DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHAEL D. FORMBY
DIRECTOR

MARK N. GARRITY, AICP
DEPUTY DIRECTOR

PT 575644

August 14, 2014

Ms. Jessica Wooley, Director
Office of Environmental Quality Control (OEQC)
State Office Tower
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813-2437

Dear Ms. Wooley:

Subject:	Chapter 343, Hawaii Revised Statutes Draft Environmental Assessment (DEA)
Project:	Kalihi-Palama Bus Facility (Kalihi Stream) Improvements
Applicant:	Department of Transportation Services, City and County of Honolulu
Agent:	R. M. Towill Corporation, Chester Koga, AICP
Tax Map Keys:	(1) 1-2-015:006 and (1) 1-2-017:002
Proposal:	Installation of stream stabilization measures to prevent further erosion of the west bank of Kalihi Stream, located along the eastern boundary of the Kalihi-Palama Bus Facility.
Determination:	Anticipated Finding of No Significant Impact

The Department of Transportation Services, City and County of Honolulu, has reviewed the Draft Environmental Assessment (DEA) for the subject project, and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish the notice of availability of the DEA for this project in the next available edition of the OEQC *Environmental Notice*.

Enclosed with this transmittal are the following:

- One (1) hard copy of the completed OEQC Bulletin Publication Form;
- One (1) hard copy of the DEA; and
- One (1) CDROM containing a PDF of the DEA and MS Word copy of the OEQC Bulletin Publication Form.

Should you or your staff have any questions about this submittal, please contact Mr. Wayne Tomita at 768-8378, or our consultant, Brian Takeda, at R. M. Towill Corporation at 842-1133.

Very truly yours,

Michael D. Formby
Director

Enclosures

cc: Brian Takeda, R. M. Towill Corporation

Agency Action EA
Chapter 343, HRS
Publication Form

Project Name	Kalihi-Palama Bus Facility (Kalihi Stream) Improvements
Island:	O'ahu
District:	Honolulu
TMK:	(1) 1-2-015:006 and (1) 1-2-017:002
Permits:	U.S. Army Corps of Engineers Section 404 and Section 10 permit, Section 401 Water Quality Certification, National Pollutant Discharge Elimination System (NOI C and NOI G) permits, Stream Channel Alteration permit, Coastal Zone Management Federal Consistency Review, City and County of Honolulu Grading permit.
Approving Agency:	Department of Transportation Services, City and County of Honolulu 650 South King Street, 3rd Floor, Honolulu, Hawai'i 96813 (808) 768-8378
Applicant:	Department of Transportation Services, City and County of Honolulu 650 South King Street, 3rd Floor, Honolulu, Hawai'i 96813 (808) 768-8378
Consultant:	R. M. Towill Corporation 2024 North King Street, Honolulu, Hawai'i 96819 Mr. Brian Takeda (808) 842-1133

Status (check one only):

X DEA-AFONSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov; no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the approving agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov. NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. No comment period ensues upon publication in the periodic bulletin.
__Statutory hammer Acceptance	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.
__Section 11-200-27 Determination	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page):

The City and County of Honolulu (CCH), Department of Transportation Services (DTS), proposes to install stream stabilization measures to prevent further erosion of the west bank of Kalihi Stream, located along the eastern boundary of the Kalihi-Palama Bus Facility. Past storm events have significantly eroded the Kalihi Stream bank, specifically near the western curve of the stream bend, to the extent that a portion of the Kalihi-Palama Bus Facility's parking lot is in danger of being structurally undermined. Therefore, DTS proposes to install stream bank protection and stabilization measures along the western bank of Kalihi Stream to prevent further erosion, scour and loss of the Kalihi-Palama Bus Facility. The proposed Project includes the improvement of approximately 18,000 square feet of the west bank of Kalihi Stream (approximately 620 linear feet in length, and 29 feet in width). The Project site and area of disturbance is primarily within the CCH's parcel containing the west bank of Kalihi Stream and the Kalihi-Palama Bus Facility, identified by Tax Map Key (TMK) (1):1-2-015:006. A portion of the Project site within the banks of Kalihi Stream is also within the neighboring, privately-owned parcel identified as TMK (1):1-2-017:002.

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared in Accordance with Chapter 343, Hawai‘i Revised Statutes

Kalihi-Palama Bus Facility (Kalihi Stream) Improvements Kalihi, O‘ahu, Hawai‘i

TMK (1) 1-2-015: 006 and (1) 1-2-017:002

August 2014

PREPARED FOR:
Department of Transportation Services
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawai‘i 96813

DRAFT ENVIRONMENTAL ASSESSMENT

Kalihi-Palama Bus Facility (Kalihi Stream) Improvements Kalihi, O‘ahu, Hawai‘i

TMK (1) 1-2-015: 006 and (1) 1-2-017:002

August 2014

PREPARED FOR:
Department of Transportation Services
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawai‘i 96813

PREPARED BY:
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawai‘i 96819
RMTC Ref No. 1-21572-1P

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SECTION 1
PROJECT SUMMARY

Project:	Kalihi Stream Improvements
Landowner/Applicant	Dept. of Transportation Services, City and County of Honolulu
Accepting Agency	Dept. of Transportation Services, City and County of Honolulu
Agent	R.M. Towill Corporation
Location	Kalihi Stream - Northeast of Middle Street and Kamehameha Highway Intersection
Tax Map Key	(1) 1-2-015:006 and (1) 1-2-017:002
Proposed Action	Stream bank stabilization along Kalihi Stream
Land Area	18,000 sf. (approximately 620 feet x 29 feet)
Present Use	Industrial, Kalihi Stream
State Land Use District	Urban
Zoning	I-2, IMX-1
Primary Urban Center Development Plan Land Use Designation	Industrial
Special Management Area	Not within the Special Management Area
Permits Required	Grading Permit; NPDES Construction Stormwater Discharge, and Construction Dewatering; Department of the Army Individual Permit; Section 401 (CWA) Water Quality Certification; CZM Federal Consistency Review; Stream Channel Alteration Permit
Determination	Anticipated Finding of No Significant Impact (FONSI)

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SECTION 2
INTRODUCTION

2.1 PROJECT OVERVIEW, LOCATION AND AREA OF USE

The City and County of Honolulu (CCH), Department of Transportation Services (DTS), proposes to install stream stabilization measures to prevent further erosion of the west bank of Kalihi Stream, located along the eastern boundary of the Kalihi-Palama Bus Facility.

The Project site and area of disturbance is primarily within the CCH's parcel containing the west bank of Kalihi Stream and the Kalihi-Palama Bus Facility, located at 811 Middle Street, Honolulu, identified by Tax Map Key (TMK) (1):1-2-015:006. However, due to the curvature of the stream alignment, a portion of the Project site within the banks of Kalihi Stream is within the neighboring , privately-owned parcel located at 2312 Kamehameha Highway, identified as TMK (1):1-2-017:002. See **Figure 1, Project Location**, and **Figure 2, Tax Map Key Map**.

The proposed Project includes the improvement of approximately 18,000 square feet (sf.) of the west bank of Kalihi Stream (approximately 620 linear feet in length, and 29 feet in width). Approximately 12,045.3 sf. of the estimated area of disturbance is within (TMK) (1):1-2-015:006, and approximately 5,954.7 sf. is within TMK (1):1-2-017:002. Stream bank improvements to the opposing eastern bank located on TMK (1):1-2-017:002 are not included in the scope of this Project.

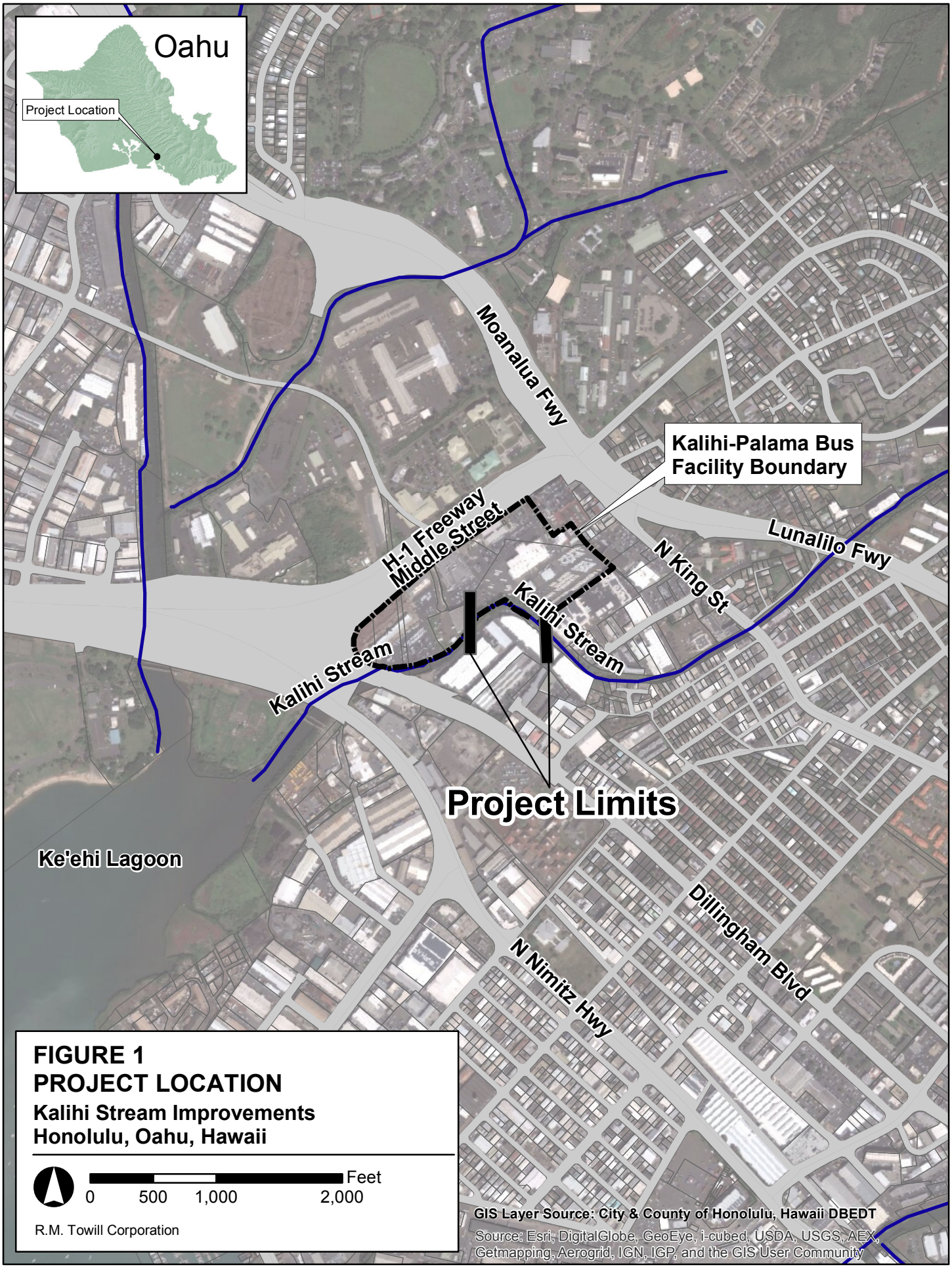
2.2 PURPOSE AND NEED FOR THE PROPOSED PROJECT

Past storm events that have caused increased storm flows within Kalihi Stream have significantly eroded the stream bank, specifically near the western curve of the stream bend, to the extent that a portion of the Kalihi-Palama Bus Facility's parking lot is in danger of being structurally undermined. Overtime, continued erosion of the stream bank will compromise the Kalihi-Palama Bus Facility. Therefore, the DTS proposes to install stream bank protection and stabilization measures along the western bank of the Kalihi Stream to prevent further erosion, scour and loss of the Kalihi-Palama Bus Facility. See **Figure 3, View of Kalihi-Palama Bus Facility Looking Downstream** and **Figure 4, View of Undercut Due to Scour on West Bank.**

2.3 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

The subject Project requires the use of land and funds of the City and County of Honolulu. In accordance with Section 5, Chapter 343, Hawai'i Revised Statutes (HRS), the Project involves the following actions that require the preparation of an Environmental Assessment (EA):

"*(1) propose the use of state or county lands or the use of state or county funds, other than funds to be used for feasibility or planning studies for possible future programs or projects which the agency has not approved, adopted, or funded, or funds to be used for the acquisition of unimproved real property; provided that the agency shall consider environmental factors and available alternatives in its feasibility or planning studies".*


Oahu
Project Location
Moanalua Fwy
Kalihi-Palama Bus Facility Boundary
H-1 Freeway
Middle Street
Lunalilo Fwy
N King St
Kalihi Stream
Kalihi Stream
Project Limits
Ke'ehi Lagoon
Dillingham Blvd
N Nimitz Hwy
FIGURE 1
PROJECT LOCATION
Kalihi Stream Improvements
Honolulu, Oahu, Hawaii
Feet
0
500
1,000
2,000
R.M. Towill Corporation
GIS Layer Source: City & County of Honolulu, Hawaii DBEDT
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

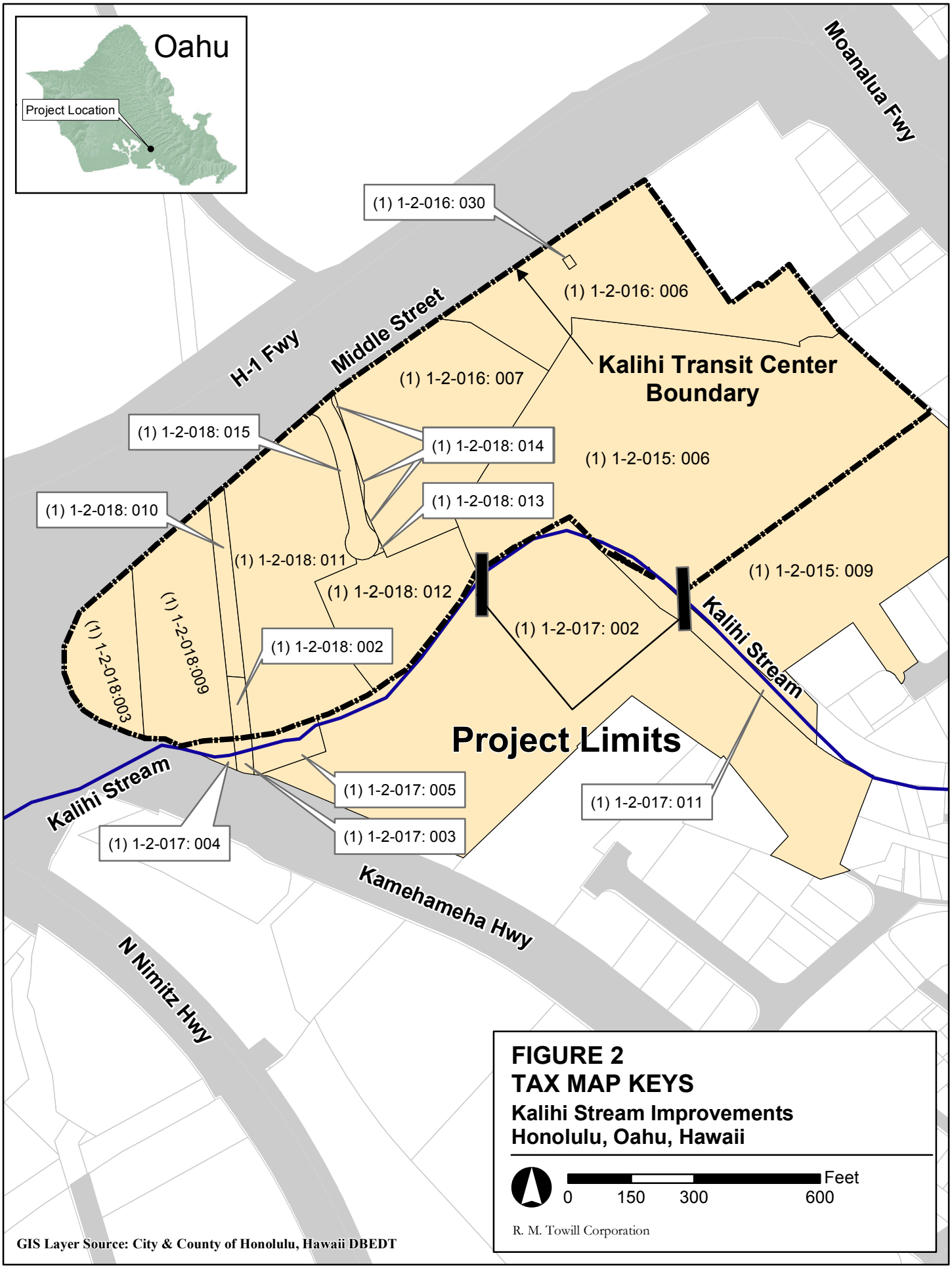

Oahu
Project Location
Moanalua Fwy
(1) 1-2-016: 030
(1) 1-2-016: 006
H-1 Fwy
Middle Street
(1) 1-2-016: 007
Kalihi Transit Center Boundary
(1) 1-2-018: 015
(1) 1-2-018: 014
(1) 1-2-015: 006
(1) 1-2-018: 010
(1) 1-2-018: 013
(1) 1-2-018: 011
(1) 1-2-015: 009
(1) 1-2-018: 012
(1) 1-2-018:009
(1) 1-2-018:003
(1) 1-2-017: 002
Kalihi Stream
(1) 1-2-018: 002
Project Limits
Kalihi Stream
(1) 1-2-017: 005
(1) 1-2-017: 011
(1) 1-2-017: 004
(1) 1-2-017: 003
Kamehameha Hwy
N Nimitz Hwy
FIGURE 2
TAX MAP KEYS
Kalihi Stream Improvements
Honolulu, Oahu, Hawaii
Feet
0
150
300
600
R. M. Towill Corporation
GIS Layer Source: City & County of Honolulu, Hawaii DBEDT

Figure 3. View of Kalihi-Palama Bus Facility Looking Downstream

Figure 4. View of Undercut Due to Scour on West Bank

A secondary purpose for the preparation of this Draft Environmental Assessment (DEA) is to inform interested parties of the proposed Project and to seek public comment on subject areas that should be addressed prior to the acceptance of the Final Environmental Assessment (FEA). This DEA describes existing conditions at the site and addresses the potential for adverse environmental impacts as a result of the proposed action.

Pursuant to the requirements of Chapter 343, HRS, and Chapter 11-200, Hawai'i Administrative Rules (HAR), the approving agency, DTS, has preliminarily determined that the proposed Project is not expected to have significant environmental effects. Based on analysis and review of environmental conditions, Project effects, and proposed mitigation measures, it is anticipated that a Finding of No Significant Impact (FONSI) will be issued for this Project.

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SECTION 3
PROJECT DESCRIPTON AND ALTERNATIVES CONSIDERED

3.1 EXISTING CONDITIONS

The proposed Project includes the improvement of approximately 18,000 square feet (sf.) of the west bank of Kalihi Stream; approximately 12,045.3 sf. of the estimated area of disturbance is within (TMK) (1):1-2-015:006, and approximately 5,954.7 sf. is within TMK (1):1-2-017:002. The Project is located within the Kalihi Stream channel approximately 2,000 feet upstream of Keʻehi Lagoon. During storm events, increased flows within Kalihi Stream have significantly eroded the west stream bank in the proximity of the Project. Erosion and scour have compromised the structural stability of the Kalihi-Palama Bus Facility's parking lot. There are two existing concrete headwalls on the west stream bank; one is near the north end of the Project (mauka), and the other is near the south end (makai). There is currently, approximately 800 sf. of shotcrete near the bend of the Kalihi Stream where the western bank is heavily eroded. Shotcrete was previously installed as an emergency mitigation measure to reduce erosion and scour at the stream bend. See **Figure 5, Existing Conditions (Plan)**.

Subject parcels TMK (1):1-2-015:006 and (1):1-2-017:002 are both within the State Land Use (SLU) designated 'Urban' district, within the CCH zoning district designated as 'I-2' and 'IMX-1', and within the Primary Urban Center Development Plan land use 'Industrial' designation. The Kalihi-Palama Bus Facility parcel, TMK (1):1-2-015:006, is owned by the CCH and operated by the DTS. The parcel was purchased and developed from Hawaiʻi Meat Company and Consumer Tire and Auto Center in 1991. Existing services provided at the Kalihi-Palama Bus Facility include the following: Handi-Van program facilities, a major bus transportation center, 1,000-vehicle parking structure for park-and-ride services and employees, DTS administrative offices, bus maintenance and repair facilities, bus parking areas, and vehicle wash rack and fueling station. Access to Kalihi Stream from the bus facility is from within a secured area with a locked fence gate on the crest of the stream embankment. The parcel on the east bank neighboring the Kalihi-Palama Bus Facility (TMK (1):1-2-017:002), is privately owned by a number of trusts. The land is currently used for industrial uses, businesses, and warehousing. The east stream embankment is more gradual and not currently threatened by erosion or scour. The buildings are separated from Kalihi Stream by a chain link fence.

3.2 ALTERNATIVES CONSIDERED

The City and County of Honolulu (CCH), Department of Transportation Services (DTS), proposes to install stream stabilization measures to prevent further erosion of the west bank of Kalihi Stream, located along the eastern boundary of the Kalihi-Palama Bus Facility. The alternatives considered for this Project included the following:

- Stream Bank Stabilization Alternatives
  - Conventional Retaining Wall
  - Steel Sheet Pile Wall
  - Stream Bank Lining
- No action/Delayed Action Alternative

3.2.1 Stream Bank Stabilization Alternatives

The following criteria were considered in the design of appropriate stream bank stabilization methods and selection of the alternatives presented hereafter, to address the soil erosion along the western bank of Kalihi Stream:

- Design Storm and No-Rise Criteria – Federal Emergency Management Agency (FEMA) 100-year flood limits defines the limitation of development within the flood zone. According to the FEMA Flood Insurance Rate Map (FIRM) 15003C0353G (dated January 19, 2011), the Project site lies within the AE flood zone of Kalihi Stream, with 100-year flood elevations between 18 feet and 20 feet MSL. One of the goals for the proposed stream bank improvements was to generate no increase in storm water elevations. Therefore, a hydraulic analysis utilizing the HEC-RAS Computer Program compared several conceptual alternative channel sections to show no-rise in the 100-year flood due to the proposed improvements.
- Scour Criteria – HEC-12 software was utilized to analyze the potential for scour in the HEC-RAS Computer Program. Prior to construction of walls within the stream channel, it is necessary to study the potential for scouring of the stream bottom and undermining of the wall foundations. Based on a 100-year storm event, it was estimated that the stream could potentially scour to an approximate depth of 14 feet. Therefore, the alternatives that present a vertical wall need to have a footing design that assumes a potential retaining height at approximately 14 feet or greater than existing conditions.
- Geotechnical Criteria – The study "Foundation Investigation, Kalihi Stream Improvements, Kalihi-Kai, Honolulu, Hawai'i TMK: 1-2-015 and 1-2-018", Hirata & Associates, February 5, 2010, as amended, was utilized to analyze the soil profile and conditions at the Project site and to select an appropriate erosion control measure for the alternatives presented.
- Structural Criteria – Structural analysis was performed for various alternatives of both shallow and deep foundations, to assess wall stability, bearing capacity, sliding (passive resistance), eccentricity and active pressure. Alternatives were considered structurally impractical, as the depth of excavation required to eliminate scour would have been infeasible.
- City and County of Honolulu (CCH) Criteria – "Rules Relating to Storm Drainage Standards" and "Flood Plain Ordinance", both provided guidance relating to drainage improvements.

KALIHI–PALAMA
BUS FACILITY

HEAVILY ERODED AREA

620'±

TMK: (1) 1–2–015: 006

EXIST. SHOTCRETE

HEAVILY ERODED AREA

EXIST CONC. HEADWALL.

℄ TYP.

TRUE NORTH
1"=40'

Easement 21

EXIST CONC. HEADWALL.

KALIHI STREAM

TMK: (1) 1–2–017: 002

℄ TYP.

℄ TYP.

40' 20' 0 40' 80'

SCALE: 1" = 40'

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management

R. M. TOWILL CORPORATION

808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819–3494

KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Existing Conditions (Plan)

Figure 5

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A. "Group A" Alternatives: Conventional Concrete Retaining Wall

Conventional retaining walls are vertical walls constructed to retain soil at an unnatural slope. Reinforced concrete is commonly used for retaining wall construction. A reinforced concrete retaining wall would provide permanent, hardened protection of the stream bank and the Kalihi-Palama Bus Facility's parking lot. An advantage of a utilizing a retaining wall is the amount of land required for installation; a vertical wall typically has minimal stream bed encroachment. However, a concrete retaining wall would require a substantial footing to support the loads associated with the height and weight of the soil behind the wall. Excavation for such a footing would significantly impact the stream bed as well as the Kalihi-Palama Bus Facility parking area. Scour protection along the base of the retaining wall would be necessary to avoid undermining of the footing with a deepened foundation. Scour protection would be provided by a scour protection mat, such as an articulating concrete block (ACB) lining system with geotextile filter fabric produced by Armortec or similar. ACB systems are composed of a matrix of interlocking preformed concrete blocks and cables that provide flexibility and conform to changes in the subgrade while maintaining protective cover. The ACB lining would be comprised of concrete blocks that are approximately 18 inches in width, 18 inches in length and 6 inches in height.

Two reinforced concrete retaining wall alternatives, with scour protection were evaluated for the Project; they are identified as Alternatives "A1" and "A2".

A.1 Alternative A1: Concrete Retaining Wall with 15 feet Wide Strip Footing (with Scour Protection)

In Alternative A1, a reinforced concrete retaining wall with a scour protection mat is proposed. The concrete retaining wall, including the concrete footing and footing key (2 and 4 feet respectively), would be 18 feet in height (depending on location the height will vary). The retaining wall and footing key would be 1-foot in width, and the concrete footing would be a 15-foot wide strip that extends 12 feet beyond the face of the wall into the stream. The retaining wall, footing and footing key would span the Project length of approximately 620 feet. The scour protection mat in Alternative A1 would extend 34 feet from the face of the retaining wall into the stream bed; the scour mat would start a height of 8 feet above existing ground and slope down to the existing grade at a slope of 2H:1V and span the Project length of approximately 620 feet. An advantage of a concrete strip footing of 15 feet is the provision of additional scour protection and footing stabilization. In Alternative A1 both of the existing concrete headwalls, as well as the existing shotcrete would be demolished and removed. See **Figure 6, Alternative A1 and A2: Concrete Retaining Wall (Plan),** and **Figure 7, Alternative A1 and A2: Concrete Retaining Wall (Section).**

A.2 Alternative A2: Concrete Retaining Wall with 12 feet Wide Strip Footing (with Scour Protection)

In Alternative A2, a reinforced concrete retaining wall with a scour protection mat is proposed. The concrete retaining wall, including the concrete footing and footing key (2 and 4 feet respectively), would be 18 feet in height (depending on location the height will vary). The retaining wall and footing key would be 1-foot in width, and the concrete footing would be a

12-foot wide strip that extends 7 feet beyond the face of the wall into the stream. The retaining wall, footing and footing key would span the Project length of approximately 620 feet. The scour protection mat in Alternative A1 would extend 29 feet from the face of the retaining wall into the stream bed; the scour mat would start a height of 8 feet above existing ground and slope down to the existing grade at a slope of 2H:1V and span the Project length of approximately 620 feet. An advantage of a concrete strip footing of 12 feet is reduced intrusion from grading and installing of the footing, and reduced costs. In Alternative A2 both of the existing concrete headwalls, as well as the existing shotcrete would be demolished and removed. See **Figure 6, Alternative A1 and A2: Concrete Retaining Wall (Plan),** and **Figure 7, Alternative A1 and A2: Concrete Retaining Wall (Section).**

B. Alternative B1: Sheet Pile Wall with Tie-backs (with Scour Protection)

Another common type of vertical retaining wall construction is sheet piling. Sheet piles sections with interlocking edges are hammered together to form a retaining wall. Similar to other retaining walls, an advantage of a sheet pile wall includes minimal stream bed intrusion; in fact, sheet piles typically require the least amount of land. The disadvantages of using a sheet pile wall include its height limitations of ten feet and its potential for noise disturbance during the driving operations. Sheet piles are typically installed with vibratory hammers or are hydraulically driven into the ground, which can cause distress to adjacent structures.

In Alternative "B1", a steel sheet pile wall with a tie-back anchor system and a scour protection mat is being proposed. Steel sheet piles sections would be driven to 20-30 foot depths along the top edge of the stream bank, and span the Project length of approximately 620 feet. To provide lateral support and reinforce the stability of the retaining wall, a tie-back anchor system, comprised of 45-foot long and 6-inch diameter horizontal wires/rods, spaced 8 feet apart, would be secured to the sheet pile wall, extend behind the wall into the soil and be anchored to a concrete deadman. Excavation of the stream bank would be limited to the depth and space required to install the tie-back anchor system. Scour protection along the base of the sheet piles is necessary to avoid significant excavation depths for installation of tie-backs. A scour protection mat, such as a geotextile filter fabric and ACB lining system produced by Armortec, or an approved equal is proposed. The scour protection mat in Alternative B1 would start at a height of 10 feet above existing ground, extend 22 feet from the face of the sheet pile wall into the stream bed at a slope of 2H:1V, and span the Project length of approximately 620 feet. In Alternative B1, both of the existing concrete headwalls would be demolished and removed, and new concrete headwalls would be constructed in place. The existing shotcrete would also be demolished and removed. See **Figure 8, Alternative B1: Sheet Pile Wall with Tie-backs (Plan)** and **Figure 9, Alternative B1: Sheet Pile Wall with Tie-backs (Section).**

KALIHI–PALAMA
BUS FACILITY

620±

TMK: (1) 1-2-015: 006

DEMOLISH AND REMOVE
EXIST. SHOTCRETE

APPROX. RETAINING WALL
LOCATION, HEIGHT VARIES

DEMOLISH AND REMOVE
EXIST CONC. HEADWALL.
EXTEND E/D30 TO
RETAINING WALL

DEMOLISH AND REMOVE
EXIST CONC. HEADWALL.

TRUE NORTH
1"=40'

Easement 21

℄ TYP.

SCOUR MAT
(ARTICULATING
CONCRETE BLOCK)
34' (ALT. A1)
29' (ALT. A2)

KALIHI STREAM

ABUT PROPOSED
RETAINING WALL TO
EXIST. WALL

TMK: (1) 1-2-017: 002

40' 20' 0 40' 80'

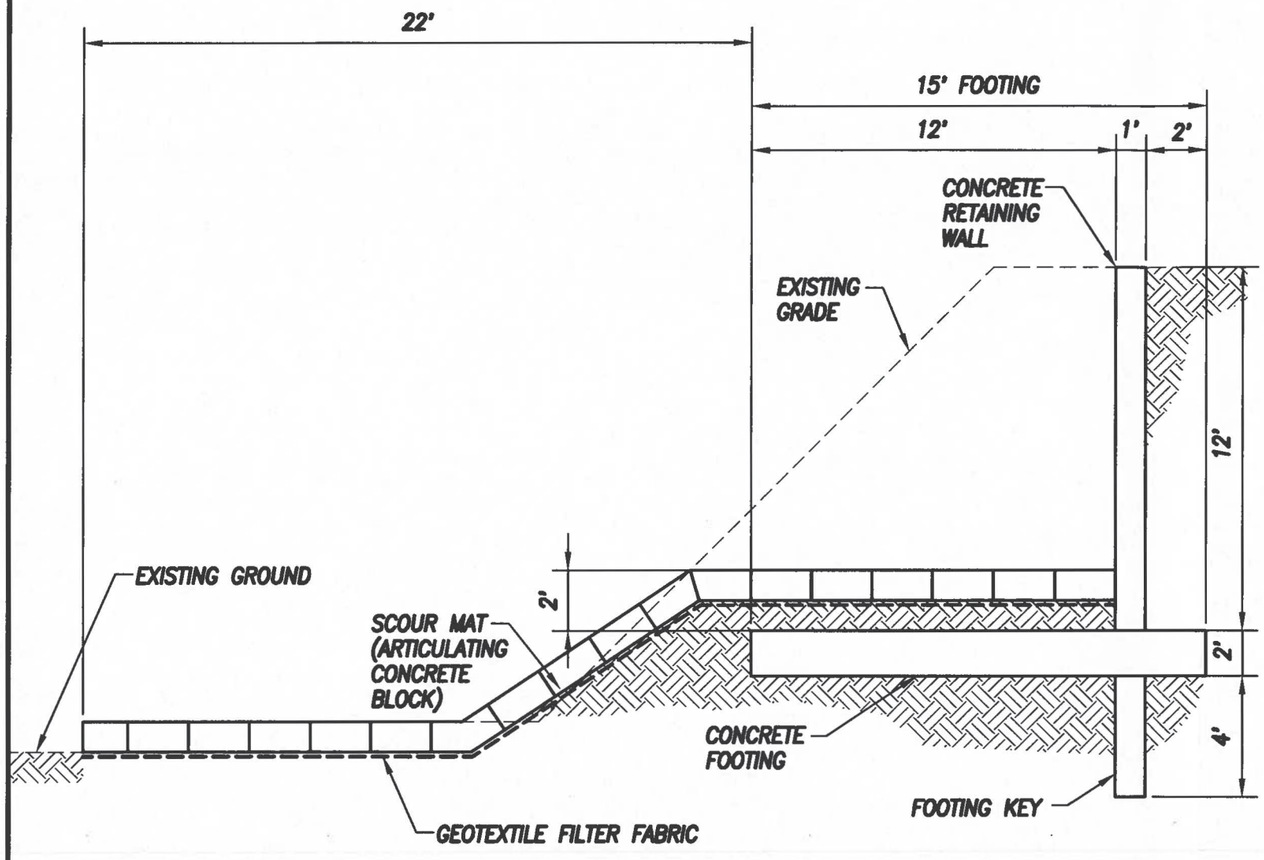
SCALE: 1" = 40'

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819-3494

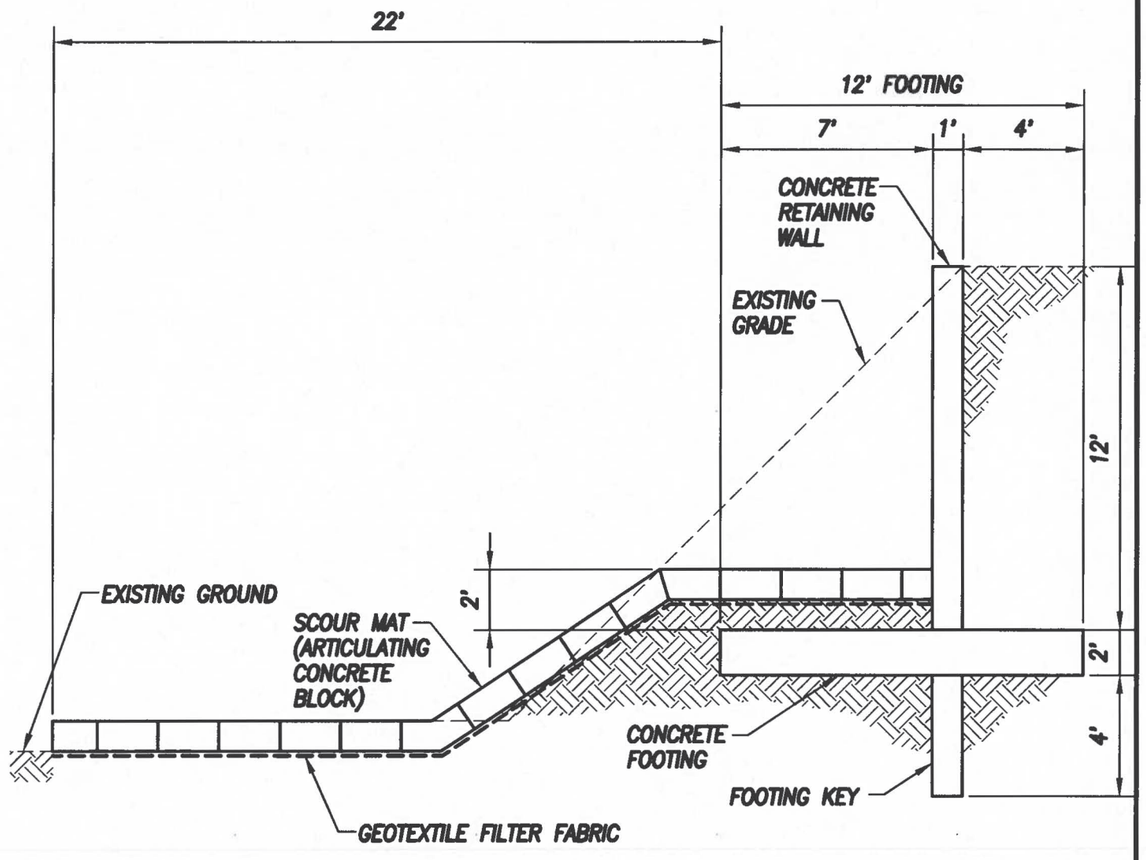
KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Alternative A1 and A2: Concrete Retaining Wall (Plan)

Figure 6



ALTERNATIVE A1



ALTERNATIVE A2

5' 0 5' 10'

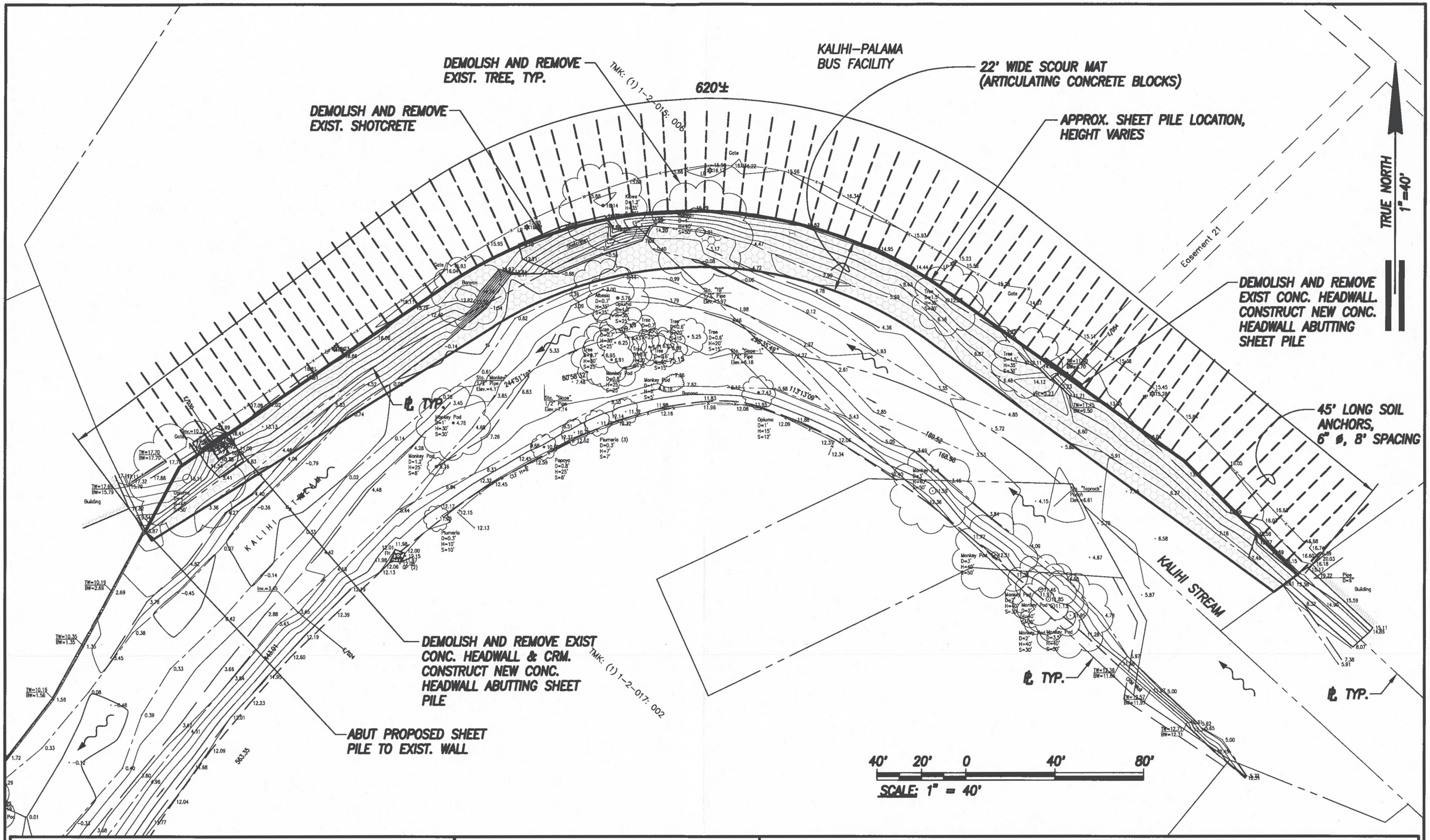
SCALE: 1" = 5'

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
R. M. TOWILL CORPORATION
808 842 1133 2024 North King Street, Suite 200 Honolulu Hawaii 96819-3494

KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Alternative A1 and A2: Concrete Retaining Wall (Section)

Figure 7



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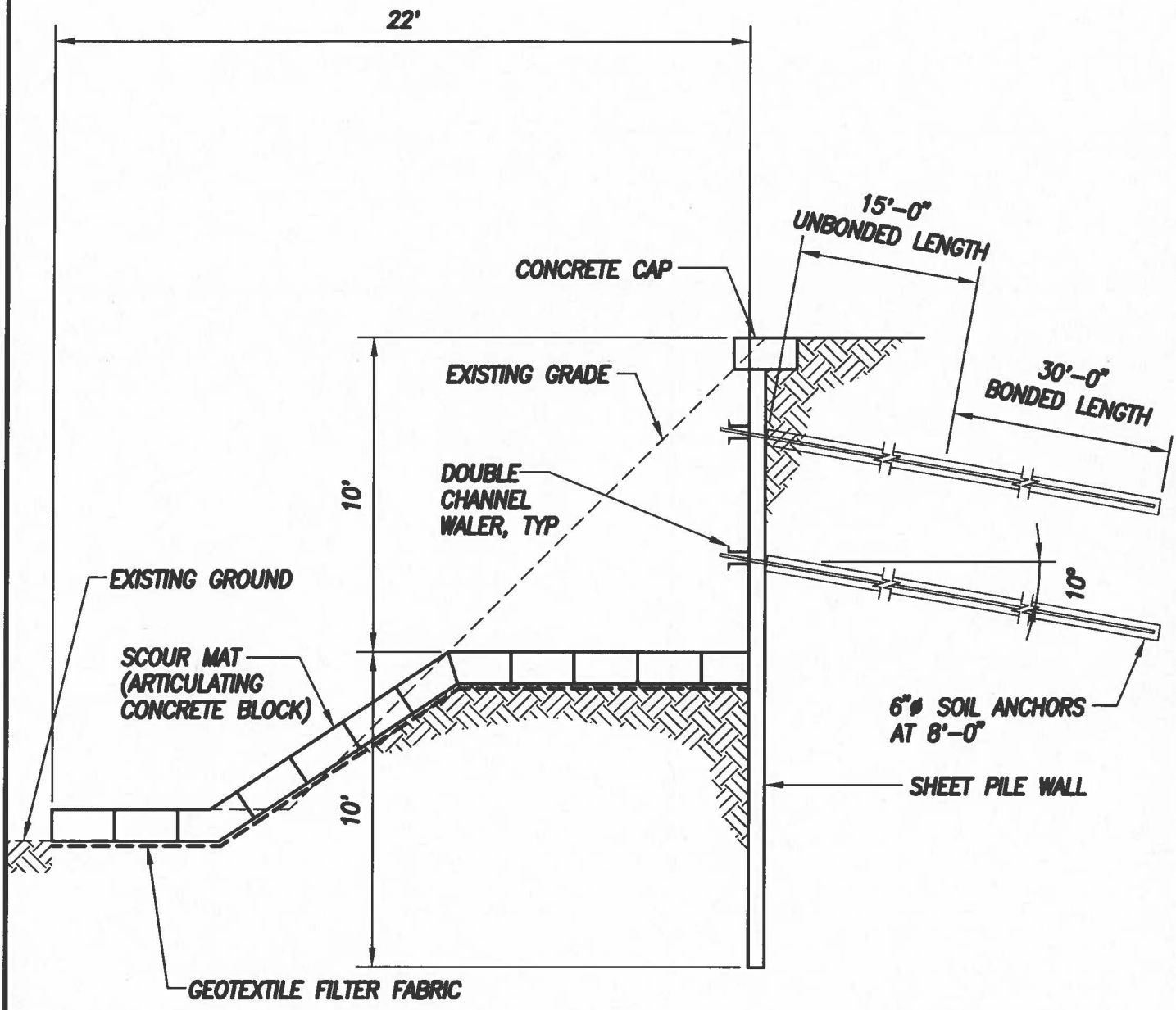
KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Alternative B1: Sheet Pile Wall with Tie-backs (Plan)

Figure 8



5' 0 5' 10'

SCALE: 1" = 5'

KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

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Alternative B1: Sheet Pile Wall with Tie-backs (Section)

Figure 9

C. "Group C" Alternatives: Stream Bank Lining

Stream bank lining typically refers to the lining of a stream bank with a pre-manufactured material, which retains soil via a sloped structure. The advantage of a stream bank lining is its lower installation and maintenance costs. A disadvantage of a stream bank lining is the amount of land required for the installation; compared to retaining walls, stream bank linings typically require a excessive amount of land.

Three stream bank lining alternatives were evaluated for the Project; they are identified as Alternatives "C1", "C2" and "C3".

C.1 Alternative C1: Stream Bank Lining with Grouted Concrete Rock Masonry Rip-Rap

In Alternative C1, a stream bank lining with conventional grouted concrete rock masonry (CRM) rip-rap ("grouted CRM rip-rap lining") is proposed. Grouted CRM rip-rap consists of loose rock, strengthened and bound together by grouting with mortar. The advantages of using a grouted CRM rip-rap lining are its effectiveness in areas of high velocity and shear stress, and its ability to conform to irregularities in bank slopes. The disadvantages include significant exposure of the stream bed during construction and the potential for damages due to scour and undermining of the stream lining.

Prior to the installing of the grouted CRM rip-rap lining, the stream bank would be graded to a uniform slope of 2H:1V. The grouted CRM rip-rap lining would be approximately 24 inches thick, comprised of stones that are approximately 16 inch diameter. The grouted CRM rip-rap lining would extend into the stream bed to a depth of 15 feet at a uniform slope of 2H:1V. The lining would span the Project length of approximately 620 feet. The grouted CRM rip-rap would have a two foot span at the top of the bank for compacted, vegetated backfill, leaving space in between the existing chain link fence near the eastern boundary of the Kalihi-Palama Bus Facility. In between the subgrade and the grouted CRM rip-rap lining would be a filter layer comprised of gravel or geotextile fabric, for the purpose of preventing soil loss. In addition, a cover of loose non-grouted loose rip-rap (stones) will be dumped on top of the grouted CRM rip-rap lining, to provide toe protection and further mitigate the undermining due to scour. In Alternative C1, the existing concrete headwalls would remain in place; however, the existing shotcrete would be demolished and removed. See **Figure 10, Alternative C1: Stream Bank Lining with Grouted Concrete Rock Masonry Rip-Rap (Plan),** and **Figure 11, Alternative C1: Stream Bank Lining with Grouted Concrete Rock Masonry Rip-Rap (Section).**

C.2 Alternative C2: Stream Bank Lining with Articulated Concrete Block

In Alternative C2, a stream bank lining with an articulated concrete block (ACB) is proposed. ACB lining, such as Armorflex® by Armortec, would serve the same purpose as grouted CRM rip-rap stream bank lining, as is proposed in Alternative C1; however, it would be able to settle with the stream bed, which would minimize undermining due to scour. Advantages of using an ACB lining are its minimal visual impact to the stream bank due to the open cell composition, which would allow natural vegetation to grow through each

concrete block, and its ability to conform to irregularities in bank slopes. Disadvantages are similar to those experienced with CRM rip-rap lining: significant exposure of the stream bed during construction and potential damages due to scour and undermining. Prior to the installing of the ACB lining, the stream bank would be graded to a uniform slope of 2H:1V. The ACB lining would be comprised of concrete blocks that are approximately 18 inches in width, 18 inches in length and 6 inches in height. The ACB lining would extend into the stream bed at a uniform slope of 2H:1V laid atop a geotextile filter fabric. In addition, a 22-foot wide apron also comprised of ACB lining would extend into the stream to mitigate undermining due to scour. The total ACB stream bank lining would span the Project length of approximately 620 feet. The ACB lining would be installed flush against the existing chain link fence near the eastern boundary of the Kalihi-Palama Bus Facility. In Alternative C2, the existing concrete headwalls would remain in place; however, the existing shotcrete would be demolished and removed. See **Figure 12, Alternative C2: Stream Bank Lining with Articulated Concrete Block (Plan)**, and **Figure 13, Alternative C2: Stream Bank Lining with Articulated Concrete Block (Section).**

C.3 Alternative C3: Concrete-Lined Channel

In Alternative C3, a concrete-lined channel extending across from the western stream bank to the eastern stream bank is proposed. The advantages of a concrete-lined channel are its durability, its minimal maintenance requirements and its ability to improve stream hydraulics. The disadvantages include its potential to have an adverse impact on the aquatic habitat, the loss of aesthetic appeal along stream corridors, and its facilitation of higher flood peaks. Prior to installing of the concrete-lined channel, the stream bank would be graded to a uniform slope of 2H:1V. On the western stream bank, the concrete lining would start at a height of 4 to 9 feet above existing ground, and extend to the stream bed at a slope of 2H:1V. On the eastern stream bank, the concrete lining would start a height of 4 to 9 feet and extend to the stream bed at a slope of 2H:1V. The entire concrete lined-channel would span the Project length of approximately 620 feet. The concrete lining would be installed flush against the existing chain link fence near the eastern boundary of the Kalihi-Palama Bus Facility. In Alternative C3, the existing concrete headwalls would remain in place; however, the existing shotcrete would be demolished and removed. See **Figure 14, Alternative C3: Concrete Lined-Channel (Plan)**, and **Figure 15, Alternative C3: Concrete Lined-Channel (Section).**

D. Alternative D1: No Action and Delayed Action

State legislation requires that a "no-action" alternative be considered to serve as a baseline against which potential actions can be measured. The no action alternative would involve no effort to modify the existing stream channel and no protective action to the Kalihi-Palama Bus Facility's parking lot to prevent further erosion and degradation.

If Alternative D1is pursued, continual stream bank erosion will occur over time and eventually the stream bank will encroach into the Kalihi-Palama Bus Facility parking area and undermine the parking lot and possibly adjacent building structures. Extensive erosion could potentially lead to a significant loss of a portion of the Kalihi-Palama Bus Facility, potential damage to public buses, and existing structures such as the public bus repair facility.

KALIHI–PALAMA
BUS FACILITY

DEMOLISH AND REMOVE
EXIST. TREE, TYP.

DEMOLISH AND REMOVE
EXIST. SHOTCRETE

APPROX. LIMITS OF PROPOSED
CRM RIPRAP 24" THICK, 16" MIN.
AVE DIA. STONES
APPROX. 2:1 SIDE SLOPE

EXIST. CRM
HEADWALL
TO REMAIN

EXIST. CONC.
HEADWALL TO
REMAIN

TRUE NORTH
1"=40'

TMK: (1) 1-2-015: 006

TMK: (1) 1-2-017: 002

620±

Easement 21

℄ TYP.

℄ TYP.

℄ TYP.

20'

DUMPED RIPRAP FOR
TOE PROTECTION

KALIHI STREAM

KALIHI STREAM

40' 20' 0 40' 80'

SCALE: 1" = 40'

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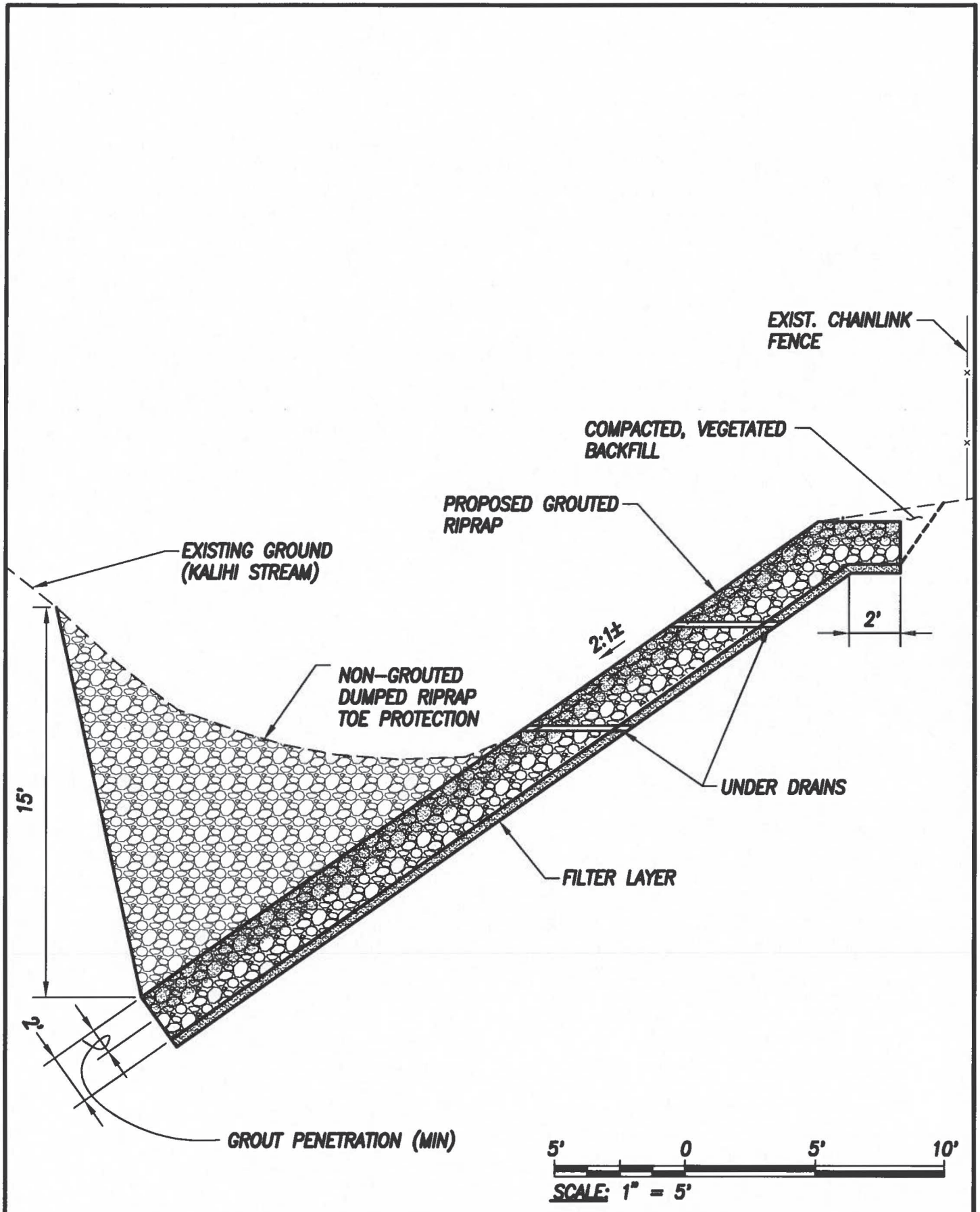
KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Alternative C1: Stream Bank Lining with Grouted Concrete Rock Masonry (Plan)

Figure 10



KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

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Alternative C1: Stream Bank Lining with Grouted Concrete Rock Masonry (Section)

Figure 11

KALIHI–PALAMA
BUS FACILITY

DEMOLISH AND REMOVE
EXIST. TREE, TYP.

DEMOLISH AND REMOVE
EXIST. SHOTCRETE

EXIST. CRM
HEADWALL
TO REMAIN

APPROX. LIMITS OF PROPOSED
ARTICULATED CONCRETE BLOCK (ACB)
LINING, APPROX. 2:1 SIDE SLOPE

EXIST. CONC.
HEADWALL TO
REMAIN

TRUE NORTH
1"=40'

TMK: (1) 1-2-015: 006

TMK: (1) 1-2-017: 002

620±

2:1±

℄ TYP.

STREAM

KALIHI STREAM

ACB APRON

Easement 21

40' 20' 0 40' 80'

SCALE: 1" = 40'

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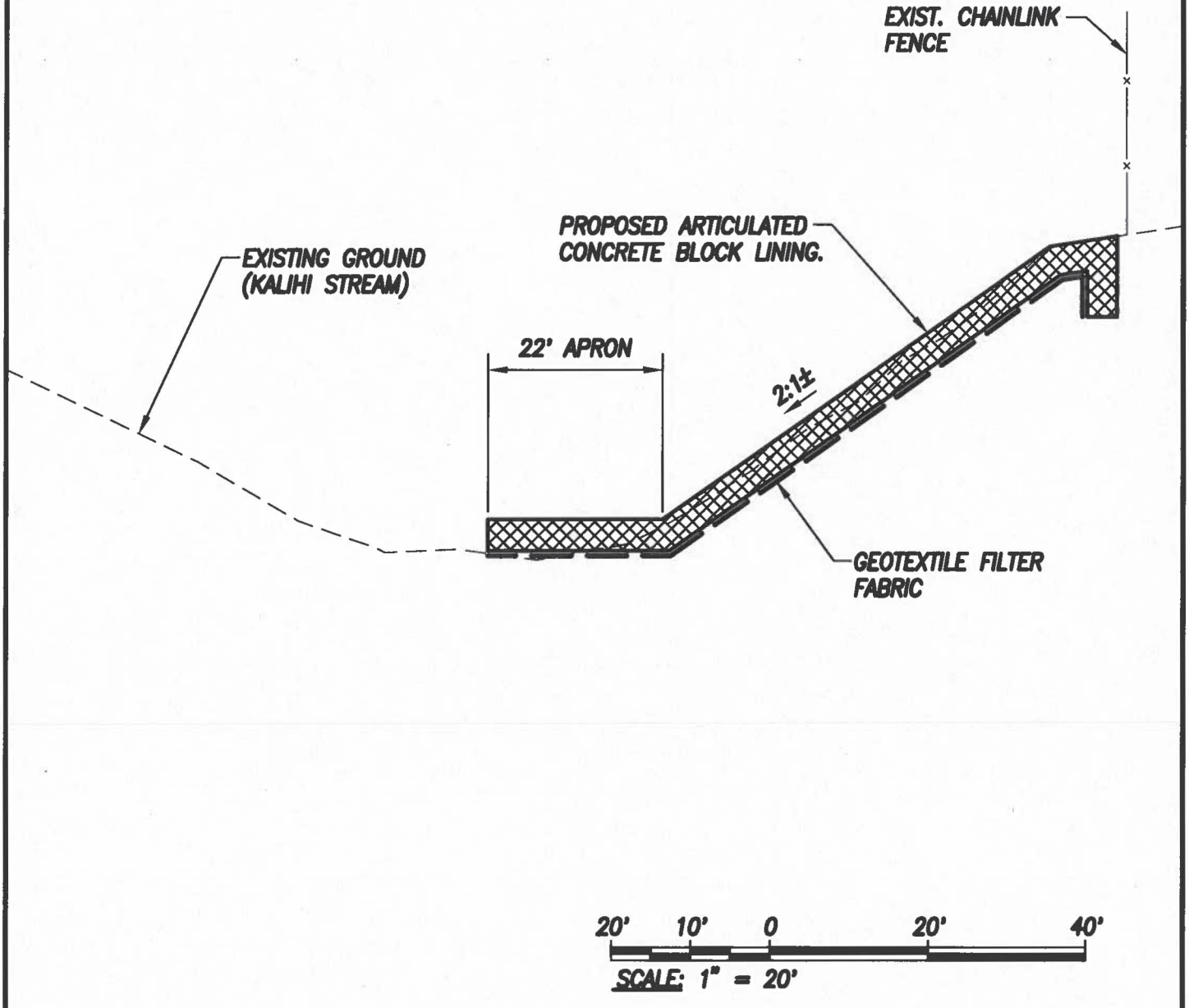
KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Alternative C2: Stream Bank Lining with Articulated Concrete Block (Plan)

Figure 12



KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

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Alternative C2: Stream Bank Lining with Articulated Concrete Block (Section)

Figure 13

KALIHI–PALAMA
BUS FACILITY

DEMOLISH AND REMOVE
EXIST. TREE, TYP.

DEMOLISH AND REMOVE
EXIST. SHOTCRETE

APPROX. LIMITS OF PROPOSED
CONCRETE LINED CHANNEL
APPROX. 2:1 SIDE SLOPE

EXIST. CRM
HEADWALL
TO REMAIN

EXIST. CONC.
HEADWALL TO
REMAIN

TMK: (1) 1–2–015: 006

TMK: (1) 1–2–017: 002

620'±

℄ TYP.

℄ TYP.

℄ TYP.

2:1±

STREAM

KALIHI STREAM

Easement 21

TRUE NORTH
1"=40'

40' 20' 0 40' 80'
SCALE: 1" = 40'

Planning – Engineering – Environmental Services – Photogrammetry – Surveying – Construction Management
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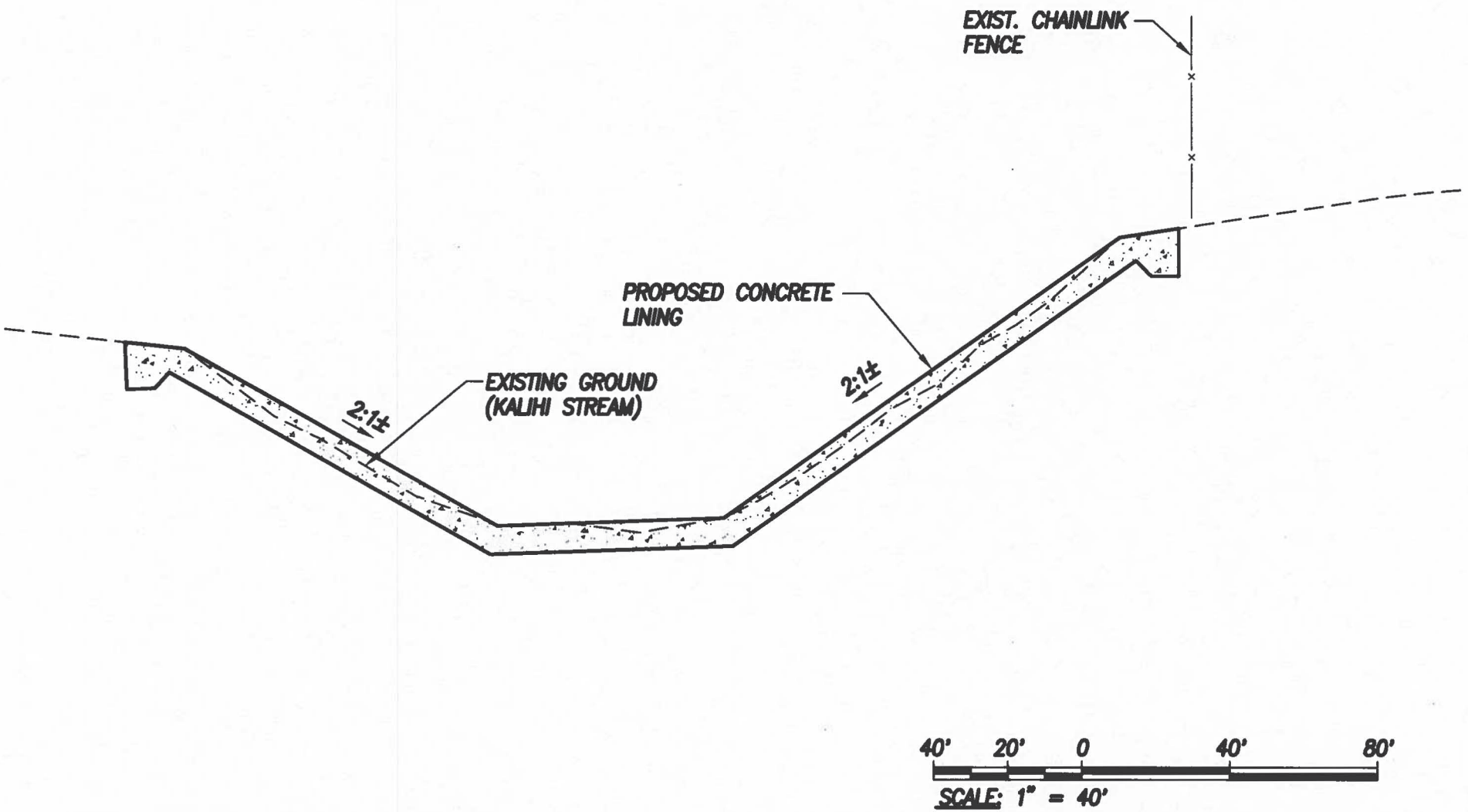
KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Alternative C3: Concrete-Lined Channel (Plan)

Figure 14



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KALIHI-PALAMA BUS FACILITY (KALIHI STREAM) IMPROVEMENTS

Alternative C3: Concrete-Lined Channel (Section)

Figure 15

Alternative D1 does not address the need to stabilize the stream bank from further erosion. This alternative would result in no immediate capital expenditures. However, potential consequences of no action include future expenditures to repair or reconstruct the eroded stream bank and undermined pavements as part of necessary routine maintenance. This alternative was evaluated based on its initial and future routine maintenance costs. Future life cycle costs evaluated include the potential for future emergency repair and restoration of the embankment, asphalt surfaces, and chain link fence. Life cycle costs are described in **Section 3.3.1**, below. The existing shotcrete as well as a portion of the existing chain link fence and asphalt concrete may have to be demolished and removed in the event of emergency repair work and restoration.

3.3 EVALUATION OF ALTERNATIVES

The alternatives presented in the previous section were evaluated by seven criteria, as a means to select the preferred alternative, and were presented in the "Decision Matrix". Each criterion was assigned a "weighting factor" of 1 (least desirable) to 3 (most desirable) according to their relative importance. Criteria and weighting factors were developed by a licensed engineer in cooperation with the DTS. The seven criteria and their respective weighting factors are listed below in **Table 1, Evaluation Criteria Weighting Factors**:

Table 1. Evaluation Criteria Weighting Factors

Criteria	Weighting Factor
Life cycle cost	3
Impacts to stream during construction	1
Impacts to stream bank erosion	3
Constructability	2
Aesthetics	1
Property acquisition	2
Impacts to City property	3

Each alternative was assigned a "rating" of 1 (least desirable) to 5 (most desirable) for each criterion, developed by a licensed engineer in cooperation with the DTS. Then each criterion weighting factor and rating was multiplied to produce a "score" for each alternative. The "total score" is the sum of the seven criterion scores. The highest possible score in Decision Matrix is '75'. See **Table 2, Decision Matrix**. A description of each criterion and a discussion explaining the rating/scoring of each criterion for each alternative follows.

3.3.1 Life Cycle Cost

The "Life cycle cost" criterion was assessed by calculating the sum total of the approximate initial construction cost, the approximate property acquisition cost and the

Table 2. Decision Matrix

Criteria	Weighting Factor	Alternatives													
		A1		**A2**		**B1**		**C1**		**C2**		**C3**		**D1**	
		Concrete Retaining Wall (15' Wide Footing)		Concrete Retaining Wall (12' Wide Footing)		Sheet Pile Wall with Tie-Backs		Bank Lining (CRM Rip-rap)		Bank Lining (ACB)		Concrete-Lined Channel		No Action/Delayed Action	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Life cycle	3	2	6	2	6	2	6	5	15	3	9	1	3	3	9
Impacts to Stream During Construction	1	2	2	3	3	4	4	2	2	3	3	1	1	3	3
Impacts to Stream Bank Erosion	3	5	15	5	15	5	15	5	15	4	12	5	15	1	3
Constructability	2	2	4	2	4	2	4	2	4	4	8	1	2	3	6
Aesthetics	1	2	2	2	2	2	2	4	4	5	5	1	1	3	3
Property Acquisition	2	3	6	3	6	4	8	2	4	2	4	1	2	5	10
Impacts to City Property	3	4	12	4	12	3	9	5	15	5	15	5	15	1	3
TOTAL SCORE			47		48		48		59		56		39		37

Table 3. Life Cycle Cost Estimates							
Alternatives	**Initial Construction Cost**	**Property Acquisition Cost**	**Replacement Cost**	**50-year Life Cycle Cost**			
				Scenario 1 (5 years)	Scenario 2 (10 years)	Scenario 3 (15 years)	Scenario 4 (20 years)
A1: Concrete Retaining Wall (15' Wide Footing)	$3.0 million	$ 144,000	$673,000	$7.8 million	$5.3 million	$4.7 million	$4.2 million
A2: Concrete Retaining Wall (12' Wide Footing)	$2.8 million	$ 144,000	$510,000	$6.5 million	$4.5 million	$4.5 million	$3.7 million
B1: Sheet Pile Wall with Tie-Backs	$3.0 million	$ 21,000	$510,000	$6.6 million	$4.6 million	$4.2 million	$3.8 million
C1: Bank Lining (CRM Rip-rap)	$2.3 million	$ 223,000	$ 92,000	$3.1 million	$2.8 million	$2.7 million	$2.6 million
C2: Bank Lining (ACB)	$0.7 million	$ 223,000	$870,000	$6.9 million	$3.6 million	$2.8 million	$2.2 million
C3: Concrete-Lined Channel	$5.5 million	$1,103,000	$0	$6.6 million	$6.6 million	$6.6 million	$6.6 million
D1: No Action/Delayed Action	$0	$0	$536,000	$3.7 million	$3.7 million	$3.7 million	$3.7 million

approximate future present value for all future replacement costs. It is anticipated that the ACB lining will require periodic replacement due to damage and displacement during large storms. However, there is no information available on the expected lifetime for a properly installed ACB lining system. Four scenarios included an "ACB replacement" – Alternatives A1, A2, B1 and Cl. In "Scenario 1", the replacement was assumed to occur every 5 years; in "Scenario 2" the replacement was assumed to take place every 10 years; in "Scenario 3" the replacement was assumed to take place every 15 years; and in "Scenario 4" the replacement was assumed to take place every 20 years. See **Table 3, Life Cycle Cost Estimates**, above.

For each life cycle cost scenario, Alternative C1, CRM Rip-Rap, had the lowest life cycle cost, and so it was assigned a rating of '5'. Alternatives C2 and D1 were both assigned a rating of '3' because they both had the lowest initial construction costs. Alternatives A1, A2 and B1 were given a rating of '2', because they each had lower initial costs than Alternative C3. Alternative C3 was given a rating of '1'.

3.3.2 Impacts to Stream Bank during Construction

The "Impacts to stream bank during construction" criterion is a reflection of the anticipated construction methods and the assumed impacts to stream banks during construction for each alternative. A description for each alternative is provided below:

- **Alternatives Al and A2**: Conventional concrete retaining wall construction is possible, although the excavation within the stream channel will have significant dewatering and erosion control challenges. Installation of the scour protection mat (bank lining) will also have a moderate impact to the stream channel and stream diversion in certain areas may be necessary to be able to key in the lining at the bottom of the bank. It is assumed that removal of trees and loading of channel lining materials can be accomplished by the use of a crane, which can be set up within the Kalihi-Palama Bus Facility. Alternative Al was given a rating of '2', because there is significant excavation required in the stream for the footing. Alternative A2 was given a rating of '3', because there is less excavation in the stream for the footing than for Alternative A1.
- **Alternative B1**: Sheet piles are commonly used and predrilling and driving of the sheet piles are feasible. Much of the drilling and driving operations can be done from the Kalihi-Palama Bus Facility. Excavation within the stream channel and installation of the tie-backs and scour protection mat (bank lining) will have a moderate impact to the stream channel. Platforms for the drill rig within the stream channel can be utilized. Stream diversion may be necessary in certain areas to be able to key in the lining at the bottom of the bank. It is assumed that removal of trees and loading of channel lining materials can be accomplished by the use of a crane, which can be set up within the Kalihi-Palama Bus Facility. Alternative B1 was given a rating of '4', because there is only minimal excavation required in the stream to lay the ACB scour protection
- **Alternatives C1 and C2**: Installation of stream bank lining is feasible, with moderate impacts to the stream channel. Stream diversion may be necessary in certain areas to be able to key in the lining at the bottom of the bank. It is assumed that removal of trees and loading of channel lining materials can be accomplished by the use of a crane which can be set up within the Kalihi-Palama Bus Facility. Alternative C1 was given a rating of '2', because significant excavation is required at the toe of the slope. Alternative C2 was

given a rating of '3', because there is only minimal excavation required in the stream and bank to lay the ACB lining and scour protection.

- **Alternative C3**: Construction of the concrete lining will require stream diversions and will likely be difficult working "in the wet." It is assumed heavy equipment will need to be placed in the stream to clear and grade the stream and to construct the lining. The lining invert could be precast concrete slabs or cast-in-place. Alternative C3 was given a rating of '1', because it will have the longest construction duration, and will require lengthy stream diversions.
- **Alternative D1:** If no stream bank stabilization measures are done at this time, the repair and reconstruction of a potential future eroded stream bank is feasible, although permits to work within the stream will be necessary. Impacts to the stream channel are likely. Repair and construction of asphalt surfaces and chain link fence is also feasible, with no anticipated problems. Erosion and the need for repairs will be a recurring problem. Alternative D1 was given a rating of '3'.

3.3.3 Impacts to Stream Bank Erosion

The "Impacts to stream bank erosion" criterion is a measure of the anticipated effectiveness at stopping further erosion to the stream bank. Alternatives A1, A2, B1, C1 and C3 are all very effective at stopping further erosion; therefore, those five alternatives were given a rating of '5'. Although ACB lining systems have a reputation for halting erosion, there are no known ACB lining system installations in Hawai'i, therefore, Alternative C2 is given a rating of '4'. Alternative D1 is a "No Action" alternative and so it is given a rating of '1'.

3.3.4 Constructability

The "Constructability" criterion is an estimate of the degree of difficulty and complexity of the construction method and permitting process required. However, constructability is not intended to be a measure of the effort required or duration of construction.

Alternatives A1, A2, B1 and Cl will all have significant dewatering and erosion control challenges during construction, as well as lengthy permitting with the Department of Health (Section 401 and NPDES Permits) and Army Corps of Engineers (Section 404 Permit), due to the amount of excavation required in the stream. Therefore, these four alternatives were given ratings of '2'. Alternative C3 is expected to be even more difficult to construct and permit because of the size of the area of disturbance, thus it is given a rating of '1'. Alternative D1 will have limited work in the stream, and was therefore given a rating of '3'. Alternative C2 has the least work in the stream and is anticipated to be simpler to obtain permits, so it is given a rating of '4'.

3.3.5 Aesthetics

The "Aesthetics" criterion assesses the impact the alternatives would have on the visual appearance of Kalihi Stream after construction. Alternative C2 allows for vegetation to grow through the ACB lining, therefore, the stream bank should be more aesthetically pleasing than the other alternatives, and so this alternative was given a rating of '5'. Alternatives A1, A2 and B1 will change the natural look of the stream bank to a blank concrete or steel face, and so these alternatives were given a rating of '2'. Alternative C3 will change the natural look of the entire

channel to concrete, so it was given a rating of '1'. Alternative C1 would result in stream hardening but would appear more natural than concrete lining while also mitigating the potential for erosion and undermining. Therefore, C1 was given a rating of '4'. Alternative D1 would involve no action and therefore remain in its natural state. However, erosion and scour is resulting in the undermining of the Kalihi-Palama Bus Facility which is why D1 was given a rating of '3'.

3.3.6 Right-of-Way Acquisition

The "Right-of-Way (ROW) acquisition" criterion refers to the amount of property or rights of entry each alternative would need to acquire, as each alternative encroaches on the neighboring parcel, identified as TMK: 1-2-017:002 (11.416 acres) in varying degrees. See **Table 4, ROW Acquisition**. The "land acquisition value" was calculated, based on the assessed land value in 2013, which was $18,662,000.

Alternative D1 would require no land acquisition, thus it was given a rating of '5'. Alternative B1 would require the least amount of land acquisition, thus it was given a rating of '4'. Alternative C3 would require the most amount of land acquisition and so was given a rating of '1'. Alternatives A1 and A2 will predominantly be located within the DTS parcel but will partially fall within the adjacent parcel and was therefore given a rating of '3'. Alternatives C1 and C2 were given ratings of '2' as a result of the necessary room required to install toe protection and the ACB apron extending into the stream and upstream further than other alternatives.

Table 4: ROW Acquisition

Alternatives	Property Acquisition (Acres)	% of Lot (TMK: 1-2-017:002)	Acquisition Land Value
A1: Concrete Retaining Wall (15' Wide Footing)	0.0879	0.7700%	$ 143,692
A2: Concrete Retaining Wall (12' Wide Footing)	0.0879	0.7700%	$ 143,692
B1: Sheet Pile Wall with Tie-Backs	0.0129	0.1130%	$ 21,088
C1: Bank Lining (CRM Rip-rap)	0.1367	1.1974%	$ 223,467
C2: Bank Lining (ACB)	0.1367	1.1974%	$ 223,467
C3: Concrete-Lined Channel	0.6746	5.9093%	$1,102,784

3.3.7 Impacts to City Property

The "Impacts to City property" criterion is a measure of the increase or decrease in the usability of the land adjacent to the stream bank and within the Kalihi-Palama Bus Facility.

Alternatives A1 and A2 would maximize the use of space above the wall, thus was given a rating of '4'. Alternative B1 would also maximize the use of space above the wall; however, the tie-back anchor system would extend 45 feet into the city property, which would restrict future construction, so it was given a rating of '3'. Alternatives C1, C2 and C3 maintain the amount of useable land in the Kalihi-Palama Bus Facility without the need for footings or tie-backs, and so were given a rating of '5'. Alternative D1, no action, provides no mitigation measures, therefore, the stream bank would continue to erode, causing property damage and consequently decreasing property value. As a result, alternative D1 was given a rating of '1'.

3.4 PREFERRED ALTERNATIVE AND PROJECT DESCRIPTION

Based on comparison of the proposed alternatives, and as reflected in the **Table 2**, **Decision Matrix**. Alternative C1 was selected as the preferred alternative with a score of '59.' Alternative C1 is an effective low-cost solution with one of the lowest life-cycle costs. The preferred alternative will stabilize the stream bank through the use of stream bank lining with CRM rip-rap. Though certain aspects of construction are anticipated to be difficult, overall Alternative C1 is the alternative that best balances environmental and economic costs. Project costs are estimated at $2.3 million. A more detailed description of the preferred alternative is found above in **Section 3.2.1, *Alternative C.1***.

Proposed Project activities will include site preparation of the Kalihi-Palama Bus Facility, construction, and associated improvements to the western stream bank of Kalihi Stream. Project activities include the following:

- Installation of Best Management Practices (BMPs) to prevent water pollution;
- Clearing of vegetation;
- Removal of accumulated stream debris and disposal at an approved landfill facility;
- Installation of stream protection system in accordance with City and County of Honolulu standards;
- Installation of stream diversion methods;
- Construction of stream access ramp;
- Restoration of areas above the stream bank;
- Demolition and removal of existing shotcrete;
- Construction and installation of the CRM rip-rap lining system;
- Installation and relocation of boundary fencing at the top of the bank;
- Restoration of pavement for parking areas

3.5 PROJECT SCHEDULE

Major components of the Project are preliminarily scheduled as follows:

- Preliminary Design, environmental documents, and permitting
- Final Design (and Bid)
- Construction

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SECTION 4
DESCRIPTION OF THE ENVIRONMENTAL SETTING, POTENTIAL IMPACTS AND PROPOSED MITIGATION

4.1 CLIMATE

South O‘ahu has a mild semi-tropical climate which is characterized by abundant sunshine, persistent northeast trade winds, relatively constant temperatures and moderate humidity. Severe storms are infrequent in this region of O‘ahu.

Persistent trade winds, relatively constant temperatures, and moderate rainfall characterize the climate near the proposed Project site. Trade winds are produced by the outflow of air from the Pacific Anticyclone high-pressure system, also known as the Pacific High. In the summer months, trade winds are at their strongest, and in the winter, trade winds are at their weakest. The nearest Local Climate Data (LCD) station to the proposed Project site is 1.2 miles southwest of the Project site near the Honolulu International Airport (PHNL) located at 21.322° N, 157.909° W (Giambelluca et. al., 2013).

The ‘PHNL LCD’ recorded an annual daily average wind speed of 10.6 miles per hour (MPH) based on approximately 12 years of recorded Automated Surface Observing System (ASOS) data. The PHNL rain gauge (SKN 703) reports to having an annual rainfall of 24.66 inches from 1947 to the present. The Rainfall Atlas of Hawai‘i estimates the average rainfall at the Project site, mauka of the airport, to be approximately 33 inches annually.

Potential Impact and Proposed Mitigation

The proposed Project is not anticipated to adversely affect the climatic conditions of the area therefore no mitigation measures are proposed.

4.2 SOILS AND TOPOGRAPHY

The site is located near the southwest terminus of Kalihi Stream, north of Kamehameha Highway approximately 2,000 feet upstream of Ke‘ehi Lagoon. The areas around the stream are relatively flat with a ground elevation ranging from 5 feet above MSL (at the Kamehameha Highway Bridge) to 16 feet above MSL (at mauka boundary of the Project site). The stream water level ranges from -1.5 to 5.8 feet MSL and is tidally influenced.

The soil along the bank is generally described as loose to medium-dense, brown clayey silt/sand (alluvial soils) with cobbles and boulders, extending to depths of 22 feet and greater in some areas. Actual soil composition varies, depending on location. The alluvial soils are underlain by stiff silty clay and then moderately weathered, medium hard to hard, basalt. Basalt was found during the drilling at 54 feet in depth on the lower (makai) end of the Project area and was not encountered at a 94 foot depth on the higher (mauka) end of the Project area. The loose silty clay/sand soils have relatively low structural bearing values and scour potential is moderate.

The west embankment has experienced erosion beneath a portion of the Kalihi-Palama Bus Facility. See **Figure 16, Views of West Bank Erosion**. The embankment on the east side of the stream is more gradual comprised mostly of rock with little vegetation. See **Figure 17, Views of East Bank Looking Downstream.**

Figure 16. Views of West Bank Erosion

Figure 17. Views of East Bank Looking Downstream

Soils types within the proposed Project site boundary are limited to Fill Land, mixed (FL). See **Figure 18, Soil Map.** FL soils general consist of material dredged from the ocean or hauled from nearby areas and are not highly erodible (USDA, 1972). The National Cooperative Soil Survey classifies the soil in the Project area as having am erosion hazard of "slight."

Kimura International conducted a Phase I and II Environmental Site Assessment (ESA) in early 2006 as part of the Final EA for the Middle Street Transit Center (Kalihi-Palama Bus Facility). The objectives of the investigation were as follows:

- Evaluate the historic uses of the site and surrounding area, and determine whether historic use of the areas surrounding the site resulted in adverse impacts to the soil and groundwater; and,
- Conduct sampling to evaluate the geology and hydrogeology of the adjacent site. Assess whether chemicals of potential concern (COPCs) are present in shallow soil or groundwater at the adjacent site.

Soil samples were collected and analyzed for total petroleum hydrocarbon (THP) constituents, volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and eight Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). The results of the laboratory testing are summarized below:

- Eight RCRA metals, THP-diesel-range organics, THP-oil-range organics, and PAHs were detected in the soil samples. However, the concentrations of these constituents were found to be below the current DOH environmental action levels (EALs).
- The metal arsenic was detected at one location on the site adjacent to the stream at a concentration above DOH EAL. However, the concentration found on the Kalihi-Palama Bus Facility site is below the EPA preliminary remediation guideline (PRG) for the industrial occupational worker scenario of 16 ppm.
- 2-Butanone was detected in three of the four soil samples at concentrations below the DOH EAL on the adjacent site.
- One of the groundwater samples contained dissolved selenium at a concentration above the DOH EAL, but below the applicable marine chronic ambient water quality criteria (AWQC). Groundwater samples also contained arsenic, barium, cadmium, chromium, lead, and silver at concentrations below the respective DOH EALs and applicable AWQC. PAHs, THP-gasoline, and acetone were detected in groundwater samples at concentrations above the laboratory reporting limit, but below the respective DOH EALs and applicable chronic AWQC.

Potential Impact and Proposed Mitigation

Earthwork will likely consist of soil removal to create a base for the stream erosion protection and the removal of accumulated debris which include vegetation, rocks, and urban debris. The Project will involve bank restoration, excavation, grouted rip-rap, and dumped rip-rap. Excavated material will be used on-site for fill material. Imported fill will be limited to clean and uncontaminated material. Any excess fill material will be disposed of off-site at County-approved waste facility in compliance with State and federal regulations.

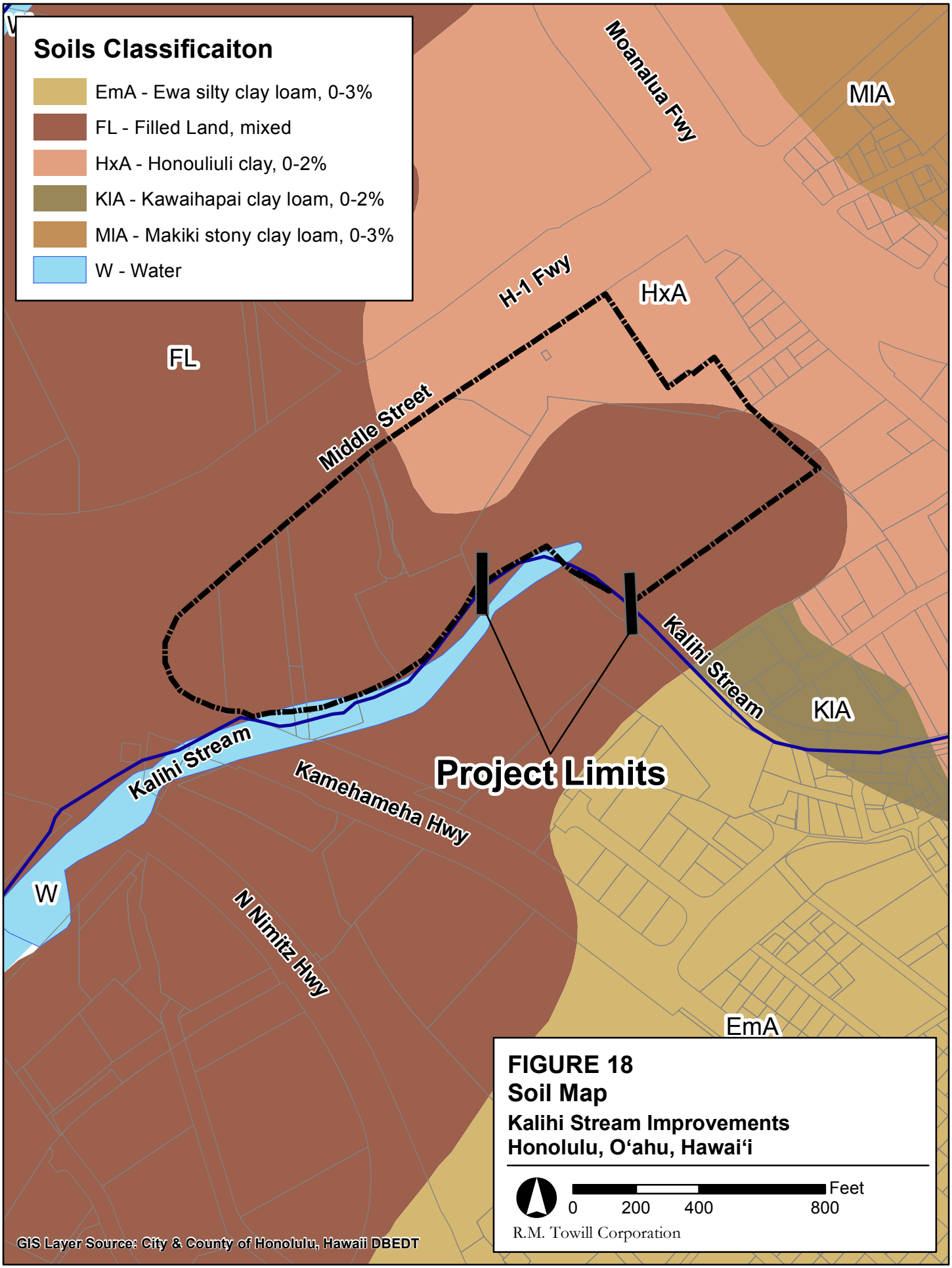


FIGURE 18
Soil Map
Kalihi Stream Improvements
Honolulu, O'ahu, Hawai'i

0 200 400 800 Feet

R.M. Towill Corporation

During construction a National Pollutant Discharge Elimination System (NPDES) construction stormwater permit (Notice of Intent (NOI) – Form C) and dewatering permit (NOI – Form G) will be filed with the State Department of Health, Clean Water Branch (DOH-CWB) to prevent and mitigate potential storm water from causing runoff into the stream and to address the proper treatment of dewatering effluent in accordance with State water quality standards. Silt fences, silt curtains and other necessary erosion control measures will also be utilized during construction to prevent and mitigate any untreated construction storm water runoff from entering into State waters. No further mitigation measures are anticipated.

The previous ESA report concluded that based on the results of the laboratory analyses that additional action or investigation is not needed. The report recommended that a soil management plan be created for the Kalihi-Palama Bus Facility to outline procedures for the handling of potentially impacted soils or groundwater at the site during construction.

The implementation of the proposed mitigation measures described above is expected to result in no adverse impact to the topography or soil conditions on the Project site. No further mitigation measures are proposed or are anticipated to be required.

4.3 SURFACE WATERS

The Project site is located within Kalihi Stream which is classified as a perennial stream. Kalihi Stream is a Class 2 inland water (DOH-CWB, October 1987 Water Quality Standards Map of the Island of Oʻahu). Approximately 2,000 feet downstream Kalihi Stream empties into Keʻehi Lagoon. Keʻehi Lagoon is rated Class "A" waters. Class "A" waters are intended to be protected for recreational purposes and aesthetic enjoyment. According to the standards for Class "A" waters, discharges are not permitted unless they have received the best degree of treatment or control compatible with the established criteria for the receiving water.

Both Kalihi Stream and Keʻehi Lagoon are listed on the Section 303(d) list as impaired bodies of water. Section 303(d) of the federal Clean Water Act (CWA) states that a water body is considered impaired if: (a) the current water quality does not meet the established water quality standards; or (b) the designated use that is described in Chapter 11-54, Hawaiʻi Administrative Rules (HAR), is not being achieved.

Kalihi Stream (state stream ID No.3-3-11) is classified as a continuous, perennial stream. According to the 2012 State of Hawaiʻi Water Quality Monitoring and Assessment Report 303(d) list, Kalihi Stream is impaired by an exceedance of Nitrite/Nitrate, Total Nitrogen, turbidity, and trash. Kalihi Stream is categorized as having a "High" Total Maximum Daily Load (TMDL) priority.

Potential Impact and Proposed Mitigation

Construction of the proposed Project will involve the use of a Construction Best Management Practices (BMPs) Plan as required by Chapter 11-55, HAR, Water Pollution Control. Grading, soil, erosion, and sediment control provisions for construction projects will be utilized in accordance with Chapter 14, Articles 13 through 16, ROH.

The proposed activities involving fill may impact coral colonies in Keʻehi Lagoon if excessive silt is transported into the Lagoon. A Water Quality Monitoring Plan will be developed as part of the 401 Water Quality Certification process and submitted to DOH for approval at least 30-days prior to the start of construction. Through the use of stream diversion devices (i.e.

sandbags), an area of the stream will be isolated to create a "dry" work environment. At no point during construction will stream flow be interrupted.

To address the potential for accidental spills, all petroleum products will be stored in a covered area with measures to contain spills (containment barriers will be employed). In the event of any accidental spill during normal operations, it will be immediately isolated and cleaned up as required by best management practices regarding accidental spills. Additional BMPs will include structural (e.g., berms, silt fences, barriers), vegetative (e.g., grass, mulch, ground cover, soil stabilization), and management measures (e.g., project phasing and good housekeeping practices), will be implemented as appropriate. To address the potential for pollutants entering Kalihi Stream, an NPDES construction storm water discharge permit application will be filed with DOH-CWB for the Project in accordance with the requirements of Section 6, Chapter 11-55, HAR.

The mitigation measures described above are anticipated to be sufficient to ensure against inadvertent or accidental spills of pollutants from entering into State waters. No adverse impacts to surface waters are therefore anticipated. As required, consultation with the State DOH-CWB, through the application of the Section 401 Water Quality Certification, will be performed prior to and during construction to meet all regulatory requirements.

4.4 WATER QUALITY

As identified in **Section 4.3, Surface Waters**, above, Kalihi Stream is listed as an impaired body of water. The impairments to the stream include Nitrite/Nitrate, Total Nitrogen, turbidity, and trash. Between 2006 and 2009 Section 319(h) funds were expended to assist in load reductions and water quality improvement of Kalihi Stream as part of the Kalihi Ahupua'a Community Service Project. The project was responsible for the removal of 497 pounds of litter from the stream (DOH CWB, 2008).

Potential Impact and Proposed Mitigation

Potential impacts to water quality as a result of Project construction include the generation of silt (during grading and excavation of footings), erosion, and storm water runoff from the Project site discharging into the Kalihi Stream. Construction activities will temporarily disturb soils on the property, however silt fences, berms, stream diversion devices, and other applicable erosion control measures will be implemented to prevent soil and construction related debris from discharging into Kalihi Stream. As required, exposed soils will be covered with PVC sheet plastic and/or the use of berms to prevent inadvertent contact and mixing with stormwater. Silt curtains will be employed around the work area to limit the migration of silt and sediments.

Additional mitigation measures to ensure protection of water quality will also be provided through the conditions imposed as part of the water quality associated environmental permit applications that will be filed for this Project. The detailed mitigation measures that will be prepared will be developed and guided by the permitting process that will follow the completion of the subject HRS, Chapter 343, Environmental Assessment:

- Department of the Army Permit Application, Section 404/Title 10 Rivers and Harbors Act of 1899, Corps of Engineers. This permit application will govern work activities in the water and require review and approval of mitigation measures to address environmental and water quality concerns.

- Section 401 Water Quality Certification (WQC), DOH. This permit application will govern the water quality of discharges associated with construction of the Project. A Water Quality Monitoring Plan (WQMP) and a Section 401 WQC Best Management Practices (BMPs) Plan to address 401 WQC related permitting concerns will be prepared. Due to the designation of Kalihi Stream as an impaired water on the Section 303(d) list in addition to the potential presence of THP, VOCs, PAHs, and RCRA metals observed in nearby soils, further on-site testing will be included prior to and during site disturbance.
- Coastal Zone Management (CZM) Federal Consistency Determination, Office of Coastal Zone Management. This application will govern the review of the Project in relation to the State of Hawai‘i coastal zone management law as promulgated in HRS, Chapter 205A. The major concerns will involve the protection, preservation, and/or appropriate management of Hawai‘i's coastal resources.
- National Pollutant Discharge Elimination System (NPDES), NOI – Form C, Construction Stormwater Permit Application, DOH. This application will govern the generation and management of stormwater associated with the construction of the Project. A Construction Stormwater BMPs Plan will be prepared as part of the permit application. An NPDES, NOI – Form G, Construction Activity Dewatering permit will govern the treatment and discharge of potential dewatering effluent associated with construction, dredging, and dewatering. Due to the designation of Kalihi Stream as an impaired water on the Section 303(d) list in addition to the potential presence of THP, VOCs, PAHs, and RCRA metals observed in nearby soils, per further on-site testing dewatering effluent may need to be filtered prior to being discharged back into the stream.
- All Project activities with the potential for impacts to water quality will be addressed in accordance with regulatory standards. It is therefore anticipated that based on the application of the mitigation measures described above, as well as additional measures that would be implemented during the environmental permitting process, that no adverse environmental impacts to water quality will result.

4.5 STREAM HYDROLOGY

Kalihi Stream (state stream ID No.3-3-11) is classified as a continuous, perennial stream with an average annual stream flow of 15.7 CFS from 1963 to 2004 (USGS, 2014). Kalihi Stream in the vicinity of the Project site has a tributary area of approximately 6.7 square miles (4,290 acres) and a 100-year storm peak flow of 16,880 CFS. The closest active USGS stream gage station, USGS 16229300, was located 0.75 miles upstream, but is no longer in use. The only other stream gage for Kalihi Stream, USGS 16229000, is located approximately 3.8 miles upstream at 464 feet MSL.

Stream scour is increasing the rate of erosion along the west bank of the stream channel. Based on a 100-year storm event, it is estimated that the stream could scour to an approximate depth of 14 feet. The stream bottom has already been impacted by scour transitioning from 1.93 feet MSL prior to the stream bend, to -1.54 feet MSL in the middle of the bend, to 0.33 feet MSL downstream of the project site. See **Figure 5**.

The top bank elevations of Kalihi Stream in the project vicinity vary between 15 feet and 18 feet along the west bank and between 12 feet and 13 feet along the east bank of the stream.

The stream does not have the capacity to effectively convey anticipated flows from a 100-year storm event. During a 100-year storm event, the anticipated surface elevation of the stream has the potential to breach both banks. However, as the east bank is approximately 5 feet lower than the west bank, flooding will likely occur primarily to the east. Additional scouring of the stream caused by a storm event or erosion has the potential to further undermine the Kalihi-Palama Bus Facility's parking lot.

Potential Impact and Proposed Mitigation

The proposed project will mitigate scour and reduce stream bank erosion through the creation of a retaining wall and placement of dumped rip-rap at the toe of the wall. Stream bank lining with grouted CRM rip-rap will not increase runoff or adversely impact potential base flood elevations. The 14 foot depth of potential scour is a significant factor in the design of the retaining structures. If scour is not eliminated then the potential retaining wall height, combined with the soft soils, makes it difficult to design a feasible structural solution. Proposed stream channel lining will mitigate scour which could otherwise adversely impact stream hydrology by further eroding the west bank of the stream channel. The proposed project will not adversely impact the capacity of the stream channel.

4.6 FLORA AND FAUNA

4.6.1 Flora

The proposed Project site is located on the west bank of Kalihi Stream. The Project site area is comprised primarily of introduced fill material, rocks (boulders), mixed vegetation, and urban debris. The flora found at the Project site include mostly introduced species with mostly herbaceous plants including grasses and weedy species typical of disturbed areas. No threatened or endangered fauna are known to inhabit the site. No plant species were observed within the Project area that are listed as threatened or endangered, or which are otherwise considered to be rare or special by the State of Hawai‘i or federal government.

A Botanical Resources Study was conducted by Char & Associates in February, 2002 for the Kalihi-Palama Bus Facility. The findings of the survey are as follows:

Swollen fingergrass (*Chloris barbata*), bristly foxtail (*Setaria verticillata*), Spanish needle or beggar's tick (*Bidens pilosa*), and black pigweed, (*Trianthema portulacastrum*) are the most abundant components of the vegetation. Other species occurring here occasionally include wiregrass (*Eleusine indica*), spiny amaranth (*Amaranthus spinosus*), field bindweed (*Ipomoea obscura*), castor bean (*Ricinus communis*), and hairy merremia (*Merremia aegyptia*). Woody components are few and include a kiawe sapling (*Prosopis pallida*), koa haole shrubs (*Leucaena leucoce1hala*), and iopiuma (*Pithecellobium dulce*) and Chinese banyan (*Ficus microcarpa*) trees. Two indigenous species are found along the stream: the water hyssop (*Bacopa monnieri*) and kipukai (*Heliotropium curassavicum*), neither of which is classified as threatened or endangered.

A site visit was performed by R. M. Towill Corporation on May 30, 2014. In addition to the above observed fauna, mangrove, octopus trees (*Schefflera actinophylla*), papaya trees, and banana trees were also found at the site. The species above are introduced and are not classified as threatened or endangered. Banana leaves can be used for traditional or cultural uses but as they were not reported in the previous Botanical Resources Study or Cultural Impact Assessment (CIA). Other than removing trash and debris, the Kalihi Ahupua‘a Community Service Project

also was responsible for planting Cassava in one area and 50 other edible and medicinal plants between 2006 and 2009.

Potential Impact and Proposed Mitigation

Stream maintenance is performed routinely including the clearing of vegetation from the stream channel. Impacts to vegetation will be mostly to introduced or invasive species. None of the vegetation to be impacted is classified as threatened or endangered.

4.6.2 Aquatic Biota

An aquatic biological survey of the Project site was conducted by Michael Kido identifying macro-algae, coral and other macro-invertebrates, and fishes present (Kido, 2002). Two native oʻopu, naniha and akupa, that were sighted in the stream. During the May 30, 2014 site visit six naniha of varying sizes were observed as well as four other oʻopu.

Fishing activities along the shoreline and from Kamehameha Highway Bridge was observed by Cultural Surveys Hawaiʻi, Inc. during the conducting of the Cultural Impact Assessment (CIA). See **Section 5.6**. During the May 30, 2014 site visit, no fishing activity was observed.

One of the two oʻopu observed in the stream, naniha, is not typically believed to be a good food source though it has been reported to have been used in some religious ceremonies. The spawning season of the naniha is year-round with more research need to understand the akupa spawning behavior.

Potential Impact and Proposed Mitigation

It is not feasible to restore the Kalihi Stream channel and banks to its original state. The proposed design work takes into account rip-rap lining and V-notched, unlined channel bottoms to the stream environment per Section 3.1.1.1, PUC Development Plan but will not affect the existing stream bottom. See **Section 3.3**, above, for a greater discussion of alternatives. No long term adverse impacts are anticipated from the proposed Project. Mitigation measures to minimize construction-related impacts on stream fauna include:

- Installation and maintenance of construction BMPs to prevent pollutant discharges from work activities include, but are not limited to, the use of stormwater runoff berms, silt curtains, silt screens, and other related protective measures;
- Installation of stream diversion BMPs to isolate the work area while maintaining continuous stream flow to allow movement aquatic biota;
- Construction will be sequenced such that at no time is the entire stream bed blocked in a manner that would prevent upstream migration;
- Implementation of Water Quality monitoring throughout construction in accordance with required Clean Water Act permits; and,
- Prior to construction, Project personnel will be instructed on the importance of protecting the stream environment and measures for doing so. A strict prohibition on the introduction of non-native species to the stream, and fish feeding will be enforced by the Project contractor throughout the period of construction.

Access to fishing from the public ROW along Kamehameha Highway Bridge will not be affected. The potential impact to aquatic biota will be temporary, and limited to the immediate

area between the bridges. Potential adverse impacts to aquatic biota and fishing will be mitigated by the actions above and cease once the construction is completed and BMPs are removed from the stream. As there is no critical spawning period, no mitigation measure is proposed in terms of what season construction will be performed in.

4.6.3 Avifauna and Terrestrial Biota

Avifauna observed at the site is comprised primarily of introduced species including the Common Indian Mynah (*Acridotheres tristis*), House Sparrow (*Passer domesticus*), Spotted or Lace-necked Dove (*Streptopelia chinensis*), Zebra Dove (*Geopelia striata*), and Cardinal (*Cardinalis cardinalis*). A biological study performed on December 22, 2001 by Kimura International, Inc. for the Kalihi-Palama Bus Facility also identified one Black crowned night heron (*Nycticorax nycticorax*), one Lesser golden plover (*Pluvialis dominica*), one Red vented bulbul (*Pnycnonotus cafer*), and five Japanese white eye (*Zosterops japonicas*). It is also possible that foraging seabirds may also be attracted to the area due to the site's proximity to the ocean and relatively flat surrounding topography.

Feral cats (*Felis cattus*) have been observed in the area. Mongoose, rats, and mice are also expected to inhabit the area though none have been observed during site visits or biological surveys.

Potential Impact and Proposed Mitigation

A regulatory review of the Project will be required from the Department of the Army, Corps of Engineers; Department of Land and Natural Resources (DLNR); the Office of Coastal Zone Management; and the Department of Health. Regulatory review of the Project from these agencies may involve addition of mitigation measures in the form of monitoring and/or other controls to reduce the potential for impacts to stream flora and fauna. The applicant intends to coordinate the review of the Project with these agencies, as required, thereby reducing or ameliorating the potential for adverse impacts to the environment.

There is no anticipated impact to endangered, endemic, or native terrestrial biota from the proposed Project. Construction activity and the removal of non-native vegetation may potentially disturb terrestrial biota currently residing in proximity to the Project area. No mitigation measures are proposed.

4.7 SCENIC AND VISUAL RESOURCES

The Project area is located in an industrial area adjacent to properties with existing warehouse structures. Major land uses in the area are primarily industrial in nature and include the bus maintenance facility, bakery, bulk storage facilities, shipping container storage yards, and warehouses. Keʻehi Lagoon is located to the south of the Project site and serves as the terminus of Kalihi Stream. Keʻehi Lagoon is not visible from the Project site due to a bend in the stream and the obstruction of industrial buildings. The Primary Urban Center (PUC) Development Plan does not identify this Project location as having significant views that require protection.

The Project site is not visible from a public right-of-way. Upstream and downstream views of Kalihi Stream from North King Street Bridge and Kamehameha Highway Bridge, respectively, as they cross Kalihi Stream are shown in **Figure 19, View from North King Street Looking Makai** and **Figure 20, View from Kamehameha Highway Looking Mauka** below.

Figure 19. View from North King Street Looking Makai

Figure 20. View from Kamehameha Highway Looking Mauka

Potential Impact and Proposed Mitigation

The proposed stream bank stabilization work will not be visible from Kamehameha Highway or North King Street and is therefore not anticipated to adversely affect scenic and visual resources. Landscaping on the Kalihi-Palama Bus Facility will be provided along the top of the stream bank. No further mitigation measures are therefore anticipated or proposed.

4.8 HISTORIC/ARCHAEOLOGICAL RESOURCES

Cultural Surveys Hawai‘i, Inc. conducted a CIA, an archaeological literature review, and a field inspection of the Kalihi-Palama Bus Facility in March 2007. The following is a summary of the investigations:

- A review of the archaeological literature found no archaeological properties in the vicinity of the Project area. Several traditional fishponds once existed somewhat inland, but all of these were filled as "reclamation" land beginning in early twentieth century.
- Some human burials have been found in coastline or coastal estuarine environments in Kalihi Kai, however these are scattered and are not near the Project area.
- Because the dry land portion of the Project area is believed to be entirely 20th century fill land, development of this land seems exceedingly unlikely to adversely impact any land resources.

Potential Impact and Proposed Mitigation

The proposed construction is within an industrialized area and on land that is composed entirely of fill material. It is therefore highly unlikely that significant historic or archaeological resources are present at the Project site. However, should any unidentified deposits be uncovered during construction, work will cease in the immediate area and the State Historic Preservation Office will be contacted.

4.9 NOISE

Regulation of noise in residential areas of O‘ahu is governed by DOH, Indoor Radiological Health (IRH) Branch, under HAR, Chapter 11-46, *Community Noise Control*. The DOH-IRS has established maximum permissible day and night sound levels decibels adjusted (dBA) for various classifications (Class A, B and C) of zoning districts. The Project site is zoned as industrial (I-2 and IMX-1), which falls under Class C. The maximum permissible day and night sound levels for the Class C district are as follows:

Time	Permissible Noise Levels
7:00 am to 10:00 pm (day)	70 dBA
10:00 pm to 7:00 am (night)	70 dBA

Ambient noise levels at and around the Project site are generally varying spatially and temporally. An Environmental Noise Assessment performed by D.L Adams Associated, Ltd. for the Final EA for the Middle Street Transit Center (now Kalihi-Palama Bus Facility) in August

2002, observed ambient noise levels ranging from 52 to 72 dBA, or already in exceedance of the permissible noise levels described above. Noise levels tend to increase during the day and subside slightly during the night. Noise levels result primarily from bus traffic from the Kalihi-Palama Bus Facility and its bus maintenance facility, Kamehameha Highway located 700 feet downstream, H-1 Freeway located 650 feet to the northwest, businesses and warehouses to the south and east, as well as intermittent background noise from aircraft flyovers and the airport located 1.3 miles to the west. Neighboring uses primarily include warehouses and other industrial uses.

Potential Impact and Proposed Mitigation

The potential for short term adverse impacts to existing noise conditions are expected to result from construction activities, particularly noise generated during mobilization activities, and operation of heavy construction equipment. Construction equipment is expected to include, but not be limited to, pile driver, a compactor, concrete mixer, concrete delivery trucks, cranes, welders, excavators, loaders and powered hand tools. All combustion powered equipment will be muffled in accordance with industry recognized engine operating practices.

Construction equipment typically generates noise in the range of 55 to 90 dBA in close proximity. The General Contractor will ensure that Project activities are in compliance with the provisions of HAR, Chapter 11-46, *Community Noise Control*. The contractor may secure a noise permit from the DOH prior to the initiation of construction if deemed necessary, but it is unlikely due to the Class C zoning and topography of the Project site.

The potential for noise associated impacts, as a result of construction are expected to be temporary, of limited duration, and restricted to normal daytime working hours: between 7:30 to 4:30 p.m., Monday through Friday. Construction noise will cease once the work is completed. Upon completion of work, noise will return to pre-existing background levels. No long term impacts on noise conditions are expected, as the proposed Project will involve substantively the same land use. No further mitigation measures are planned or proposed beyond the adherence to regulated safe working practices to prevent adverse noise impacts to the general public and area employees.

4.10 AIR QUALITY

The State DOH maintains a network of air monitoring stations around the state to gather data on particulate matter (PM_{10}), sulfur dioxide ($S0_2$), nitrogen dioxide ($N0_2$), carbon monoxide (CO) and ozone (0_3). There are no DOH monitoring stations in the Project vicinity. The nearest air quality monitoring stations are located 2.2 miles southeast on Sand Island, 21.30384°N, 157.87117°W, and 2.7 miles east at the DOH in Downtown, 21.30758°N, 157.85542°W.

The 2012 Annual Summary Air Quality Data, produced by DOH, reports annually the EPA national ambient air quality standards (NAAQS) through a published report. Sand Island and DOH Stations were in attainment with the 24-hour PM_{10} and $PM_{2.5}$ NAAQS; 8-hour O_3 NAAQS; 1-hour and 8-hour CO NAAQS; and 1-hour, 3-hour, and 24-hour SO_2 NAAQS. The highest monthly maximum recorded 24-Hour PM_{10} values for Honolulu were 32 $\mu g/m^3$. State and federal standards for 24-hour PM_{10} are not to exceed 150 $\mu g/m^3$.

In conjunction with the Kalihi-Palama Bus Facility Project, air sampling was conducted in July 2002 at the Middle Street / Kamehameha Highway intersection. Carbon monoxide (CO)

levels were measured during the AM and PM peak traffic hours, and were found to be very low, averaging 0.39 mg/m3 and 0.41 mg/m3 on two separate days.

Potential Impact and Proposed Mitigation

Construction activities are expected to have little or no impact on air quality because the Project will be of limited in scope and cease upon completion of construction. Engine exhausts may be a source of potential air pollution. All internal combustion equipment will be governed in accordance with applicable state and county regulations. During construction, fugitive dust may be generated, which can constitute a nuisance to the nearby users, the Kalihi-Palama Bus Facility, and the general public transiting the area along the Kamehameha Highway. To reduce the potential incidence of fugitive dust, the construction contractor will erect dust fencing and regularly wet disturbed soil areas, as necessary. Based on the mitigation measures described above, the proposed Project is expected to have minimal to no impact to long term air quality.

4.11 NATURAL HAZARDS

4.11.1 Flood

The proposed Project will occur along the west bank of Kalihi Stream. According to Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM), Map No. 15003C0353F, dated January 19, 2011, the Project site is in an area designated as Zone AO (Elevation ranges between 2 -3 feet). See **Figure 21, FEMA FIRM**. The Zone AE designation is the flood insurance rate zone that corresponds to the 1-percent annual chance floodplains that are determined in the Flood Insurance Study by detailed methods of analysis.

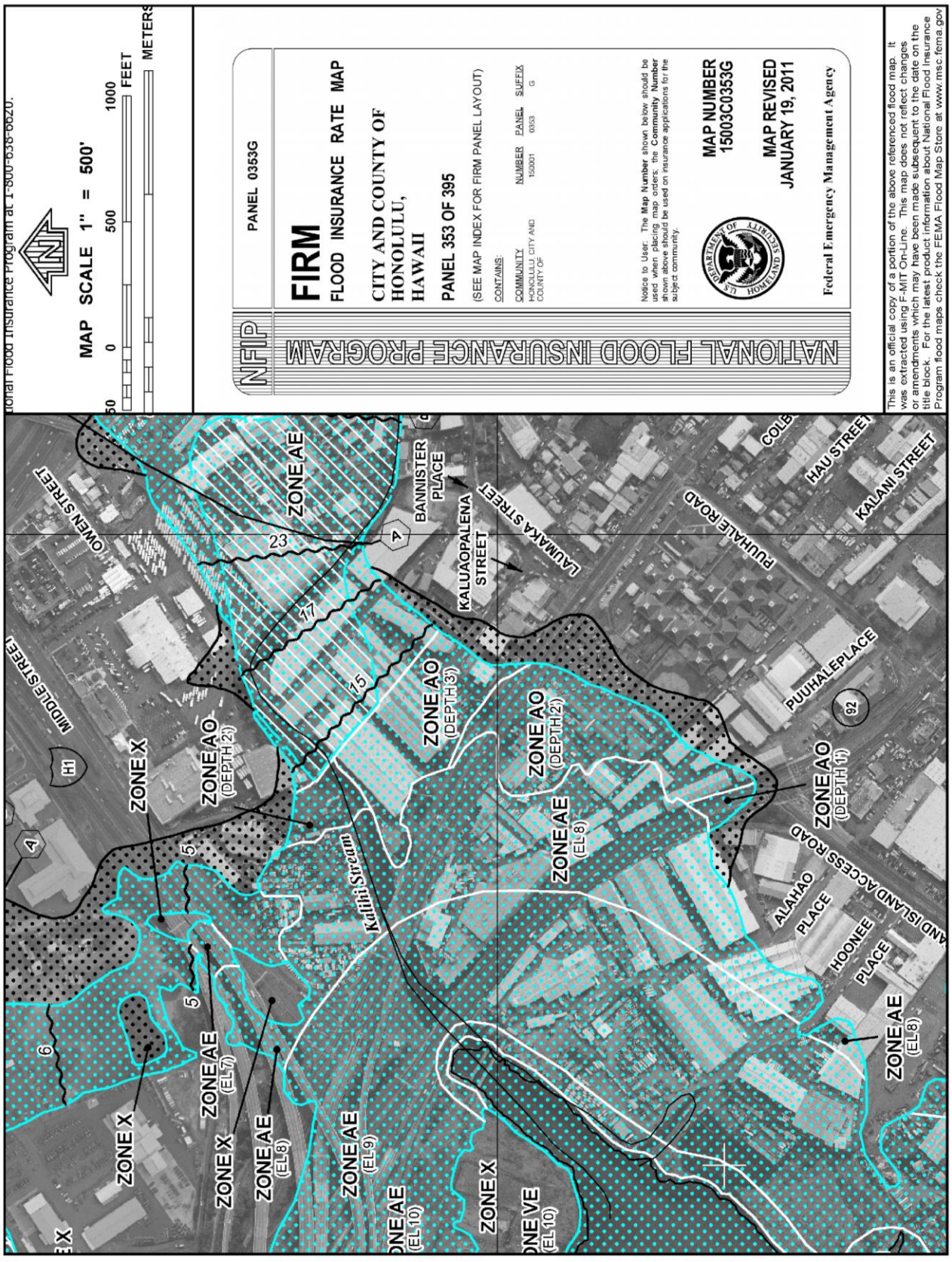
Kalihi Stream in the vicinity of the Project site has a 100-year storm estimated peak flow of 16,880 CFS. Within the AE flood zone, Kalihi Stream has 100-year flood elevations between 15 feet and 20 feet MSL. Within the Project limits, the top bank elevations of the stream vary between 15 feet and 18 feet along the west bank and between 12 feet and 13 feet along the east bank of the stream. The industrial area on the east side of the stream is anticipated to be significantly inundated by approximately 6-7 feet during peak flow from a 100-year storm event.

A USGS stream gage (USGS 16229300) was 0.75 miles upstream from the project site, and recorded peak stream flow from 1960 to 2004. The highest peak stream flow for Kalihi Stream recorded occurred on April 19, 1974 at 7,110 CFS. December 7, 2003 recorded one of the last peak stream flows of 3,580 CFS.

Potential Impact and Proposed Mitigation

Although the proposed facility will be located within the base flood elevation, no habitable structures are proposed that would constitute an unreasonable risk to life or property. Given the requirement for the proposed Project to be located within a flood zone, the proposed improvements will be designed to maintain or decrease existing flood elevation and is not anticipated to have significant adverse impacts on flood conditions. No further mitigation measures are planned or proposed.

Figure 21. FEMA FIRM



4.11.2 Tsunami

A tsunami involves the generation of a series of destructive ocean waves that can affect all shorelines. Most tsunamis in Hawai‘i originate from earthquake activity (magnitude 7.0 or greater), i.e. shifting of tectonic plates in the Pacific Rim (e.g., Alaska and Chile), and may take hours to reach Hawai‘i. Oftentimes, the Pacific Tsunami Warning Center (PTWC)’s network of sensors is able to give a warning several hours in advance. Although rare, tsunamis may originate from seismic activity within the Hawaiian Islands, which can occur at any time with limited or no advance warning.

Since 1946, there have been four significant tsunami events (1946, 1957, 1960, and 1964); these tsunami waves rose to heights of 1- 14 feet above sea level. While these events are rare, it is prudent to assume that future events will occur.

The proposed Project is located 2,000 feet upstream of Ke‘ehi Lagoon on the south shore of O‘ahu. According to the CCH, and based on scientific techniques and technology with the assistance of the County Public Safety Officials, the proposed Project site is determined to be outside of the Tsunami Evacuation Zone. In the event of a tsunami, the PTWC of the National Oceanic and Atmospheric Administration (NOAA) will issue a tsunami warning and Civil Defense agencies, including the Honolulu Police and Fire departments will oversee the evacuation of areas at risk for tsunami inundation.

Potential Impacts and Mitigation

Though the Project site is located outside the tsunami evacuation zone. See **Figure 22, Tsunami Evacuation Zone.** In the event of a tsunami, as the stream is tidally influenced and at sea level, the Project area will likely be impacted.

To mitigate the impacts of a tsunami on the Project site, when a “tsunami advisory” or “tsunami watch” is issued, the Project contractor will perform the following as time allows:

- Remove or secure equipment, machinery, construction materials, and portable toilets.
- Clean up all construction debris.
- Stop scheduled deliveries of building materials.
- Remove jobsite signage, dust screens, silt screens, and other temporary installations.
- Locate and turn off jobsite utilities, including electricity and water connections.

Upon issuance of a “tsunami warning”, construction operations will cease, work crews will finalize securing the Project site and will evacuate until an “all clear” has been issued or until the tsunami watch or advisory has been cancelled.

4.11.3 Seismic Hazard

The Hawaiian Islands experience thousands of earthquakes each year; some are strong enough to be felt, while a few cause minor to moderate damage, but most are small and detectable only by a seismometer. Most of Hawai‘i's earthquakes are directly related to volcanic activity and are caused by magma moving beneath the earth's surface (Juvik & Juvik, 1998). The vast majority of recent (1990-2006) earthquakes have occurred on or near the island of Hawai‘i; the most recent large (magnitude 6.7) earthquake on Hawai‘i island was in October 2006.

Therefore, while earthquakes pose a threat throughout Hawai‘i, disruptive seismic events are relatively uncommon in this region and near the Project site.

According to FEMA's Seismic Design Category (SDC) map, the Project site is located in SDC "D_0". This is an earthquake hazard area that "*Could* experience very strong shaking. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse."

Potential Impacts and Mitigation

The Project is being proposed to mitigate potential bank erosion which could be caused by a seismic event. The proposed Project is not anticipated to be adversely impacted by seismic activity, nor will it exacerbate seismic activity conditions. Mitigation measures will be implemented to ensure against potential adverse impacts during construction.

4.11.4 Hurricanes and High Winds

The Hawaiian Islands endure seasonal hurricanes, from the late summer to early winter months. Since 1982, hurricane ‘Iwa (1982) and hurricane ‘Iniki (1992), have been the most destructive to the Hawaiian Islands. During hurricanes, high winds often uplift roofs and other debris, which can attain high velocity and cause devastating property damage, and harm to life.

It is difficult to predict these natural occurrences, but it is reasonable to assume that future events will occur. The Project area is particularly vulnerable to storm surge associated with hurricanes characterized as flooding that would originate from Ke‘ehi Lagoon. Coastal areas and stream inlets are the most vulnerable to storm surge. Hurricanes are also associated with destructive winds and torrential rains associated with hurricanes.

Potential Impacts and Proposed Mitigation

The proposed Project site is not anticipated to exacerbate hurricanes and high wind conditions. However, the proposed Project site has the potential to be adversely impacted by hurricanes during construction. Therefore, mitigation measures are proposed to ensure against potential adverse impacts.

The potential for adverse impacts during construction will be addressed by protecting construction equipment and will involve early preparation upon notification of an impending hurricane event. The National Hurricane Center issues a "Hurricane Watch" within 48 hours of a potential hurricane event, and issues a "Hurricane Warning" when sustained winds of at least 74 mph are expected within 36 hours of a potential hurricane event. Upon issuance of a "Hurricane Watch" notice, work crews will begin securing the construction site as follows:

- Remove or secure equipment, machinery, construction materials, and portable toilets.
- Clean up all construction debris.
- Stop scheduled deliveries of building materials.
- Remove jobsite signage, dust screens, silt screens, and other temporary installations.
- Locate and turn off jobsite utilities, including electricity and water connections.

Upon issuance of a "Hurricane Warning", construction operations will cease, work crews will finalize securing the Project site and will evacuate until the hurricane threat has abated.

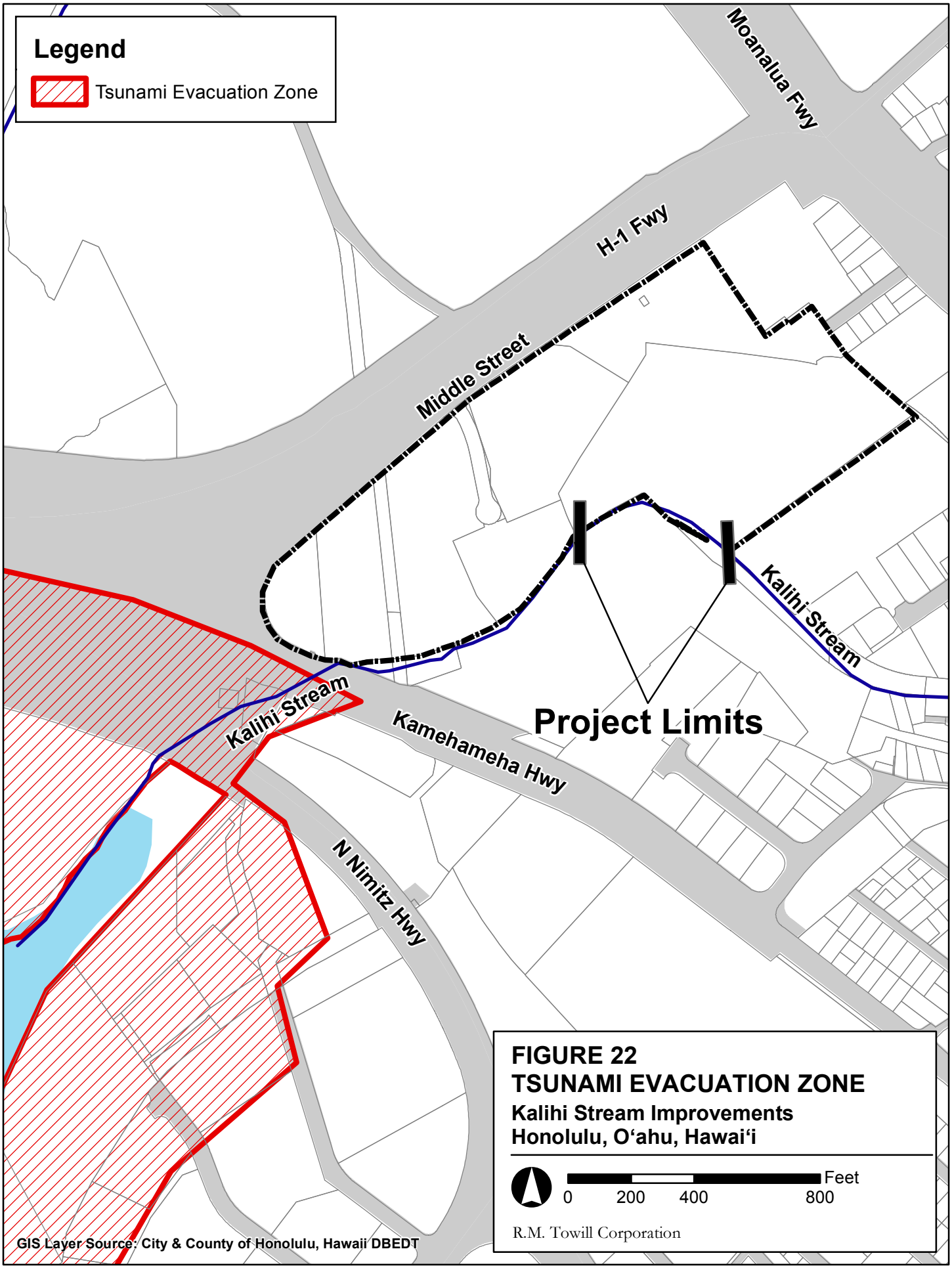


FIGURE 22
TSUNAMI EVACUATION ZONE
Kalihi Stream Improvements
Honolulu, O‘ahu, Hawai‘i

0 200 400 800 Feet

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SECTION 5
DESCRIPTION OF PUBLIC SERVICES, POTENTIAL IMPACTS AND PROPOSED MITIGATION

5.1 TRAFFIC AND CIRCULATION

The portion of Kalihi Stream containing the Project site is accessed from Middle Street with east- and west-bound traffic largely accessing Middle Street from the H-1 Freeway. The primary entry into the Kalihi Stream in the vicinity of the Project site has no public facilities and is accessed, with prior permission, at the Kalihi-Palama Bus Facility. Peak traffic movement both for Honolulu and the area occurs in the mornings and afternoons corresponding to commuter traffic.

Potential Impact and Proposed Mitigation

Construction traffic associated with the installation of the stream bank protection will be limited to personnel associated with the construction on a daily basis. It is anticipated that the work period will be between 7 a.m. and 3:30 p.m. The total number of workers is not expected to exceed 15 persons. The proposed Project is not expected to significantly alter the total volume of traffic on Middle Street.

Construction-related work, including delivery of building supplies, construction vehicles and other related traffic will affect traffic flow on Middle Street; however, these effects are expected to be short term and will be experienced primarily during the initial and final stages of the Project when construction equipment is moved to and from the Project site. Occasional increases in construction traffic may result from the periodic movement of construction materials and when vehicles leave the site to remove debris. Construction activity is planned during the daytime hours with no night work anticipated to be required. These impacts on traffic will be temporary and will cease upon completion of construction. No additional mitigation measures are proposed or are anticipated to be required.

Kalihi Stream in the vicinity of the Project area is a non-navigable waterway. There are no Aids to Navigation found upstream of Kamehameha Highway. Therefore no further action is required.

5.2 DRAINAGE SYSTEM

The CCH's Department of Facility Maintenance (DFM) manages the storm drain system on O'ahu, which is regulated under a NPDES Municipal Separate Sewer System (MS4) permit, administered by the SDOH from the EPA.

There is no developed drainage system on the Project site. Rainfall runoff near the Project site collects and flows into the Kalihi Stream, which then flows into the Ke'ehi Lagoon, approximately 2,000 feet downstream.

Potential Impacts and Proposed Mitigation

The proposed Project consists of channel improvements to Kalihi Stream, which will alleviate erosion and flood conditions on the western bank adjacent the Kalihi-Palama Bus Facility. During construction activities, there is the potential for pollutants to discharge from the proposed Project site in storm water runoff. Mitigation measures to ensure against the discharge

of pollutants in storm water and non-storm water runoff will be addressed through compliance with SDOH, HAR, Chapter 11-54, *Water Quality Standards*, and Chapter 11-54, *Water Pollution Controls*. Construction activities will comply with NPDES permit conditions, which will include the use of appropriate erosion controls and the implementation of a Site-Specific Construction Best Management Practices (BMPs) Plan.

The proposed Project will not significantly increase the amount of impervious surfaces within the stream channel and will be limited to grouted rip-rap lining along the west bank. Proposed mitigation measures to address potential stormwater runoff will include revegetation of the area using native plants to reduce sedimentation in the stream. The purpose of the Project is to improve stream drainage and mitigate the effects of drainage on the stream embankments. No adverse impacts are anticipated.

5.3 SOLID WASTE DISPOSAL SYSTEM

The CCH ENV, Refuse Division and private waste collection haulers provide solid waste collection and disposal services on O‘ahu. The proposed Project will generate solid waste including the following: vegetation, dried spoils, debris, and rocks.

Potential Impacts and Proposed Mitigation

Solid waste generated during construction activities will consist of typical construction refuse and excavated soils from the stream channel. Approximately 7,244 CY of sediment will be excavated from Kalihi Stream with some spoils reused as backfill for toe protection upon completion of stream improvements. Additional waste will be generated during the initial clearing of vegetation. Solid waste will be handled by the construction contractor in accordance with State and CCH regulations governing the safe disposal of such materials at an acceptable facility such as the PVT Land Company Landfill, located at 87-2020 Farrington Highway, Waianae. Soils that cannot be reused for fill or cover material will be disposed of off-site in accordance with State and CCH regulations at a County-approved waste facility. No other mitigation measures are required or recommended.

5.4 POLICE, FIRE AND MEDICAL SERVICES

The Honolulu Fire Department (HFD) provides firefighting services for O‘ahu. The HFD responds to emergencies including, but not limited to fires, emergency medical calls, hazardous materials incidents, motor vehicle accidents, natural disasters and technical rescues. The island of O‘ahu is divided into five battalions containing 45 fire stations. Fire Station 6, Kalihi Fire Station, is located at 1742 North King Street, approximately 1.0 miles from the Project site.

Police protection services on O‘ahu are provided by the Honolulu Police Department (HPD). The HPD is comprised of 29 divisions. As of May 2012, the department had 1,933 sworn officers and 463 civilian personnel. The Honolulu Police Headquarters is located on 801 South Beretania Street in Honolulu. The Project site is located within Patrol District 5, “Kalihi District”, Beat 562. The Kalihi City Police Station is located mauka 1.3 miles at 1865 Kamehameha IV Road.

Major medical service providers located in Honolulu include Kaiser Permanente Moanalua Medical Center and Clinic, Queen's Medical Center, Straub Clinic and Hospital, Kuakini Hospital, Tripler Army Medical Center, and Kapi'olani Women's and Children's Hospital. The closest medical service provider is the Kalihi-Palama Health Center, which is approximately 2.4 miles east from the Project site.

Potential Impacts and Proposed Mitigation

The proposed Project is not anticipated to result in an increase in calls for fire, police, or medical services or have any adverse impacts on fire, police, or medical resources. No mitigation measures are required or recommended.

5.5 PARKS AND RECREATION

There are no public parks in the vicinity of the Project site. To the south of the Project site is Ke'ehi Lagoon which is used for aquatic recreation with access either from Ke'ehi Lagoon Park on the west bank of Moanalua Stream with access off of Nimitz Highway, or at La Mariana Marina with access off of Sand Island Access Road.

Stream corridors are identified in the PUC Development Plan as having the potential to extend and improve Honolulu's open space network by reintroducing natural elements to the stream environment. Section 3.1.3.5 of the plan identifies portions of Kalihi Stream makai of the H-1 Freeway as an area suitable for the development of a streamside pathway to improve access to recreation sites and natural areas and provide safe, convenient pedestrian routes between neighborhoods.

Potential Impacts and Proposed Mitigation

The proposed stream improvements in not anticipated to adversely impact Ke'ehi Lagoon Park or marine recreation at Ke'ehi Lagoon. There are no existing public pathways within the makai portion of the Kalihi Stream corridor. The purpose of the proposed stream improvements is limited in scope and scale to address erosion of the west bank of the Kalihi Stream. It is not feasible as part of this Project to construct a pedestrian route along the west bank. No mitigations measures or further actions are proposed.

5.6 IMPACTS TO TRADITIONAL/CULTURAL RESOURCES

A Cultural Impact Assessment (CIA), archaeological literature review, and field inspection was conducted for the Final EA for the Middle Street Transit Center by Cultural Surveys Hawai'i in 2002. The following provides a summary of the findings of the assessments:

- The land on which the project area is located is composed primarily of fill material.
- A review of the archaeological literature found no archaeological properties within the stream or banks of the project area, and, because the land is composed primarily of fill material, it is highly unlikely that significant historic or archaeological resources are present at the project site.

- There are no plants on the property that are of significant importance for traditional or cultural use. Plant cover in the project area is limited to grass and other species that are either common or introduced varieties.
- The potential for adverse impacts as a result of the proposed project to near shore resources and fishing access is unclear. However, there is a long tradition of use of coastal resources in the vicinity.

Potential Impacts and Proposed Mitigation

No other impacts to the use of flora and fauna associated with cultural practices are anticipated. The study recommends that the Project attempt to minimize adverse impacts to the stream and coastal environment for purposes of fishing and use of other coastal resources. If fishing does occur within Kalihi Stream, it would most likely occur from the Kamehameha Highway Bridge. The Project is not anticipated to adversely impact fishing from Kamehameha Highway. At no point during construction will Kalihi Stream be interrupted. Instead stream diversion will be used to isolate a "dry" work environment.

One of the two o'opu observed in the stream, naniha, is not typically believed to be a food source though it has been reported to have been used in some religious ceremonies. The spawning season of the naniha is year-round with more research need to understand the akupa spawning behavior. As a result no mitigation measure is proposed in terms of what season construction will be performed in.

SECTION 6
RELATIONSHIP TO STATE AND COUNTY LAND USE PLANS AND POLICIES

6.1 STATE LAND USE DISTRICT

The Project site and the surrounding area are within the State Urban District. According to Section 205-2(b), HRS, "Urban districts shall include activities or uses as provided by ordinances or regulations of the county within which the urban district is situated."

Discussion:

The proposed Project is consistent with the current land use designation as urban.

6.2 GENERAL PLAN

The current edition of the General Plan for the City & County of Honolulu was adopted in 1977, revised in 1992, and was last updated in October 2006. The Plan is a comprehensive statement of objectives and policies for the future development of Honolulu. The proposed Project is consistent with the following objectives and policies of the City and County of Honolulu's General Plan:

Economic Activity

The objectives and policies for economic activity as stated in the General Plan, "attempt to address the need for an adequate standard of living for residents and future generations. Issues of employment opportunities, viability of major industries, diversification of the economic base, and the location of jobs are addressed in terms of what government can do to provide, encourage, and promote economic opportunities for our people."

Objective A: To promote employment opportunities that will enable all the people of O'ahu to attain a decent standard of living.

Physical Development and Urban Design

The objectives and policies in Physical Development and Urban Design "deal with the coordination of public facilities and land development, compatibility of land uses, and specification of certain land uses at particular locations. Urban design emphasis is contained in objectives to create and maintain attractive, meaningful, and stimulating environments and to promote and enhance the social and physical character of O'ahu's older towns and neighborhoods".

Objective A: To coordinate changes in the physical environment of O'ahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located.

Discussion:

The Project will take place in a location that has adequate water supply and sewage treatment facilities. BMPs will be installed in accordance with State and Federal regulations and a NPDES General Permit Coverage Authorizing Discharges of Storm Water Associated with the proposed work and will be filed with the DOH to address and maintain the environmental quality of storm water runoff.

The Project location is within an existing industrial area with air, ground and harbor related transportation linkages. The added vehicular traffic from the construction of the proposed Project is not expected to have significant impacts to the existing traffic volume in the area and will cease upon completion of construction. Fire protection is provided by the City & County Fire Department out of the Kalihi Kai Fire Station # 6, and police service is provided by the Kalihi Police Station. Coordination of the proposed Project with these agencies as well as the Department of Planning and Permitting (DPP), Department of Design and Construction (DDC), and other departments of government, as applicable, will be provided as a part of the Project's environmental documentation review process.

Policy 5: Provide for more compact development and intensive use of urban lands where compatible with the physical and social character of existing communities.

Discussion:

The proposed location of the stream improvements is in an area zoned for industrial activities and is located away from residential uses. Uses immediately surrounding the site include warehouses, bakery, distribution center, and bus maintenance and passenger transfer facility.

6.3 PRIMARY URBAN CENTER DEVELOPMENT PLAN

The Project site is designated for industrial uses in the Primary Urban Center (PUC) Development Plan Land Use Map (March 2004). See **Figure 23, PUC Development Plan**, below.

Discussion:

The proposed Project is consistent within the industrial use designation.

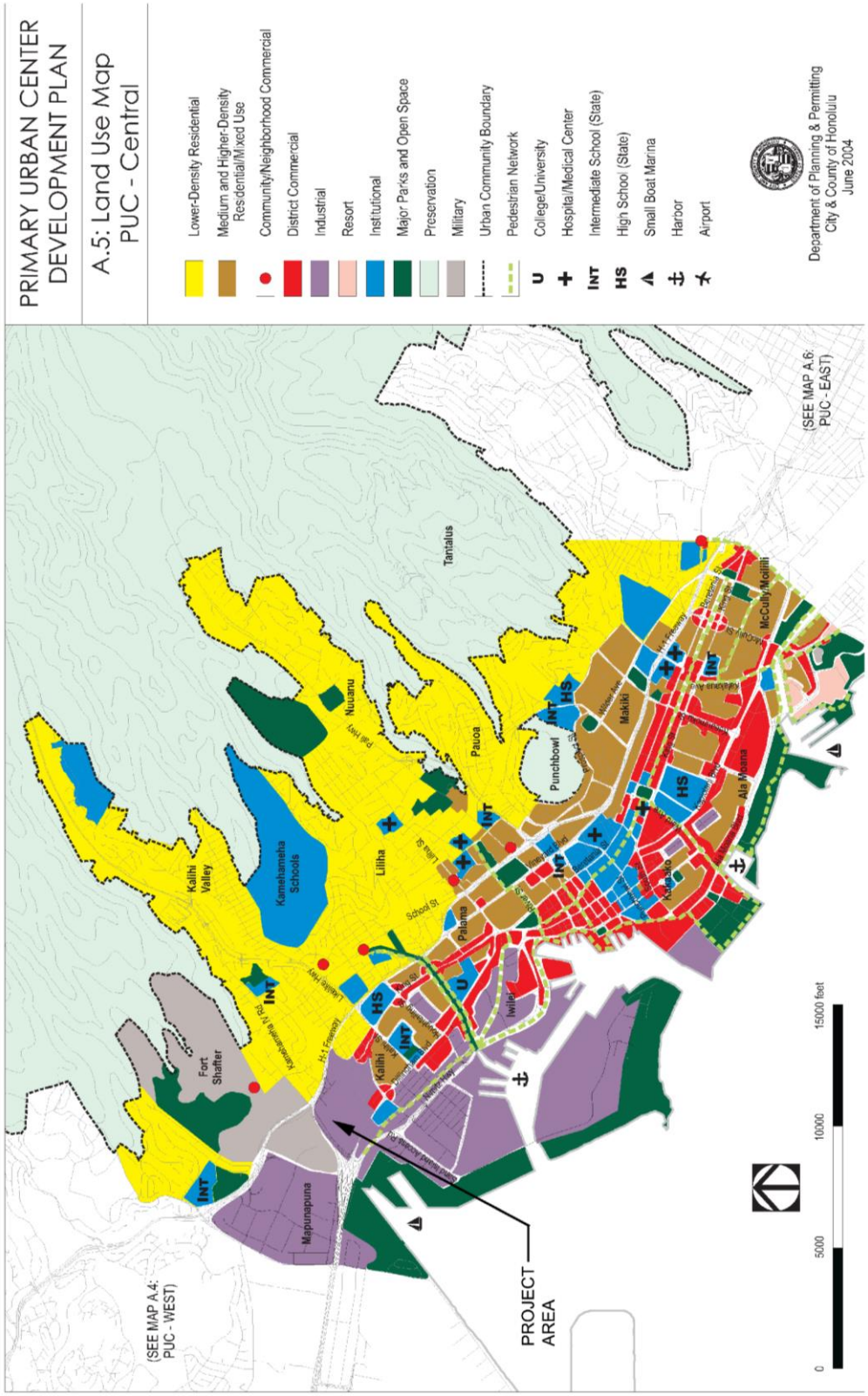
6.4 ZONING

The Project site is located on land designated I-2, Light Industrial District. Kalihi Stream in the Project vicinity also falls within the IMX-1 zone, Industrial-Commercial Mixed Use Zoning District. See **Figure 24, Zoning Map**. The intent of the I-2, Light Industrial District, is to set apart and protect areas considered vital to the performance of industrial functions and to their efficient operation. The I-2 zoning designation is intended to permit a full range of facilities necessary for successful and efficient performance of industrial functions. It is intended to exclude uses which are not only inappropriate but which could locate elsewhere (Chapter 21 - Land Use Ordinance, Section 21-3.130(e), ROH).

Discussion:

The proposed stream improvements will not change the zoning in the area. The stream improvements being proposed are intended to mitigate potential damages caused by stream bank erosion and ensure the continued use of land along the west bank by the Kalihi-Palama Bus Facility and bus maintenance facility. The improvement does not conflict with the existing zoning.

Figure 23. PUC Development Plan



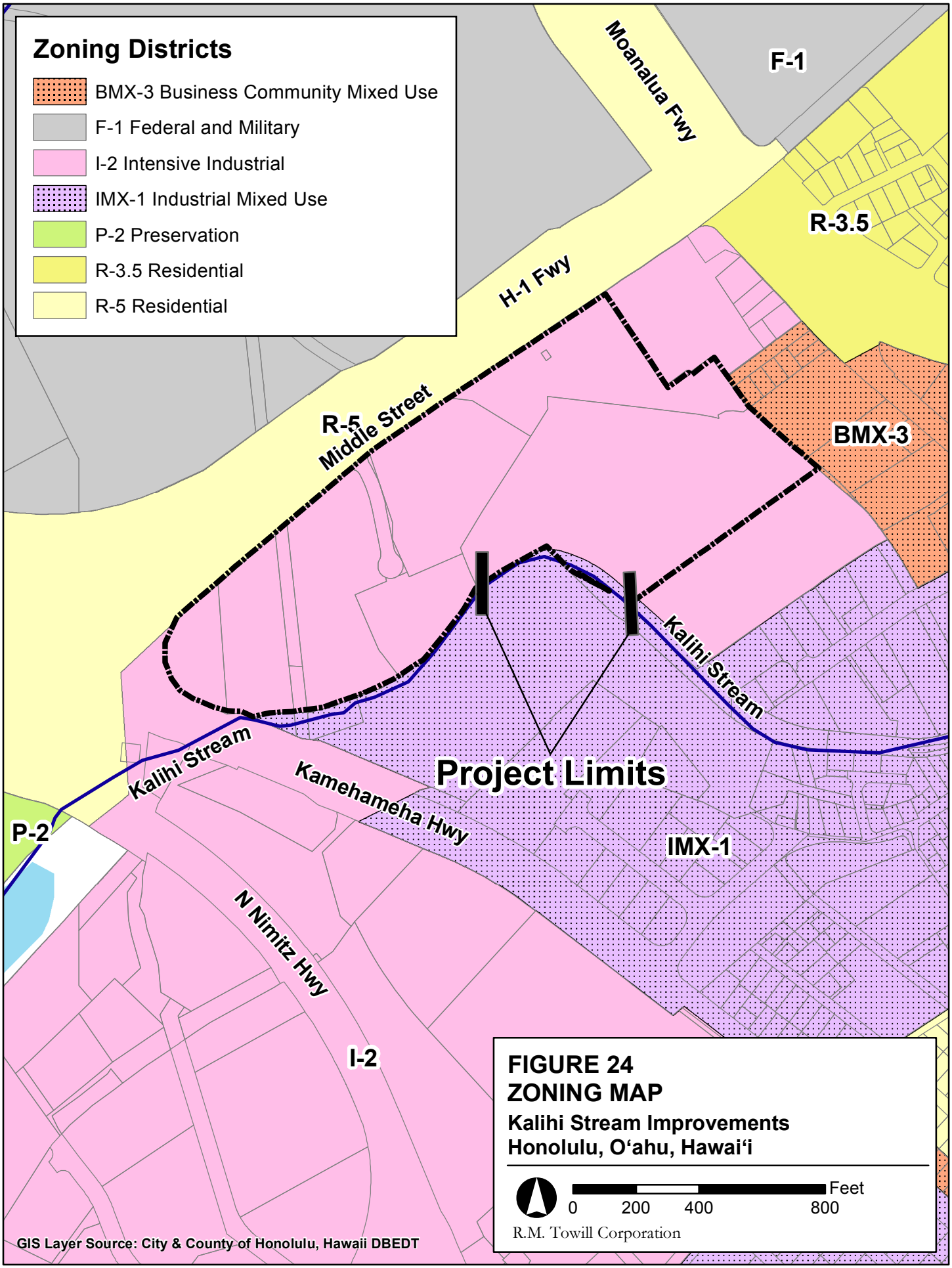


FIGURE 24
ZONING MAP
Kalihi Stream Improvements
Honolulu, O‘ahu, Hawai‘i

0 200 400 800 Feet

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6.5 SPECIAL MANAGEMENT AREA

The City and County of Honolulu has designated the shoreline and certain inland areas of Oʻahu as being within the Special Management Area (SMA). SMA areas are designated sensitive environments that should be protected in accordance with the State's Coastal Zone Management policies, as set forth in Chapter 25, Shoreline Management, ROH, and Section 205A, Coastal Zone Management, HRS. The limits of the SMA are shown in **Figure 25, SMA Map**.

Discussion:

The proposed stream improvements are located outside the SMA. Therefore no further action is required.

6.6 COASTAL ZONE MANAGEMENT, HRS 205(A)

The State of Hawaiʻi designates the Coastal Zone Management Program (CZMP) to manage the intent, purpose and provisions of the federal Coastal Zone Management Act, and HRS, Chapter 205(A)-2, as amended, for the areas from the shoreline to the seaward limit of the State's jurisdiction, and any other area which a lead agency may designate for the purpose of administering the Coastal Zone Management Program. The following is an assessment of the Project with respect to the CZMP objectives and policies set forth in Section 205(A)-2.

1. Recreational resources

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

A) Improve coordination and funding of coastal recreational planning and management; and

B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

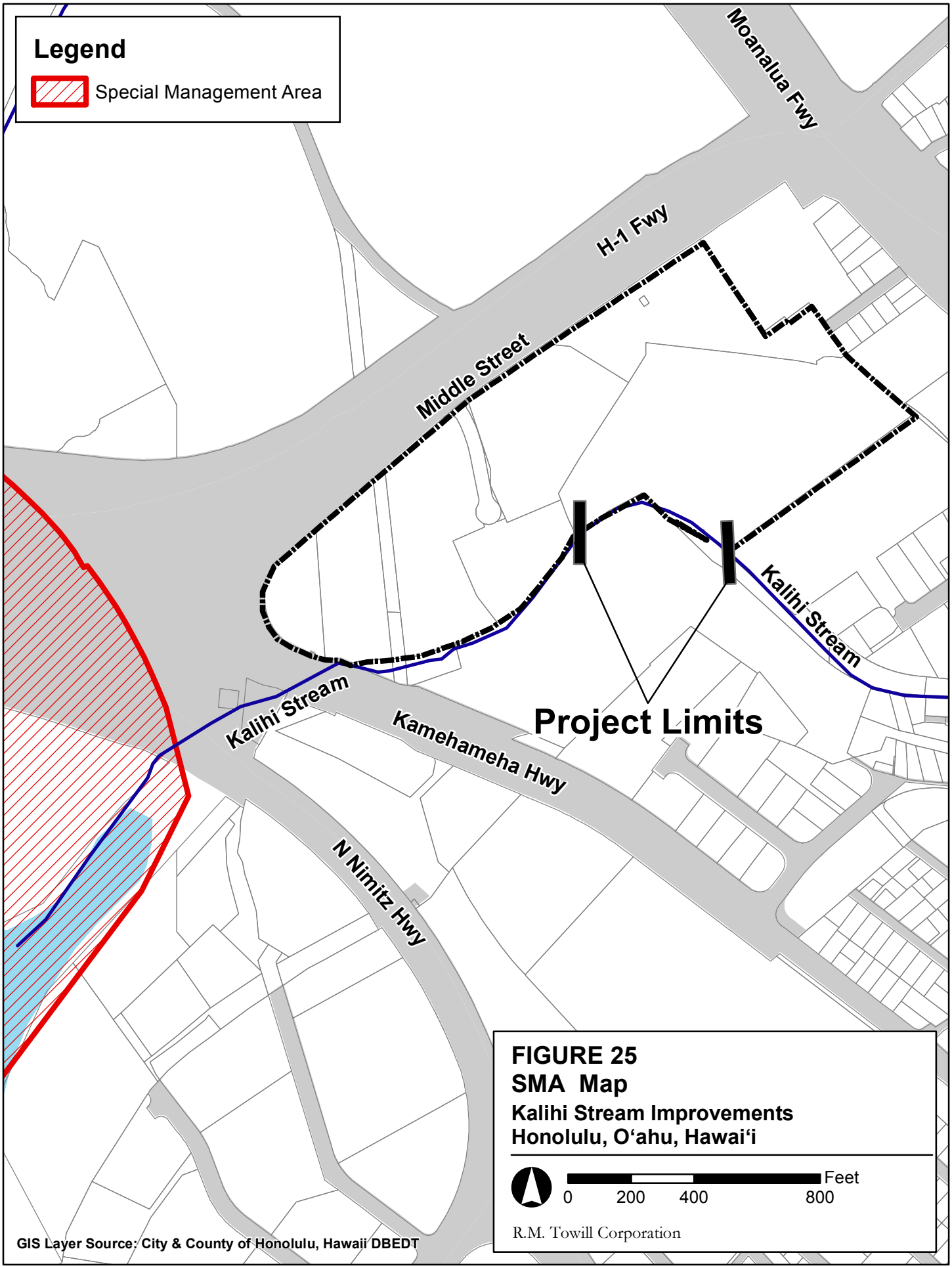
(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;


Legend
Special Management Area
Moanalua Fwy
H-1 Fwy
Middle Street
Kalihi Stream
Kalihi Stream
Kamehameha Hwy
N Nimitz Hwy
Project Limits
FIGURE 25
SMA Map
Kalihi Stream Improvements
Honolulu, O'ahu, Hawai'i
Feet
0
200
400
800
R.M. Towill Corporation
GIS Layer Source: City & County of Honolulu, Hawaii DBEDT

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6.

Discussion:

No existing recreational facilities will be adversely affected by the proposed Project. The Project area is located along Kalihi Stream adjacent to properties in industrial use. The proposed stream work will not impact adjoining uses. Water quality will be protected during construction through the application of BMPs in accordance with NPDES, Section 401 Water Quality Certification, and other permitting requirements. The Project will not adversely alter the existing shoreline area.

2. Historic resources

Objective: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archaeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion:

No adverse impacts to historic resources associated with construction of the proposed stream improvements are expected. See **Section 4.8**, Historic/Archaeological Resources. No adverse impacts to cultural practices are expected as a result of this the proposed Project. See **Section 5.6**, Impacts to Traditional/Cultural Resources. The Project site is dominated by common and introduced plant species not identified with traditional or cultural gathering practices. Project activities will not diminish the availability of any plant type for use in cultural practices. No further action is required

3. Scenic and open space resources

Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural land forms and existing public views to and along the shoreline;

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion:

The proposed improvements will not impact existing views along Kalihi Stream.

4. Coastal ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion:

The proposed Project is not expected to have any adverse effects on marine resources. During construction, construction related activities will be covered under an NPDES permit application to address proper treatment of storm water discharges during construction. Measures to reduce and prevent sediment discharges in stormwater runoff during construction will be in place and functional before Project activities begin and will be maintained throughout the construction period. Runoff and discharge pollution prevention measures will be incorporated into a Site-Specific Construction Stormwater BMPs plan by the Project contractor.

5. Economic uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Discussion:

The proposed Project has been assessed for potential social, visual, and environmental impacts in accordance with Chapter 25, ROH. With the implementation of the mitigation measures identified in this document, no adverse impacts are anticipated to result.

6. Coastal hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Discussion:

The subject property is located along Kalihi Stream prior to the stream entering into Keʻehi Lagoon. According to FEMA FIRM Map No. 15003C0353 F, dated January 19, 2011, the Project site is in an area designated as Zone AE (EL BFE ~17 feet). See **Figure 21**, **FEMA FIRM**. An engineering assessment was conducted to determine the potential impacts on flooding

events to the Project site. The development of the Project will be in compliance with the requirements of the Federal Flood Insurance Program, the City & County of Honolulu Drainage, Grading and Development standards for Flood Hazard Districts, and the LUO, Section 21-9.10, Flood Hazard Districts.

7. Managing development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

(C) Communicate the potential short and long term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Discussion:

The Project site is within the State Urban Land Use District. Land uses within this designation are subject to regulation by the City & County of Honolulu. The county's zoning designation is I-2, Light Industrial and IMX-1, Industrial-Commercial Mixed Use.

All improvement activities will be conducted in compliance with State and County environmental rules and regulations. This EA document is prepared to identify and, where necessary, propose mitigation measures to address the potential for impacts anticipated from the construction and operation of the Project. This document will be published for public review in compliance with procedures set forth in ROH, Chapter 25.

8. Public participation;

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

(A) Promote public involvement in coastal zone management processes;

(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific mitigation to respond to coastal issues and conflicts.

Discussion:

Public involvement in the Project will consist of public review of this environmental assessment. Public notice of the proposed action will be provided in the Office of Environmental Quality Control (OEQC) Bulletin. See **Section 8**, Agencies, Organizations, and Individuals Consulted for a list of agencies, organizations and individuals consulted for this Project. All written public comments will be provided with a written response and incorporated, as appropriate, into the Final EA. Where appropriate, mitigation measures will be developed to address issues and concerns raised during public review of the Project.

9. Beach protection;

Objective: Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion:

The proposed action will not directly impact any beaches. BMPs will be put in place prior to construction to prevent discharges from entering into Kalihi Stream and transporting those discharges to Keʻehi Lagoon.

10. Marine resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand

how ocean development activities relate to and impact upon ocean and coastal resources; and

(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion:

Aquatic biological and water quality assessments were conducted in 2002 to determine the potential effects of the proposed Project on aquatic resources. Studies conducted are referenced, as appropriate, in this EA.

The Army Corps of Engineers, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the U.S. Coast Guard will be consulted on the proposed Project. All necessary permit applications and environmental and building permit approvals will be secured prior to the initiation of construction activities. See **Section 7**, Necessary Permits and Approvals for further detail.

SECTION 7
NECESSARY PERMITS AND APPROVALS

7.1 CITY AND COUNTY OF HONOLULU

- Grading Permit

7.2 STATE OF HAWAIʻI

- NPDES NOI-C, Discharges of Storm Water Associated With Construction Activities
- NPDES NOI-G, Discharges Associated With Construction Activity Dewatering
- Stream Channel Alteration Permit
- Coastal Zone Management Federal Consistency Review
- Water Quality Certification (Section 401, Clean Water Act)
    - Best Management Practices Plan
    - Water Quality Monitoring Plan

7.3 FEDERAL

- Department of the Army Permit (Section 404, Clean Water Act, and/or Section 10, Rivers and Act)

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SECTION 8
AGENCIES AND ORGANIZATIONS CONSULTED

The following agencies, organizations, and individuals were sent copies of this Draft EA for comments:

8.1 CITY AND COUNTY OF HONOLULU

- Department of Planning and Permitting
- Department of Design and Construction
- Department of Facility Management
- Department of Parks and Recreation
- Police Department
- Fire Department
- Councilman Romy M. Cachola

9.2 STATE OF HAWAIʻI

- Department of Health
- Department of Land and Natural Resources
    - Land Division
    - State Historic Preservation Division
    - Commission on Water Resource Management
- Department of Transportation
- Department of Business and Economic Development and Tourism
- Hawaiʻi State Library and Kalihi-Palama Public Library

9.3 FEDERAL GOVERNMENT

- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service

9.4 ORGANIZATIONS AND INDIVIDUALS

- Kalihi/Palama Neighborhood Board No. 15
- Oʻahu Transit Service
- Kalihi Ahupuaʻa Ulu Pono ʻAhahui

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SECTION 9
SUMMARY OF IMPACTS AND SIGNIFICANCE DETERMINATION

9.1 SHORT TERM IMPACTS

Short term impacts associated with the proposed Project are expected to be minimal. The construction contractor will need to access the Project site via Middle Street. No impacts are anticipated to vehicular traffic on Middle Street. Noise will be generated from construction and related mobilization of equipment, but is expected to be within the existing ambient noise range.

Construction equipment is expected to include, but not be limited to, a compactor, backhoe, front-end loader, concrete mixers, concrete delivery trucks, cranes, welders and powered hand tools. All equipment will be muffled in accordance with standard engine operating practices. The work will be limited to weekday daylight hours and engine exhausts will be governed in accordance with applicable state and county regulations. Upon completion of construction, noise levels will return to ambient levels.

Dust and associated nuisance problems are expected to be slight to insignificant due to the limited scope and scale of the Project. Fugitive dust will be controlled with the use of dust screens and/or regular wetting of the soil by the contractor.

Construction activity will temporarily disturb soil on the property. To minimize soil erosion and sediment suspension, silt fences, berms, silt curtains and other applicable erosion control devices will be utilized to prevent construction-related soil and silt from leaving the active work area. As necessary, exposed soils will be covered with PVC sheet plastic or similar material to prevent inadvertent contact and mixing with storm water.

All necessary environmental permit applications and building permit approvals will be secured prior to initiation of construction activities.

9.2 LONG TERM IMPACTS

Long term benefits derived from this Project include the prevention of soil erosion along Kalihi Stream from the Kalihi-Palama Bus Facility. The facility will continue to provide repair and maintenance services, parking of transit buses, and a passenger transfer station.

No long term adverse impacts are anticipated. Upon completion, all construction equipment used on-site will be demobilized and all debris and waste materials will be disposed of off-site at a County approved waste facility. The Kalihi-Palama Bus Facility will employ mitigation measures to contain and prevent petroleum and other potential petroleum, oil, and lubricant (POL) associated product from entering State waters. Proposed mitigation measures will include, but will not be limited to, use of a properly engineered fuel containment pit, on-site drainage system with an oil-water separator and fuel-handling BMPs. Spill containment kits will be employed on-site to handle inadvertent spills or releases of POL-associated product.

9.3 SIGNIFICANCE CRITERIA

Based on the significance criteria set forth in HAR, Title 11, Chapter 200, Environmental Impact Statement Rules, the proposed Project is not anticipated to result in significant

environmental impacts. The recommended preliminary determination for the proposed Project is a Finding of No Significant Impact (FONSI). The findings and reasons supporting this determination are summarized as follows:

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

The proposed Project will not result in the adverse loss of natural or cultural resources. There are no threatened or endangered species of plants or wildlife that inhabit the Project site. Given the history, industrial use of the area, and the composition of the underlying soils, historic or archaeological sites are not known to be present within the banks of Kalihi Stream. However, in the unlikely event of a discovery of significant historic or archaeological resources, construction will cease and the State Historic Preservation Division will be immediately notified for appropriate action and treatment.

2. Curtails the range of beneficial uses of the environment.

The subject Project site is part of a perennial stream and the proposed improvements will not impact stream flow. The proposed action does not curtail beneficial uses of the environment.

3. Conflicts with the State's long term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed Project is consistent with the environmental policies, goals and guidelines expressed in HRS, Chapter 343. Potential sources of adverse impacts have been identified and appropriate measures have been developed to either mitigate or minimize potential impacts to negligible levels.

4. Substantially affects the economic and social welfare of the community or state.

The proposed Project will not affect the economic and social welfare of the community or state. The installation of the erosion control measure will be regulated in accordance with County, State and Federal regulations.

5. Substantially affects public health

Factors affecting public health, including air quality, water quality, and noise levels, are expected to be only minimally affected, or unaffected, by the proposed Project during construction. Once construction is completed, the proposed improvements do not pose a direct threat to public health and safety. Potential impacts from construction will be mitigated in accordance with Federal, State and City and County of Honolulu regulations.

6. Involves substantial secondary impact, such as population changes or effects on public facilities

The proposed activity is expected to have little to no substantial secondary or indirect impacts such as population changes or effects on public facilities based on the limited scope and scale of the Project.

7. Involves a substantial degradation of environmental quality

Impacts to air and water quality, noise levels, natural resources, and land use associated with the planned improvements are anticipated to be minimal. Mitigation measures will be employed as practicable to further minimize potentially detrimental effects to the environment. Any potential impacts to air, water quality, noise levels, natural resources, and land use will be temporary and cease upon completion of construction. The proposed Project does not involve substantial degradation of environmental quality.

8. *Is individually limited but cumulatively has considerable effect upon the environment or* involves a commitment for larger actions

The proposed improvements are not expected to cause adverse cumulative impacts to the environment, nor does the proposed Project involve a commitment for larger actions. The area of use is limited and is not likely to be further expanded.

9. Substantially affects a rare, threatened or endangered species

There are no rare, threatened or endangered plants or animal species on the subject property. BMPs will be implemented to minimize the impact to the marine environment.

10. Detrimentally affects air or water quality or ambient noise levels

On a short term basis, ambient air and noise conditions may be affected by construction activities related to the proposed facility improvements, but these are potential impacts will be temporary and can be controlled by mitigation measures as described in this EA. Once the Project is completed, air and noise in the Project vicinity will be allowed to return to preconstruction conditions. Erosion control measures and other BMPs will be employed to prevent untreated storm water runoff from construction activities entering State waters.

11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters

A portion of the Project area is located within an area determined by the Federal Emergency Management Agency to be within the 1-percent annual chance floodplain with a Base Flood Elevation of 17 feet. The proposed action is not expected to have a significant impact on flood conditions.

12. Substantially affects scenic vistas and viewplanes identified in county or state plans or studies

From a regional perspective, the proposed Project will not obstruct any significant scenic features and viewplanes due to the existing stream vegetation and a number of industrial buildings in close proximity to the Project site. The site improvements will not substantially affect any existing views from surrounding areas.

13. Requires substantial energy consumption

Construction and daily activities associated with the proposed site improvements will not require substantial amounts of energy. The proposed improvements are anticipated to require the use of petroleum products for the operations of construction equipment.

SECTION 10
FINDINGS

In accordance with the provisions set forth in HRS, Chapter 343, and the significance criteria in HAR, Section 11-200-12 of Title 11, Chapter 200, it is anticipated that the proposed Project will have no significant adverse impacts to water quality, air quality, existing utilities, noise levels, social welfare, archaeological sites, or wildlife habitat. All anticipated impacts are expected to be temporary in duration and will not adversely impact the environmental quality of the area. It is expected that an Environmental Impact Statement (EIS) will not be required, and that a Finding of No Significant Impact (FONSI) will be issued for this Project.

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