan-18	
X010000E11	ID Number 1d: EKP-Elevator (#1) and Escalators Installation, Partial Access for E&E (7/7/17)	17-Mar-18	

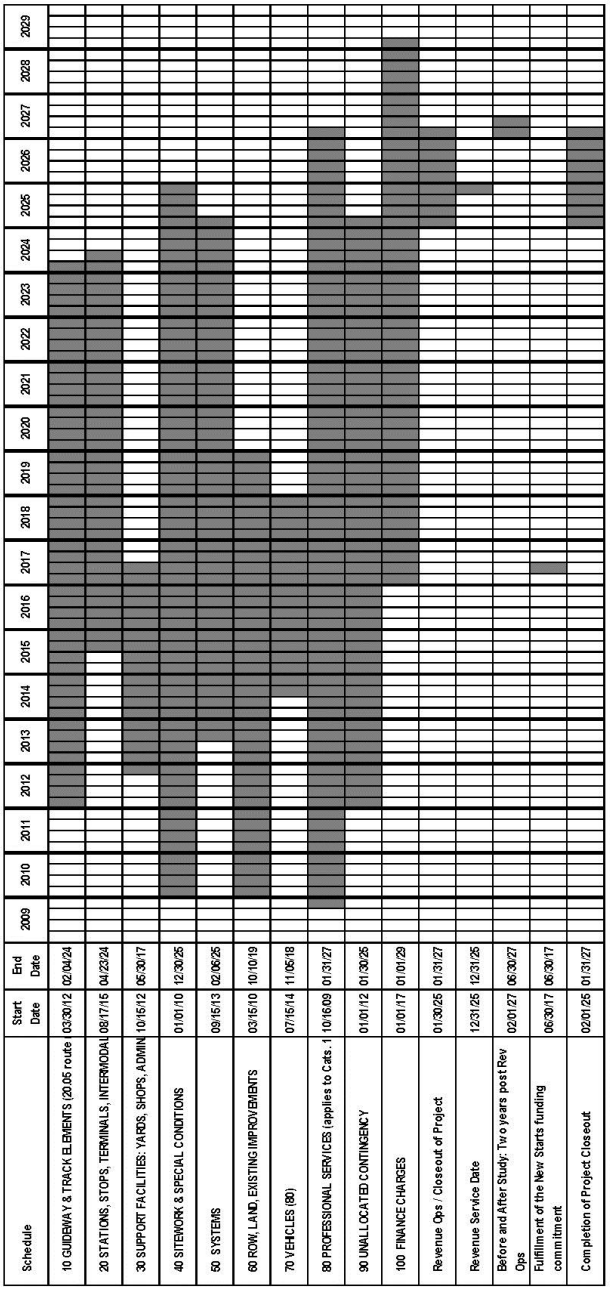
Activity ID	Activity Name	Early Start	Early Finish
X010000E21	ID Number 1d: EKP-Elevator & Escalators Installation, Partial Access for E&E (7/7/17)	28-Mar-18	
X010000W09	ID Number 2d: UHWO-Elevator (#1) & Escalators Installation Partial Access for E&E (4/8/17)	11-Apr-18	
X010000W19	ID Number 2d: UHWO-Elevator (#5) & Escalators Installation, Partial Access for E&E (4/8/17)	11-Apr-18	
X010000W21	ID Number 2d: UHWO-Elevator (#3) & Escalators Installation, Partial Access for E&E (4/8/17)	11-Apr-18	
X010000W23	ID Number 2d: UHWO-Elevator & Escalator Installation, Partial Access for E&E (4/8/17)	11-Apr-18	
X010000E19	ID Number 1h: EKP-CSC provided Full Access at Station Construction Completion (1/5/18)	21-Apr-18	
X010000W17	ID Number 2h: UHWO-CSC provided Full Access at Station Construction Completion (11/5/17)	30-May-18	
CCGS HART	Core Systems Stations Install		
ST12LD1480	CSC Access at AUX Equip Bldg/TCCR-3A at LGD		26-Jul-18
ST10NV1480	CSC Access at AUX Equip Bldg/TCCR-3A at PNB		27-Nov-18
ST12LD1740	CSC Partial Access Balance of Station Structure-3B at LGD		13-Mar-19
ST13MS1480	CSC Access at AUX Equip Bldg/TCCR-8A at MTC		28-May-19
ST11HN1480	CSC Access at AUX Equip Bldg/TCCR-8A at ARP		14-Jun-19
ST12LD1950	Lagoon Dr - CSC FULL ACCESS IN STA-3H		20-Jun-19
ST12LD1840	CSC Partial Platform Access for CSC Install-3E at LGD		11-Sep-19
ST13MS1740	CSC Partial Access Balance of Station Structure-8B at MTC		20-Sep-19
ST11HN1740	CSC Partial Access Balance of Station Structure-8B at ARP		8-Oct-19
ST10NV1740	CSC Partial Access Balance of Station Structure-3B at PNB		1-Nov-19
ST10NV1840	CSC Partial Platform Access for CSC Install-3E at PNB		18-Dec-19
ST10NV1950	Pearl Harbor - CSC FULL ACCESS IN STA-3H		17-Jan-20
ST13MS1840	CSC Partial Platform Access for CSC Install-8E at MTC		2-Nov-20
ST13MS1950	Middle Street Station - CSC FULL ACCESS IN STA-8H		21-Jun-21
ST11HN1840	CSC Partial Platform Access for CSC Install-8E at ARP		14-Jul-21
ST11HN1950	HNL Airport - CSC FULL ACCESS IN STA-8H		8-Dec-21
	Airport Guideway and Stations		
ST12LD1360	Station Contractor Access to GW for Platform Erection	24-Dec-18	
ST12LDEE10	E&E Contractor Partial Access to Install Elev/Escalators	8-Jan-19	
ST10NVEE10	E&E Contractor Partial Access to Install Elev/Escalators	20-Jun-19	
ST10NV1360	Station Contractor Access to GW for Platform Erection	26-Aug-19	
ST13MS1360	Station Contractor Access to GW for Platform Erection	25-Mar-20	
ST11HN1360	Station Contractor Access to GW for Platform Erection	1-Dec-20	
ST13MSEE10	E&E Contractor Partial Access to Install Elev/Escalators	22-Feb-21	
ST11HNEE10	E&E Contractor Partial Access to Install Elev/Escalators	25-Aug-21	
	Details of Rail Activation Schedule		
A2195	Access to Hoopili System #3		28-Feb-17
A1840	Access to Guideway West Loch		28-Feb-17
A1862	Access to Guideway East Kapolei		1-Mar-17
A1818	Access to Guideway LCC		3-Apr-17
A2178	Access to LCC SS#9		1-May-17
A1807	Access to Guideway Pearl Higland		1-May-17
A2127	Access to Pearlridge SS#12		1-Jun-17
A1796	Access to Guideway Pearlridge		1-Jun-17

Activity ID	Activity Name	Early Start	Early Finish
A1785	Access to Guideway Aloha Stadium		1-Aug-17
A1639	TCCR Access Fixed Facilities (25250) West Loch		30-Sep-17
A1578	TCCR Access (25250) West Loch		30-Sep-17
A1836	Access to TCCR (25250) West Loch		30-Sep-17
A2416	Access to TCCR West Loch	30-Sep-17	
A2413	TCCR Access Fixed Facilities West Loch		30-Sep-17
A1616	Partial Access to Platform (37880) Hoopili		30-Oct-17
A1605	TCCR Access Fixed Facilities (26740) Hoopili		30-Oct-17
A1577	TCCR Access (26740) Hoopili		30-Oct-17
A1847	Access to TCCR (26740) Hoopili		30-Oct-17
A2464	Access to TCCR Hoopili	30-Oct-17	
A2461	TCCR Access Fixed Facilities Hoopili		30-Oct-17
A2113	Access to Aloha Stadium SS#24		1-Nov-17
A2488	Access to TCCR UH West Oahu	30-Jan-18	
A2485	TCCR Access Fixed Facilities UH West Oahu		30-Jan-18
A1576	TCCR Access East Kapolei	30-Jan-18	
A1858	Access to TCCR East Kapolei		30-Jan-18
A2005	TCCR Access Fixed Facilities East Kapolei		30-Jan-18
A2015	Access to TCCR East Kapolei	30-Jan-18	
A1573	TCCR Access UHWO		30-Jan-18
A1581	TCCR Access Pearl Highland		28-Feb-18
A1803	Access to TCCR Pearl Higland		28-Feb-18
A1937	TCCR Access Fixed Facilities (28570) Pearl Highland		28-Feb-18
A1947	Access to TCCR (28570) Pearl Highland	28-Feb-18	
A1101	TCCR Access Fixed Facilities (22550) Waipahu		13-Mar-18
A1825	Access to TCCR (22550) Waiphau		13-Mar-18
A2440	Access to TCCR Waiphau	13-Mar-18	
A2437	TCCR Access Fixed Facilities Waiphau		13-Mar-18
A1579	TCCR Access (26740) Waipahu		13-Mar-18
A1650	Partial Access to Platform (37310) West Loch	30-Apr-18	
A2016	Partial Access to Platform East Kapolei	30-Apr-18	
A1582	TCCR Access Pearlridge		30-May-18
A1580	TCCR Access LCC		30-May-18
A1792	Access to TCCR Pearlridge		30-May-18
A1814	Access to TCCR LCC		30-May-18
A1872	Access to TCCR (35680) Pearlridge		30-May-18
A1879	Access to TCCR (35680) Pearlridge	30-May-18	
A1971	TCCR Access Fixed Facilities LCC		30-May-18
A1981	Access to TCCR LCC	30-May-18	
A1948	Partial Access to Platform (38360) Pearl Highland	30-Jul-18	
A1914	Partial Access to Platform (37290) Aloha Stadium	8-Aug-18	
A1170	Partial Access to Platform (35830) Waipahu	30-Aug-18	
A2441	Partial Access to Platform Waiphau	30-Aug-18	
A1781	Access to TCCR Aloha Stadium		30-Aug-18
A1903	TCCR Access Fixed Facilities (32990) Aloha Stadium		30-Aug-18
A1913	Access to TCCR (32990) Aloha Stadium	30-Aug-18	
A1880	Partial Access to Platform (41700) Pearlridge	30-Sep-18	
A1982	Partial Access to Platform LCC	30-Jan-19	

Activity ID	Activity Name	Early Start	Early Finish
WOFH - 98 Progress Schedule			
MIL 10	CSC Partial Access on deck to install Cabling (Sta 650 to 730)		30-Dec-16
MIL 11	CSC Partial Access on deck to install Cabling (Sta 730 to 760)		30-Dec-16
MIL 07	CSC Partial Access to at grade balance of Ductbank for SS #8		30-Dec-16
MIL 08	CSC Partial Access to at grade TPSS Pad/Ductbank for SS #9		30-Dec-16
MIL 13	Station Contractor Access to Waipahu Station for Platform Erection (7/15/2015)		10-Jan-17
MIL 12	Station Contractor Access to LCC Station for Platform Erection		8-May-17
Guideway			
CO.137.00086.003	LCC Access Structure - FPS Walls		30-Dec-16
CO.137.00086.004	LCC Access Structure - FPS Suspended Slabs		30-Dec-16
CO.137.00086.010	LCC Access Structure - Construct Aesthetic Treatment on Retaining Wall		30-Dec-16
CORE SYSTEMS	FUNCTIONAL TEST TRACK (Hoopili to Waipahu)		
A1101	TCCR Access Fixed Facilities (22550) Waipahu		13-Mar-18
A1170	Partial Access to Platform (35830) Waipahu	30-Aug-18	
A1577	TCCR Access (26740) Hoopili		30-Oct-17
A1578	TCCR Access (25250) West Loch		30-Sep-17
A1579	TCCR Access (26740) Waipahu		13-Mar-18
A1605	TCCR Access Fixed Facilities (26740) Hoopili		30-Oct-17
A1616	Partial Access to Platform (37880) Hoopili		30-Oct-17
A1639	TCCR Access Fixed Facilities (25250) West Loch		30-Sep-17
A1650	Partial Access to Platform (37310) West Loch	30-Apr-18	
A1825	Access to TCCR (22550) Waiphau		13-Mar-18
A1836	Access to TCCR (25250) West Loch		30-Sep-17
A1840	Access to Guideway West Loch		28-Feb-17
A1847	Access to TCCR (26740) Hoopili		30-Oct-17
A2195	Access to Hoopili System #3		28-Feb-17
ACTIVATION			
A1573	TCCR Access UHWO		30-Jan-18
A1576	TCCR Access East Kapolei	30-Jan-18	
A1580	TCCR Access LCC		30-May-18
A1581	TCCR Access Pearl Highland		28-Feb-18
A1582	TCCR Access Pearlridge		30-May-18
A1781	Access to TCCR Aloha Stadium		30-Aug-18
A1785	Access to Guideway Aloha Stadium		1-Aug-17
A1792	Access to TCCR Pearlridge		30-May-18
A1796	Access to Guideway Pearlridge		1-Jun-17
A1803	Access to TCCR Pearl Higland		28-Feb-18
A1807	Access to Guideway Pearl Higland		1-May-17
A1814	Access to TCCR LCC		30-May-18
A1818	Access to Guideway LCC		3-Apr-17
A1858	Access to TCCR East Kapolei		30-Jan-18
A1862	Access to Guideway East Kapolei		1-Mar-17
A1872	Access to TCCR (35680) Pearlridge		30-May-18
A1879	Access to TCCR (35680) Pearlridge	30-May-18	

Activity ID	Activity Name	Early Start	Early Finish
A1880	Partial Access to Platform (41700) Pearlridge	30-Sep-18	
A1903	TCCR Access Fixed Facilities (32990) Aloha Stadium		30-Aug-18
A1913	Access to TCCR (32990) Aloha Stadium	30-Aug-18	
A1914	Partial Access to Platform (37290) Aloha Stadium	8-Aug-18	
A1937	TCCR Access Fixed Facilities (28570) Pearl Highland		28-Feb-18
A1947	Access to TCCR (28570) Pearl Highland	28-Feb-18	
A1948	Partial Access to Platform (38360) Pearl Highland	30-Jul-18	
A1971	TCCR Access Fixed Facilities LCC		30-May-18
A1981	Access to TCCR LCC	30-May-18	
A1982	Partial Access to Platform LCC	30-Jan-19	
A2005	TCCR Access Fixed Facilities East Kapolei		30-Jan-18
A2015	Access to TCCR East Kapolei	30-Jan-18	
A2016	Partial Access to Platform East Kapolei	30-Apr-18	
A2113	Access to Aloha Stadium SS#24		1-Nov-17
A2127	Access to Pearlridge SS#12		1-Jun-17
A2178	Access to LCC SS#9		1-May-17
A2413	TCCR Access Fixed Facilities West Loch		30-Sep-17
A2416	Access to TCCR West Loch	30-Sep-17	
A2437	TCCR Access Fixed Facilities Waiphau		13-Mar-18
A2440	Access to TCCR Waiphau	13-Mar-18	
A2441	Partial Access to Platform Waiphau	30-Aug-18	
A2461	TCCR Access Fixed Facilities Hoopili		30-Oct-17
A2464	Access to TCCR Hoopili	30-Oct-17	
A2485	TCCR Access Fixed Facilities UH West Oahu		30-Jan-18
A2488	Access to TCCR UH West Oahu	30-Jan-18	

Appendix C *Summary Schedule*



Schedule	Start Date	End Date
10 GUIDEWAY & TRACK ELEMENTS (20.05 route	03/30/12	02/04/24
20 STATIONS, STOPS, TERMINALS, INTERMODAL	08/17/15	04/23/24
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN	10/15/12	05/30/17
40 SITEWORK & SPECIAL CONDITIONS	01/01/10	12/30/25
50 SYSTEMS	09/15/13	02/06/25
60 ROW, LAND, EXISTING IMPROVEMENTS	03/15/10	10/10/19
70 VEHICLES (80)	07/15/14	11/05/18
80 PROFESSIONAL SERVICES (applies to Cats. 1	10/16/09	01/31/27
90 UNALLOCATED CONTINGENCY	01/01/12	01/30/26
100 FINANCE CHARGES	01/01/17	01/01/29
Revenue Ops / Closeout of Project	01/30/26	01/31/27
Revenue Service Date	12/31/25	12/31/25
Before and After Study: Two years post Rev Ops	02/01/27	06/30/27
Fulfillment of the New Starts funding commitment	06/30/17	06/30/17
Completion of Project Closeout	02/01/26	01/31/27

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Exhibit H-2: Plan B

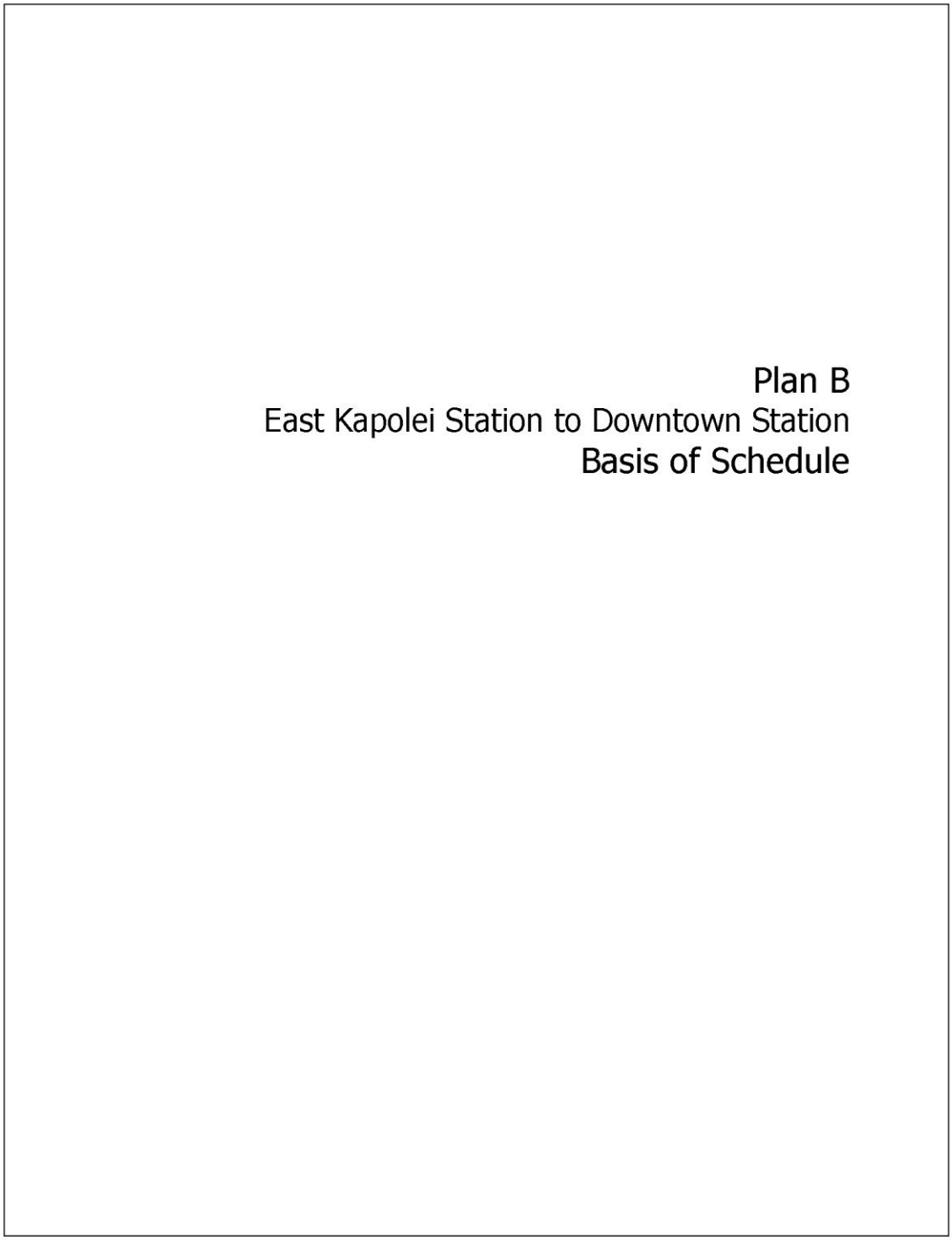


Table of Contents

Appendices

Acronyms and Abbreviations

AGS	Airport Guideway and Stations
BCS	Balanced Cantilevered Spans
BFS	City and County of Honolulu, Department of Budget and Fiscal Services
BOS	Basis of Schedule
CAM	Construction Access Milestone
CCGS	City Center Guideway and Stations
CEI	Construction Engineering and Inspection
CFCG	Configuration Control Group
CPM	Critical Path Methodology
CSC	Core Systems Contractor
DB	Design-Build
DBB	Design-Bid-Build
DBOM	Design-Build-Operate-Maintain
DFIM	Design-Furnish-Install-Maintain
DTU	Dillingham Temporary Utilities
E&E	Elevators and Escalators
EV	Earned Value
FEIS	Final Environmental Impact Statement
FHSG	Farrington Highway Station Group
FTA	Federal Transit Administration
GET	General Excise Tax
HART	Honolulu Authority for Rapid Transportation
HRTP	Honolulu Rail Transit Project
KHG	Kamehameha Highway Guideway
KHSG	Kamehameha Highway Station Group
kV	Kilovolt
LCC	Leeward Community College
MOT	Maintenance of Traffic
MPIS	Master Project Integrated Schedule
MPS	Master Project Schedule
MSF	Maintenance and Storage Facility
NTP	Notice to Proceed
PHGT	Pearl Highlands Garage and Transit Center
ROC	Rail Operations Center
ROW	Right-of-Way
SOM	Schedule of Milestones
SOV	Schedule of Values
SPI	Schedule Performance Index
SV	Schedule Variance
TCCR	Train Control and Communications Room
TPSS	Traction Power Substation
UHWO	University of Hawai`i–West O`ahu
WBS	Work Breakdown Structure
WOFH	West O`ahu/Farrington Highway Guideway
WOSG	West O`ahu Stations Group

1 Introduction

This Basis of Schedule (BOS) has been updated to submit with the Federal Transit Administration (FTA) Recovery Plan– Plan B in April 2017 with proposed scope modifications for cost recovery.

The Project scope for Plan B includes an approximately 18-mile fixed rail system on elevated guideway structure from East Kapolei to Downtown Station, 13 elevated stations, 1 at-grade station, a Rail Operations Center (ROC, formerly known as the Maintenance and Storage Facility [MSF]) and service yard, one temporary park-and-ride facility at the University of Hawai'i–West O'ahu (UHWO), utilities, roadway improvements, all system work, right-of-way (ROW) acquisition, relocations, 80 driverless rail cars, and complete professional services, including design, construction management, and owner costs. The scope in the City Center Guideway and Stations (CCGS) Contract will include the following modifications:

- Consist of an elevated guideway, Downtown Station, and associated elements for the rail transit system beginning at Kamehameha Highway at Middle Street and ending at the Downtown Station.
- Eliminate the proposed Kalihi Station, Kapalama Station, Iwilei Station, Chinatown Station, Civic Center Station, Kaka'ako Station, Ala Moana Station, and System Site #23.
- Eliminate the elevated guideway and associated elements for the rail system in Work Areas 4, 5, or 6, with the exception of tail track following the Downtown Station.
- Downtown Station Assumptions:
  - Assume the guideway segment will extend 600 feet, with crossover, past the Downtown Station for tail track.
  - Assume the guideway will end at Column 743; utility relocations will proceed to enable installation of all columns through Column 743 (four spans after the Downtown Station).
  - Assume all single guideway accommodating two tracks and side platforms at Downtown Station as originally planned.
  - Assume Plan B does not need to accommodate future work (intermediate stations and guideway extensions).
- Limit utility relocations beyond the Downtown Station to necessary relocations in conflict with the remaining guideway and columns within the revised scope of work.
- Assume building only Traction Power Substation (TPSS) site(s) to accommodate guideway from Middle Street to Downtown Station, including associated infrastructure and sitework.

- Assume the necessity to move System Site #22 (at Civic Center) to the Downtown Station. HART has identified real estate for the new location.

The Project scope for Plan B is approximately 36% complete, which includes completion of the ROC and construction of 10.75 miles of elevated guideway constructed from the East Kapolei Station site to just past the Aloha Stadium Station site. It should be noted that the reported percentages complete are based on the current Estimate at Completion (EAC) and estimated Revenue Service Date (RSD) of July 2025.

With the recent award of the Airport Guideway and Stations (AGS) Design-Build contract, the Honolulu Authority for Rapid Transportation (HART) currently has over $4.27 billion either completed or under contract, which includes 15.8 of the 18 miles of guideway and 13 of the 14 stations. The most significant contract package yet to be awarded is the CCGS Design-Build package scheduled to be procured in 2018.

The upcoming contract in Plan B and the remaining work in progress will require a Baseline Schedule that will utilize the Critical Path Methodology (CPM) to depict the necessary detail of activities, durations, interim milestones, and logic necessary to achieve the contract-defined milestone requirements. In addition, interdependency logic ties by way of Contract Access Milestones (CAMs) will be included in order to define crucial access and cross-contract exchange of design, construction, and operational status information.

The Master Project Integrated Schedule (MPIS) shall be cost-loaded to enable cost disbursement charts and trending histograms to be created from current actual costs. A Schedule of Milestones (SOM) will enable the MPIS to also be structured with earned value measurement gauges with assigned payment amounts upon accomplishment; Schedule Performance Index (SPI) indicators can then be charted and monitored at both the contract level and at the overall MPIS level. Each monthly update of individual contracts' baseline CPM schedules will be summarized into the MPIS and included CAM interfaces, coordination with third-party entities, and contract milestones. Each monthly update is reviewed and compared against the approved baseline, with any variances noted and reported with recommended corrective actions.

2 *Project Goals*

The Project has the following goals:

- Improve mobility within the corridor
- Improve travel reliability within the corridor
- Improve access to planned development in support of the City and County of Honolulu (City) policy to develop a Second Urban Center
- Improve transportation equity within the corridor

3 Project Calendars

The standard global Project calendar used for work days is 5 days per week, 8 hours per day, with 10 holidays, as indicated below.

The following ten holidays are incorporated as non-work periods in the global calendar.

Table 3-1 Global Project Calendar Holidays

Holiday	Time of Event
New Year's Day	1st work day in January
Martin Luther King, Jr., Day	2nd Monday in January
President's Day	3rd Monday in February
Memorial Day	Last Monday in May
King Kamehameha Day	11th day in June
Independence Day	4th day in July
Labor Day	1st Monday in September
Thanksgiving	4th Thursday in November
Day after Thanksgiving	4th Friday in November
Christmas	25th day in December

The global Project calendar to be used for contractor and subcontractor procurement activities for calendar days is 7 days per week, 8 hours per day (without holidays).

4 FTA Milestones

The following table details dates upon which the Project has achieved or is projected to achieve certain FTA milestones:

Table 4-1 Project FTA Milestones

Milestone	Date
Approval to Enter Preliminary Engineering	October 29, 2010 (Actual)
Final Environmental Impact Statement (FEIS) Record of Decision Issued	January 18, 2011 (Actual)
Approval to Enter Final Engineering	December 29, 2011 (Actual)
Full Funding Grant Agreement	December 19, 2012 (Actual)
FTA Recovery Plan A Submittal	April 30, 2017 (Projected)
Current FTA Revenue Service Date	January 31, 2020 (Projected)
Recovery Plan – Plan B Revenue Service Date	July 8, 2025 (Projected)

The following are awarded construction contracts with Substantial Completion dates listed:

Table 4-2 Awarded Construction Contract Substantial Completion Dates

Construction Contract	Substantial Completion Date
West O'ahu/Farrington Highway Guideway (WOFH) Design-Build (DB)	March 3, 2017*
Kamehameha Highway Guideway (KHG) DB	May 12, 2017
MSF DB	July 2, 2016 (actual)
West O'ahu Stations Group (WOSG) Design-Bid-Build (DBB)	March 12, 2018*
Farrington Highway Station Group (FHSG) DBB	December 17, 2017*
Kamehameha Highway Station Group (KHSG) DBB	May 17, 2019*
AGS DB	April 30, 2021
Core Systems Contractor (CSC) Design-Build-Operate-Maintain (DBOM)	March 15, 2019*
Fare Collection System Design-Furnish-Install-Maintain (DFIM)	January 15, 2029*
Elevators and Escalators (E&E) DFIM	July 12, 2018*

*Change orders are expected, or are in process that may amend the Substantial Completion date.

During the last four years, and since the BOS Revision 3 was completed, there was a change in the expected contracting methodology and re-packaging of several construction contracts. The remaining large construction contract to be awarded is the CCGS DB contract.

Passenger Service has been planned to support a uniform startup process and is broken into two passenger service opening dates.

- December 2020 for the nine west side stations and guideway through Aloha Stadium Station, to be completed and opened as an Interim Opening Service date.
- July 2025 for the balance of the system including all 14 stations in Plan B.

This BOS assumes the current General Excise Tax (GET) extension request will not be approved by the State Legislature, Governor, and City Council in an amount to permit the full build-out of the original planned Minimum Operation Segment from East Kapolei to Ala Moana Center.

5 Schedule Control and Reporting

The original assumption of the June 2012 BOS was to have a MPIS consisting of summarized dates from a series of project-wide network activities (ROW, Utilities by Utility Companies, Environmental Permits, etc., as well as unawarded construction or DB projects). These summarized dates and activities were to be updated on a monthly basis by HART personnel utilizing the final design and construction contract milestone dates. Over time, this translated into HART Project Controls staff updating the MPIS feeder schedules based on contractor progress schedules from the construction contractors. The HART personnel, starting with the WOFH contract, were not able to receive timely progress schedules from the contractors, resulting in HART's delayed ability to keep the MPIS current.

As of the writing of this BOS (April 2017), the CPM schedule update process is being revised. The MPIS will consist of Control Level Schedules (Level 3) with summary activities or Level of Effort activities (with status taken from the contractors' schedule) and include the contract milestones for the overall Project. Included in the detailed Baseline CPM Schedule updates are the CAM dates that are used to monitor and control "cross-contract" interfaces. The MPIS will include milestones and activities that depict schedule activity that may potentially affect progress not detailed in the contractor schedules, or include information of pending contract awards. The primary guideline of MPIS content is that the information at a summary level contained within the MPIS is available and may be appropriate for public knowledge. The MPIS will be updated by the HART Project Controls team on a monthly basis.

The contractors' CPM monthly progress schedules will be used to provide monthly updates to the Control Level Schedules that feed input to the MPIS. If contractors do not provide timely progress schedules (as was routine through 2016), the HART Project Controls staff will update the Control Level Schedule based on field staff daily reports, weekly reports, monthly reports, and discussions with the Construction Engineering and Inspection (CEI) field staff and/or CEI schedulers.

The contractors' progress schedules are to be cost loaded according to the Schedule of Milestones (SOM) or Schedule of Values (SOV) as appropriate. With the SOM/SOV included in the Baseline Schedule, the detailed schedules will also provide a cash flow projection (Planned Value or Budgeted Cost of Work Scheduled) and actual scope accomplishment (Earned Value or Budgeted Cost of Work Performed), allowing for an evaluation of schedule performance.

6 Network of Schedules

6.1 Master Project Schedule

The Master Project Schedule (MPS) is a feeder schedule to the MPIS that includes the following:

- Environmental Actions
- Professional Services contracts (that is, Final Design, General Engineering Consultant, and CEI)
- Summary Levels of Effort for presentation purposes
- Procurement activities
- On-Call Contractor durations
- Airport Guideway and Stations construction planning activities
- Agreements/Memoranda of Understanding
- Major milestone dates such as Interim Opening and Revenue Service Date.

The purpose of the MPS has been to act as the backbone of the MPIS. The construction contracts and the Core Systems Contract started out as a set of summary activities embedded in the MPS. As the Project specifics were developed, the activities were expanded and eventually became a separate feeder schedule with external logic ties to the MPIS. There are only two remaining construction schedules remaining in the MPS at the time of this writing: AGS and PHGT. As the baseline schedule for AGS is submitted and eventually accepted by HART, the AGS activities in the MPS schedule will be deleted and replaced with a summarized schedule developed from the contractor's schedule, and external logic ties will be made in order to integrate it with the other related contracts.

The CSC schedule is currently presented as two separate feeder schedules. The schedule portraying the western segment (Segment 1), leading to the Interim Opening at Aloha Stadium Station, summarizes the CSC schedule into a manner against which HART can properly track and forecast the impact of other contracts. The schedule portraying the eastern segment (Segment 2), leading to the Revenue Service Date, is more conceptual but still provides the necessary activities, durations, and milestones in order to portray the CSC time required to complete the systems work upon the completion of the construction. The CSC Segment 2 schedule will be expanded upon within the next year in order to provide a higher level of detail for tracking impacts to specific systems work leading to the RSD.

6.2 Guideway Segments

Each guideway section contains utility relocations, cast-in-place drilled shaft foundations, cast-in-place columns, pre-cast structural guideway bridge segments, trackwork, and roadway/site restoration work. The 18.1-mile corridor (from Middle Street to Downtown Station) is broken down into the following segments:

- WOFH: 6.87 miles
- KHG: 3.88 miles
- AGS: 5.15 miles
- CCGS: 2.34 miles

Table 6-1 Guideway Segment Elements Breakdown

Segment	Foundation Shafts (Piers)	Columns	Pre-cast Segments	Aerial Stations	At-Grade Stations
West O'ahu/ Farrington Highway	309 completed	283 completed	3,209 – completed 84 – Balanced Cantilevered Spans (BCS) completed	6	1
Kamehameha Highway	186 completed	169 completed	2,029 – completed 43 – BCS completed	3	0
Airport	239	232	2,780	4	0
City Center	109	109	1,436 segments (109 spans)	1	0
Project Totals	**843**	**793**	**9,581**	**14**	**1**

Foundation shafts and columns that are not yet designed as part of a DB contract are based on typical 125-foot spacing. Pre-cast segments are based on normal 11-foot lengths. Some foundations have multiple piers (drilled shafts) supporting a single column, thus the difference in quantities.

Utility Relocations are performed by DB contractors, utility relocation contractors, and utility owners (based on Utility Agreements).

6.3 West-side Stations

The station groups on the WOFH and KHG segments, from East Kapolei to Aloha Stadium, are currently under construction as separate DBB contracts as indicated below. CAM dates are established within each of the three station contracts that correlate to milestone start activities in the CSC and E&E contracts.

The FHSG consists of West Loch Station, Waipahu Transit Center Station, and Leeward Community College (LCC) Station. LCC Station is the only at-grade station in the corridor, with the other facilities built alongside and over/under the WOFH guideway segment.

The WOSG consists of Ho'opili Station, UHWO Station, and East Kapolei Station. All stations are built alongside and over/under the WOFH guideway segment.

The KHSG consists of Pearl Highlands Station, Pearlridge Station, and Aloha Stadium Station. Pearl Highlands Station is built alongside and over WOFH. Aloha Stadium Station and Pearlridge Station are built alongside and over/under the KHG segment.

6.4 East-side Guideway and Stations

The AGS DB contract is underway and consists of 171 spans of guideway and four stations, namely Pearl Harbor Naval Base Station, Honolulu International Airport Station, Lagoon Drive Station, and Middle Street Transit Center Station.

Dillingham Temporary Utilities (DTU) is an advanced utility relocation contract with the goal of temporarily relocating existing underground dry utilities (electrical, communications, telephone, cable, etc.) to newly installed utility poles along the Makai side of Dillingham Boulevard. It is anticipated that HART's On-Call Construction Contractor will be performing this work with the respective public utility companies.

The CCGS DB contract has yet to be awarded, and in Plan B the modified scope of work involves 2.3 miles of elevated guideway and one elevated station. This contract is planned for award in May 2018 with Notice to Proceed (NTP) in August 2018. The CCGS guideway segment begins along Kamehameha Highway/Dillingham Boulevard, just east of the Middle Street Transit Center Station, and ends 600 feet east of Downtown Station. There will be no provisions for future stations within the alignment.

The details of the current contracting strategy for the CCGS schedule were initially developed in June 2015, with the Basis of Schedule contained in Appendix B of the "White Paper on Remaining Schedule and Expected Revenue Service Date" prepared by the HART Project Controls Division. In the months that followed, the schedule underwent an iterative process between HART Project Controls and the East CEI team, focusing on both the AGS and CCGS contracts. This process added more detailed activities/logic and considered topics such as productivity and work sequencing. Several meetings and discussions took place during this time.

With the AGS contract now awarded, the primary focus on the remaining CCGS segment is provided herein. Under Plan B, the CCGS guideway segments are broken down into the following work areas for HART scheduling purposes only and are likely to be modified by the selected DB contractor in 2018.

- Area 1A: Track Stationing 1275 to Stationing 1295, (Span 636 to Span 655).
- Area 1B: Track Stationing 1295 to Stationing 1333, (Span 656 to Span 680).
- Area 1C: Track Stationing 1333 to Stationing 1356, (Span 681 to Span 697).
- Area 2: Track Stationing 1356 to Stationing 1374, (Span 698 to Span 711).

- Area 3: Track Stationing 1374 to Stationing 1407, (Span 712 to Span 739), which includes Downtown Station and extends 600 feet to Span 743.

6.5 Rail Operations Center (ROC)

The ROC reached substantial completion on July 2, 2016. The CSC is now in control of the ROC facilities. Installation of facility equipment and rail yard track power and communications is ongoing.

6.6 Core Systems Contractor (CSC)

The CSC has partial/shared access to the guideway and stations during fixed facility construction to install cable and equipment until Substantial Completion of a fixed facility. CSC then has full access to complete systems installation and to perform integrated testing and pre-operations demonstrations that lead to the passenger opening. In general, each guideway and station contract has been scheduled such that the CSC will have a period of 4 to 6 months for installation prior to Substantial Completion of the fixed facility. The partial/shared access will require coordination and site control by the associated fixed facility contractor. Following Substantial Completion of the fixed facilities, the CSC has up to 9 months to complete installation, testing, and commissioning activities with full site control.

Remaining Access Criteria for CSC:

- Partial/shared access at-grade or on-deck of the guideway:
  - Guideway site remains under the control of the guideway contractor.
  - Specified civil interface points are complete and validated.
  - The Traction Power Substation (TPSS) sites have been prepared by the civil contractor and are free and clear and available for the installation of the TPSS equipment.
  - A reasonable section of at-grade system-wide duct bank is available to allow the commencement of CSC cable pulling activities.
  - On-deck access is available into the viaduct for installation of main cable ways.
  - On-deck access is available to a reasonable length of installed track to allow commencement of wayside equipment installation.
- Full access work-site control at-grade or on-deck of the guideway:
  - The site is handed over from the guideway contractor to the CSC.

- All civil activities are complete to enable the electrical and mechanical systems to be powered and tested.
- At-grade, all system-wide duct banks are installed.
- On-deck, all track and third rail equipment is fully installed.

- Shared access to equipment rooms in stations:
  - Equipment rooms within a station are complete including the first coat of paint.
  - The rooms and adjacent areas are clean and free of dust.
  - Doors are mounted and lockable.
  - Hanging ceilings and raised floors (if applicable) have not necessarily been installed, but all mounting positions are marked.
  - Temporary power and lighting is available.
  - All specified civil interface points are complete and validated.
- Balance of partial/shared access in stations:
  - Access is provided to passenger circulation and platform areas for installation of the balance of electrical and mechanical systems.
  - All areas are clean and free of dust or dust-producing activities.
  - Hanging ceilings have not necessarily been installed, but mounting brackets or locations are marked.
  - All specified civil interface points are complete and validated.
  - For fare vending machine installation (by the separate Fare Collection System contractor), passenger concourse areas must have final floor finishing complete.
- Full access work-site control in stations:
  - Work site control is handed over from the station contractor to the CSC.
  - With the exception of minor finishing activities, all civil and facility works are complete including station auxiliary equipment such as fire control and air conditioning, enabling all electrical and mechanical work to be completed and tested.

- The station is clean and free of dust.
- Subject to the CSC processes, the station is able to be powered and functionally tested.

Due to delays to the CSC contract, from the original contract award, the CSC is planning to incorporate a "pause" of the systems installation from April 25, 2019, to October 8, 2021, and a "pause" of all work not related to the operation and maintenance activities in the CSC contract from January 20, 2020, to October 9, 2021. With this scenario, the CSC will have approximately three years to complete systems installation and testing prior to the full RSD.

6.7 Other Project-wide Contracts

The E&E Contract has been established wherein each station will be designed to standard dimensions and envelopes so that the E&E Contractor can furnish, install, test, and maintain the elevators and escalators in concert with the CSC and fixed facility operations. The E&E contractor will work closely with each station designer and contractor to interface and integrate associated supporting systems installation.

7 Contract Status

The status of each HRTP contract and its impact on the Interim Opening Date and the Revenue Service Date is shown below.

Table 7-1 Contract Status and Impact

Contract	Impacts	Status
WOFH	Interim Opening	Nearing Substantial Completion
KHG	Interim Opening	Nearing Substantial Completion
WOSG	Interim Opening	Early Construction – Not Critical Path
FHSG	Interim Opening	Early Construction – Not Critical Path
KHSG	Interim Opening	Early Construction – **Critical Path**
MSF	Interim Opening	Substantially Complete
AGS	Revenue Service	Early Design – Not Critical Path
DTU	Revenue Service	Design planned completion in April 2017
CCGS	Revenue Service	Planned solicitation for NTP on August 31, 2018 – **Critical Path**
CSC	Both	**Critical Path** upon KHSG completion for Interim Opening **Critical Path** upon CCGS completion for Revenue Service

8 Production Rate Assumptions

Table 8-1 Production Rate Assumptions

Type of Work	Production Rate (per crew)
Foundations (drilled shafts 7 to 8 feet in diameter)	6 days per shaft (drilling, cleaning, inspection, install rebar cage, monitoring ducts, place concrete and complete transition zone)
Columns (20 to 50 feet)	6 days per column (install rebar, install formwork, place concrete, and remove formwork for standard piers and L-type piers)
Precast Segment Structure (each truss for supporting 11 segments per span)	4.6 days per span (launch, initial set, epoxy, align, post-tension, and grout)
Utilities Relocation	
Water Line (Trenching and Installation)	9 to 16 linear feet per day
Sewer Line (Trenching and Installation)	8 to 13 linear feet per day
Duct Bank, 18 inches wide x 4 feet deep	14 linear feet per day
Duct Bank, 24 inches wide x 5 feet deep	10 linear feet per day
Duct Bank, 36 inches wide x 5 feet deep	4 to 9 linear feet per day

9 Schedule Contingency

Given the critical path described below, the current schedule (Plan B) contains 355 days of contingency leading to a Revenue Service Date of July 8, 2025. Contingency is tracked as a separate activity at the end of the project.

10 Assumptions (CCGS Plan B)

The following assumptions have been considered in Plan B regarding CCGS:

- No Supplemental Environmental Impact Statement process is required in order to complete the Project only to Downtown Station.
- The CSC will incorporate a "pause" of the systems installation from April 25, 2019, to October 8, 2021, and a "pause" of all work not related to the operation and maintenance activities in the CSC contract from January 20, 2020, to October 9, 2021.
- NTP provided to CCGS contractor by or on August 31, 2018.
- ROW acquisition by HART is assumed to be completed before August 31, 2018.
- The MPIS assumes the HART On-Call Contractor will complete the DTU Contract relocations prior to the CCGS Contractor widening Dillingham Boulevard.
- The CCGS schedule assumes wet utility relocation work will be concurrent with the interim road widening activities.
- The 138 kilovolt (kV) work on Dillingham Boulevard can be performed concurrently with dry utility work, but must be completed prior to the drill shaft operation beginning in the area. The schedule assumes the 138 kV line must be energized prior to segment erection in Areas 1A, 1B, and 1C.
- It is assumed the interim road widening activity must be complete prior to commencing permanent dry utility relocation work in each given Work Area.
- AECOM is preparing final design drawings for the utility relocation and roadway realignment along the entire guideway alignment. The "Signed and Sealed" and utility coordinated drawings provided at the end of the AECOM design contract will be provided to the CCGS bidders as they become available.
    - The intention is for HART to provide Signed and Sealed Drawings for Utility Relocation and Roadwork construction, making the utility relocation a DBB component to the full CCGS DB contract.
    - It is assumed and anticipated that providing utility designs to the selected DB contractor will avoid the large delays experienced on the west-side contracts, due to third-party coordination and review occurring prior to the DB construction contract.

- The Utility Relocations sequencing generally starts with relocating wet utilities, then removal of pre-existing lines with a concurrent effort to relocate dry utilities, followed by guideway drainage and site drainage.

- It is assumed that the relocation of utilities (especially trenching, laying, and backfill of underground power and telecommunication lines) in the median does not overlap with the commencement of drilled shaft construction, except for approximately 100 days in Area 1B.

- The maximum number of crews working in each area is tabulated below. Area 1B is on the critical path.

Table 10-1 CCGS Work Crew Breakdown

Work Area	Length (Feet)	Maximum Number of Crews	Total Float (Months)
Area 1A	2,100	3	2
Area 1B	3,700	5	0
Area 1C	2,400	4	2
Area 2	1,700	3	3

- The elevated guideway length is 2.3 miles, spans from Middle Street to Downtown Station, and extends 600 feet beyond the last station with 4 piers.

- Downtown Station will be the only CCGS station designed and built in Plan B; however, a facility will be constructed at each of the station sites at Kalihi, Kapalama, Iwilei, and Chinatown ("future stations") to house Train Control and Communications Room (TCCR) equipment, in addition to the relocated System Site #22 TPSS.

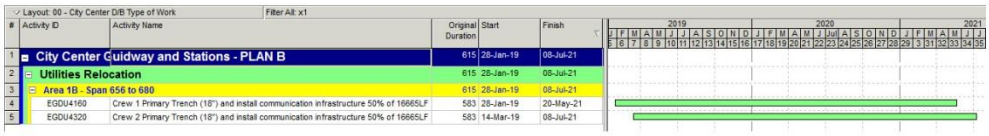
- The following activities are added and removed in the Plan B schedule:

Figure 10-2 CGGS Schedule Activities, Plan A versus Plan B

	Added - Removed Activities	
ID	Description	PLAN B
EGDU4320	Crew 2 Primary Trench (18") and install communication infrastructure 50% of 16665LF (sta. 1295 to sta. 1333)	Added Activity
EGDU4165	Remaining Trench (18") and install communication infrastructure 16665LF (sta. 1295 to sta. 1333)	Removed Activity

- Two crews are proposed for the trenching of 16,665 feet of 18-inch communication infrastructure lines. Durations are 583 days, which are half of the original 1,166 days in the previous schedule:

Figure 10-3 CGGS Trenching Sequence of Work



- The drilled shaft productivity rate used is 6 days per shaft (drilling, installing rebar cage, placing concrete, and complete transition zone). Typical dimensions are 7 to 8 feet in diameter, and depths range from 40 to 150 feet. A particular area in Area 3, over Nuuanu Stream in the Chinatown area, has a lower productivity of 10 days per drilled shaft to accommodate for the deeper shafts and the difficulty of drilling in and near the stream. The productivity is based on historical data from KHG and WOFH contracts as well as data drawn from Airport and Guideway (AGS) proposals.

- The cast-in-place column/pier productivity rate used is 6 days per column. This is also consistent with the durations on WOFH and KHG, adjusting for specific columns where issues were experienced.

- Two crews are used for drilled shaft construction for Plan B, instead of the three crews planned for Plan A. The sequence of each crew is shown below:

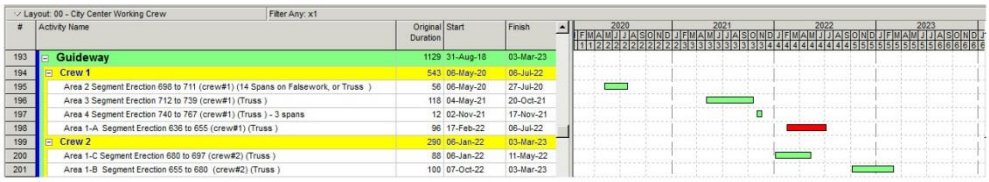
Figure 10-4 CGGS Drilled Shaft Sequence of Work

- Two crews are used to construct the columns/piers for Plan B, instead of the three crews planned for Plan A. The sequence of each crew is shown below:

Figure 10-5 CGGS Column Sequence of Work

- Two sets of trusses are maintained for the erection of guideway segments. The sequence of each crew is shown below:

Figure 10-6 CGGS Truss Sequence of Work



11 Critical Path

The MPIS is being managed using the CPM, which is managing the longest sequence of activities that must be completed on time for the Project to complete on or by the due date. It identifies critical (versus non-critical) activities that, if one is delayed for a day, the entire project will be delayed for a day unless a successor Critical Path activity is completed a day earlier. The Critical Path may potentially change each month the MPIS is updated. At the time of this writing, the Critical Path shows the following:

- The DTU Contract removes all of the underground dry utilities from beneath the existing roadway and has the utility companies installing their respective utility lines on temporary joint-use poles. The HART On-Call Contractor will provide assistance to pole installation by removing trees, repairing sidewalks, and providing other support types of construction work.

- Utility relocation is a significant part of the CCGS DB project. The first action envisioned for the CCGS contractor is to temporarily widen Dillingham Boulevard in order to provide sufficient room for Maintenance of Traffic (MOT). Wet and dry utility relocation work will occur immediately following roadway widening. Installation of dry utility infrastructure, such as duct banks, manholes, handholes, etc., that support the various utilities (Oceanic-Time Warner, Hawaiian Electric Company, Hawaiian Telcom, AT&T) is planned to be completed prior to the utility companies installing conductors and prior to removal from the joint-use poles installed during the DTU project.

- In Plan B, the utility relocation and construction of the Guideway in Area 1B drives the Critical Path. The only elevated station to be built is Downtown Station and is not anticipated to be on the Critical Path.

- Subsequent to the removal and relocation of utilities, the construction of drilled shafts and columns and segment erection will follow suit. The final tasks at the guideway are laying the tracks and third-rail installation.

- There is also 355 days of float (contingency) included, leading to Revenue Service on July 8, 2025.

The duration of the CCGS DB contract is planned to be 60 months.

After NTP and mobilization, the Critical Path runs through Area 1B, interim road widening, utility relocation (trenching, laying of telecommunication lines, and backfilling), drilled shaft construction, column construction, and segment erection, ending with trackwork installations (Area 1B to Area 1C), which leads to CCGS Substantial Completion on August 2, 2023.

12 Price-Allocation

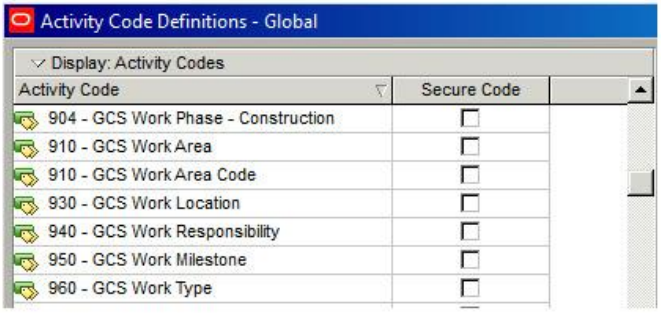
Each contract baseline schedule will be cost loaded and contain cost (price) allocation to activities and/or milestones according to bid/proposal items. These allocations come from the SOM/SOV Pay Items and provide a cash flow based on scope accomplishment and the payment disbursement planned and actual as the contract progresses. The monthly plan versus actual accomplishment will provide a progress indicator that tracks and reports Earned Value (EV), SPI, as well as the Schedule Variance (SV) and financial percent complete.

13 Activity Coding

Based on the HART-furnished Work Breakdown Structure (WBS), the coding system will enable common framework for contracts to be summarized to the MPIS level.

The Global Activity Codes used are as follow:

Figure 13-1 Global Activity Codes



There are three types of milestones used on the contract and MPIS schedules: Pay Milestones, Interface/Coordination Milestones, and Contract Access Milestones. These have unique codes that enable filtering and reporting as well as summarizing to the MPIS level from the contract level. Refer to Appendix A for the WBS established for the HRTP.

14 Constraints and Interfaces

Minimum constraints are used in the MPIS to enable the longest path or Critical Path to be tracked. Constraints are classified as hard constraints or soft constraints. Any constraints other than the start, Interim Opening, and RSD will contain a justification for use.

14.1 Constraints

Each contract contains a list of HART-furnished dates for facility access, environmental permits, materials, and interface milestones (work by others). In addition, a contract may have other site constraints that would be identified with dates (ROW/easements and/or utility relocations by others) or work conditions (for example the corridor's MOT requirements). It is expected that each contract will contain logic, milestones and activities that reflect these constraints and interfaces and will be summarized with plans, updates, and progress to the MPIS on a monthly basis. Any interface or impact to other contracts identified at the contract level will be immediately reported through the HART Project Controls Manager to the Configuration Control Group (CFCG) for disposition. The impacting contract status will provide corrective action and/or recommendations for the CFCG to consider.

Core Systems installation access is planned to occur at each station's equipment room approximately 4 months prior to that station's Substantial Completion. Guideway access is first at grade on the completed System Site slabs and duct banks and on deck approximately 6 months prior to Guideway Substantial Completion. At Substantial Completion, full access (and site control) is transferred over to the CSC to complete installation and make ready for Integrated Testing and Demonstration prior to passenger service. This requires that each operating section be Substantially Complete at least 9 months prior to passenger service (Guideway, Stations, and ROC).

14.2 Interface Table

An Interface Table has been generated which lists milestones that are provided ("pitched") by the contractor to others and those received ("caught") by the contractor from others to perform its work. The Interface Manager has the responsibility to conduct meetings to address these interactions of the contractors and maintain/circulate the Interface Table and accompanying status documentation. The contractor-assigned coordinators must participate in these meetings and may identify other key interfaces that could affect schedule performance, which will be monitored by the Interface Manager. Should a contract interface impact progress or productivity or threaten the attainment of key MPIS milestones, the interface is reported with recommended actions to the CFCG.

Please see Appendix B for the Interface Table with CAM dates.

15 Measurement of Scope Accomplishment

The following are typical metrics used to measure progress of scope items:

- Number of design deliverables submitted or approved
- Schedule of Value or Schedule of Milestone items completed
- Linear feet of utilities relocated or installed
- Linear feet of roadwork completed
- Number of drilled shafts/foundations completed
- Number of columns completed
- Number of precast segments casted
- Number of precast segments erected, post-tensioned, and grouted
- Quantity of earthwork excavated or backfilled
- Square feet of slab erected

16 Schedule of Milestones/Schedule of Values

The SOM consists of a number of Pay Items that detail the contract's Schedule of Prices (Price Items) into manageable and verifiable scope items. For example, a Guideway contractor may break their foundations into work areas, and each associated foundation has a SOM Pay Item. When that pay item is accomplished and verified by HART staff, payment is made on the agreed-upon portion of the firm price assigned to that item. Pay Items must summarize to and cannot exceed the contract's Price Item and their contract value (lump sum). With payment on completed (accomplished) scope items, the contractors have the freedom to identify discrete elements for payment as long as their accomplishment can be verified by HART. Another example may be the Quality Management Plan (QMP) being broken down into (1) QMP outline, (2) QMP draft, and (3) QMP final, where each has an allocated payment value when submitted.

The SOV is a list furnished by contractors outlining the breakdown of the contract sum by schedule activity. It allocates values for the various parts of the work and is also used as the basis for submitting and reviewing Pay Requests. The SOV is intended to provide linkage between the contractor's baseline schedule and the planned payment request details. Once approved by HART, the SOV serves as the basis for contractor pay requests/invoices, subject to review and confirmation that the amount of work associated with the requested pay item values has been satisfactorily performed.

17 Cash Flow Forecast

The revised cost-loaded MPIS Baseline uses a data date of January 31, 2017, which is a re-baseline of the previous MPS. The target completion date is July 8, 2025, which is the projected Revenue Service Date. The EAC Cost Curve and Remaining Early Cost Histograms will be plotted and used as a baseline for comparison against monthly achievement (Earned Value). The Cash Flow Forecast will be reported in the HART Monthly Progress Report.

For each contract package, the EAC cost curve and Remaining Early Cost Histograms (as of January 31, 2017) will be used to measure the monthly progress.

18 Monthly Pay Request

Each month, contractors submit a Pay Request based on the last Friday of the month, which includes the following: the updated SOV or SOM with items accomplished during that period, planned for next period, and supported by the progressed schedule update; and identification of variances or changes to planned (if any). The HART staff reviews and confirms the contractors' Pay Requests, by verifying the reported monthly accomplishments based on field daily reports, weekly reports, monthly progress reports, the Primavera P6 progress schedule, and progress measurements recorded by the CEI team, and recommends payment by the City Department of Budget and Fiscal Services (BFS). Contract schedules are updated and summarized to the MPIS as well as variances analyzed with corrective actions. Any variances that impact the MPIS or the Project Budget are immediately identified with recommended corrective actions.

19 Professional Services Availability

This BOS assumes that the required professional services are adequately available for existing design and project management activities, upcoming DB contracts, and other such services.

20 Construction Labor, Material, and Equipment Availability

This BOS assumes that an adequate pool of construction labor, material, and equipment is readily available in the Hawai'i marketplace to effectively support the requirements of the upcoming large DB contracts without competing or placing stress on other ongoing work.

21 ROW Acquisition, Easements and Permits

The HRTP has identified parcels that require acquisition and/or easements to deliver the MPIS as developed for this update. The HART ROW team has developed a detailed sub-schedule that is part of the MPIS's feeder schedules. Environmental permits are provided by HART to contractors, while the contractors are tasked with securing construction permits. Environmental compliance is monitored by HART.

Appendix A Work Breakdown Structure (Levels 1-3)

Exhibit A-1 Work Breakdown Structure, Level 1

Level 1 Code	Segment	WBS Level
A	Project Wide	WBS Level 1
B	West Oahu/Farrington	WBS Level 1
C	Maintenance Storage Facility	WBS Level 1
D	Kamehameha	WBS Level 1
E	West	WBS Level 1
F	Airport	WBS Level 1
G	City Center	WBS Level 1
L	East	WBS Level 1

Exhibit A-2 Work Breakdown Structure, Level 2

Level 2 Code	Location	WBS Level
B	Other	WBS Level 2
G	Guideway	WBS Level 2
P	Project Wide	WBS Level 2
S	Station	WBS Level 2

Exhibit A-3 Work Breakdown Structure, Level 3

Level 3 Code	Specific Location	WBS Level
00	Project Wide	WBS Level 3
50	HDOT Signals	WBS Level 3
70	OMPO Transit Fares	WBS Level 3
80	EPA	WBS Level 3
M0	CSC – All	WBS Level 3
M1	CSC - Opening 1	WBS Level 3
M2	CSC - Opening 2	WBS Level 3
M3	CSC - Opening 3	WBS Level 3
VG	CSC – Vehicles	WBS Level 3
R01	Core Systems Milestones	WBS Level 3
R02	Core Systems Hold Points	WBS Level 3
R03	Core Systems Manual Train Testing	WBS Level 3
R04	Core Systems Functional Train Testing	WBS Level 3
R05	Core Systems Activation	WBS Level 3
11	Park & Ride Areas	WBS Level 3
01	WOFH - Span 393 to 592	WBS Level 3
02	WOFH - Span 529 to 698	WBS Level 3
03	WOFH - Span 628 to 680	WBS Level 3
04	WOFH - Span 680 to 700	WBS Level 3

Level 3 Code	Specific Location	WBS Level
05	WOFH - Span 700 to 730	WBS Level 3
06	WOFH - Span7 30 to 745	WBS Level 3
07	WOFH - Span 745 to 755	WBS Level 3
BB	West Oahu Stations	WBS Level 3
B1	East Kapolei Station	WBS Level 3
B2	UH West Oahu Station	WBS Level 3
B3	Ho'opili Station	WBS Level 3
CC	All FHSG Stations	WBS Level 3
C1	West Loch Station	WBS Level 3
C2	Waipahu Station	WBS Level 3
C3	Leeward Community College Station	WBS Level 3
01	MSF - Maintenance Support Fac.	WBS Level 3
03	MSF - Yard and Track	WBS Level 3
04	MSF – MOW	WBS Level 3
05	MSF - Train Wash Facility	WBS Level 3
06	MSF - Wheel Truing Facility	WBS Level 3
07	MSF - Track Procurement	WBS Level 3
08	MSF – OSB	WBS Level 3
09	PHPS Pearl Highlands Parking Structure	WBS Level 3
10	H2R2 - Pearl Highlands H2 Ramps	WBS Level 3
21	KHG - Sta 755 - 886	WBS Level 3
22	KHG - Sta 886 - 961	WBS Level 3
31	KHG - Sta 961 - 975	WBS Level 3
C4	Pearl Highlands Station	WBS Level 3
D1	Pearl Ridge Station	WBS Level 3
J1	Aloha Stadium Station	WBS Level 3
EE	West Stations	WBS Level 3
32	A7 - Pearl Harbor to Airport Segment	WBS Level 3
33	A7 - Airport to Lagoon Drive	WBS Level 3
AP	ASU - Pre Pre-Construction	WBS Level 3
BN	ASU - Nimitz Highway	WBS Level 3
CK	ASU - Kamehameha Highway	WBS Level 3
DD	ASU - Airport Area	WBS Level 3
EA	ASU – Aolele	WBS Level 3
FP	ASU - Lagoon Park	WBS Level 3
GN	ASU - Nimitz East End	WBS Level 3
HO	ASU - Other Dillingham	WBS Level 3
KO	ASU - Post Construction	WBS Level 3
PP	A7 - Project Wide	WBS Level 3
P1	A7 - Pier 552R	WBS Level 3
P2	A7 - Pier 551R	WBS Level 3
P3	A7 - Pier 550	WBS Level 3
P4	A7 - Pier 549	WBS Level 3
P5	A7 - Pier 546	WBS Level 3
P6	A7 - Pier 548	WBS Level 3
34	AGS RA - Span 425 to Span 473	WBS Level 3
35	AGS RB - Span 474 to Span 510	WBS Level 3
36	AGS RC - Span 511 to Span 583	WBS Level 3
37	AGS RD - Span 784 to Span 597	WBS Level 3

Level 3 Code	Specific Location	WBS Level
38	AGS RE - Span 597 to Span 636	WBS Level 3
JJ	Airport Stations	WBS Level 3
J3	Pearl Harbor Station	WBS Level 3
J4	Airport Station	WBS Level 3
J5	Lagoon Drive Station	WBS Level 3
E3	Middle Street Transit Center Sta.	WBS Level 3
41	CCGS - Area 1A - Span 636 to Span 655	WBS Level 3
42	CCGS - Area 1B - Span 656 to Span 680	WBS Level 3
43	CCGS - Area 1C - Span 681 to Span 697	WBS Level 3
44	CCGS - Area 2 - Span 698 to Span 711	WBS Level 3
45	CCGS - Area 3 - Span 712 to Span 739	WBS Level 3
46	CCGS - Area 4 - Span 740 to Span 767	WBS Level 3
47	CCGS - Area 5 - Span 768 to Span 788	WBS Level 3
48	CCGS - Area 6 - Span 789 to Span 807	WBS Level 3
E4	Kalihi Station	WBS Level 3
E5	Kapalama Station	WBS Level 3
G1	Iwilei Station	WBS Level 3
G2	Chinatown Station	WBS Level 3
G3	Downtown Station	WBS Level 3
G4	Civic Center Station	WBS Level 3
G5	Kaka'ako Station	WBS Level 3
G6	Ala Moana Station	WBS Level 3
GG	Kaka'ako Stations	WBS Level 3
LL	East Stations	WBS Level 3

Appendix B Interface Table with Contract Access Milestone Dates

Activity ID	Activity Name	Early Start	Early Finish
CCGS	Core Systems Stations Install		
ST15KP1480	CSC Access at AUX Equip Bldg / TCCR-3A at KLM		5-Jun-20
ST16IW1480	CSC Access at AUX Equip Bldg / TCCR-8A at IWL		22-Jun-20
ST16IW1740	CSC Partial Access Balance of Station Structure-8B at IWL		3-Nov-20
ST17CH1480	CSC Access at AUX Equip Bldg / TCCR-3A at CTN		3-Mar-21
ST19CV1480	CSC Access at AUX Equip Bldg / TCCR-3A at CVC		26-Mar-21
ST21AM1480	CSC Access at AUX Equip Bldg / TCCR-6A at ALM		7-Apr-21
ST16IW1840	CSC Partial Platform Access for CSC Install-8E at IWL		19-Apr-21
ST20KK1480	CSC Access at AUX Equip Bldg / TCCR-8A at KAK		9-Jun-21
ST20KK1840	CSC Partial Platform Access for CSC Install-8E at Kaka'ako		26-Aug-21
ST20KK1740	CSC Partial Access Balance of Station Structure-8B at Kaka'ako		5-Oct-21
ST18DW1480	CSC Access at AUX Equip Bldg / TCCR-3A at DNT		8-Oct-21
ST16IW1950	Iwilei Station - CSC FULL ACCESS IN STA-8H		12-Oct-21
ST14KL1480	CSC Access at AUX Equip Bldg / TCCR-3A at KLH		27-Oct-21
ST17CH1740	CSC Partial Access Balance of Station Structure-3B at CTN		21-Dec-21
ST19CV1740	CSC Partial Access Balance of Station Structure-3B at CVC		23-Dec-21
ST18DW1740	CSC Partial Access Balance of Station Structure-3B at DNT		19-Jan-22
ST17CH1840	CSC Partial Platform Access for CSC Install-3E at CTN		25-Apr-22
ST18DW1840	CSC Partial Platform Access for CSC Install-3E at DNT		25-Apr-22
ST18DW1950	Downtown Station - CSC Full Access in Sta-3H		24-May-22
ST17CH1950	Chinatown Station - CSC FULL ACCESS IN STA-3H		24-May-22
ST20KK1950	Kaka'ako Station - CSC Full Access in Sta-8H		11-Oct-22
ST21AM1740	CSC Partial Access Balance of Station Structure-6B at ALM		5-Dec-22
ST14KL1740	CSC Partial Access Balance of Station Structure-3B at KLH		6-Jan-23
ST14KL1840	CSC Partial Platform Access for CSC Install-3E at KLH		6-Mar-23
ST21AM1840	CSC Partial Platform Access for CSC Install-6E at ALM		20-Apr-23
ST14KL1950	Kalihi Station - CSC FULL ACCESS IN STA-3H)		8-May-23
ST15KP1840	CSC Partial Platform Access for CSC Install-3E at KLM		14-Aug-23
ST15KP1740	CSC Partial Access Balance of Station Structure-3B at KLM		28-Aug-23
ST19CV1950	Civic Center Station- CSC Full Access in Sta-3H		18-Sep-23
ST19CV1840	CSC Partial Platform Access for CSC Install-3E at CVC		18-Sep-23
ST21AM1950	Ala Moana - CSC Full Access in Sta-6H		29-Nov-23
ST15KP1950	Kapalama Station - CSC FULL ACCESS IN STA-3H		12-Jan-24
	City Center Guideway and Dillingham Kakaako Stations		
ST17CHEE10	E&E Contractor Partial Access to Install Elev/Escalators	17-May-21	
ST16IW1EE10	E&E Contractor Partial Access to Install Elev/Escalators	19-Jul-21	
ST20KKEE10	E&E Contractor Partial Access to Install Elev/Escalators	7-Sep-21	
ST19CVEE10	E&E Contractor Partial Access to Install Elev/Escalators	2-Nov-21	
ST18DWEE10	E&E Contractor Partial Access to Install Elev/Escalators	23-Nov-21	
ST14KLEE10	E&E Contractor Partial Access to Install Elev/Escalators	18-Apr-22	
ST21AMEE10	E&E Contractor Partial Access to Install Elev/Escalators	6-Dec-22	
ST15KPEE10	E&E Contractor Partial Access to Install Elev/Escalators	18-May-23	
EGRW1110	Right of Way to Properties Obtained (sta. 1275 to sta. 1295) Contractor Access		29-Dec-17

Activity ID	Activity Name	Early Start	Early Finish
EGRW1210	Right of Way to Properties Obtained (sta. 1295 to sta. 1333) Contractor Access		29-Dec-17
EGRW1310	Right of Way to Properties Obtained (sta. 1334 to sta. 1356) Contractor Access		29-Dec-17
EGRE5010	Right of Entry to Properties Obtained (sta. 1448 to sta. 1459) Contractor Access		29-Dec-17
EGRE6020	Right of Entry to Properties Obtained (sta. 1472 to sta. 1479) Contractor Access		29-Dec-17
HART - FHSG			
	West Oahu / Farrington Highway Segment		
WTC-1315	Waipahu Platform Site Access Received	3-Mar-17	
WTC-03	Platform Construction, Partial Access for FHSG to Construct Platform	3-Mar-17	
LCC-2270	LCC HDCC Platform Access Turnover	10-Mar-17	
LCC-03	Platform Construction, Partial Access for FHSG to Construct Platform	16-Mar-17	
LCC-1500	Leeward CC Station General Site Access	16-Mar-17	
LCC-2165	Platform Access Received	16-Mar-17	
LCC-2265	Access to Tunnel - LCC Ped Tunnel	1-May-17	
WLO-01	Auxiliary Equipment Building / TCCR, Partial Access for Systems Installation	19-Sep-17	
WLO-04	Elevator & Escalators Installation, Partial Access for E&E	5-Oct-17	
WLO-05	Station Platform, Partial Access Systems Installation	7-Oct-17	
WLO-02	Balance of Building and Structures, Partial Access for Systems Installation	29-Dec-17	
WTC-01	Auxiliary Equipment Building / TCCR, Partial Access for Systems Installation	9-Jan-18	
WTC-05	Station Platform, Partial Access Systems Installation	14-Feb-18	
WTC-04	Elevator & Escalators Installation, Partial Access for E&E	30-Mar-18	
WTC-02	Balance of Building and Structures, Partial Access for Systems Installation	7-Apr-18	
LCC-01	Auxiliary Equipment Building / TCCR, Partial Access for Systems Installation	2-May-18	
LCC-04	Elevator & Escalators Installation, Partial Access for E&E	5-May-18	
LCC-05	Station Platform, Partial Access Systems Installation	5-May-18	
LCC-02	Balance of Building and Structures, Partial Access for Systems Installation	20-Jun-18	
WLO-08	CSC provided Full Access @ Station Construction Completion		6-Nov-18
LCC-08	CSC provided Full Access @ Station Construction Completion		30-Jan-19
WTC-08	CSC provided Full Access @ Station Construction Completion		26-Feb-19
	Kamehameha Highway Segment		
X0100031-AS	3.1 (KHG -> KHSG) Access for to ALS Site (Except Station Footprint) (6/19/17) - AS	19-Jun-17	
X010002c-PR	2c (KHG -> KHSG) Access to Guideway Platform Deck Construction (11/15/17) - PR	13-Nov-17	
X0100032-AS	3.2 (KHG -> KHSG) Access to Balance of ALS Site (Includes Station Footprint) (11/15/17) - AS	15-Nov-17	
X010003c-AS	3c (KHG -> KHSG) Access to Guideway Platform Deck Construction (12/18/17) - AS	18-Dec-17	
X010001a-PH	1a (KHSG -> CSC) Access to TCCR & UPS (11/29/17) - PH	30-Jan-18	

Activity ID	Activity Name	Early Start	Early Finish
X010002a-PR	2a (KHSG -> CSC) Access to TCCR & UPS (2/15/18) - PR	1-Mar-18	
X010001b-PH	1b (KHSG -> CSC) Access to Balance of Building & Structure (2/15/18) - PH	13-Apr-18	
X010002b-PR	2b (KHSG -> CSC) Access to Balance of Building & Structure (5/18/18) - PR	16-Apr-18	
X010001e-PH	1e (KHSG -> CSC) Access to Station Platform (4/17/18) - PH	8-Jun-18	
X010002d-PR	2d (KHSG -> E&E) Access to Install E&E (8/17/18) - PR	26-Jun-18	
X010002e-PR	2e (KHSG -> CSC) Access to Station Platform (6/18/18) - PR	29-Jun-18	
X010001d-PH	1d (KHSG -> E&E) Access to Install E&E (5/18/18) - PH	16-Jul-18	
X010003a-AS	3a (KHSG -> CSC) Access to TCCR & UPS (5/18/18) - AS	25-Jul-18	
X010003b-AS	3b (KHSG-> CSC) Access to Balance of Building & Structure (7/18/18) - AS	7-Sep-18	
X010003d-AS	3d (KHSG -> E&E) Access to Install E&E (10/18/18) - AS	7-Sep-18	
X010003e-AS	3e (KHSG -> CSC) Access to Station Platform (8/17/18) - AS	12-Oct-18	
KHG			
MIL 7	CSC Partial Access on Deck to Install Cabling		30-Dec-16
MIL 4	Station Contractor Access to Deck @ Aloha Stadium Station for Platform Erection		25-Jan-17
MIL 3	Station Contractor Access to Deck @ Pearlridge Station for Platform Erection		30-Mar-17
MIL 6	CSC Partial Access to At Grade Ductbanks/TPSS Pads (SS#10 and 24)		26-Apr-17
WOSG	West Oahu / Farrington Highway Segment		
X010000H03	ID Number 3a: HOP-TCCR/UPS rooms, Partial Access for Systems Installation (6/6/16)	10-Mar-17	
X010000H11	ID Number 3e: HOP-Station Platform, Partial Access for Systems Installation (9/6/16)	6-May-17	
X010000H05	ID Number 3b: HOP-Balance of Building and Structures, Partial Access for Systems Installation (8/6/16)	15-Jun-17	
X010000W03	ID Number 2a: UHWO-TCCR/UPS Building, Partial Access for Systems Installation (9/6/16)	7-Sep-17	
X010000E05	ID Number 1a: EKP-TCCR and UPS rooms, Partial Access for Systems Installation (1/6/17)	23-Sep-17	
X010000W11	ID Number 2e: UHWO-Station Platform, Partial Access for Systems Installation (12/7/16)	30-Sep-17	
X010000H19	ID Number 3d: HOP-Elevator (#2) & Escalators Installation, Partial Access for E&E (12/7/16)	31-Oct-17	
X010000H21	ID Number 3d: HOP-Elevator (#1) & Escalators Installation, Partial Access for E&E (12/7/16)	31-Oct-17	
X010000H17	ID Number 3h: HOP-CSC provided Full Access @ Station Construction Completion (6/5/17)	22-Nov-17	
X010000E07	ID Number 1b: EKP-Balance of Building and Structures, Partial Access for System Installation (3/8/17)	20-Dec-17	
X010000E13	ID Number 1e: EKP-Station Platform, Partial Access for Systems Installation (4/8/17)	4-Jan-18	
X010000W05	ID Number 2b: UHWO-Balance of Building and Structures, Partial Access for Systems Installation (1/6/17)	5-Jan-18	
X010000E11	ID Number 1d: EKP-Elevator (#1) and Escalators Installation, Partial Access for E&E (7/7/17)	17-Mar-18	

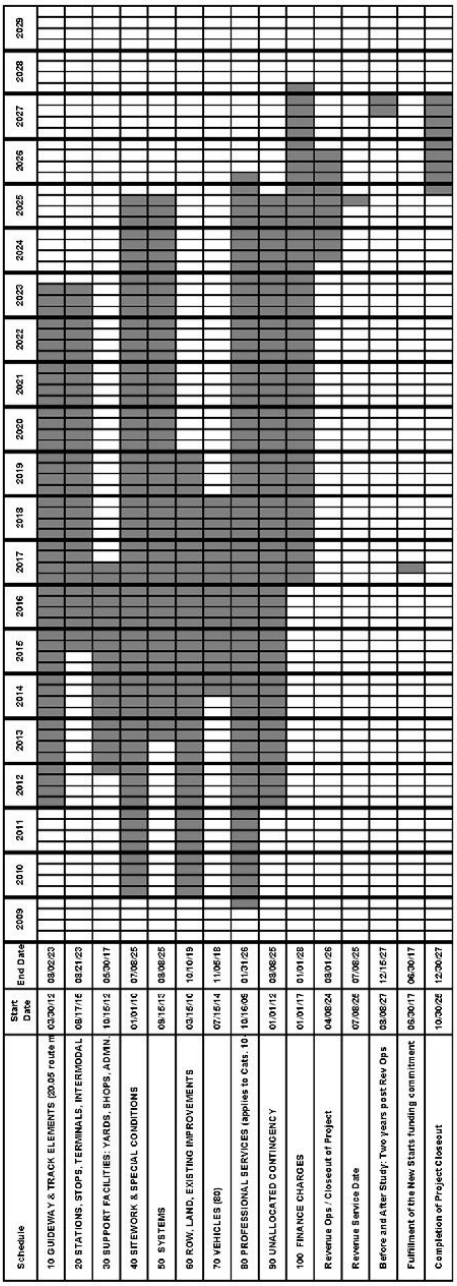
Activity ID	Activity Name	Early Start	Early Finish
X010000E21	ID Number 1d: EKP-Elevator & Escalators Installation, Partial Access for E&E (7/7/17)	28-Mar-18	
X010000W09	ID Number 2d: UHWO-Elevator (#1) & Escalators Installation Partial Access for E&E (4/8/17)	11-Apr-18	
X010000W19	ID Number 2d: UHWO-Elevator (#5) & Escalators Installation, Partial Access for E&E (4/8/17)	11-Apr-18	
X010000W21	ID Number 2d: UHWO-Elevator (#3) & Escalators Installation, Partial Access for E&E (4/8/17)	11-Apr-18	
X010000W23	ID Number 2d: UHWO-Elevator & Escalator Installation, Partial Access for E&E (4/8/17)	11-Apr-18	
X010000E19	ID Number 1h: EKP-CSC provided Full Access at Station Construction Completion (1/5/18)	21-Apr-18	
X010000W17	ID Number 2h: UHWO-CSC provided Full Access at Station Construction Completion (11/5/17)	30-May-18	
MPIS HART	Core Systems Stations Install		
ST12LD1480	CSC Access at AUX Equip Bldg / TCCR-3A at LGD		26-Jul-18
ST10NV1480	CSC Access at AUX Equip Bldg / TCCR-3A at PNB		27-Nov-18
ST12LD1740	CSC Partial Access Balance of Station Structure-3B at LGD		13-Mar-19
ST13MS1480	CSC Access at AUX Equip Bldg / TCCR-8A at MTC		28-May-19
ST11HN1480	CSC Access at AUX Equip Bldg / TCCR-8A at ARP		14-Jun-19
ST12LD1950	Lagoon Dr - CSC FULL ACCESS IN STA-3H		20-Jun-19
ST12LD1840	CSC Partial Platform Access for CSC Install-3E at LGD		11-Sep-19
ST13MS1740	CSC Partial Access Balance of Station Structure-8B at MTC		20-Sep-19
ST11HN1740	CSC Partial Access Balance of Station Structure-8B at ARP		8-Oct-19
ST10NV1740	CSC Partial Access Balance of Station Structure-3B at PNB		1-Nov-19
ST10NV1840	CSC Partial Platform Access for CSC Install-3E at PNB		18-Dec-19
ST10NV1950	Pearl Harbor - CSC FULL ACCESS IN STA-3H		17-Jan-20
ST13MS1840	CSC Partial Platform Access for CSC Install-8E at MTC		2-Nov-20
ST13MS1950	Middle Street Station - CSC FULL ACCESS IN STA-8H		21-Jun-21
ST11HN1840	CSC Partial Platform Access for CSC Install-8E at ARP		14-Jul-21
ST11HN1950	HNL Airport - CSC FULL ACCESS IN STA-8H		8-Dec-21
	Airport Guideway and Stations		
ST12LD1360	Station Contractor Access to GW for Platform Erection	24-Dec-18	
ST12LDEE10	E&E Contractor Partial Access to Install Elev/Escalators	8-Jan-19	
ST10NVEE10	E&E Contractor Partial Access to Install Elev/Escalators	20-Jun-19	
ST10NV1360	Station Contractor Access to GW for Platform Erection	26-Aug-19	
ST13MS1360	Station Contractor Access to GW for Platform Erection	25-Mar-20	
ST11HN1360	Station Contractor Access to GW for Platform Erection	1-Dec-20	
ST13MSEE10	E&E Contractor Partial Access to Install Elev/Escalators	22-Feb-21	
ST11HNEE10	E&E Contractor Partial Access to Install Elev/Escalators	25-Aug-21	
	Details of Rail Activation Schedule		
A2195	Access to Hoopili System #3		28-Feb-17
A1840	Access to Guideway West Loch		28-Feb-17
A1862	Access to Guideway East Kapolei		1-Mar-17
A1818	Access to Guideway LCC		3-Apr-17
A2178	Access to LCC SS#9		1-May-17
A1807	Access to Guideway Pearl Higland		1-May-17
A2127	Access to Pearlridge SS#12		1-Jun-17
A1796	Access to Guideway Pearlridge		1-Jun-17

Activity ID	Activity Name	Early Start	Early Finish
A1785	Access to Guideway Aloha Stadium		1-Aug-17
A1639	TCCR Access Fixed Facilities (25250) West Loch		30-Sep-17
A1578	TCCR Access (25250) West Loch		30-Sep-17
A1836	Access to TCCR (25250) West Loch		30-Sep-17
A2416	Access to TCCR West Loch	30-Sep-17	
A2413	TCCR Access Fixed Facilities West Loch		30-Sep-17
A1616	Partial Access to Platform (37880) Hoopili		30-Oct-17
A1605	TCCR Access Fixed Facilities (26740) Hoopili		30-Oct-17
A1577	TCCR Access (26740) Hoopili		30-Oct-17
A1847	Access to TCCR (26740) Hoopili		30-Oct-17
A2464	Access to TCCR Hoopili	30-Oct-17	
A2461	TCCR Access Fixed Facilities Hoopili		30-Oct-17
A2113	Access to Aloha Stadium SS#24		1-Nov-17
A2488	Access to TCCR UH West Oahu	30-Jan-18	
A2485	TCCR Access Fixed Facilities UH West Oahu		30-Jan-18
A1576	TCCR Access East Kapolei	30-Jan-18	
A1858	Access to TCCR East Kapolei		30-Jan-18
A2005	TCCR Access Fixed Facilities East Kapolei		30-Jan-18
A2015	Access to TCCR East Kapolei	30-Jan-18	
A1573	TCCR Access UHWO		30-Jan-18
A1581	TCCR Access Pearl Highland		28-Feb-18
A1803	Access to TCCR Pearl Higland		28-Feb-18
A1937	TCCR Access Fixed Facilities (28570) Pearl Highland		28-Feb-18
A1947	Access to TCCR (28570) Pearl Highland	28-Feb-18	
A1101	TCCR Access Fixed Facilities (22550) Waipahu		13-Mar-18
A1825	Access to TCCR (22550) Waiphau		13-Mar-18
A2440	Access to TCCR Waiphau	13-Mar-18	
A2437	TCCR Access Fixed Facilities Waiphau		13-Mar-18
A1579	TCCR Access (26740) Waipahu		13-Mar-18
A1650	Partial Access to Platform (37310) West Loch	30-Apr-18	
A2016	Partial Access to Platform East Kapolei	30-Apr-18	
A1582	TCCR Access Pearlridge		30-May-18
A1580	TCCR Access LCC		30-May-18
A1792	Access to TCCR Pearlridge		30-May-18
A1814	Access to TCCR LCC		30-May-18
A1872	Access to TCCR (35680) Pearlridge		30-May-18
A1879	Access to TCCR (35680) Pearlridge	30-May-18	
A1971	TCCR Access Fixed Facilities LCC		30-May-18
A1981	Access to TCCR LCC	30-May-18	
A1948	Partial Access to Platform (38360) Pearl Highland	30-Jul-18	
A1914	Partial Access to Platform (37290) Aloha Stadium	8-Aug-18	
A1170	Partial Access to Platform (35830) Waipahu	30-Aug-18	
A2441	Partial Access to Platform Waiphau	30-Aug-18	
A1781	Access to TCCR Aloha Stadium		30-Aug-18
A1903	TCCR Access Fixed Facilities (32990) Aloha Stadium		30-Aug-18
A1913	Access to TCCR (32990) Aloha Stadium	30-Aug-18	
A1880	Partial Access to Platform (41700) Pearlridge	30-Sep-18	
A1982	Partial Access to Platform LCC	30-Jan-19	

Activity ID	Activity Name	Early Start	Early Finish
WOFH - 98 Progress Schedule			
MIL 10	CSC Partial Access on deck to install Cabling (Sta 650 to 730)		30-Dec-16
MIL 11	CSC Partial Access on deck to install Cabling (Sta 730 to 760)		30-Dec-16
MIL 07	CSC Partial Access to at grade balance of Ductbank for SS #8		30-Dec-16
MIL 08	CSC Partial Access to at grade TPSS Pad / Ductbank for SS #9		30-Dec-16
MIL 13	Station Contractor Access to Waipahu Station for Platform Erection (7/15/2015)		10-Jan-17
MIL 12	Station Contractor Access to LCC Station for Platform Erection		8-May-17
Guideway			
CO.137.00086.003	LCC Access Structure - FPS Walls		30-Dec-16
CO.137.00086.004	LCC Access Structure - FPS Suspended Slabs		30-Dec-16
CO.137.00086.010	LCC Access Structure - Construct Aesthetic Treatment on Retaining Wall		30-Dec-16
CORE SYSTEMS	FUNCTIONAL TEST TRACK (Hoopili to Waipahu)		
A1101	TCCR Access Fixed Facilities (22550) Waipahu		13-Mar-18
A1170	Partial Access to Platform (35830) Waipahu	30-Aug-18	
A1577	TCCR Access (26740) Hoopili		30-Oct-17
A1578	TCCR Access (25250) West Loch		30-Sep-17
A1579	TCCR Access (26740) Waipahu		13-Mar-18
A1605	TCCR Access Fixed Facilities (26740) Hoopili		30-Oct-17
A1616	Partial Access to Platform (37880) Hoopili		30-Oct-17
A1639	TCCR Access Fixed Facilities (25250) West Loch		30-Sep-17
A1650	Partial Access to Platform (37310) West Loch	30-Apr-18	
A1825	Access to TCCR (22550) Waiphau		13-Mar-18
A1836	Access to TCCR (25250) West Loch		30-Sep-17
A1840	Access to Guideway West Loch		28-Feb-17
A1847	Access to TCCR (26740) Hoopili		30-Oct-17
A2195	Access to Hoopili System #3		28-Feb-17
ACTIVATION			
A1573	TCCR Access UHWO		30-Jan-18
A1576	TCCR Access East Kapolei	30-Jan-18	
A1580	TCCR Access LCC		30-May-18
A1581	TCCR Access Pearl Highland		28-Feb-18
A1582	TCCR Access Pearlridge		30-May-18
A1781	Access to TCCR Aloha Stadium		30-Aug-18
A1785	Access to Guideway Aloha Stadium		1-Aug-17
A1792	Access to TCCR Pearlridge		30-May-18
A1796	Access to Guideway Pearlridge		1-Jun-17
A1803	Access to TCCR Pearl Higland		28-Feb-18
A1807	Access to Guideway Pearl Higland		1-May-17
A1814	Access to TCCR LCC		30-May-18
A1818	Access to Guideway LCC		3-Apr-17
A1858	Access to TCCR East Kapolei		30-Jan-18
A1862	Access to Guideway East Kapolei		1-Mar-17
A1872	Access to TCCR (35680) Pearlridge		30-May-18
A1879	Access to TCCR (35680) Pearlridge	30-May-18	

Activity ID	Activity Name	Early Start	Early Finish
A1880	Partial Access to Platform (41700) Pearlridge	30-Sep-18	
A1903	TCCR Access Fixed Facilities (32990) Aloha Stadium		30-Aug-18
A1913	Access to TCCR (32990) Aloha Stadium	30-Aug-18	
A1914	Partial Access to Platform (37290) Aloha Stadium	8-Aug-18	
A1937	TCCR Access Fixed Facilities (28570) Pearl Highland		28-Feb-18
A1947	Access to TCCR (28570) Pearl Highland	28-Feb-18	
A1948	Partial Access to Platform (38360) Pearl Highland	30-Jul-18	
A1971	TCCR Access Fixed Facilities LCC		30-May-18
A1981	Access to TCCR LCC	30-May-18	
A1982	Partial Access to Platform LCC	30-Jan-19	
A2005	TCCR Access Fixed Facilities East Kapolei		30-Jan-18
A2015	Access to TCCR East Kapolei	30-Jan-18	
A2016	Partial Access to Platform East Kapolei	30-Apr-18	
A2113	Access to Aloha Stadium SS#24		1-Nov-17
A2127	Access to Pearlridge SS#12		1-Jun-17
A2178	Access to LCC SS#9		1-May-17
A2413	TCCR Access Fixed Facilities West Loch		30-Sep-17
A2416	Access to TCCR West Loch	30-Sep-17	
A2437	TCCR Access Fixed Facilities Waiphau		13-Mar-18
A2440	Access to TCCR Waiphau	13-Mar-18	
A2441	Partial Access to Platform Waiphau	30-Aug-18	
A2461	TCCR Access Fixed Facilities Hoopili		30-Oct-17
A2464	Access to TCCR Hoopili	30-Oct-17	
A2485	TCCR Access Fixed Facilities UH West Oahu		30-Jan-18
A2488	Access to TCCR UH West Oahu	30-Jan-18	

Appendix C *Summary Schedule*



Appendix I: Plan A Ridership Forecasts

I-1 Four-Car Trains

Project ridership forecasts were updated in 2013 when HART switched the operating plans from a mixed fleet operation to fixed, four-car trainsets running at slightly longer headways. At that time, the travel demand forecasting model parameters were also updated to better differentiate rail from traditional bus services. These new model parameters accounted for factors such as reliability, passenger amenities, increased seating, and schedule-free services.[1] At the time of the FFGA, analysts estimated that 114,400 daily passengers would use the rail transit system in 2030.[2]

Using the four-car methodology, approximately 119,600 daily passengers were expected to use the system, or an increase of approximately 5% relative to the FFGA forecast. Overall, these forecasts remained consistent with the range of ridership estimates included in the technical studies that were part of the FEIS.

I-2 Regional Model Update

In 2016, HART began using the latest Oahu MPO travel demand forecasting model. This new tour-based model uses the TransCAD 6.1 software platform and is faster and more robust than the previous MINUTP model. The geographic information systems-based model incorporates updates to long-range population and land use forecasts from the City and County of Honolulu Department of Planning and Permitting, as well as travel behavior data from 2012 surveys of households, visitors, and transit riders. The new model also updates the committed short-range highway and transit projects included in the regional transportation plan which are likely to be completed by 2030. The new model retains the supporting bus network described in the Project's FEIS, although ferry routes and associated feeder buses (eliminated in 2009) were removed from the model.

A comparison of the FFGA, Four-Car Model, and Updated Project Model (Oahu MPO) ridership forecasts by means of station access are shown in Exhibit I-1. The new model forecasts approximately 121,600 rail passengers per day in 2030. This is approximately 2% higher than the four-car model forecast and 6% higher than the FFGA forecast. The new forecasts predict that approximately 55% of rail passengers (67,300 passengers) will walk to a station—an increase from 28% in the previous forecasts. The share of rail passengers connecting from a feeder bus decreases from 60% in the previous forecast down to 36% (44,100 daily passengers). Formal park-and-ride demand decreases from approximately 7% of all rail trips down to approximately 5% of all trips.

[1] The new model parameters are called non-included attributes.
[2] Based on an end-to-end running time of 44.3 minutes, a peak headway of 2.4 minutes, and an off-peak headway of 4.7 minutes.

Exhibit I-2 shows the boarding and alighting patterns for the 22,600 east-bound rail passengers during the A.M. Peak Period (6 a.m. to 9 a.m.) by station mode of access. Approximately 66% of the east-bound passengers board the rail system west of the Aloha Stadium Station. In addition, approximately 40% of the alightings occurs at stations east of Downtown Honolulu (about 9,000 alightings). Exhibit I-3 shows the 8,900 west-bound boardings and alightings. Approximately half of the west-bound boardings occur east of the Downtown Station (4,400 boardings).

Exhibit I-1 Comparison of HRTP Ridership Forecasts, Daily Rail System Boardings, 2030

Forecast (Date)	Means of Station Access				
	Walk/ Bike	Bus	Drop Off	Parking	Total
FFGA Forecast (2/2012)	28,850	61,370	9,240	14,890	114,350
Four-Car Model (8/2013)	33,420	71,320	5,580	9,270	119,590
Updated Model (1/2017)	67,320	44,090	3,300	6,910	121,620

Exhibit I-2 East-bound Rail Boardings/Alightings, A.M. Peak Period (6 a.m.–9 a.m.), 2030

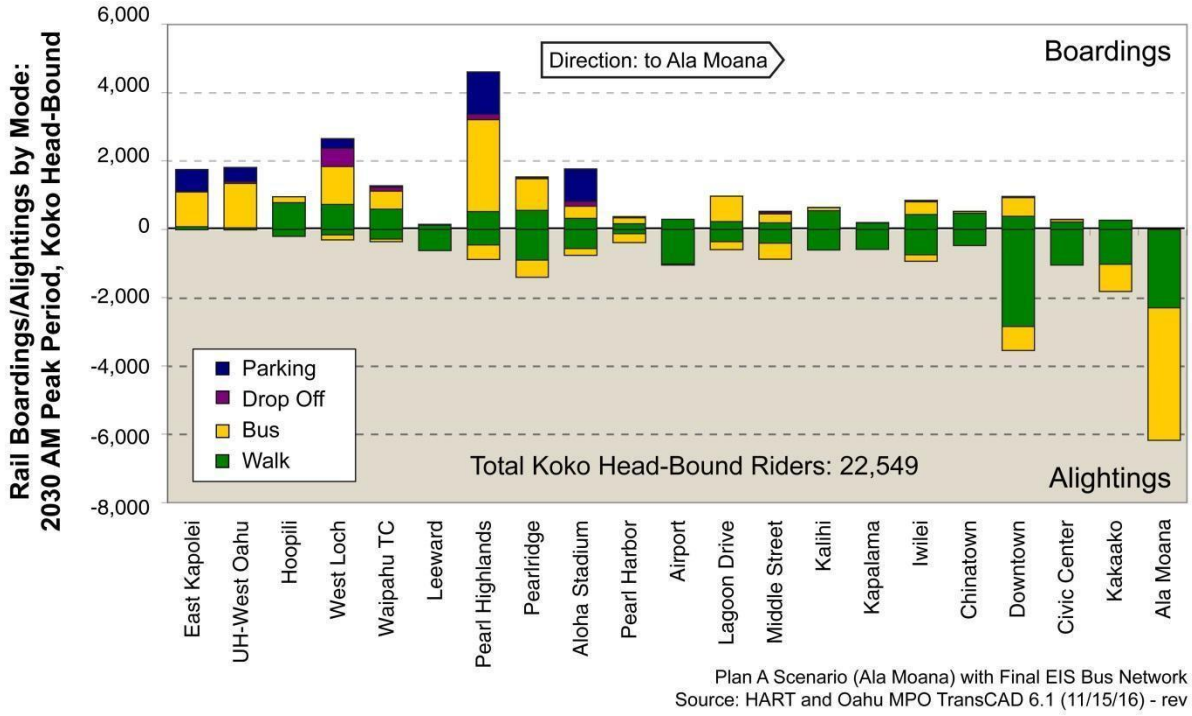
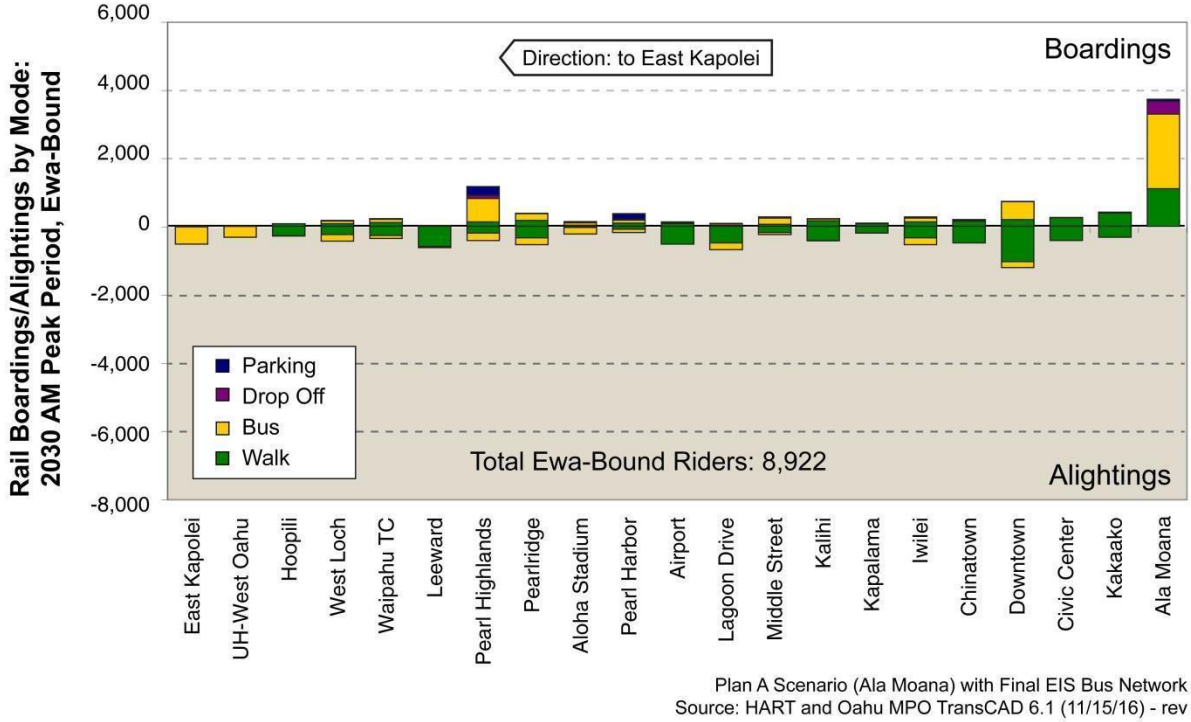


Exhibit I-3 West-bound Rail System Boardings/Alightings, A.M. Peak Period (6 a.m.–9 a.m.), 2030



Plan A Scenario (Ala Moana) with Final EIS Bus Network
Source: HART and Oahu MPO TransCAD 6.1 (11/15/16) - rev

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Appendix J: Financial Projections

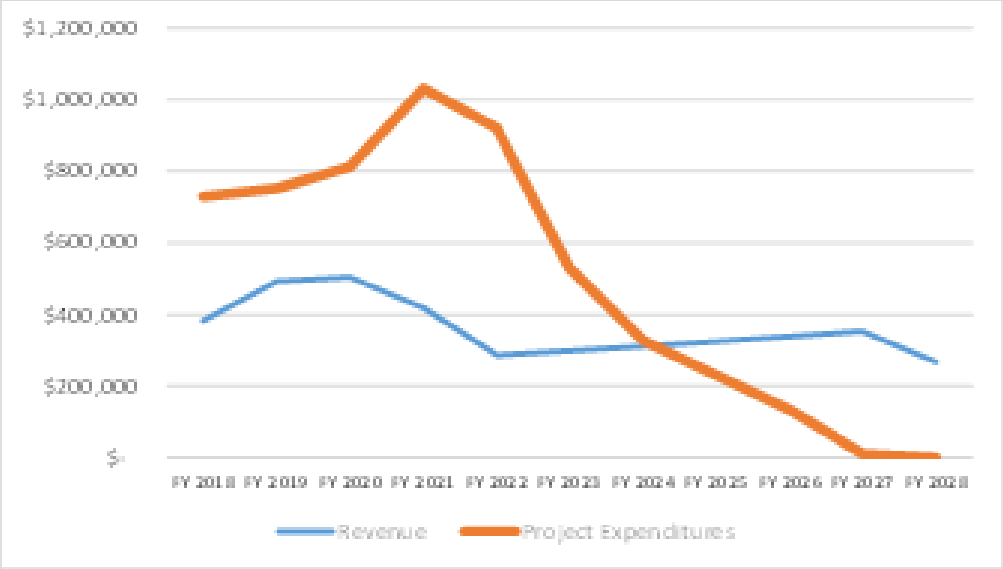
J-1 Financing of the Project

The following sections describe the financial impacts of balancing the requirements of the Project relative to various GET surcharge sunset dates and the percentage GET revenue splits with the State of Hawaii.

J-1.1 Debt Financing Required

The chart below illustrates that costs incurred during the majority of the construction period (through FY 2026) are substantially higher than the combined GET surcharge and the federal grant revenue. Debt proceeds will be required to bridge this gap during the construction period.

Exhibit J-1: Project Financing Requirements



J-1.2 Debt Financing Structure

The Project will use both short-term revolving Tax Exempt Commercial Paper (TECP) and long-term General Obligation (GO) bonds to finance the Project. The City has authorized up to a maximum outstanding amount of $350 million in TECP. Currently, there is $60 million of TECP outstanding. The commercial paper will be converted to long term GO bonds annually during construction. After construction, the GET surcharge revenue will be used to pay annual debt service on the long-term bonds secured during the construction period.

J-1.3 Financial Projections

As of this time, the State Legislature is continuing to discuss funding for the Project. There has been no decision (refer to the discussion on the status of the GET legislation in Section 6.2). The following details Senate Bill 1183, Senate Draft 2, House Draft 2 (Bill 1183), the vehicle moving through the legislative process, as well as 10-year GET extensions under an 80%/20% split and a 90%/10% split with the State.

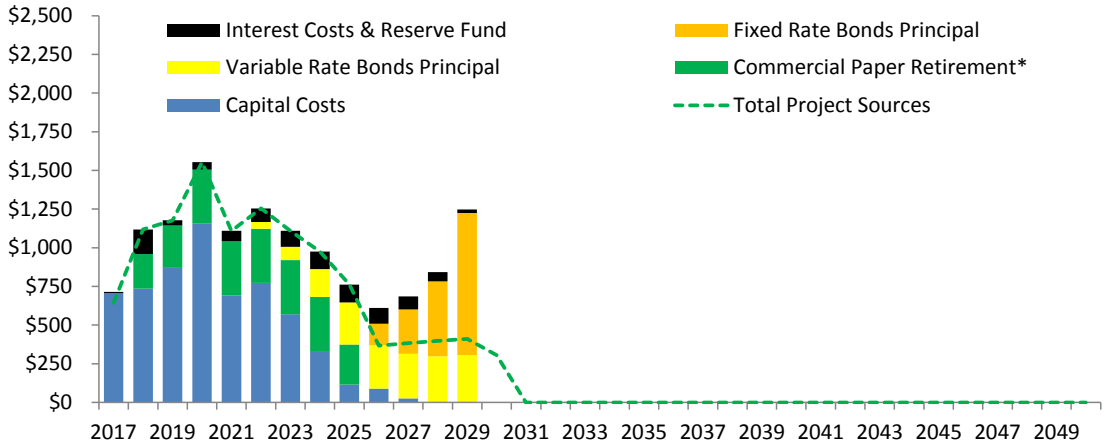
J-1.3.1 Bill 1183

The current bill as of April 2017 contains the following parameters: extension of the GET surcharge revenue for two years to December 31, 2029, with the State retaining 1% of the revenue (rather than the current 10%) starting on January 1, 2018. The projections contained in this section assume the following: GET surcharge revenues growing at 4.3% to December 31, 2027; 3% GET growth rate thereafter; interest rate ranging from 3% to 4.0%; and all debt paid off by the GET sunset date.

The following charts compare resources and uses for the Project. The green dashed line represents resources to the project including the federal grants, debt proceeds, and the GET surcharge. After constructions, the green dashed line represents GET surcharge revenues. The multicolored bars represent Project costs and debt service payments.

Under the current version of Bill 1183, GET revenues would grow from approximately $4.8 billion to $5.8 billion. However, because construction continues up to the Revenue Service Date in December 2025, there is a short time period to repay the debt. As Exhibit J-2 demonstrates, the annual GET surcharge revenue is insufficient to meet the higher debt service payments (principal and interest) after construction. This scenario results in a total deficit of $1.4 billion under the assumptions stated above. If the assumptions are "stressed" by lowering the revenue growth rate to 3.0% starting in FY 2018 through the sunset date and adding other costs, the total deficit would nearly double. To address the projected deficit of $1.4 billion, the City would need to infuse approximately $100 million per year starting in FY 2018 to pay off the debt obligations.

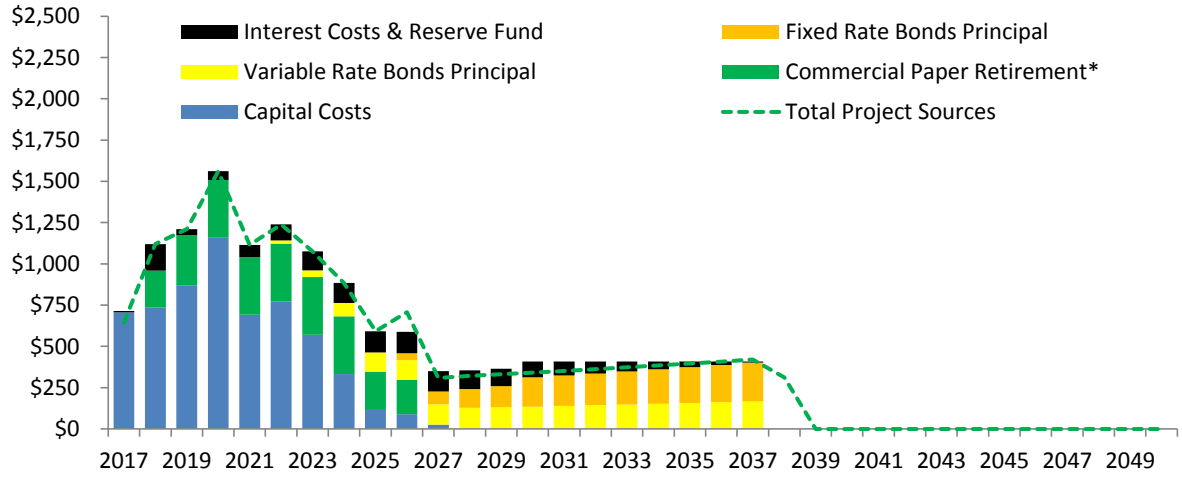
Exhibit J-2: Project Funding under Bill 1183 ($ in millions)



J-1.3.2 Ten-year Extension with an 80%/20% Split

Exhibit J-3 summarizes a 10-year GET surcharge extension that increases the State retention to 20% effective in FY 2018 (July 1, 2017). Under this scenario, GET revenues would increase from $4.8 billion to $8.1 billion. Debt proceeds of approximately $4.0 billion would be required at a financing cost of $1.6 billion. This scenario is projected to have 8 years of ending-year deficits starting in FY 2030. The City would need to offset these annual shortfalls by other revenue sources averaging approximately $35 million per year. If the projections is "stressed" utilizing the same factors as above, the other revenue source funding would increase to approximately $170 million per year.

Exhibit J-3: Funding at 80%/20% GET Split to 12/31/2037 ($ in millions)

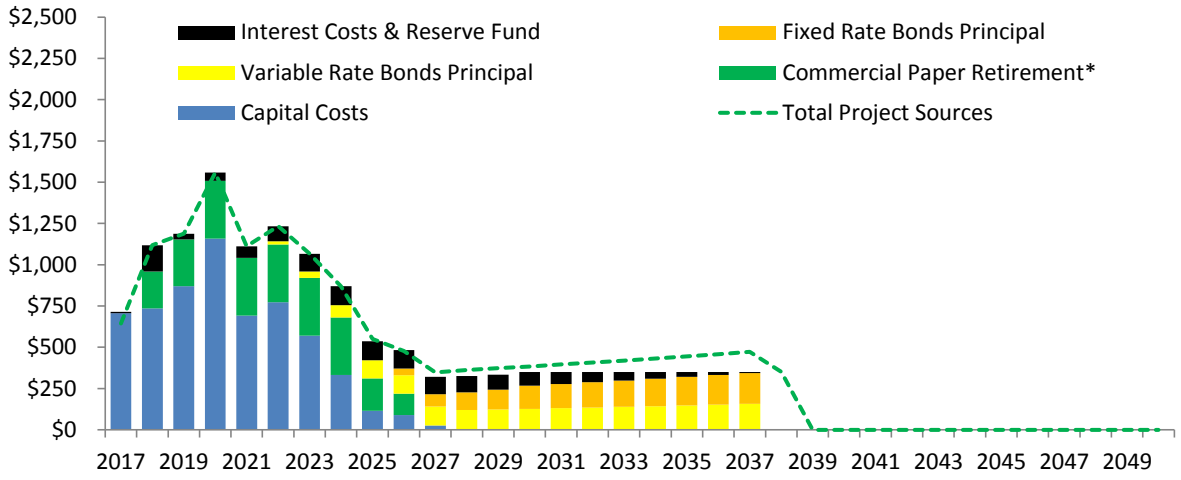


J-1.3.3 Ten-year Extension with a 90%/10% Split

Exhibit J-4 summarizes a 10-year GET surcharge extension that keeps the existing State retention at 10%. Under this scenario, GET revenues would increase from $4.8 billion to $8.9 billion. Debt proceeds of approximately $3.5 billion would be required at a financing cost of $1.4 billion. There are no years after construction in in which debt payments are in excess of GET surcharge revenues. However, after construction from FY 2027 to FY 2033, the GET revenue is only slightly more than the projected debt service payments. This scenario has only limited ability to meet deviations from the economy or fluctuations in processing returns by the State during this post-construction period. After FY 2033, the annual GET revenues continue to grow and are safely above the annual debt service payments.

If the projections are "stressed" under the same stress assumptions as in the above examples, this "stressed" scenario is projected to have 11 years of annual deficits starting in FY 2028. The City would need to offset these annual shortfalls by other revenue sources averaging approximately $90 million per year, if GET revenue grows at 3% and other costs are increased.

Exhibit J-4: Funding at 90%/10% GET Split to 12/31/2037 ($ in millions)



J-2 Network Operating Plan

Under the full 20-mile alignment, total transportation system operation and maintenance costs would total approximately $524 million in FY 2026 including rail, bus, and Handi-Van operations. On November 8, 2016, voters approved an amendment to the City Charter (Amendment 4) to transfer the responsibility for operations and maintenance to the City's Department of Transportation Services and set up a Fare Commission to recommend changes to the public transit fare structure. This charter change is effective July 1, 2017.

Under Plan B, there will be an approximate 40% reduction in rail ridership decreasing from 121,000 riders per day to approximately 76,000 riders per day. This loss in rail ridership would place greater demands and costs on bus transportation as riders would use buses to reach areas where rail stations were eliminated. Increased bus costs would also be incurred to transport rail passengers to and from the Aloha Tower Station. It is estimated that any reduction in rail costs associated with the shorter rail route would be offset by higher bus costs to service the shorter rail alignment.

Total fare revenue would drop by at least $11 million under Plan B relative to the full 20-mile alignment due to the decrease in system-wide ridership. This decrease in revenue would therefore need to be offset by higher fare rates and a higher subsidy level than under the full 20-mile alignment.

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Appendix K: Plan B Required SEIS and Associated Litigation Risk

For the reasons described herein, Plan B—which would change the eastern terminus of the Project from the Ala Moana Center Station to the Downtown Station—will require, at a minimum, a SEIS and/or likely a revised ROD on the Project. Undertaking a SEIS and/or the resulting change to the ROD will most certainly be required if the change of the Project's eastern terminus to the Downtown Station is to be accomplished within the $6.8 billion budget currently projected to be available to the Project. The issuance of a SEIS and and/or a change to the ROD—which almost certainly will follow, given the extent of changes to the Project if Plan B is adopted—will be the last or final agency action on the Project, clearly subjecting these revised environmental documents to judicial review.

HART's ROM analysis in June 2016 of what has become Plan B identified that *at least* seven stations—Kalihi, Kapalama, Iwilei, Chinatown, Civic Center, Kaka'ako, and Ala Moana Center—would need to be eliminated in order to reach the Downtown Station within the projected $6.8 billion currently available for the Project. More importantly, however, the elimination of these stations is projected to reduce ridership on the system by as much as one-half, ranging from a 35% reduction in ridership to as much as a 62% reduction in ridership—potentially as many as 72,000 riders per day by 2030 of the Project's projected ridership—which calls into question whether this shortened project would meet the FTA requirement that the Project have independent utility.

However, even if all of the stations were built between the western terminus at East Kapolei and the Downtown Station, the elimination of the Civic Center, Kaka'ako and Ala Moana Center Stations would still trigger an environmental review of some sort and a potential modification of the ROD on the Project, as the elimination of these three stations alone would potentially effect nearly 25% of the projected system ridership (just with respect to these three stations). The elimination of these stations undercuts the basis for the ROD, namely: improvements to corridor mobility; support for transit development, especially in the Kaka'ako neighborhood; and meeting the transit equity assumptions in the FEIS.

More importantly, however, there are significant physical changes required at ground level to address the logistics of tens of thousands of passengers on a daily basis originating or terminating their rail transit trips at the Downtown Station. The siting of a TheBus and TheHandi-Van transfer facility and the associated environmental impacts of passenger and pedestrian safety, marshalling of buses, and increased traffic congestion in the Downtown Station vicinity will all need to be analyzed and memorialized in some written manner. Regardless of the form the memorialization may take—either an SEIS or some other document—it will constitute a new final agency action which opens that action to judicial review.

Although the NEPA lacks a citizen-suit provision, a plaintiff may seek judicial review of any final agency action pursuant to the NEPA under the Administrative Procedure Act (APA).[3] To meet the APA standing requirement, the plaintiff must simply be "adversely affected or aggrieved ... within the meaning of a relevant statute" by some final agency action.[4] Thus, any citizen need only show that he or she is "adversely affected or aggrieved ... within the meaning of [the NEPA] statute"—a very low bar for standing to sue.

K-1 Background

The Project is described in the ROD by the FTA as "consist[ing] of the 20 mile elevated guideway with 21 stations and supporting facilities."[5] The relevant portion of the ROD for the purposes of this analysis states: "East of Middle Street the guideway will follow Dillingham Boulevard to the vicinity of Ka'aahi Street and then turn east to connect to Nimitz Highway near Iwilei Road. The guideway will follow Nimitz Highway east to Halekauwila Street, and then proceed along Halekauwila Street past Ward Avenue, where it will transition to Queen Street. The guideway will cross from Waimanu Street to Kona Street in the vicinity of Pensacola Street. The guideway will run above Kona Street to Ala Moana Center."[6]

As a starting point, changing the eastern terminus of the Project to something other than Ala Moana Center will require an evaluation of the environmental and ridership assumptions assumed in the FEIS that undergirds the ROD. Additionally, the Project's ROD identifies the Project as a 20-mile, 21-station project with a specified terminus at Ala Moana Center. While terminating the Project at the Downtown Station has been preliminarily determined by the FTA to be considered a project that would provide independent utility (as required under the NEPA and related FTA regulations to assure that projects will result in a useable transportation facility and will be a reasonable expenditure of federal funds even if no additional improvements in the area are made), that has been only a working hypothesis and not a final determination by the FTA.

Moreover, while terminating the Project at the Downtown Station may meet the requirements of a project of independent utility, the impacts on ridership and broader environment impacts will need to be evaluated in either a SEIS or other evaluations short of an SEIS that still may be time consuming. In either event, an SEIS could also require a revised ROD. Regardless of which course is chosen related to a new terminus location, *any additional environmental analysis* will be a final or last act of government and thus subject to judicial review.

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[3] Administrative Procedure Act, Pub. L. No. 79–404, 60 Stat. 237.
[4] *Lujan v. National Wildlife Federation*, 497 U.S. 871, 883 (1990).
[5] Record of Decision on the Honolulu High Capacity Transit Corridor Project in Metropolitan Honolulu, Hawaii by the Federal Transit Administration, 6, January 18, 2011.
[6] Id. at 7.

K-2 Relevant Regulations

Title 23 CFR Section 771.130 speaks specifically to instances when SEISs are required. The regulation states that an EIS shall be supplemented whenever the Administration determines that:

> (1) Changes to the proposed action would result in significant environmental impacts that were not evaluated in the EIS; or
>
> (2) New information or circumstances relevant to the environmental concerns and bearing on the proposed action or its impacts would result in significant environmental impacts not evaluated in the EIS.[7]

Terminating the Project at the Downtown Station was never analyzed in the Project's EIS.

Section 771.130 continues, however, to indicate there may be circumstances where a supplemental EIS is not necessary, as follows:

> (b) However, a supplemental EIS will not be necessary where:
>
> > (1) Changes to the proposed action, new information, or new circumstances resulting in a *lessening* of adverse environmental impacts evaluated in the EIS without causing other environmental impacts that are significant and were not evaluated in the EIS; or
> >
> > (2) The Administration decides to approve an alternative fully evaluated and approved final EIS, but not identified as the preferred alternative in such case a revised ROD shall be prepared and circulated in accordance with §771.127(b). (emphasis added)[8]

The eastern terminus of the Project at the Downtown Station meets neither of these conditions described immediately above, as there has been no analysis of how riders terminating their trips at the Downtown Station (perhaps as many as 20,000 to 30,000 riders per day) would transfer to other surface transportation alternatives to continue their trips to the city's major employment locations along Kapiolani Boulevard adjacent to the Civic Center Station, Ala Moana Center, and beyond to Waikiki. On the other hand, transfers to TheBus and to TheHandi-Van at Ala Moana Center Station were analyzed extensively in the Project's FEIS.

FTA regulations also specifically identify circumstances when a SEIS may be necessary for major new fixed guideway capital projects. Specifically, FTA regulations state the following:

> (e) A supplemental draft EIS may be necessary for major new fixed guideway capital projects proposed for FTA funding if there is substantial change in the level of detail

[7] 23 CFR § 771.130(a).
[8] 23 CFR § 771.130(b).

on the project impacts during project planning and development. The supplemental will address site-specific impacts and refined cost estimates that have been developed since the original draft EIS. It would appear that a change to a city terminus to the Downtown.

(f) In some cases, the supplemental EIS may be required to address issues of limited scope such as the extent of proposed mitigation or the evaluation of location and design variations for a limited portion of the overall project. Where this is the case, the preparation of a supplemental EIS shall not necessarily:

(1) Prevent the granting of new approvals;

(2) Require the withdrawal of previous approvals; or

(3) Require the suspension of project activities for any activity not directly affected by the supplement. If the changes in question are of such magnitude to require reassessment of the entire action, or more than a limited portion of the overall action, the Administration shall suspend any activities which would have an adverse environmental impact or limited choice of reasonable alternatives until the supplemental EIS is completed.[9]

It would appear that a change in the Project's terminus to the Downtown Station would meet the requirements of Subsection (e) cited above, given that there will be extensive site-specific impacts at the Downtown Station such as the construction of a stub Y track to reverse the trains' direction at that location as well as the pedestrian safety, parking, traffic congestion, and air quality impacts that result from creating a bus transfer facility somewhere adjacent to the Downtown Station (which may not physically be possible). Other physical impacts at ground level also will need to be analyzed since possibly as many as three times the number or transit users than estimated in the FEIS will embark and disembark at that station. Of greatest importance, however, is an environmental evaluation of how the rail transit users will transfer from and to TheBus, TheHandi-Van, and other surface transportation modes to complete their journeys. There is no such analysis of these issues in the FEIS or the Project's ROD. In the most recent meetings with the FTA about Plan B and the potential to terminate the Project at the Downtown Station, it has been acknowledged that a SEIS is almost surely to be required should Plan B be pursued.

K-3 Impact on Ridership

There are precedents under which rail transit projects funded, in part, by FTA grants that have been subject to extensive litigation and delays because of claims that the projects failed to satisfy their NEPA obligations.

[9] 23 CFR § 771.130(e) & (f).

If a determination is made to pursue Plan B, three stations in the original scope of the project—Civic Center, Kaka'ako, and Ala Moana Center Stations—would be eliminated, at a minimum. As a result of this further analysis of Plan B, it has been determined that *at least* the Kalihi, Kapalama, Iwilei, and Chinatown Stations also would have to be eliminated—and depending on available resources and the need to fund contingencies for this segment, other stations may also need to be eliminated. The elimination of additional stations beyond those four, however, would result in potential contractor claims that would minimizing the funding yield from their elimination and might just simply raise costs. The total projected ridership impact to the three stations that are *certain* to be eliminated, measured in daily boardings, amounts to nearly 29,000 riders or nearly 25% of the total system ridership projected in the Project's EIS. The ridership impact on the elimination of the *additional* four identified stations under Plan B reduces ridership by as much as one-half or more, as more fully described above.

K-4 Relevant Case Law Precedents

In March 2014, the FTA issued a ROD approving the Purple Line Project, a 16.2-mile light rail project in Montgomery and Prince George's Counties, Maryland, which was dependent on a billion-dollar federal grant. Environmental interests filed a lawsuit (Friends of the Capital Crescent Trail, et al. Plaintiffs, v. Federal Transit Administration, et al. v. State of Maryland) in the United States District Court for the District of Columbia against the FTA, the United States Fish and Wildlife Service (FWS), the USDOT, and the United States Department of the Interior. The state of Maryland intervened as a defendant.

In the original complaint, the plaintiffs challenged the FTA's ROD and related approvals by the FWS under the APA and raised multiple claims under the NEPA, the Federal Transit Act, the Federal-Aid Highway Act, the Endangered Species Act, and the Migratory Bird Treaty Act, alleging that the defendants failed to comply with the relevant statutes and regulations, including that:

1. The defendants violated the NEPA by refusing to prepare a SEIS in spite of changes to the project, its circumstances, and new information.
2. The defendants violated the core requirements of the NEPA by failing to fully and fairly assess the impacts of the project and alternatives to it and failing to document properly how the project would comply with applicable laws.
3. The defendants violated the substantive obligations imposed by the Highway Act and other statutes and regulations governing transportation projects.

The plaintiffs later added to their suit the ridership and safety issues raised by the Washington Metropolitan Area Transit Authority (WMATA), considering that both ends of the Purple Line would connect with WMATA stations as additional reasons why the project should be blocked. Specifically, the plaintiffs asserted that the Purple Line ridership numbers were inflated and should be revised downward based on WMATA ridership

reductions of 6% on weekdays and 12% on weekends (2015 versus 2016 statistics) due to system safety concerns and system reliability concerns associated with deferred maintenance of the WMATA system. It is important to note that WMATA generated boardings are projected to be only 27% of all boardings on the Purple Line, or as expressed as a whole, 1.6% to 3.24% of the *total* Purple Line ridership—a very small ridership variation, of which the court nonetheless took cognizance.

On August 3, 2016, the District Court entered partial summary judgment in favor of the plaintiffs, holding that:

1. The FTA's decision to disregard ridership and safety issues was arbitrary and capricious in violation of the APA.
2. The FTA would need to prepare a SEIS on ridership and safety issues.
3. Vacatur of FTA's ROD for the Purple Line was the appropriate remedy for the FTA and MTA's failure to consider WMATA ridership and safety issues.

Consequently, the FTA and MTA were charged with the preparation of a SEIS. However, on November 22, 2016, on motions filed by the FTA and MTA, the District Court cited "persuasive" case law in the District of Columbia Circuit that the proper course of action would be to require the FTA to determine whether a SEIS was required by NEPA regulations. The District Court explained in the amended order that should the FTA determine that a SEIS is not required, it then would return to the issue of whether a SEIS is legally required by NEPA in light of the WMATA safety issues and reduced ridership.

The FTA submitted its determination on the necessity for a SEIS on December 16 and found that one was not, in fact, needed because "changes in transit ridership, especially decreases, normally do not significantly alter the environmental impacts caused by a project." The FTA alleged that "adverse environmental effects from changes in ridership tend to result when substantial increases in ridership require larger stations or facilities, or more frequent service to accommodate riders."[10] The District Court has set a schedule for briefs to consider whether the FTA's determination is correct, the last of which were due at the end of January 2017. It is unclear whether the District Court will find the FTA's determination to be in accord with the APA. Moreover, even if the District Court rules for the FTA on the SEIS issue, it is unclear what will happen with respect to the vacated ROD, and it bears mention that the plaintiffs' other claims still remain to be adjudicated. However, it is entirely possible that if the MTA and FTA must prepare a new SEIS, they will also need to prepare a new ROD. Consequently, the litigation on the Purple Line does not appear to be close to a conclusion, and the project has been halted since August 3, 2016, which was just five days before the FTA was to sign a FFGA for $900 million on that project.

[10] MTA Purple Line-Consideration of Submitted Materials from Friends of Capital Crescent Trail and Assessment of Potential Effects of WMATA Ridership/Safety Issues on Purple Line Ridership, Federal Transit Administration, 2, December 13, 2016.

There are cases in which significant changes to projects operating subject to an FEIS and ROD have needed to complete a supplemental NEPA analysis: in the event "(i) the agency makes substantial changes in the proposed action that are relevant to environmental concerns; or (ii) there are significant new circumstances or information relevant to environmental concerns that bear on the proposed action or its impacts." It bears note that courts have often opted to interpret the CEQ regulations to require an additional ROD in cases where a SEIS is required.

Most recently, the Los Angeles Metro was required by a federal court in 2014 to prepare a supplemental NEPA analysis to "explain why open-face tunneling alternatives were rejected on the Lower Flower Segment in downtown Los Angeles." This case arose "from the June 29, 2012, decision of FTA, approving the Regional Connector Transit Corridor Project (the "Project") … [that] involves the construction of a new subway line in the City of Los Angeles that will connect certain existing stations." The "[p]laintiffs own, or previously owned, certain real property that is near the planned subway route." The plaintiffs alleged numerous violations of the NEPA with respect to properly assessing the impacts of the Los Angeles Metro's mode of tunneling through the area in question.

The plaintiffs, the FTA, and the Los Angeles Metro filed for summary judgment, and in 2014 the United States District Court for the Central District of California granted in part and denied in part the plaintiffs' and defendants' motions. The Court partially vacated the ROD, remanded the matter back to the Los Angeles Metro, and required a "supplemental NEPA analysis (either a supplemental EIS or supplemental Environmental Analysis) that addresses the feasibility of the Open–Face Shield and SEM tunneling alternatives." The Court further ordered that "the FTA shall issue either a Finding of No Significant Impact or an Amended ROD."

In analyzing the adequacy of the FEIS and ROD, the Court explained while the CEQ regulations do not define the term "substantial changes" that may require an SEIS, the United States Court of Appeals for the Ninth Circuit has held that: "In deciding whether a supplemental EIS is required, a court should consider each of the following issues: (i) whether the modified portion is a primary or secondary aspect of the overall project; (ii) whether the modifications are minor; and (iii) whether the modification will have environmental impacts that the agency has not yet considered."

The Ninth Circuit further explained that "[w]hen determining whether to issue a supplemental EIS, an agency must 'apply a rule of reason,' not supplementing 'every time new information comes to light' but continuing to maintain a 'hard look' at the impact of agency action when the 'new information is sufficient to show that the remaining action will affect the quality of the human environment in a significant manner or to a significant extent not already considered.' "[11]

[11] *Today's IV, Inc. v. FTA,* 2014 WL 3827489, at *33 (C.D. Cal. May 29, 2014)(quoting *League of Wilderness Defenders/Blue Mountains Biodiversity Project v. Connaughton*, 13–35653, 2014 WL 1814172, —— F.3d —— (9th Cir. May 8, 2014).

The Ninth Circuit also relied on the CEQ regulations in holding that "[w]hen a supplemental EIS becomes necessary, the agency must "prepare, circulate, and file a supplement ... in the same fashion (exclusive of scoping) as a draft and final statement." The Ninth Circuit quoted 40 CFR Section 1502.9(c)(4) and 23 CFR Section 771.130(d) in explaining this process: "[a] supplement is to be developed using the same process and format (i.e., draft EIS, FEIS and ROD) as an original EIS, except that scoping is not required."

Thereafter, Los Angeles Metro prepared a SEIS and a supplemental ROD while the plaintiffs appealed the District Court decision to the Ninth Circuit. The Ninth Circuit affirmed the District Court's decision on December 6, 2016.

K-5 Conclusion

It is important to note that no environmental, ridership, or engineering analysis of an eastern terminus of the Project at the Downtown Station as described in Plan B has ever been undertaken. Of greatest concern are the environmental, air quality, pedestrian, and rider safety and traffic congestion impacts associated with establishing a surface transportation (TheBus and TheHandi-Van) transfer facility for riders to continue their journeys to and from other major employment centers in the city.

These are the very impacts that Congress sought to address when the NEPA was enacted so that government action and the needs of people living near such projects could be balanced. Consequently, it is very possible that plaintiffs could challenge an eastern terminus of the Project at the Downtown Station (and elimination of other stations) as being in violation of the NEPA because there has been no environmental analysis of this alternative. Moreover, it is also possible that a federal court could agree with such a challenge, thus forcing a potential delay while a SEIS and a new ROD are produced, to say nothing of likely appeals to the Ninth Circuit.

While the ridership impact on ending the Project at the Downtown Station could amount to a possible reduction of as much as 50% of the system ridership, courts have taken cognizance of ridership reductions of significantly less impact, such as the Purple Line case cited above where the court saw total ridership variations of 1.6% to 3.2% as requiring further environmental analysis by the FTA and a delay in construction.

Regardless of the outcome of the Purple Line case and whether an SEIS is required for year 2030 or 2040 ridership variations, the litigation has resulted in almost all work on the project being suspended thus far for 8 1/2 months. Project delays associated with the Ninth Circuit case litigation involving Los Angeles Metro resulted in the suspension of work on the Lower Flower Segment of the Regional Connector Transit Corridor Project for two years. Because of these precedents, any savings projected from an eastern terminus of the Project under Plan B at the Downtown Station should take into account potential litigation costs and the costs of construction delays and project cost escalation as well as likely material financing cost increases associated with any delays—should a federal court find that there are reasonable justiciable issues with respect to the Project's compliance with the NEPA or

should the court find that there was indeed a lack of compliance with the NEPA, notwithstanding the best efforts of all to comply.

The Project has already endured its share of litigation. In two of the three lawsuits attempting to stop the Project or question the Project's compliance with both the NEPA and/or the Hawaii Environmental Policy Act, plaintiffs have been successful in shutting down all construction activities for up to 13 months in one case and shutting all planning activities for the City Center segment in another for almost the same amount of time. Fortunately, the project shutdowns mostly overlapped, but they could have been sequential had the lawsuits been filed at different times. White a third lawsuit was rejected on summary judgment without the imposition of a preliminary injunction, the record is clear that a SEIS that will most assuredly result in a final act of government which is clearly subject to judicial review.

There are estimates that a Project SEIS will take 12 to 18 months to complete, followed by appropriate PMOC, FTA, and federal CEQ review. Thus, a delay of as much as two years is reasonable just for the completion of these additional EIS reviews. Additionally, based on past experience, it is expected that the chances for further litigation are quite high. While the potential for injunctive relief for potential plaintiffs is unknowable at this time, the delay impacts just associated with the SEIS and the SEIS review by the FTA and CEQ are likely to be significantly compounded with the filing of expected litigation.

While there are other substantive negative impacts to pursuing Plan B, as described elsewhere in this appendix, the risk of litigation associated with changing the eastern terminus of the Project to the Downtown Station brings a higher degree of unpredictable risk.

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Appendix L: HECO Relocations and Related Issues

L-1 138kV, 46kV, and 12kV Overhead Power Line Working Clearance Resolution

HART and HECO have come to an agreement to resolve HECO's concerns regarding adequate working clearances between HART's rail guideway and HECO's high-voltage 138kV transmission, 46kV sub-transmission, and 12kV distribution power lines and the associated steel or wood poles. In order for HECO's work crews to perform future maintenance, repairs, or pole replacements (utilizing their existing fleet of bucket truck vehicles), HECO has required horizontal working clearances of 50 feet for 138kV power lines, 40 feet for 46kV power lines, and 30 feet for 12kV power lines. In relation to the Project, this is the horizontal distance between HECO's overhead conductors and the HRTP's edge of guideway. HART was able to work with HECO to research and identify alternate equipment (vehicles) which would allow HECO's work to be performed in less horizontal space than originally required. With the use of these alternate vehicles, HECO has granted variances to their clearance requirements in certain areas that will enable existing poles to remain overhead and not be relocated as originally contemplated.

HART assembled a Task Force to review and analyze mitigation options to the clearance issue, which explored both relocation and non-relocation alternatives. Some non-relocation alternatives that were discussed with HECO included "re-framing" poles, maintaining poles from alternate access areas, and using alternate vehicles. Re-framing is an adjustment of how the power line conductor attaches to the structural steel pole by eliminating (or shortening) the existing pole arms and relocating the insulator and conductor closer to the pole, resulting in additional clearance to the HRTP guideway. With re-framing, additional analysis of the adjacent poles were required to ensure any angle changes in the power lines can be supported by the adjacent existing structural poles. The review of alternate access areas included performing a pole-by-pole analysis of the HECO alignment to confirm if any frontage roads (such as Moloalo Street) or private property could be used to access poles, rather than the public right-of-way. Allowing HECO to work from the guideway was also reviewed and discussed, but this didn't provide adequate solutions to allow for HECO to perform its work. Alternate vehicles were another explored alternative and have become the primary solution to resolve the HECO clearance concerns. HECO successfully tested two new bucket trucks that can perform the 46kV work and two additional high-reach bucket trucks that can perform the 138kV work within less than their required horizontal working clearance.

Alternatives for relocation of HECO facilities were also analyzed to mitigate cost and schedule. Traditional overhead and underground relocations were considered, with the cost-effective overhead relocations being the preferred solution. Relocating HECO's lines and attaching them to the rail guideway was another option considered; however, this option posed access and maintenance challenges for both agencies and was not pursued.

For the WOFH and KHG sections of the Project, HECO successfully tested two new bucket trucks (the Altec AN67-E100 and Altec TA45-L55, which are not currently in their fleet) that can perform the 46kV and 12kV maintenance work with less than their required working clearance. This will mitigate the need to relocate almost 90% of the 46kV poles/lines that do not meet the required working clearances. For the 138kV lines along WOFH and KHG, HECO and HART traveled to Colorado to review the operational capabilities of the Phoenix and Skybird bucket trucks. The Phoenix has an upward reach of 180 feet, a side reach of 79 feet, and a platform carrying capacity of 2,000 pounds. The Skybird has an upward reach of 210 feet, a side reach of 102 feet, and a platform carrying capacity of 1,300 pounds. HECO has also found alternate cranes which will allow for less than the required working clearance. HECO has determined the extent of their power lines that can be addressed through the use of this new equipment and has granted variances on a case-by-case basis where possible. Variances include the 138kV lines along Kualakai Parkway and along Kamehameha Highway (west of HECO's Waiau Power Plant). HART is working to finalize the design for the additional necessary 46kV relocations along the WOFH section and is working to procure a designer to finalize the additional necessary 138kV relocations along the KHG section (east of HECO's Waiau Power Plant). For the Airport section of the Project, a HECO-HART combined solution of the use of alternate vehicles (identified on the west side), increased Navy easements, and redesigned (re-framed) pole arms will alleviate undergrounding the nine-pole 138kV system fronting Joint Base Pearl Harbor-Hickam. This solution will not require underground relocations of this 138kV system. For the City Center section of the Project, HART and HECO have agreed to underground the two existing overhead 138kV lines along Dillingham Boulevard. HECO's 46kV and 12kV lines were already considered for relocation in the CCGS procurement, and HART's designers are progressing to a preliminary engineering 138kV design with feedback from HECO.

HECO has provided a report for the 138kV alternate equipment and a separate report which covers the 46kV and 12kV alternate equipment. HART is required to purchase these alternate vehicles for HECO's future use, which will allow variances to HECO's clearance requirements and thus avoid costly line relocations (underground or overhead). As presented to HART's Board of Directors, the total underground relocation estimate for the 138kV and 46kV lines along the WOFH and KHG sections is estimated to be $200 million. With the alternate vehicles, a potential savings of $138 million is possible.

The equipment option costs are presented in the following exhibit, which includes relocation costs for WOFH and KHG (for those portions for which alternate equipment would not work and thus have to be relocated):

Exhibit L-1: HECO Equipment and Relocation Costs

Equipment/Relocation Option	Cost
Altec Vehicle Cost for 46kV	$ 4,741,000
Skybird and Phoenix Cost for 138kV	9,076,000
46kV and 12kV Relocation (WOFH)	5,700,000
138kV Underground Relocation (KHG)	32,000,000
46kV Overhead on Shorter Poles (KHG)	10,000,000
Total Cost with Vehicle Purchase	**$61,517,000**

For the Airport section, the 138kV underground relocation was included as a priced option, and HECO provided a letter allowing for the nine existing 138kV poles to remain in place by being re-framed to provide more horizontal working space. For the City Center section, the 138kV relocations are included in the contractor's base scope. The overall solution for the Project consists of a variety of alternative solutions for each section of the alignment to either allow for a variance from the standard requirements or to perform the necessary relocations to allow for acceptable working clearances, as outlined below and as shown in Exhibit L-2:

Exhibit L-2: HECO Relocation Solutions by HRTP Section

HRTP Section	Relocation Solutions
WOFH	138kV – No relocations with use of Alternate Vehicles. 46kV – No relocations with use of Alternate Vehicles except in two areas that will require overhead-to-overhead relocations.
KHG	138kV – No relocations for certain poles with use of Alternate Vehicles; relocation of overhead line to underground where variances were not granted. 46kV – Where 46kV lines are "under-built" to 138kV lines, replacement 46kV poles are required and allow for demolition of 138kV poles.
Airport	138kV – Re-frame poles (shorten conductor arms); no relocations with use of Alternate Vehicles. 46kV – No relocations with use of Alternate Vehicles.
City Center	138kV – Relocation of overhead lines to underground is included in the base scope. 46kV – Relocation of overhead lines to underground is included in the base scope.

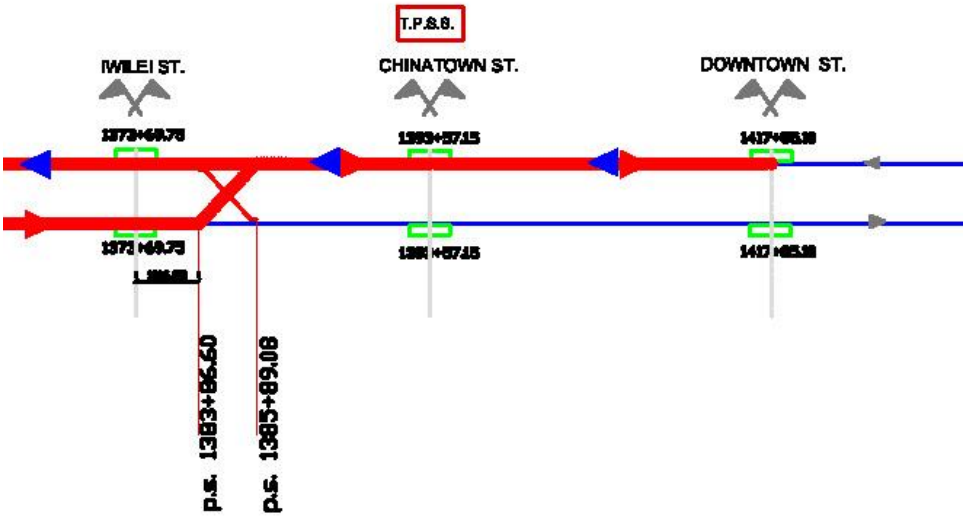
L-3 Davis-Bacon Requirements

HECO has a collective bargaining agreement that has different wage scales and allows payment to its labor forces bi-weekly, which does not satisfy the federal Davis-Bacon Act. Based on the State of Hawaii Department of Labor and Industrial Relations correspondence, HECO has begun the process to pay their employees weekly. HECO has submitted a rate conformance request that has thus far been denied by the United States Department of Labor (USDOL), although HECO has appealed. HECO and HART are still awaiting a final decision from the USDOL for the applicable rates.

Appendix M: Plan B Operational and Functional Issues

An Operations and Maintenance analysis of the Plan B alignment has been conducted, with a focus on crossover configuration, headways, and operability into a terminus at the Downtown Station.

Exhibit M-1: Operating Pattern into the Downtown Station Terminus



The headway of Plan B, using the crossover east of Iwilei Station into Downtown Station and back, provides a best-case operating scenario headway of 6 minutes and 30 seconds. Given that the Downtown Station is currently designed as a side-loading platform station, alternating trains into the terminus is not an option due to passenger confusion regarding which platform to use.

This headway is calculated as travel time plus dwells and schedule recovery at the terminus. Average dwell time for an urban city station is in the range of 20 to 25 seconds; however, a minimum dwell at a terminus is 52 seconds. Downtown station as per simulations done for the base alignment uses the 52-second dwell time for calculation purposes. It is important to note here that a 52-second dwell for at terminus station, makes no allowance for schedule recovery and therefore is insufficient and not a practical dwell for Revenue Operations.

Terminus operations must provide options and inevitably play key roles in providing the flexibility and redundancy for Rail Operations. This issue is especially true of systems, such as the HRTP, which are capable of very short headways and considerable operational flexibility.

The thoughtful location of crossovers and turnouts enhance and define operational flexibility. Crossover and/or turnback operations at or near a terminus, or mid-route, must

serve timely passenger loading and offloading requirements under both normal and failure management operations.

The design of track configurations must also support efficient reversal of trains, optimization of headway, and increased passenger demands and volume on platforms during service adjustments or delays, supported by the following basic principles:

- **Minimum Headways**: The minimum headways must support the long-term system design headways for the segment, taking into account the integration and coordination with all the other parts of the network which may dictate specific headway requirements. Headways must take into account the minimum separation currently supported by the automated system, as well as minimum station dwells for passenger loading (typically approximately 20 seconds). Crossover locations, such as those proposed at the East Kapolei and Ala Moana Stations, are reasonable as front crossovers; however, they are slightly more restrictive (typically approximately 105 seconds) due to the station dwell and direction reversal in comparison to rear crossovers, although in the case of the Project they could still offer shorter turnaround times due to their proximity to the terminus stations. Generally, as is the case for the Project, double crossovers are preferred, as a single front crossover design would add constraints to the maximum dwell times and prevent delaying the arrival of a following train.

- **Network Schedule Dependences**: Scheduled headways, and the pattern of arrivals and departures, will be affected by connections and other considerations at various points throughout the network (such as the other terminus station, crossovers junctions, and at single-track requirements). Therefore, headways and the pattern of arrivals and departures cannot necessarily be optimized for any individual station, but rather must be considered across the entire network. A non-holistic approach to scheduling will result in routine delays for trains approaching the terminus if their arrivals are constrained by a train which has not yet departed. Single-track operations into end station designs are particularly susceptible to this type of operational disruption.

- **Schedule Transitions**: During scheduled transitions, between peak and off-peak period levels of service, the incoming and outgoing in-service headways may be different as trains are added to, or removed from, service. This difference in headways can result in conflict and delays at junctions or at crossovers leading into a terminus location, where trains with higher or lower dwell requirements compete for a single platform.

- **Failure Management and Alternate Service**: In the event of a pre-planned maintenance, or shuttle operations due to a problem or incident at a terminus location or elsewhere along the line, the terminus station should support the maximum number of operating options, allowing as much residual service as practical.

The current guideway configuration locates special trackwork (crossovers) just east of the Iwilei Station location and offers a side-loading station (Downtown Station) as the eastern terminus for Plan B. The current configuration for Plan B does not support the basic operational principles depicted above and therefore does not support the concept of a "system of independent utility" within FTA guidelines.