

Iwilei/Kapalama Transit-Oriented Development Infrastructure Needs Assessment



City and County of Honolulu

August 2018



Prepared for:

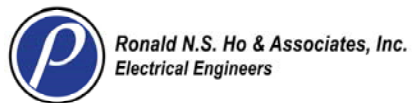


City and County of Honolulu

Prepared by:



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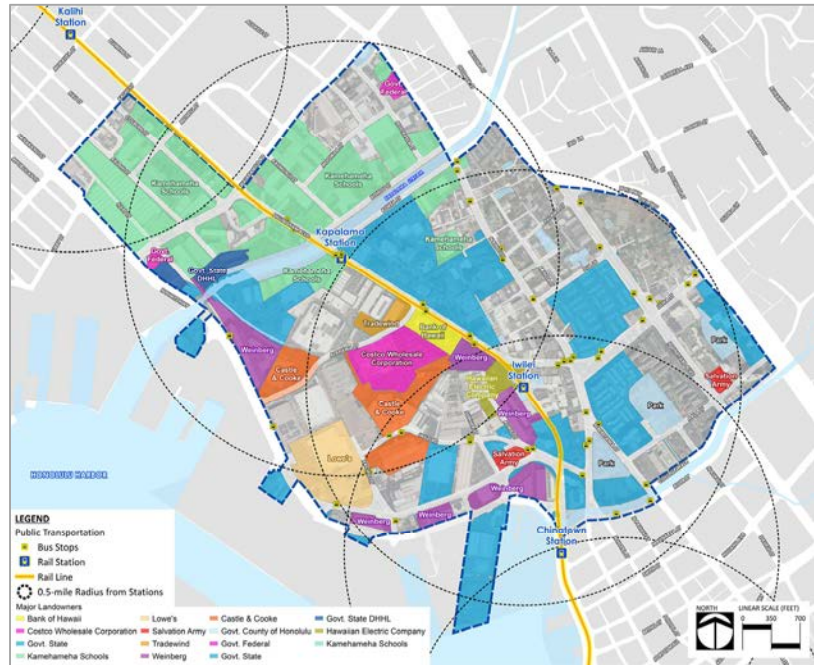
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1 Executive Summary

Introduction

The City and County of Honolulu (City) has conducted the Iwilei/Kapalama Transit-Oriented Development (TOD) Infrastructure Needs Assessment to identify and advance improvements needed to support new development around the future Iwilei and Kapalama rail transit stations—in the heart of the City Center segment of the Honolulu Rail Project. As envisioned in the Downtown and Kalihi Neighborhood TOD Plans, the area will grow into an urban mixed-use neighborhood with housing, jobs, shopping, and services within easy walking distance of the rail stations. This transformation will require improvement of current infrastructure to support more transit-oriented land uses and densities.



The planning team (City staff and its consultants) has engaged public and private property owners and infrastructure agencies to identify these critical investments needed to accommodate anticipated growth, with a high priority on supporting affordable housing development. The assessment includes high-level cost estimates for infrastructure improvements, a phasing strategy, and other recommendations to support TOD. An associated study is exploring innovative financial tools to help fund the necessary improvements.

Development Estimates

The Iwilei and Kapalama stations are in an area that currently consists of primarily low-density industrial and commercial uses on large lots. Major landowners include several State of Hawaii agencies, Kamehameha Schools, Castle & Cooke, and the Weinberg Foundation. Due to the low-density character of existing development, close proximity to Downtown, and consolidated landownership, Iwilei/Kapalama is expected to see the highest levels of TOD in the entire rail corridor. Based on land and entitlement capacity, market demand, and landowner input, this study has anticipated that approximately 12,350 new housing units may be constructed over the coming decades.

The development estimates in the following table have been divided into the short (Phase 1: 0-10 years); mid (Phase 2: 11-25 years), and long-term (Phase 3: 26-40+ years). The first phase includes a significant amount of new housing on State-owned lands (e.g., at Mayor Wright Homes). There is also near-term development interest by private landowners, especially in the Kapalama Canal area. Throughout all phases of development, it is anticipated that the number of housing units will increase, while the total amount of commercial square footage (SF) will decrease slightly as industrial uses transition to residences or mixed

use. Although the total amount of commercial square footage is expected to be lower than today, 2.5 million square feet of new commercial development is anticipated as some buildings are demolished and commercial uses are replaced in mixed-use projects.

Existing and Anticipated Redevelopment by Phase

	Approximate Existing	Anticipated New Development			Anticipated Total*
		PHASE 1 1-10 years	PHASE 2 11-25 years	PHASE 3 26-40+ years	
Residential Units	3,030	4,460	3,820	4,760	15,200
Commercial SF	6,770,913	521,100	760,790	1,302,540	5,717,740

* Anticipated total assumes some existing units/SF will be replaced while other units and/or SF will remain. Development estimates subject to change.

Infrastructure Needs

The assessment concluded that nearly all infrastructure systems need to be upgraded to allow for the anticipated growth. The Iwilei area in particular has poor roadway connectivity, which negatively impacts pedestrian, transit, bicycle and vehicular access. There are also significant deficiencies in the drainage, electrical, and sewer systems throughout the district that limit development potential.

The total infrastructure investment needs identified through this study are in the range of \$760 to \$910 million¹, roughly one third of which is already funded or programmed by the City. The total unfunded infrastructure needs, for those improvements identified below, is roughly \$450-475 million, which will need to be funded through a variety of sources, including both public and private contributions. Given the amount of needed upgrades, and the scale of expected development, it is impractical for landowners to make these improvements on a project-by-project basis. The following is a summary of unfunded infrastructure needs that have been identified and costed out. Strategies to address drainage deficiencies and sea-level rise, improvements to area schools, new emergency service facilities, and upgrades to smaller utility systems like natural gas have not yet been estimated.

- Mobility/Circulation: \$160 million
- Sewer/Wastewater: \$60 million
- Electrical: \$45 million (excludes private utility funding responsibility)
- Parks/Recreation: \$170 million

Mobility and Circulation Network

A new mobility and street network plan was developed to improve roadway connectivity, provide multimodal access, maximize development potential, and expand the utility network. The Street Network Plan outlines new facilities to improve connections to the rail stations and provide a finer-grained block pattern, along with improved sidewalks, lighting, bicycle facilities, and building/street interface. These improvements are also important for distributing vehicular traffic and providing additional routes for some anticipated growth in driving in the district.

The study assumed new roadways with a 66-foot right-of-way, irrigation and street trees, stormwater catch basins, and street lights. It is assumed that when these new roadways are constructed, sewer, water,

¹ All cost estimates are presented in 2017 dollars.

drainage and underground electrical utilities are also put in place. The new roadways and associated improvements are estimated to cost \$110.3 million: approximately \$11 million for Phase 1 and approximately \$99 million for Phases 2 and 3.

Improvements to existing area streets, including North King Street, Waiakamilo Road, Liliha Street, and Vineyard Boulevard are estimated to cost \$45 to \$48 million.

Water System

The backbone water infrastructure is relatively strong in the planning area, however aging lines with frequent breaks will need replacement. New development must contribute to pay water system facilities charges, installation and any other charges as determined by the Board of Water Supply (BWS); and projects are required to include, within the project's property, localized water system improvements.

Broadly, the district needs replaced and upsized water mains in many existing roadways, and BWS has system capacity projects programmed through 2042. There may be \$12.4 million in additional upgrades needed for fire protection, and new water lines are proposed to be provided with the construction of new roadways; the cost to install these new water lines is estimated to be \$2.5 million and is included in the total roadway costs. These costs will increase in areas with petroleum soil contamination and where sea-level rise is expected to frequently expose water lines to brackish and ocean water.

Sewer System

Sewer and wastewater capacity is already constrained throughout the Iwilei/Kapalama area. With the anticipated increase in residential units, capacity will need to be increased, including upgrades to pump stations and local collection lines. There are several projects currently underway to improve regional capacity, including two phases of the Awa Street Wastewater Pump Station, Force Main, and Sewer System Improvements project. These upgrades are already funded or programmed in the City's six-year Capital Improvement Program (CIP) at a cost of roughly \$240 million.

There is an additional \$60 million need to provide new or upsize existing collection lines under existing streets in the neighborhood. New sewer lines may also be provided with the construction of the new roadways; the cost to install these sewer lines is estimated to be \$3.7 million and is included in the total roadway costs.

Drainage System

The stormwater drainage system in Iwilei (the eastern portion of the planning area) is antiquated, incomplete, and in poor condition. Localized flooding occurs during heavy rainstorms due to low-lying areas, a lack of drainage inlets, inadequate storm sewer capacity, and insufficient pump capacity at the discharge location behind the Best Buy store. The City has initiated the Iwilei Drainage Study to determine the solution and cost for the current problem.

Exacerbating this situation is the oncoming challenge of sea-level rise, and associated higher groundwater tables, as well as the expected increase in the frequency and severity of flooding events as a result of climate change. The City is working through its new Office of Climate Change, Sustainability, and Resilience, as well as the US Environmental Protection Agency (EPA), to identify strategies for mitigating these impacts through both innovative infrastructure and development designs.

TOD redevelopment does create opportunities to soften the amount of hardscape in the area through low-impact development and green infrastructure, reducing flows into the City's drainage system. The

provision of new roadway connections also provide opportunities for expansion of the drainage system; the cost of including catch basins and reinforced concrete pipes under the new streets is estimated to be \$10.6 million and is included in the total roadway costs.

Electrical and Telecommunications Systems

Utility poles, carrying electrical and telecommunication lines, run overhead throughout the planning area. All TOD areas, including Iwilei/Kapalama, will be required by ordinance to have new utilities or upgrades buried underground. Overhead lines that are in conflict with the rail guideway and safety clearance requirements will be relocated underground as part of the rail project.

The district's electrical system is also nearing capacity and needs upgrades to support the anticipated development. Suggested improvements to electrical facilities from this study are to extend 25-kV distribution circuits throughout Iwilei/Kapalama, provide a new 46-kV transmission line, provide additional transmission station and distribution substation capacity, and explore the need for a new substation in the area. The cost to upgrade and bury the distribution system, the 25-kV improvements, is estimated to cost between \$62.1 and \$68.1 million, while the 46-kV transmission improvements are estimated to cost between \$13.4 and \$45.6 million. These costs will be borne by landowners, the City, and Hawaiian Electric Company (HECO). Other system improvements are HECO's responsibility. Depending on who initiates a project (City, State, or private developers) and the improvements needed, funding mechanisms and responsibilities might vary.

Parks and Recreation

The broader Kalihi neighborhood is severely deficient in park space, and the Iwilei/Kapalama district is no exception. This is not surprising given its history as an industrial area and the lack of residences, particularly makai of Dillingham Boulevard. To ensure quality of life for future area residents, and to attract market interest in development, the district needs new park and recreational spaces within walking distance.

The City's current project to create a linear park along Kapalama Canal is a critical part of the area's transformation into a livable urban community. Another community park space within central Iwilei is also justified by the anticipated levels of development. The cost to complete all phases of the Kapalama Canal project is estimated at \$108 to \$122 million, depending on the dredging method and including the cost for Complete Street upgrades to Kohou and Kokea Streets. Revenues collected from development projects needing to satisfy park dedication requirements could be used to help provide recreational space in the district.

Implementation

The infrastructure projects identified by this study will be implemented by the City, the State, private utilities, and private developers. The City is developing an implementation and financing strategy for these improvements, working closely with the State, infrastructure agencies, and area landowners. This strategy will address infrastructure by type and phase. As part of this process, the City is evaluating the potential revenue that might be generated through a Community Facilities District (CFD) and/or an Improvement District (ID). Ultimately, the funding strategy for the Iwilei/Kapalama area could serve as a model for district-based financing in other TOD areas. As in other TOD areas, private provision of regional infrastructure will be considered a community benefit that may qualify projects for higher building heights and densities.

2 Background and Project Overview

The Iwilei/Kapalama TOD Infrastructure Assessment provides an overview of the necessary changes and improvements to support redevelopment of the area surrounding the future Iwilei and Kapalama rail transit stations. With the construction of the Honolulu Rail Project by the Honolulu Authority for Rapid Transportation (HART), and the plans for TOD around the future stations, adjustments will be required to current infrastructure to support the changes in land uses and densities.

2.1 Background

For the last ten years, the Department of Planning and Permitting (DPP) has been engaging local residents, businesses, and community leaders in the creation of neighborhood TOD plans that intend to focus much of the island's future within easy walking distance of the rail stations. The rail system will serve 21 stations over 20 miles from East Kapolei to Ala Moana Center. It will travel through some of the densest communities on the island, serving nearly 15% of the island's households and more than 40% of all jobs. The City is working proactively in 19 station areas (the two stations in Kakaako are under the authority of the Hawaii Community Development Authority) to update zoning and land use requirements, upgrade infrastructure, including streets and parks, and encourage development consistent with community values.

Through its planning efforts, the City has identified the Iwilei and Kapalama station areas as among the most transformative TOD areas along the rail corridor. The Iwilei station area serves as a gateway to downtown Honolulu, but with a low-density, light industrial character that features several big-box retailers. The Kapalama station area is notable for the presence of the Honolulu Community College (HCC), Kapalama Canal, and several shopping centers. Due to the proximity to Downtown and two rail stations, consolidated land ownership of large parcels, and the current low-density nature of the commercial uses in the district, the Kalihi and Downtown Neighborhood TOD Plans identified an opportunity to create a new mixed-use, high-density urban community in Iwilei/Kapalama.

Development in already urbanized communities with high-quality transit access—TOD—is critical for accommodating future growth on Oahu, without sacrificing our limited agricultural lands and open space. The Department of Business and Economic Development and Tourism Population and Economic Projections for the State of Hawaii to 2040 (2012) report suggests that the population of our island will continue to grow at a rate of 0.4 percent from 2010 to 2040, with population increasing by 79,000 to 100,000 people through 2040.

2.2 Project Overview

Consistent with the Neighborhood TOD Plans for the two station areas, this report outlines the growth potential of the area and the issues that must be addressed to provide adequate infrastructure capacity to support that development. This assessment provides high-level cost estimates for infrastructure improvements, phasing assumptions, and other recommendations to support the TOD buildout of Iwilei/Kapalama. All project recommendations will need to be confirmed and further developed by technical follow-up studies.

The TOD projections for this area generally assume that existing housing will remain or be redeveloped in the same place and new housing will be provided in the development of multi-story and mixed-use

buildings. There is not expected to be a significant increase in net commercial development as the character of the area changes from light industrial to residential and mixed use.

Challenges to development include infrastructure that is nearing capacity, poor drainage, a lack of roadway and multimodal connectivity, lack of open space and public facilities, and homelessness. Given the extent of needed upgrades and the scale of expected development, it is impractical to expect private landowners to bear the cost of all improvements or deliver them on a project-by-project basis. Therefore, current City practices need to be restructured to create more efficient provision of infrastructure to encourage urban infill development, as opposed to infrastructure provided for large master-planned communities. Establishing a clear direction for infrastructure and public facilities is essential to ensuring that new development can proceed without unexpected delays, that the timing and costs of improvements are transparent, and that the neighborhood develops in a sustainable and orderly manner. This assessment provides an initial overview of all currently known needs.

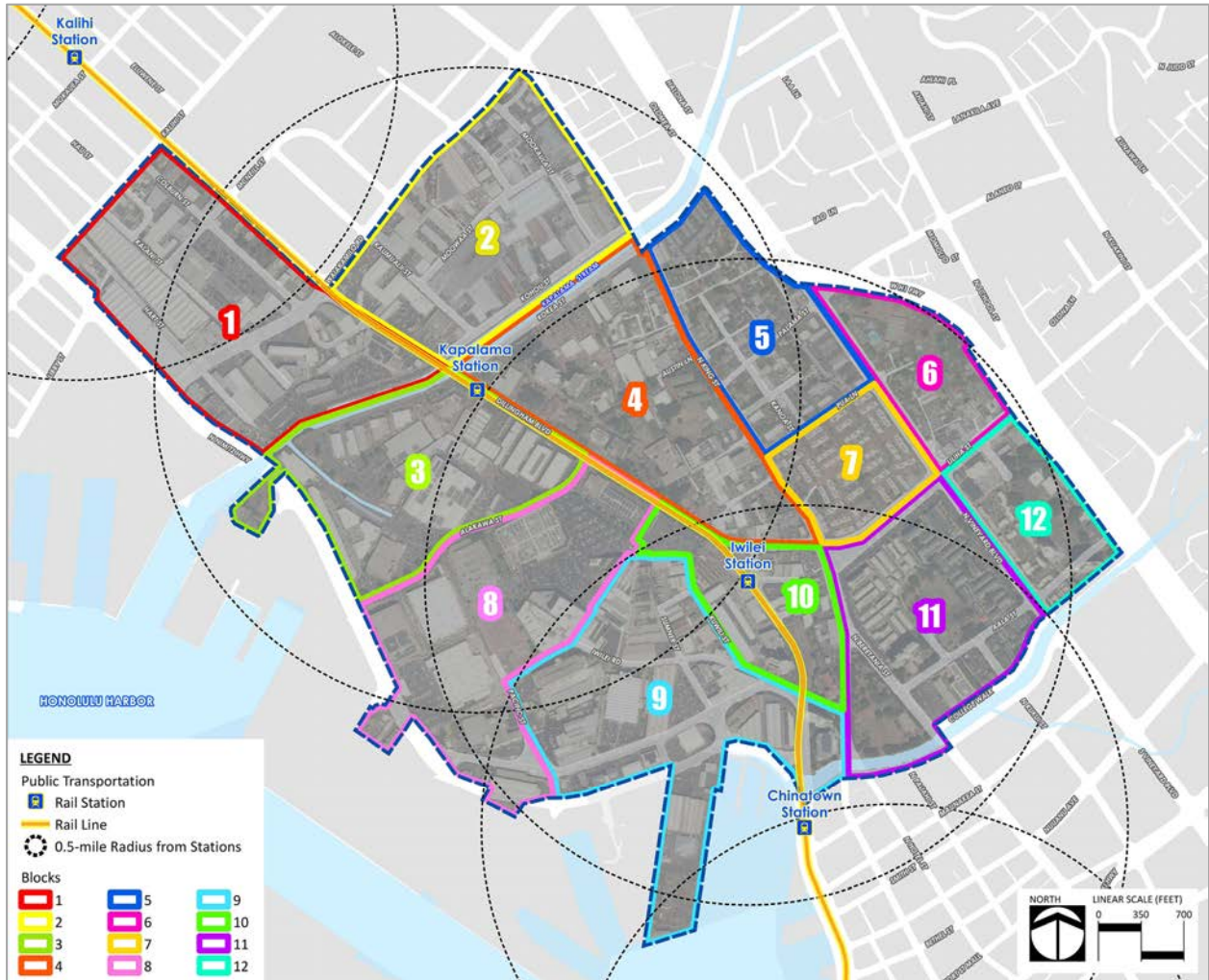
This study is complemented by several other City-led efforts to support TOD in this area including the adopted Neighborhood TOD Plans, City-initiated rezoning of TOD lands, the TOD Infrastructure Finance Study, Kapalama Canal Catalytic Project, the Iwilei Drainage Study, implementation of the City's Affordable Housing Strategy, the Greening Iwilei and Kapalama US EPA technical assistance grant, and the City's Brownfields Assessment Grant. State agency partners are actively participating in these projects and planning for affordable housing and mixed-use developments in the area as well.

2.3 Location and Planning Area

The project area boundaries were based on the Neighborhood TOD Plan boundaries, which are generally within a half mile of the Iwilei and Kapalama stations. This boundary considers factors such as land use, natural and man-made barriers, infrastructure, development potential, and land ownership. The planning area is generally bounded by Nuuanu Stream, Nimitz Highway, Waiakamilo Street, and the H-1 Freeway.

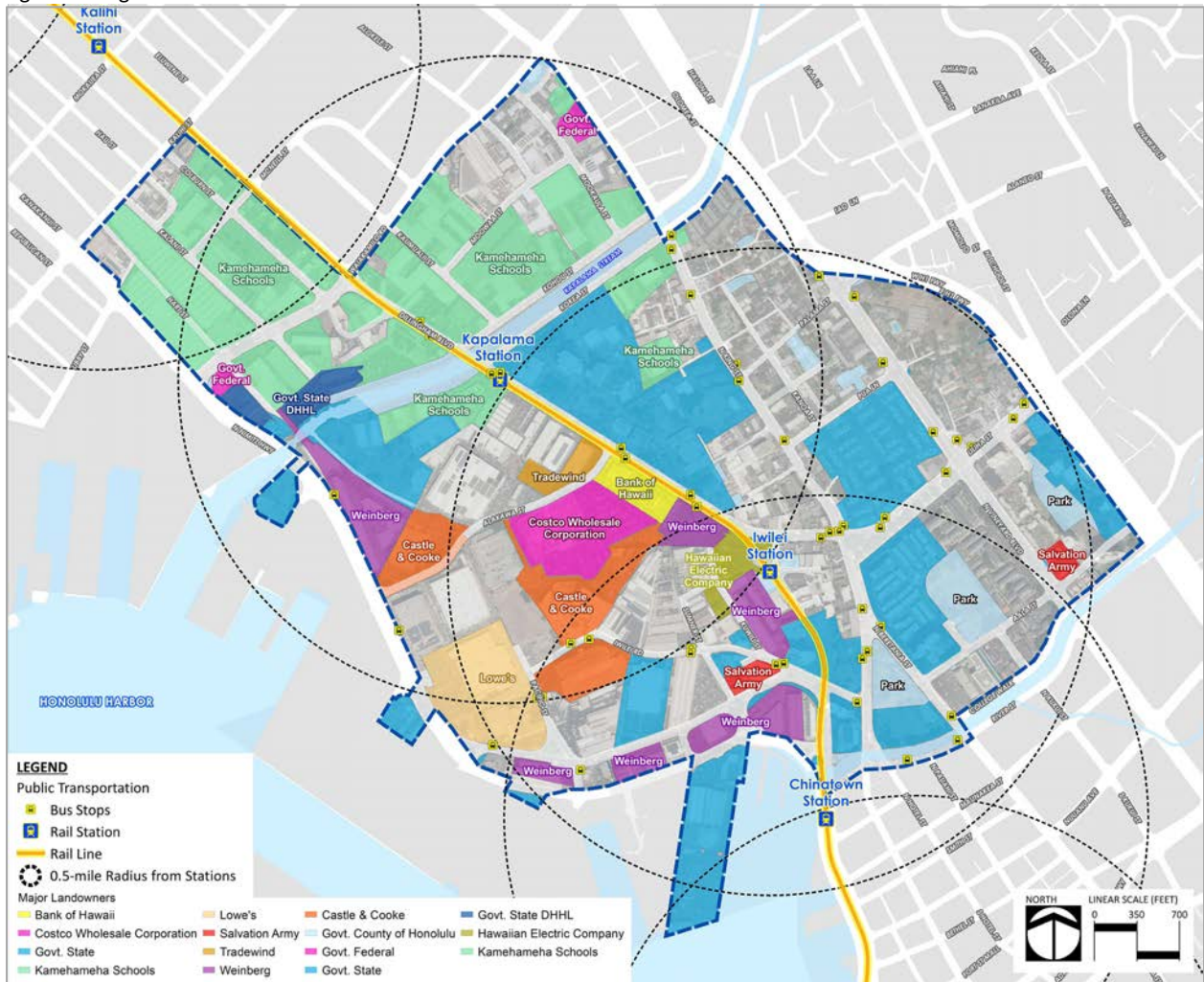
The project area was divided into twelve subdistricts to be able to better analyze the infrastructure impacts of potential redevelopment. The twelve subdistricts also represent different types of existing land uses. For example, Subdistricts 1, 2, 3, 8, 9, and 10 are predominantly used for small-scale industrial uses or big-box retailers; while Subdistricts 5, 6, 7, 11, and 12 are more residential in nature. Subdistrict 4 has some residential but is predominantly comprised of the HCC campus (see Figure 1).

Figure 1: Project Area and Subdistricts



As shown in Figure 2, land in the planning area is owned primarily by the State of Hawaii, including the University of Hawaii system, Hawaii Public Housing Authority (HPHA), Hawaii Housing Finance and Development Corporation (HHFDC), Office of Hawaiian Affairs (OHA), Department of Hawaiian Homelands, Department of Land and Natural Resources, and Hawaii Department of Transportation (HDOT), as well as large private landowners that include Kamehameha Schools (KS), Castle and Cooke, Costco, Harry and Jeanette Weinberg Foundation, Lowe’s Home Improvement, and the Salvation Army. Most of the small residential and industrial lots are individually owned.

Figure 2: Large Area Landowners



2.4 Public Outreach and Engagement

In conducting this assessment, the planning team engaged public and private property owners, infrastructure agencies, and other stakeholders to understand planned developments and infrastructure deficiencies. Outreach activities included meetings with infrastructure agencies and large landowners, public meetings and a survey for smaller private property owners, a street network and parks planning charrette, and ongoing communication to refine the infrastructure strategy. Input from other public workshops for related projects, such as the EPA Greening Iwilei and Kapalama study and the Kapalama Canal Catalytic Project, were also utilized.

2.4.1 Landowner Meetings

The large landowner meetings provided insight on potential redevelopment plans and concerns for specific infrastructure conditions. This input assisted in shaping the focus of the study and refining the TOD growth estimates in the Downtown and Kalihi Neighborhood TOD Plans.

Landowner interviews were conducted with Castle and Cooke, HCC, HPHA, KS, OHA, and the Harry and Jeanette Weinberg Foundation. There were also two landowner open house sessions held at the Mission Memorial Hearing Room in January of 2016. Coordination of land use and infrastructure plans is ongoing with major landowners in the area.

2.4.2 Agency Coordination

Agency coordination has been ongoing throughout the duration of the project, kicking off with a city and state infrastructure agency meeting in January of 2016. Attendance included the City's BWS, Department of Design and Construction (DDC), Department of Environmental Services (ENV), Department of Facilities Maintenance, Department of Information Technology, DPP, Office of Housing, Department of Transportation Services, and HART; and the State Hawaii's Department of Accounting and General Services, HDOT, HFDC, and Office of Planning. Follow-up meetings were held with the University of Hawaii at Manoa-Sea Grant Program and the State DOE.

Further identification and development of infrastructure needs has been assisted by HECO staff and the City's TOD Subcabinet, which meets bi-weekly to coordinate infrastructure projects and policies among relevant city agencies.

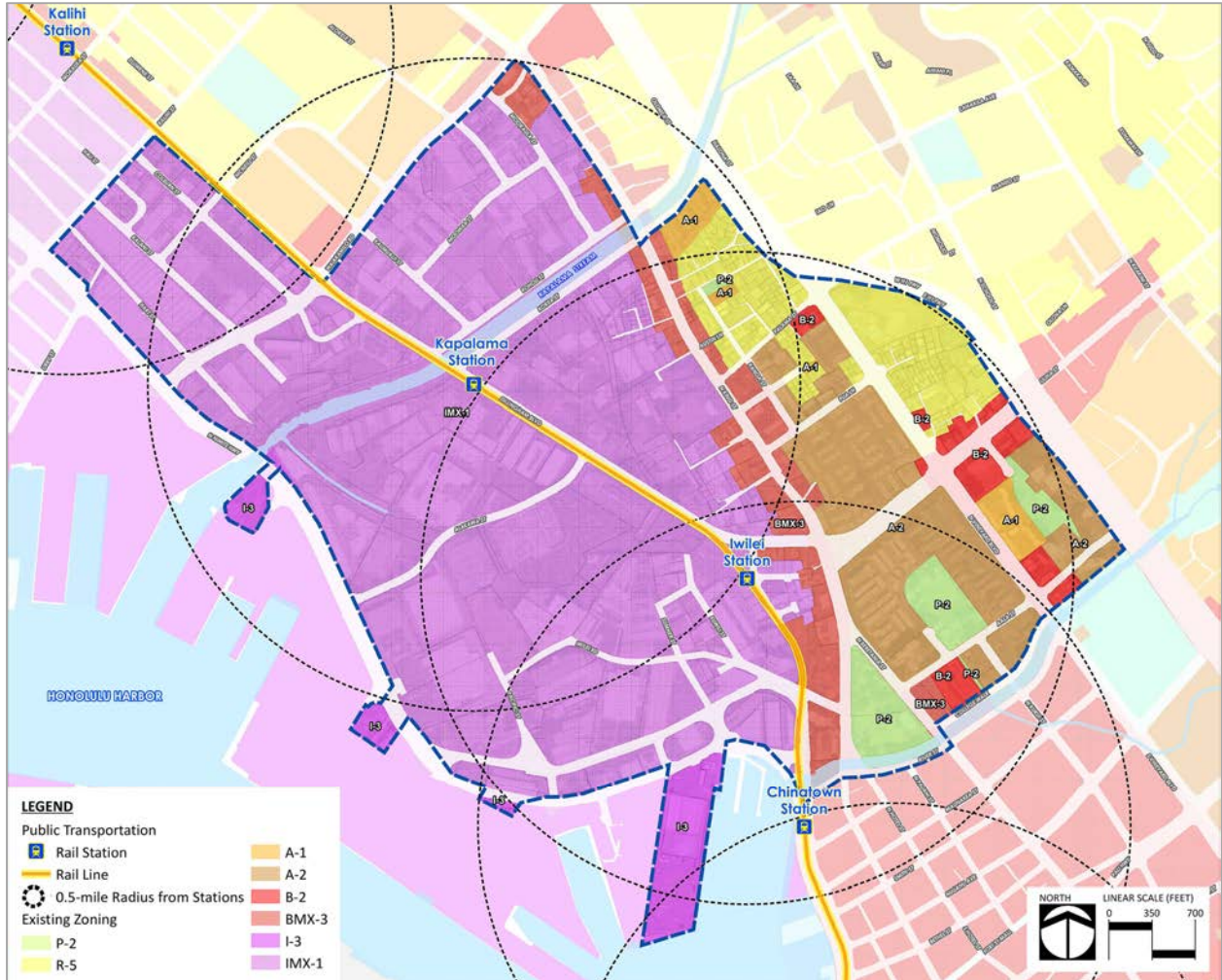
2.4.3 Mobility and Parks Charrette

A half-day mobility and parks charrette was held in June of 2016 with around 60 attendees representing public agencies, area businesses, local developers and designers, real estate companies, and landowners. The workshop was focused primarily on recommendations for connectivity and recreational space, which provided the basis for the street network plan and the location of proposed infrastructure improvements.

3 Planning Context

3.1 Land Use

Figure 3: Existing Zoning



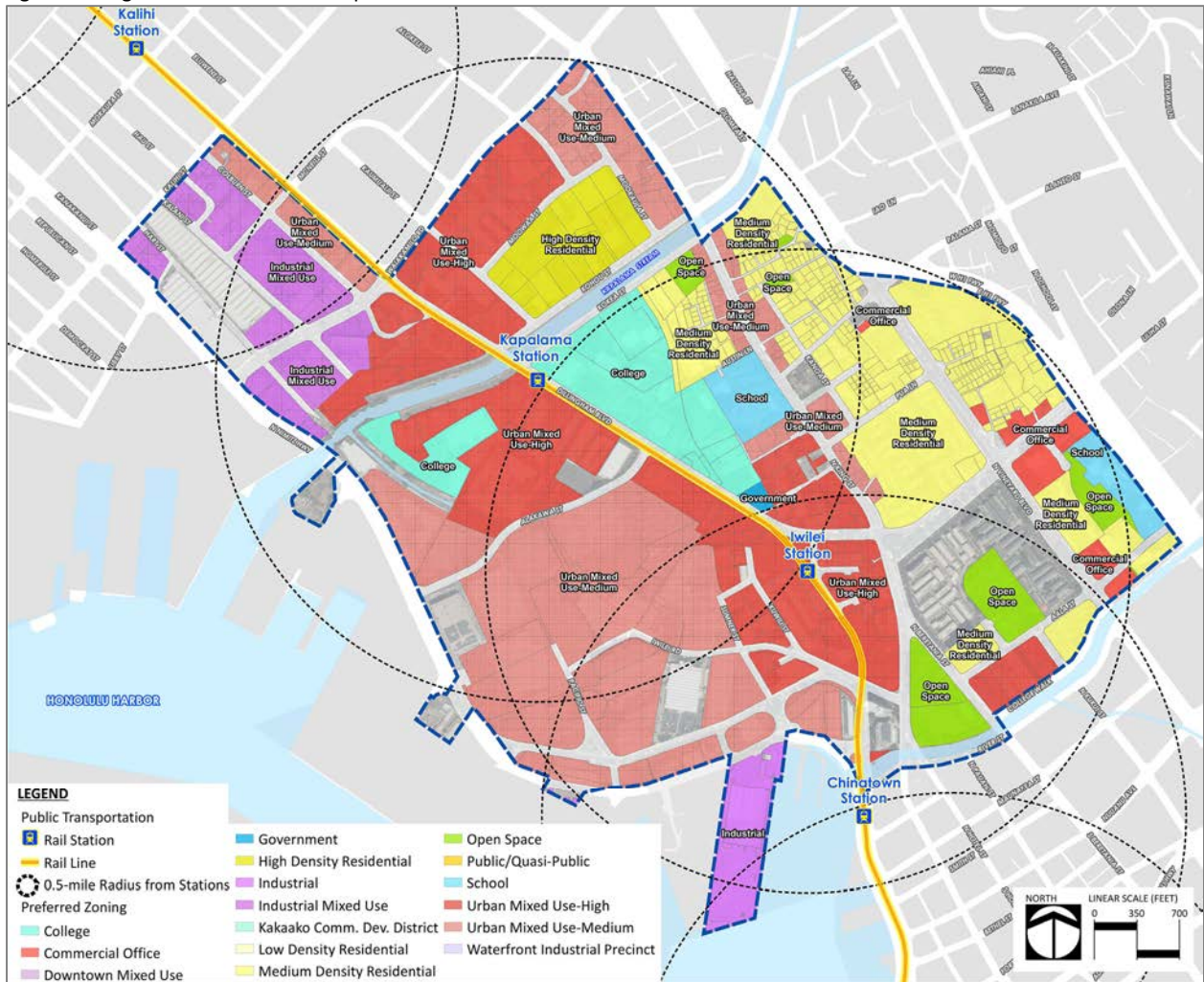
The study area predominantly consists of light industrial and commercial uses on large lots. Makai and mauka of Dillingham Boulevard are commercial and warehouse uses, including trucking, import, and woodworking businesses, as well as hardware stores and contractors’ supplies, generally housed in one- or two-story buildings. The area is also home to large-format retailers Costco, Best Buy, Lowe’s and Home Depot, as well as smaller retail and service businesses. Residential uses are limited in this area and are predominantly mauka of King Street. Kukui Gardens and Mayor Wright Homes, both income-restricted affordable housing projects, are the primary residential uses on the mauka side of the Iwilei Station.

Zoning designations in the planning area include I-3: Waterfront Industrial, IMX-1: Industrial-Commercial Mixed Use, B-2: Community Business, BMX-3: Community Business Mixed Use, P-2: General Preservation, R-5: Residential, and A-2: Medium Density Apartment (see Figure 3). The industrial district is makai of King Street, with waterfront industrial makai of Nimitz Highway. The area’s P-2 park parcels are all mauka of

King Street, and primarily Diamond Head of Liliha Street, including Aala Park, Beretania Community Park, and Kauluwela Park.

These station areas are planned to become a new high-intensity, mixed-use district with residences, jobs, public facilities, and neighborhood retail and services. Redevelopment opportunity sites include older warehouses and commercial strip malls along Dillingham Boulevard and Kohou Street, especially where leases are set to expire in the near term. Figure 4 shows that the predominantly residential uses mauka of King Street are expected to remain, and a shift to urban mixed use will be promoted along and makai of Dillingham Boulevard.

Figure 4: Neighborhood TOD Plan Proposed Land Uses



Most of the existing commercial buildings are low rise, and primarily low value when compared to their underlying land values, making them excellent candidates for redevelopment. The TOD Plans allow higher building heights than is allowed under current zoning—up to 400 feet near the Iwilei Station. With exception, greater heights are encouraged on parcels closer to the stations, and the maximum allowable heights step down farther from the stations. The maximum floor area ratios (FAR) for these TOD parcels are also higher than what is allowed under current zoning. The FAR limits are set by the type of TOD

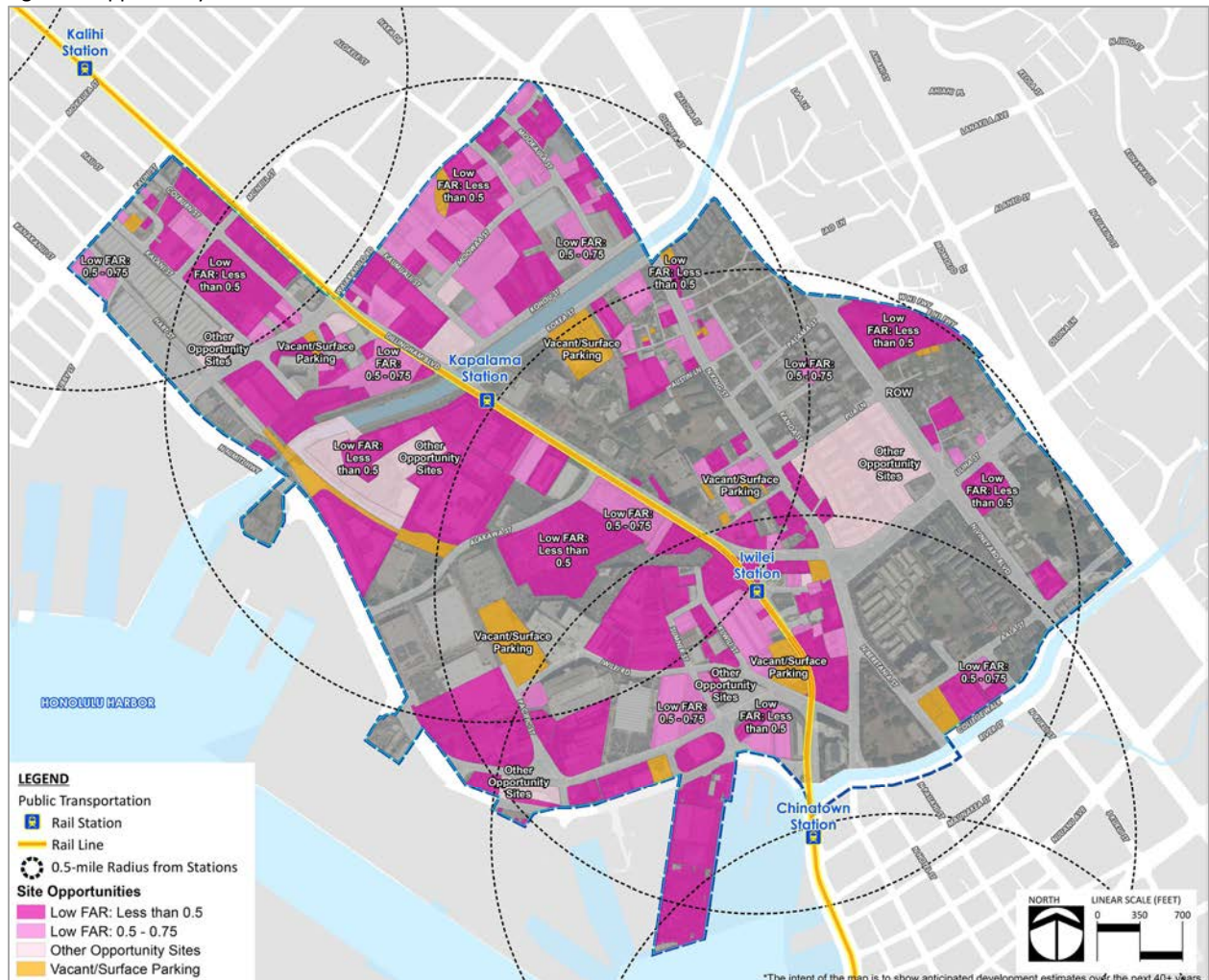
Special District permit being sought, up to a maximum of 7.0 with a TOD Special District permit and provision of commensurate community benefits.

3.2 Redevelopment Potential

In addition to its central location, the Iwilei/Kapalama area was identified as a major opportunity for transit-oriented redevelopment because of its large parcel sizes, relatively low building values, consolidated land ownership, and landowner interested in TOD. As shown in Figure 5, the district has many underutilized sites (e.g., parking lots, low FAR buildings) that are opportunities for redevelopment that can take advantage of the convenience of the rail system, the potential heights and densities available in TOD areas, and the harbor views those higher building heights enable. The amount of new development anticipated in the district is described in more detail in Section 4.

The area’s redevelopment potential is severely limited, however, without the concurrent investment in supportive infrastructure. As this report will explore, upgrades are needed to a variety of infrastructure systems to support the district’s TOD potential.

Figure 5: Opportunity Sites



3.3 Environmental Conditions

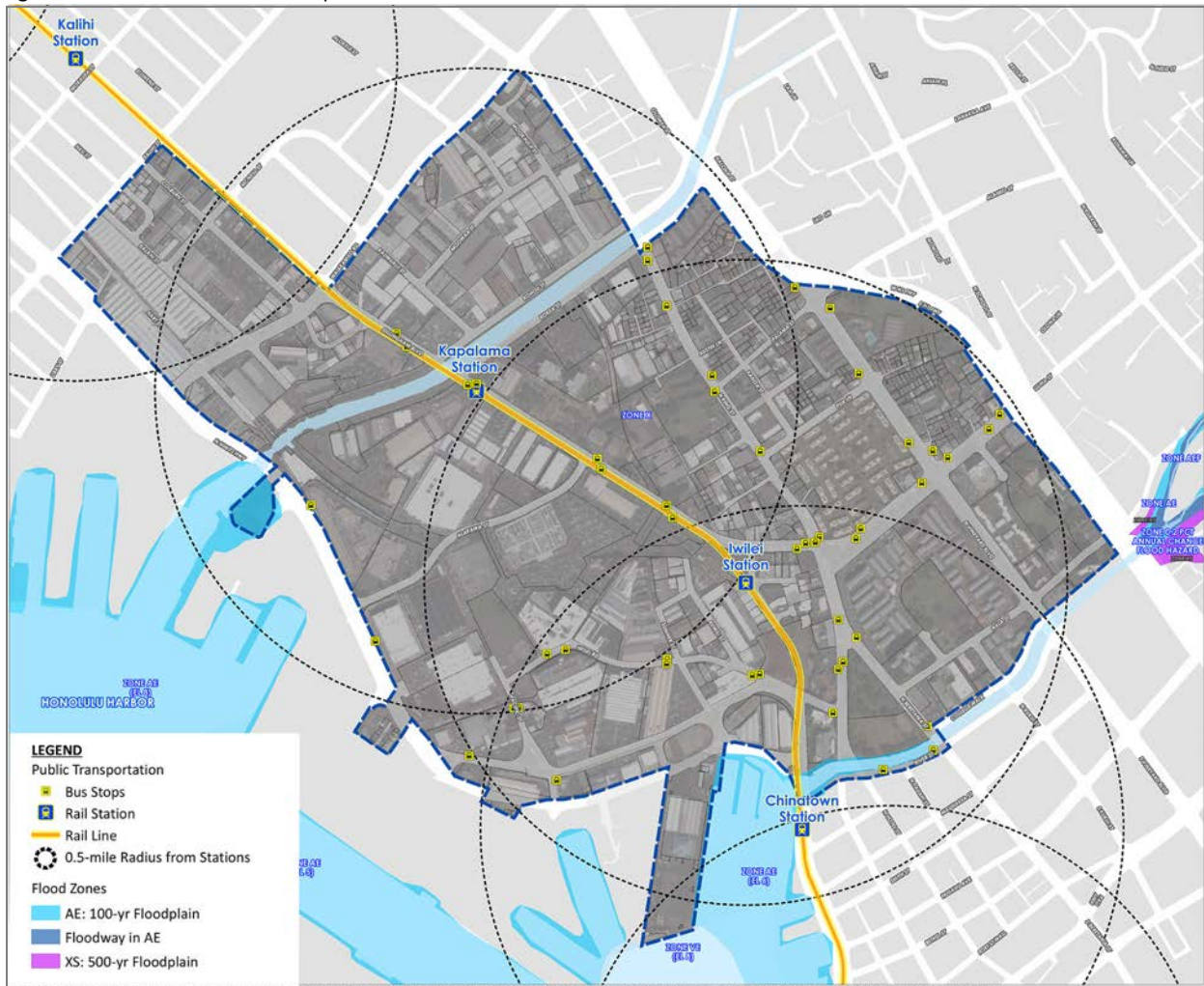
Environmental conditions and constraints are also important considerations for understanding development potential in the planning area. The environmental conditions evaluated below include flood and tsunami hazards, tsunami, sea-level rise, and the potential for hazardous materials.

3.3.1 Flood and Tsunami Hazard Zones

The current Flood Insurance Rate Map (See Figure 6: Flood Insurance Rate Map, *January 19, 2011*) designate the vast majority of the Iwilei/Kapalama area as Zone X, with several minor exceptions. Zone X is defined as “areas determined to be outside the 0.2 percent annual (500-year) flood chance”; based on that standard, there is low potential for flooding. There are no requirements with respect to the Federal Emergency Management Agency and floodplain regulations for Zone X, and the district is not within the Special Management Area (SMA) boundary.

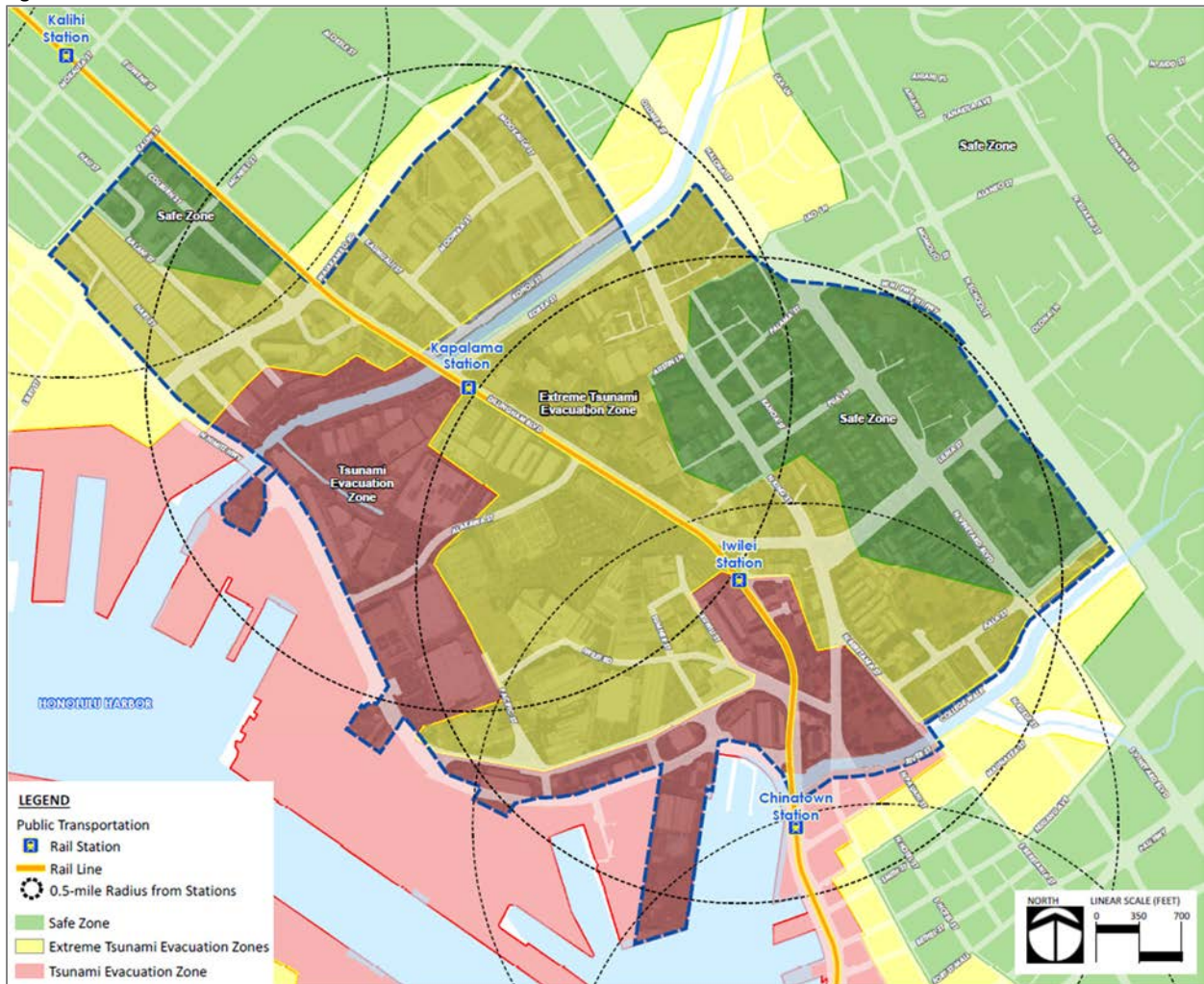
Although the majority of the district’s land is designated as having ‘low flood potential’, parts of Iwilei suffer from severe flooding and ponding after heavy rainfall events due to stormwater runoff and deficiencies in the stormwater drainage system that will be discussed in more detail in Section 6.3.

Figure 6: Flood Insurance Rate Map



The area also has exposure to tsunami hazards, as depicted by the Tsunami Evacuation map (Figure 7), due to its proximity to the coast. According to the 2015 updated tsunami evacuation mapping, the areas located in close proximity to the harbor are within the tsunami evacuation zone, while the extreme tsunami evacuation zone covers most of the area with TOD potential. These evacuation zones present challenges for infrastructure, in that inundation may overwhelm these systems, for emergency evacuation, and for potential impacts to the social and economic vulnerability of the area if and when such an event should happen.

Figure 7: Tsunami Evacuation Zones



3.3.2 Sea-Level Rise

Flooding problems in the area are expected to be compounded by sea-level rise. The National Oceanic and Atmospheric Administration estimates that, within their “intermediate” and “intermediate-high” scenarios, sea level will rise at least four feet by the end of the century; and, the City’s Climate Change Commission has concluded that it is reasonable to set as a planning benchmark up to 3.2 feet of sea-level rise by mid-century, and up to 6 feet in the later decades of the century for critical infrastructure with long expected lifespans and low risk tolerance.

Figure 8 below shows four feet of sea-level rise at mean higher high water (highest tides of the month)². Areas that are hydrologically connected to the ocean are shown in shades of blue; the darker the blue the greater the depth of anticipated inundation. The low-lying, hydrologically "unconnected" areas that may also flood due to groundwater inundation are displayed in green. These low-lying areas are determined solely by how well the elevation data captures the area's drainage characteristics, thus more detailed analysis is recommended that more accurately captures detailed hydrologic/hydraulic features and stormwater infrastructure.

Additional analysis and planning is being pursued through the City's participation in the 100 Resilient Cities network to better understand the implications of sea-level rise on this district and the specific strategies and tools the City and property owners can explore to reduce hazards associated with coastal erosion and intrusion, more extreme flooding, high wave events, extreme tides, and rising groundwater tables. Of particular concern are areas makai of Dillingham Boulevard.

Figure 8: Anticipated Inundation due to Sea-Level Rise (NOAA Sea Level Rise Viewer, 4 feet)



² Water levels are relative to local mean higher high-water datum.

3.3.3 Hazardous Materials

Given the industrial history of the Iwilei/Kapalama area, hazardous materials, such as lead and petroleum, may exist on many parcels due to past or present activities. The presence of hazardous materials can pose air and water quality and fire threats, add time and cost to redevelopment and infrastructure projects, and make certain uses infeasible due to sensitive users (such as residential units or schools).

The City is providing some smaller landowners with property assessments, soil testing, and clean-up plans at no cost as part of its brownfield assessment grant program through the US EPA and is planning to further investigate and map potentially contaminated parcels in the area mauka of Nimitz Highway. Several larger properties, such as the former Gasco site at Iwilei and Pacific Streets, are undergoing their own remediation process, and still others will need to address these issues as they are discovered through the redevelopment process.

4 Anticipated Development

4.1 Methodology³

In order to determine the level of infrastructure investment needed in the Iwilei/Kapalama district, it is essential to understand the type, location, and magnitude of anticipated development. Development estimates were prepared for the Kalihi and Downtown Neighborhood TOD Plans. These were updated to reflect more recent landowner plans, a slightly larger TOD district, and the public sector's recent commitment to aggressively provide housing on public land near the rail stations.

Development is anticipated first and foremost on vacant or underutilized parcels (e.g., sites with low building values compared to land values and sites with low building intensities). Vacant and underutilized sites can provide strategic opportunities to create new uses, meet community needs, and capitalize on access to rail transit. These potential opportunity sites, shown in Figure 5, are based on the following assessment methodology:

- Vacant sites or sites currently occupied by surface parking lots;
- Properties where assessed value is less than land value, suggesting that the site is “underutilized;”
- Low intensity sites, where FAR values are below 0.50 or 0.75, and more intensive redevelopment may be appropriate (sites with low FAR values);
- “Other Opportunity Sites” that have been identified as potential opportunities by stakeholders, landowners, City staff or consultants; but
- Excluding parks, schools, and residential uses (except those identified as “Other Opportunity Sites.”)

The development estimates assume a realistic amount of development over time, as opposed to a maximum land capacity allowed by TOD regulations, as it is unlikely that every site will build out to the maximum density and height permitted. Identification of a site as an “opportunity” does not guarantee the site will undergo change over the next 40 to 50 years due to landowner preferences or other factors; it is also possible that sites that appear to already be largely built out may undergo change.

Development potential was estimated based on the TOD land use plans, average assumptions for density and land use mix, the opportunity sites analysis, comparison with population growth forecasts, and the market study prepared for the Neighborhood TOD Plans. Sites that are currently vacant or have been specifically identified by the City, stakeholders, or property owners are assumed to have a high level of redevelopment potential. Sites with low densities and/or low building values are shown as having a moderate level of redevelopment potential. Development potential is summarized in terms of housing units and commercial/industrial building floor area that can be expected in the next 40+ years.

Finally, the total amount of anticipated development was grouped into three phases: Phase 1 (1-10 years), Phase 2 (11-25 years), and Phase 3 (26-40+ years). Development timing assumptions were based on current development activity, the schedule of rail construction and operations, and other market trends. The anticipated development assigned to Phase 1 is mostly based on landowner input; it comprises

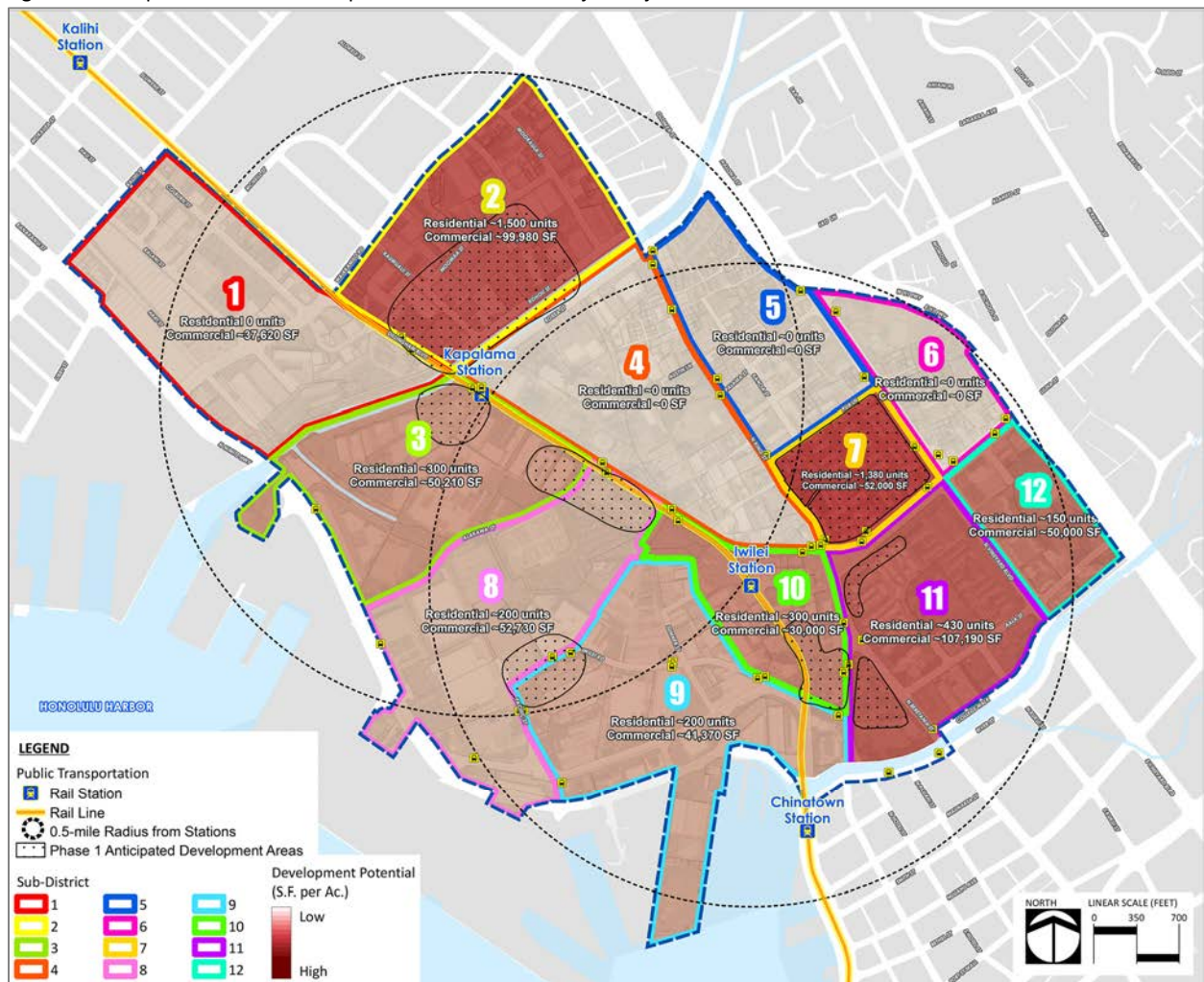
³ Quantitatively predicting the future is very challenging, as there are many uncertainties and outside factors influencing change, such as regional growth, market demands, shifting demographics, etc. Nevertheless, the exercise of developing estimates is necessary to provide insights on how to plan for the future. As with every exercise in predicting the future, we are aware that anticipated outcomes may not be manifested as originally planned.

projects that are in planning or design and are expected to be constructed in the next 10 years. Phase 1 also assumes a small amount of development in the areas within close proximity of the rail stations. It is assumed that 30% of total development will occur in Phase 2, and the remainder is expected in Phase 3. Exceptions and special assumptions were applied to certain subdistricts based on their characteristics or landowner input.

4.2 Anticipated Development Summary

Due to the low-density character of existing development, proximity to Downtown, and consolidated landownership, Iwilei/Kapalama is expected to see the highest levels of TOD in the entire rail corridor. Several hundred acres of land have been identified as candidates for redevelopment in the planning area, providing decades of development capacity in the urban core.

Figure 9: Anticipated Phase 1 Development Estimates and Major Projects



Based on the analysis of potential development and landowner input, this study anticipates that approximately 12,350 new housing units and 2.5 million square feet of new commercial development may be constructed in Iwilei and Kapalama, as detailed in the table below. While the total number of housing units will increase significantly, overall there will be a decrease in net commercial development as the character of the area changes from industrial to mixed use.

Phase 1 development estimates include a significant amount of new housing on state-owned lands (primarily the redevelopment of Mayor Wright Homes) as well as private lands, especially in the Kapalama Canal area.

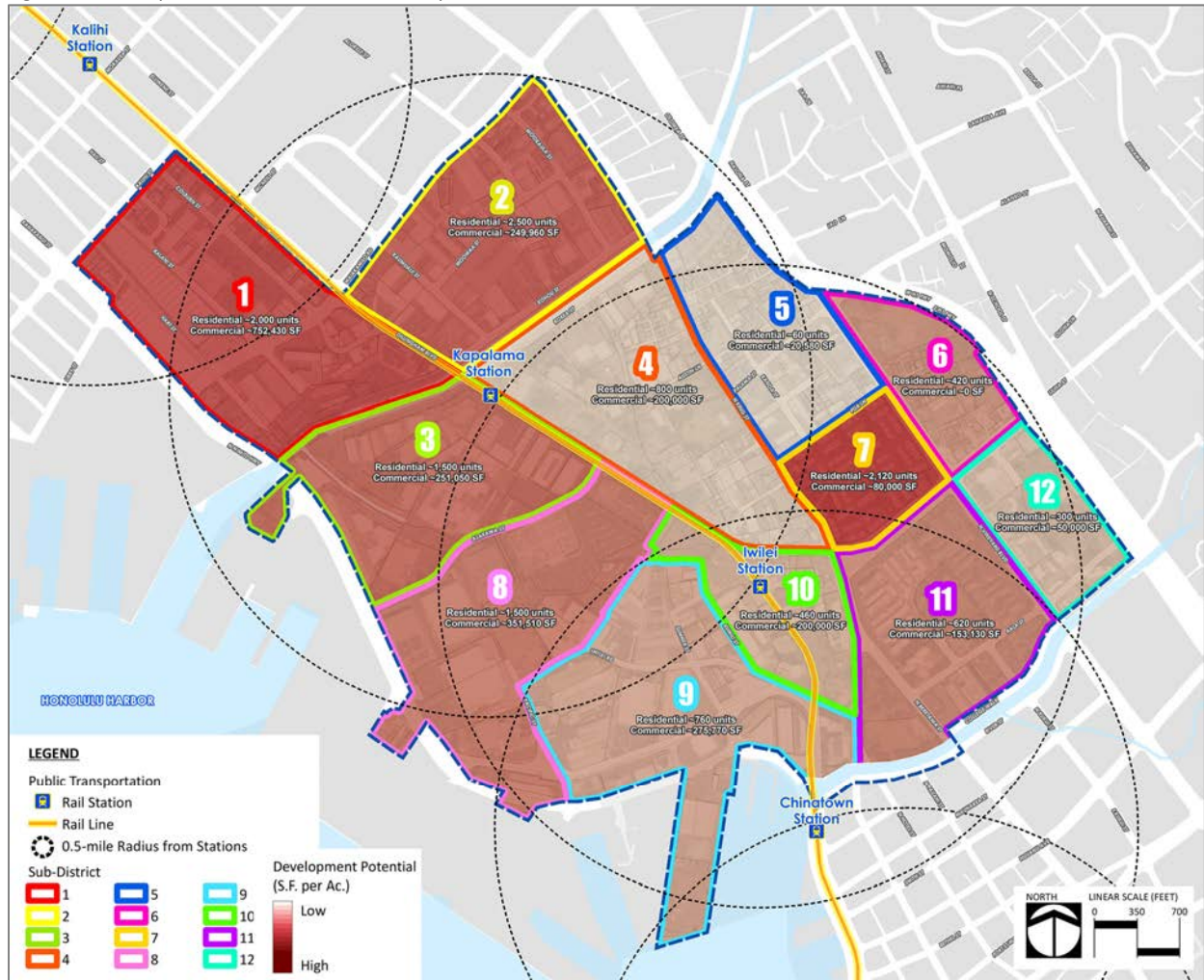
Table 1: Existing and Anticipated Development

	Approximate Existing	Anticipated New Development			Total Anticipated New Development	Anticipated Total*
		PHASE 1 1-10 years	PHASE 2 11-25 years	PHASE 3 26-40+ years		
Residential Units	3,030	4,460	3,820	4,760	12,350	15,200
Commercial SF	6,770,913	521,100	760,790	1,302,540	2,584,430	5,717,740

* Anticipated total assumes some existing units/SF will be replaced while other units and/or square footage (SF) will remain. Development estimates subject to change.

Table 1 above summarizes the approximate amount of existing residential and commercial development, along with the anticipated redevelopment by phase. The anticipated total includes existing units that are anticipated to remain; some buildings may be demolished and rebuilt from the ground up, and others may be adaptively reused or improved. And accessory dwelling units will be allowed on many single-family lots once additional infrastructure capacity is available. Figure 9 on the previous page illustrates the anticipated development in Phase 1 (with approximate locations shown in the dot pattern), and Figure 10 on the following page maps the total anticipated development by subdistrict. The density of development potential is illustrated with shades of red; the darker the sub-district, the more development is anticipated (per acre).

Figure 10: Anticipated Total Additional Development



5 Mobility

To accommodate rail station access and facilitate non-vehicular circulation, the Kalihi and Downtown Neighborhood TOD Plans recommend creating a multimodal circulation network by improving the street grid and addressing pedestrian and bicycle facility deficiencies in the area. Given the anticipated levels of redevelopment, including major expansion of residential uses throughout the area, circulation is a key infrastructure consideration for the City. All improvements will also need to be consistent with the City and County of Honolulu Complete Streets Ordinance.

5.1 Existing Conditions

The project area is bordered and intersected by a number of major roads that provide regional east-west access, including Nimitz Highway, Dillingham Boulevard, North King Street, Vineyard Boulevard, and the H-1 Freeway. Waiakamilo Road and Liliha Street are minor arterial streets that provide mauka-makai access between the interstate and principal arterials, however they do not provide full on- and off-ramps in both eastbound and westbound directions. A limited number of collector and local streets, many of which are privately owned, provide direct access to industrial, commercial, and residential areas within the planning area. This “top-heavy” street network results in limited route choices for local trips, congested intersections, and pressure to accommodate vehicular traffic at the expense of other travel modes.

The lack of a well-connected grid of streets in the Iwilei Station area has created large blocks, dead-end streets, and missing connections for all modes. The Kapalama Station area also has a broken street network, caused in part by Kapalama Canal, which is bridged only by the principal arterial streets. Both station areas also have large land tracts occupied by a variety of large-scale land use functions, including education, warehousing and big-box commercial, which further interrupt the street network. The absence of route redundancy also has potential impacts on emergency evacuation options.

Safe and convenient pedestrian access is limited in the district due to the irregular street network pattern. For instance, while 95 percent of all street curbs in the Iwilei planning area have sidewalks, a major section of the TOD planning area does not have reasonably direct pedestrian access to the rail station. Additionally, only 74 percent of curb length in the Kapalama TOD planning area has sidewalks, and the few bridges over Kapalama Canal (Nimitz Highway, Dillingham Boulevard, King Street, and Olomea Street) primarily cater to vehicular connectivity. Figure 11 exhibits the type of pedestrian facilities present on a five minute walkshed to the rail stations⁴. Safe pedestrian movement is also compromised by large roadways that are difficult to cross, such as Nimitz Highway and Vineyard Boulevard.

There is also a lack of bicycle facilities in the area, so bicycles tend to use the sidewalks to obtain safe passage, sharing narrow sidewalks with pedestrian traffic. Other factors that deter bicycling include a lack of local street connections, heavy traffic on arterial roadways, and the frequent presence of large buses and trucks.

⁴ Analysis from Kalihi and Downtown Neighborhoods TOD Plans.

Figure 11: Pedestrian Access around the Iwilei and Kapalama Rail Stations



The area does benefit from high-quality bus transit service and boasts one of the highest share of transit riders on the island. Public transportation on Oahu is currently composed of TheBus for fixed route operations and TheHandi-Van for on-demand service for persons with disabilities. The rail project will complement these existing services with high-frequency east-west service. Bus routes will be adjusted once rail is operational to bring people to and from the stations, especially from upland areas.

5.2 Street Network Plan

Adding new development to the area will only exacerbate existing problems without major investment in the local circulation network. Needed improvements include new roadways and multimodal paths to improve connection to the rail stations and provide a finer-grained block pattern, along with improved sidewalks, street lighting, pedestrian crossings, and street trees. The future circulation network should accommodate private vehicles, buses, bicyclists, and pedestrians, provide access to public and private properties, and consider the implications of emerging mobility options such as bike-sharing, car-sharing, ride-hailing, and automated vehicles.

The proposed street network plan is based on the recommendations of the Kalihi and Downtown Neighborhood TOD Plans and input from area landowners and relevant public agencies. The street network plan identifies new desired street connections that are intended to:

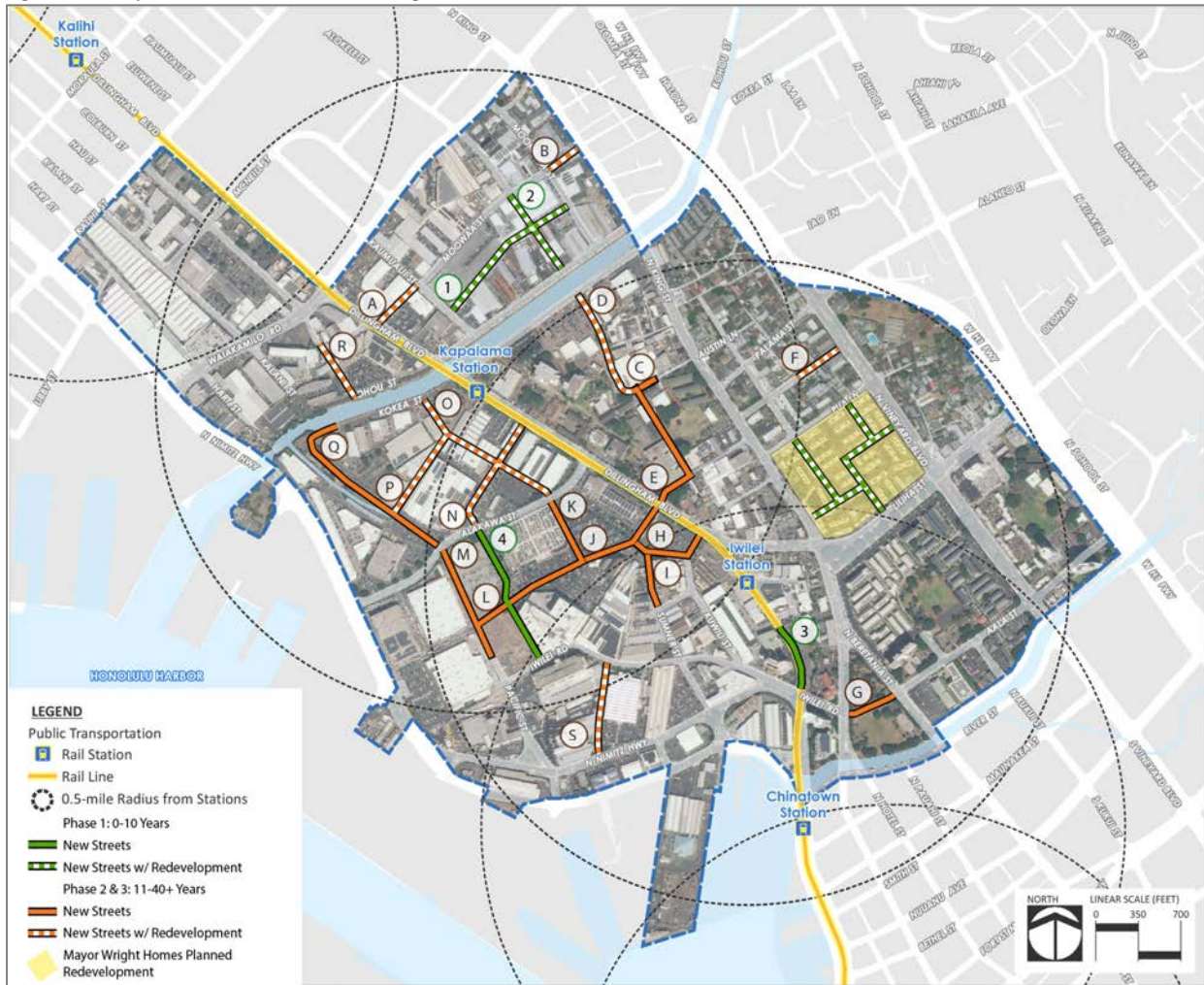
- Create connections that are missing in the existing network
- Provide more route choices for all modes
- Reduce block sizes and shorten trip lengths
- Distribute traffic and relieve congested corridors and intersections
- Improve connectivity to transit
- Increase the number of properties within a ten-minute walk of each rail station
- Enhance redevelopment potential
- Improve commercial development viability by creating additional street frontage and storefront opportunities
- Expand the utility network
- Reduce the distance between buildings and fire hydrants

The proposed roadways are primarily needed between North King Street and Nimitz Highway. Their approximate locations on the map are intended to identify missing or key connections, not precise street alignments or intersection configurations. Ideally, these streets would be able to accommodate all travel modes, but limited space and other concerns may limit some corridors to non-vehicular travel (at least in the near to mid-term) or prioritize additional travel lanes or on-street parking over bicycle lanes, for instance. The goal is to create a “complete network” that serves the circulation needs of all modes in the district, consistent with the City’s Complete Streets policy. The specific street alignments and designs need to be developed through a comprehensive transportation study and additional technical analysis, coordination with development plans for specific parcels, and community involvement.

The proposed roadways have been divided into two implementation phases, and two implementation categories (Figure 12). Phase 1 projects, in green, represent priority connections that are recommended in the next 10 years; Phase 2 and 3 projects, in orange, denote projects recommended over the longer term. Phasing was determined based on importance for overall connectivity and ease of implementation. There are two priority projects proposed: the extension of Kaaahi Street, which connects Dillingham Boulevard and the Iwilei Station to Iwilei Road and Nimitz Highway along the rail alignment on State-owned land, and creating a public street between Alakawa Street and Iwilei Road through private land.

In addition, the proposed roadways were categorized by whether or not they require the redevelopment of existing buildings. The solid lines represent new street segments that have limited physical barriers that impede their implementation, and the streets represented with dashed lines are desired connections where structures currently exist. The construction of the second group of roads will depend on redevelopment of the parcels through which they are envisioned. Ongoing and transparent collaboration with area landowners is necessary to achieve the desired connectivity in Iwilei and Kapalama.

Figure 12: Proposed Street Network Phasing



The cost to build these new roadway segments has been estimated for planning purposes. The cost estimates assume that all new roadways within this area will have a 66-foot right-of-way (ROW), which would allow for a 36-foot travel way (which allows for one lane in each direction and on-street parking or bicycle lanes) and 10 feet of sidewalk space on each side. Green infrastructure costs are not included, but it is assumed that they could be incorporated into the 66' ROW. Demolition and removal of the existing buildings or hardened surfaces and relocation of existing utilities are also not included. The proposed roads consist of typical asphalt concrete pavement, concrete sidewalks with curb and gutter, utilities (water, sewer, drainage, and electrical/telecommunications), and landscape strips with storm water management systems. Costs may increase if roadways need a wider cross section, poor soils and/or groundwater are encountered, or roadways need to be designed to accommodate heavy vehicle loads. It is also possible that not all utilities will be included in every new roadway segment.

Table 2: Estimated New Roadway Capital Costs

Development Component	Phase 1 Roadways (1 through 4)	Phase 2 & 3 Roadways (A through S)	Estimated Total Cost
Land Acquisition ⁵	\$0	\$62,100,000	\$62,100,000
Roadway	\$2,900,000	\$10,600,000	\$13,500,000
Drainage	\$2,700,000	\$7,900,000	\$10,600,000
Sewer	\$900,000	\$2,800,000	\$3,700,000
Water	\$600,000	\$1,900,000	\$2,500,000
Landscaping	\$1,600,000	\$4,800,000	\$6,400,000
Electrical & Telecommunications	\$2,500,000	\$9,000,000	\$11,500,000
Estimated Total Cost	\$11,200,000	\$99,100,000	\$110,300,000

The cost of the proposed roads, as shown in Table 2, is estimated to be \$110.3 million in 2017 dollars. The cost to build the Phase 1 roadways is approximately \$11.2 million, including \$1.3 million for the Kaaahi Street extension and \$10 million for the connection between Alakawa Street and Iwilei Road. The Phase 2 and 3 roadways are estimated to cost approximately \$99.1 million in 2017 dollars.

5.3 Upgrade of Existing Streets

In addition to new streets, improvement to existing streets consistent with the City's Honolulu Complete Streets Design Manual is also necessary to make the district walkable, bicycle-friendly, and livable for existing and future residents. An important element of these upgrades will be new street trees that provide shade, beautification, and environmental benefits as part of Mayor Caldwell's commitment to plant 100,000 new trees by 2025 (species with non-aggressive root systems will minimize damage to surrounding urban infrastructure). The following list of complete streets improvements are already underway or are recommended in the near to mid-term (summarized in Figure 15).

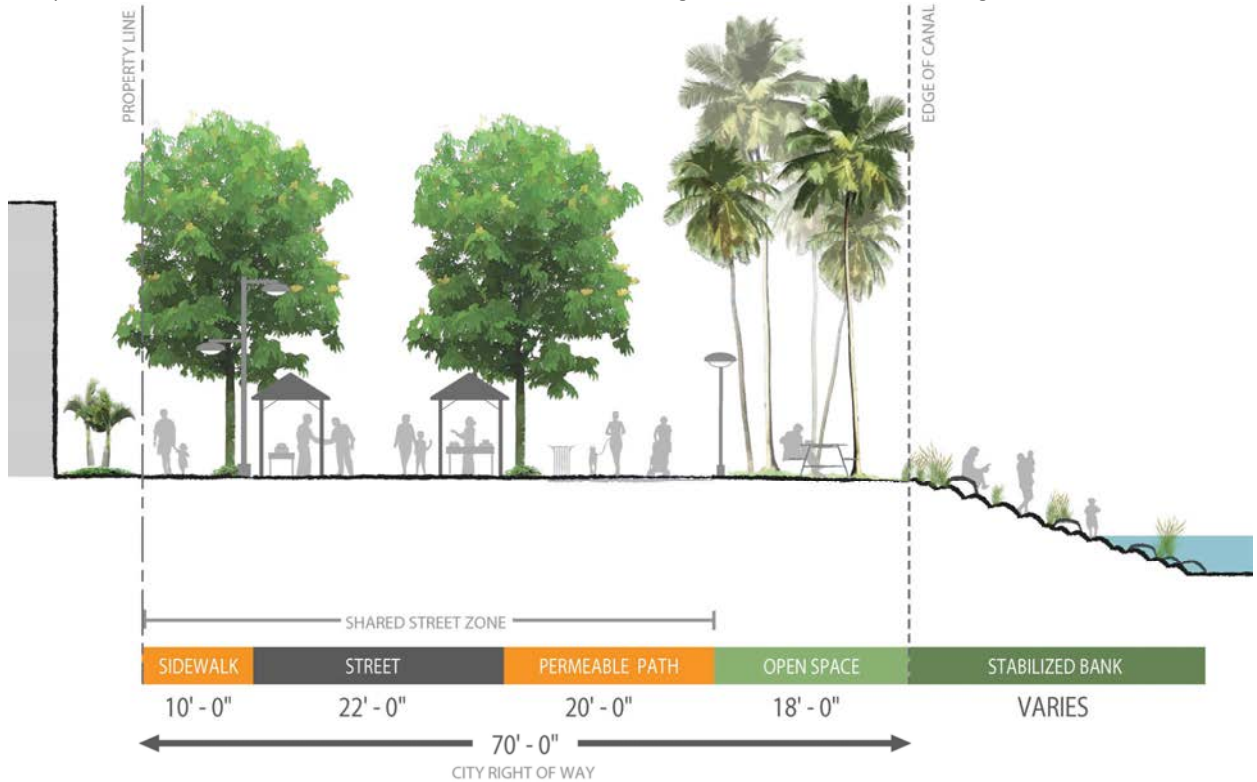
- Bicycle lanes on Iwilei Road (completed in 2017)
- Multimodal upgrade of the Liliha Street/Dillingham Boulevard/North King Street intersection is important for connecting areas mauka of North King Street with the rail station. A roundabout concept has been developed with a cost estimate of \$7-10 million.
- A streetscape project along Liliha Street and Vineyard Boulevard, including wider sidewalks and street trees, is also important for encouraging walking and biking in the district. Both streets are under the jurisdiction of HDOT. Improvements have been estimated to cost \$12.8 million.
- Multimodal upgrades along North King Street, including streetscape improvements and protected bicycle lanes, are critical for this community thoroughfare. This corridor will be studied through an upcoming Complete Street planning effort. A rough cost has been estimated at \$14.3 million.
- Multimodal upgrades along Waiakamilo Road, including streetscape improvements and protected bicycle lanes, are essential for connecting the rail stations along Dillingham Boulevard to upland

⁵ Land acquisition costs may vary and might not be applicable, depending on land ownership.

communities. This corridor will also be studied through an upcoming Complete Street planning effort. A rough cost has been estimated at \$11 million.

- Kokea and Kohou Streets are proposed for enhancement as part of the Kapalama Canal linear park project. They will provide high-quality facilities for bicycle and pedestrian travel to and from the Kapalama rail station and include “shared street” designs for the blocks between Dillingham Boulevard and North King Street, as shown in Figure 13 below, to support community events. The cost for these improvements is included in the overall cost of the Kapalama Canal project (described further in Section 6.6.1).

Figure 13: Proposed Cross Section for Kohou and Kokea Streets between Dillingham Boulevard and North King Street

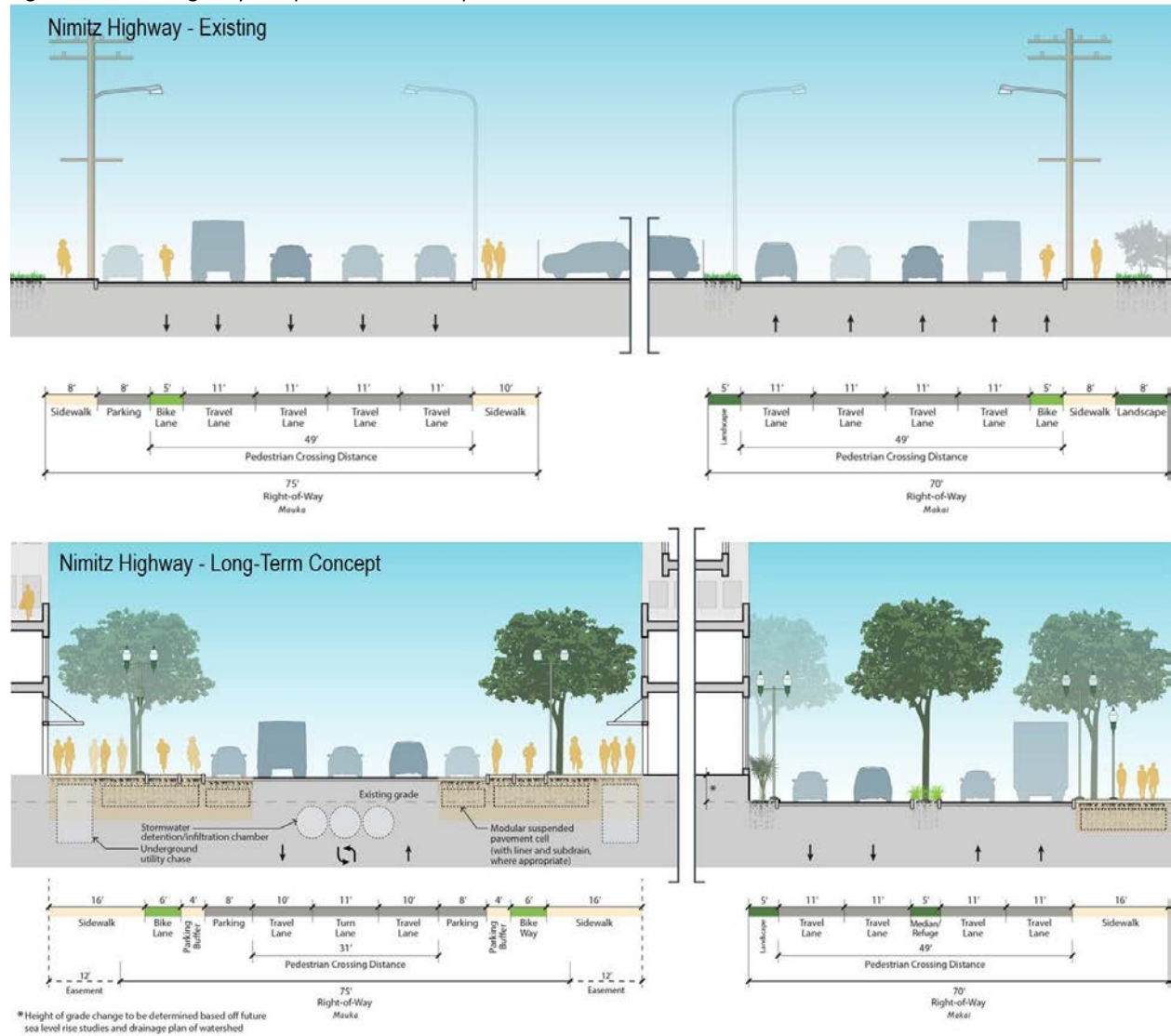


- Concepts to apply Complete Streets design principles to Nimitz Highway were explored through assistance from the US EPA’s Greening America’s Communities program. Short and long-term concepts are presented in the “Greening Iwilei and Kapalama” report (2018). The concepts, which include transforming the one-way couplet into two streets that each accommodate two-way traffic (Figure 14), aim to support multimodal circulation and rail station access, enhance the development potential of parcels identified by HDOT-Harbors Division for redevelopment, and adapt to sea-level rise. The addition of trees would also improve the character of the area and reduce the heat island effect. Cost estimates, and concepts for reconfiguring the intersections on either end, have not been developed.

These projects are critical for improving the character of the area into a desirable place to live and for providing safe, comfortable access to the rail stations. However, they are also critical for serving the existing community, which already relies heavily on walking, biking, and transit for their daily trips. Both US Census data, and a 2011 community survey conducted as part of the Kalihi Neighborhood TOD Plan,

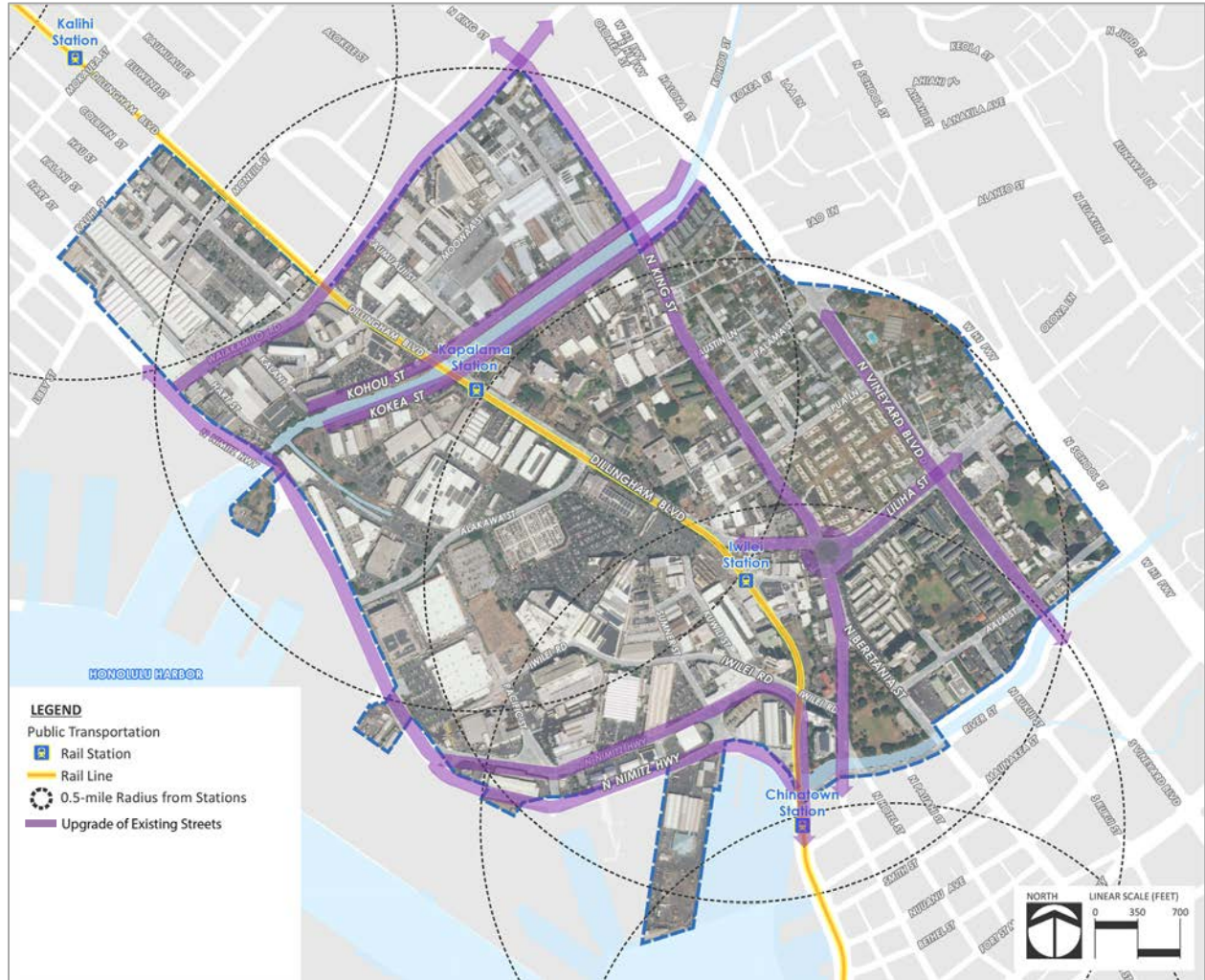
show that only 40% of residents drive alone to work/school, compared to roughly 60% islandwide, and 30% commute by transit, compared to 8% islandwide.

Figure 14: Nimitz Highway Complete Street Concept



In addition to new local streets and Complete Street improvements to existing streets, exploration of new freeway on- and off-ramps for missing movements in the project area has not yet been completed but may be necessary to accommodate the district’s anticipated growth.

Figure 15: Streets Proposed for Complete Street Improvements



6 Public Facilities and Infrastructure

The following sections outline the infrastructure assessment performed for the following infrastructure systems: water, sewer, drainage, electrical/communications, parks, and schools. The assessment considers existing conditions, explores opportunities and constraints, and presents cost estimates for proposed improvements.

6.1 Water System

The water system in Iwilei/Kapalama is owned and operated by the City's BWS. The backbone water infrastructure is relatively strong in the planning area, however aging infrastructure is an ongoing challenge. Pipelines experiencing frequent breaks, with a high consequence and likelihood of failure risk, will be programmed for replacement and possible upsizing. Water availability is not yet a concern for new development. The BWS has multiple projects in its capital program that will address current deficiencies and increase capacity (Table 3), and the agency is updating its Primary Urban Center Watershed Master Plan, in part to reflect new growth assumptions related to TOD.

Table 3: Planned Water System Improvements

Project	Estimated Capital Cost	Estimated Construction Year
Kalihi Pump Station Low and High Service Renovation	\$10 M	2016
42-Inch Mains - Liliha To Moiliili (Phase I)	\$38 M	2024
42-Inch Mains - Liliha To Moiliili (Phase II)	\$30.1 M	2028
Nimitz Highway/Waiakamilo Road Area System Improvements	\$2.8 M	2032
Kokea Street/Auld Lane System Improvements	\$2.7 M	2037
Dillingham Boulevard at Kohou Street 12-Inch Main	\$11.0 M	2038
Aala Street/North Vineyard Boulevard	\$6.8 M	2039
Nimitz Highway 16-Inch Main	\$11.0 M	2041

Based on anticipated development, the existing and net increase in average daily water usage within the Iwilei/Kapalama TOD district is summarized in Table 4. To accommodate these demands, the district will need upgrades to some existing water mains and larger water pipe diameters in some existing roadways.

Table 4: Existing and Net Increases in Water Usage

Iwilei/Kapalama TOD Planning Area	Water Requirement MGD ⁶ (Commercial)	Water Requirement MGD ⁷ (Residential)	Total Water Requirement (MGD)
Existing Uses ⁸	0.31	0.53	0.84
Anticipated Demand (Net Increase)	0.26	3.71	3.97
Total	0.57	4.24	4.81

⁶ Based on 100 gallons per 1,000 sq. ft. average daily flow (BWS Water System Standards, 2002)

⁷ Based on 300 gallons per unit, multiple-family average daily flow (BWS Water System Standards, rev.)

⁸ Remaining from existing residential and commercial area (portion not redeveloped)

Water-demand side conservation initiatives should also be implemented, such as on-site rain water capture, low-impact development strategies, ultra low-flow water fixtures and toilets, air conditioning condensate recovery systems, and drought-tolerant landscaping and water-efficient irrigation, to extend the limited potable supply to accommodate the increased water demands anticipated from TOD.

Water transmission is constrained for certain flows in the district. For fire protection, the demand required for mixed-use zoned areas is 2,000 gallons per minute (GPM), per BWS Standards. The existing water system along the major service roads such as Alakawa Street, Pacific Street, Dillingham Boulevard, and Nimitz Highway consists of pipes ranging from 12 to 16 inches in size that can accommodate the required fire flow. Subdistrict 2 (mauka of Dillingham Boulevard and west of Kapalama Canal) may require upgrades to 12-inch waterlines on the main roads to supply the required demand. The fire protection demand required for light-industrial zoned areas (Subdistrict 1) is 4,000 GPM. A majority of the existing water lines in Subdistrict 1 are 8-inches and 12-inches. The cost to upgrade the existing water system to 12-inches and 16-inches, where required, is estimated to be \$12.4 million in 2017 dollars (Table 5).

Table 5: Conceptual Fire Protection Water System Improvements

Location	Description	Estimated Cost
Hart Street	16" C905 PVC Class 150 water pipe including asphalt concrete (AC) pavement removal, trenching, pipe cushion, connection to existing laterals, backfill, AC pavement restoration, and other incidentals	\$1,920,000
Kalani Street, Dillingham Boulevard, Waiakamilo Road, Colburn Street, McNeill Street, Kaumualii Street (east), Moonui Street, Moowaa Street, Kokea Street, Kohou Street	12" C900 PVC Class 150 water pipe, including AC pavement removal, trenching, pipe cushion, connection to existing laterals, backfill, AC pavement restoration, and other incidentals	\$10,504,000
Total Estimated Cost for Fire Protection Improvements		\$12,424,000

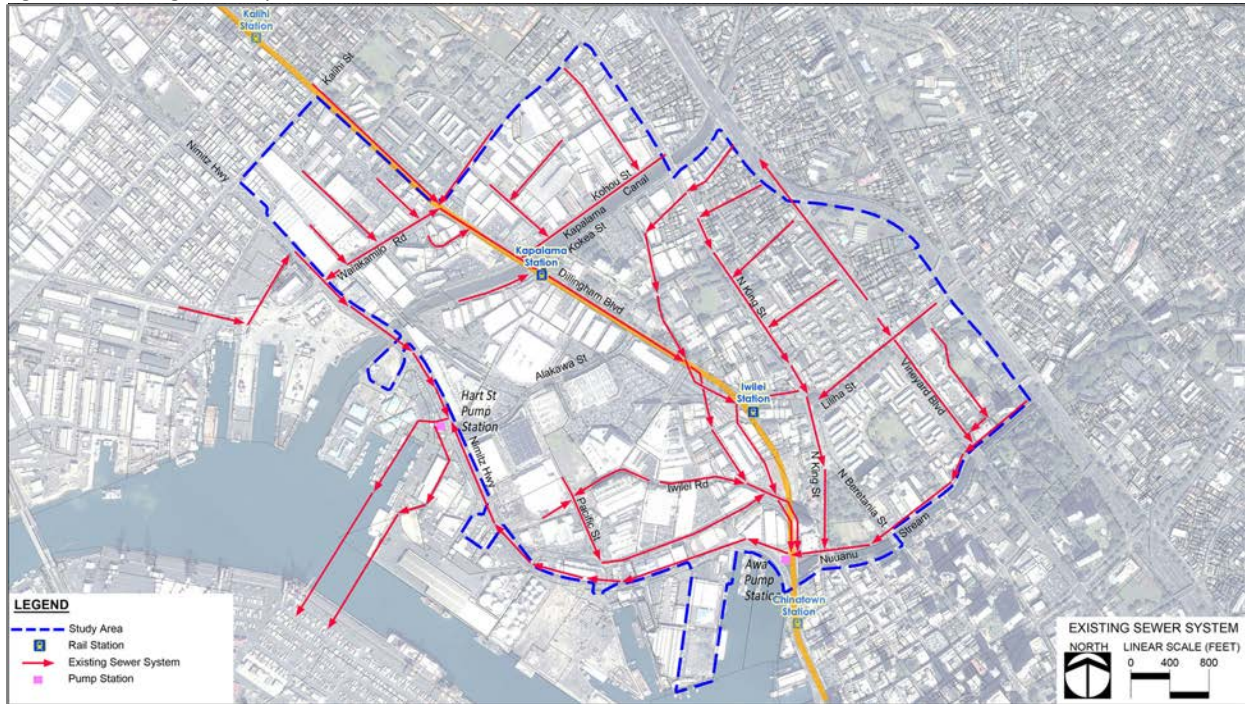
In addition, new water lines, consisting of 8-inch or 12-inch PVC pipes, are proposed with the construction of the new roadways, as mentioned in Section 5.2, to connect to and supplement the existing water system. The cost to install these water lines is included in the total roadway costs and is estimated to be \$2.5 million in 2017 dollars.

These conceptual cost estimates do not yet reflect the need to upgrade water pipe materials in certain areas to corrosion-protected ductile iron pipes. This material is required where petroleum soil contamination is present and in low-lying areas with high water tables that are prone to flooding and where sea-level rise is expected. The costs also do not include the removal of existing lines, relocation of other utilities, or the replacement of deteriorating infrastructure.

6.2 Sewer System

The City’s ENV provides sewer service in the Iwilei/Kapalama TOD planning area. The existing sewer infrastructure, typically collected by gravity, connects to two pump stations at Awa Street and Hart Street, and continues to the Sand Island Wastewater Treatment Plant (Figure 16). Throughout the planning process, landowners have expressed concern over the limitations of the sewer system and its potential impacts on new development.

Figure 16: Existing Sewer System



The existing and anticipated net increase in wastewater demands within the Iwilei/Kapalama TOD planning area is summarized in the following table.

Table 6: Existing and Anticipated Wastewater Demand

Iwilei/Kapalama TOD Planning Area	Wastewater Generation MGD ⁹ (Commercial)	Wastewater Generation MGD ¹⁰ (Residential)	Total Wastewater Generation (MGD)
Existing Uses ¹¹	1.01	0.35	1.36
Anticipated Demand (Net Increase)	0.83	2.42	3.25
Total	1.84	2.77	4.61

Wastewater capacity is already constrained throughout the Iwilei/Kapalama area. With the anticipated increase in residential units, capacity will need to be increased, including upgrades to local collection lines. A second sewage digester has already been added at the Sand Island Wastewater Treatment Plant, which

⁹ Based on 200 persons per acre and 70 gallons per capita per day (Wastewater System Design Standards, July 2017)

¹⁰ Based on 2.8 persons per unit and 70 gallons per capita per day, multiple-family (Wastewater System Design Standards, July 2017)

¹¹ Remaining from existing residential and commercial area (portion not developed)

created additional treatment capacity, and the renovation of the original digester opened up wastewater treatment capacity for most of urban Honolulu, including TOD from Ala Moana to the Airport area. There are also several other projects underway to improve regional capacity, including two phases of the Awa Street Wastewater Pump Station, Force Main, and Sewer System Improvements project. These upgrades are already funded or programmed in the City’s six-year CIP at a cost of roughly \$240 million. Table 7 below lists ongoing wastewater CIP projects in the Iwilei/Kapalama TOD planning area.

Table 7: Planned Sewer System Improvements

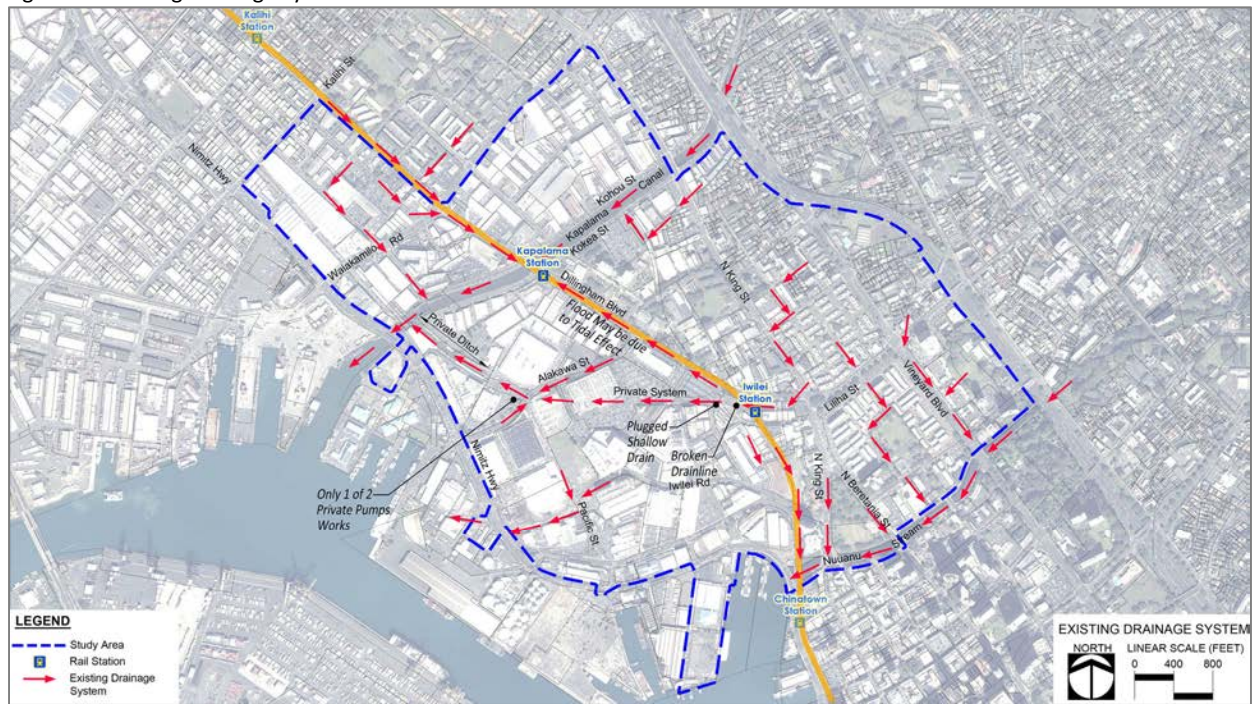
Project	Estimated Capital Cost	Status
Awa Street Wastewater Pump Station, Force Main, and Sewer System Improvements – Phase 1 (incl. Waiakamilo Road relief sewer line)	\$120 M	funded; construction complete in 2020
Awa Street Wastewater Pump Station, Force Main, and Sewer System Improvements – Phase 2 (incl. pump station upgrades)	\$100 M	programmed; in planning/design
Hart Street Wastewater Pump Station – Phase 3	\$20 M	programmed; in planning/design

The aforementioned projects are critical for regional sewer system capacity, but there is also an estimated \$60 million in upgrades needed to provide new or upsized collection lines under existing streets in the neighborhood. Additional analysis and modeling is underway to determine more details on this set of improvements. In addition, new sewer lines may be provided with the construction of the proposed roads, as mentioned in Section 5.2, to connect to the existing sewer system. The cost to install these sewer lines is included in the total roadway costs and is estimated to be \$3.7 million in 2017 dollars.

6.3 Drainage System

The existing drainage system in Iwilei/Kapalama has various deficiencies and constraints. A large swath of the district lacks adequate slope to channel water to desired areas; there are low-lying areas where extreme flooding and ponding occur; and the drainage system itself is incomplete and in poor condition. In the mauka portion of Iwilei, drainage flows towards Nuuanu Stream. West of the Iwilei rail station, most stormwater drains towards Kapalama Canal (Figure 17). The Kapalama area has a more developed drainage system than Iwilei, however ponding still occurs on certain streets during heavy rainfalls. In Iwilei, there is a drainage system under most major roads, however the drainage system is at capacity. A major deficiency is that the makai part of the Iwilei drainage system is privately owned, and the private pumps are underperforming and are not maintained to City standards.

Figure 17: Existing Drainage System

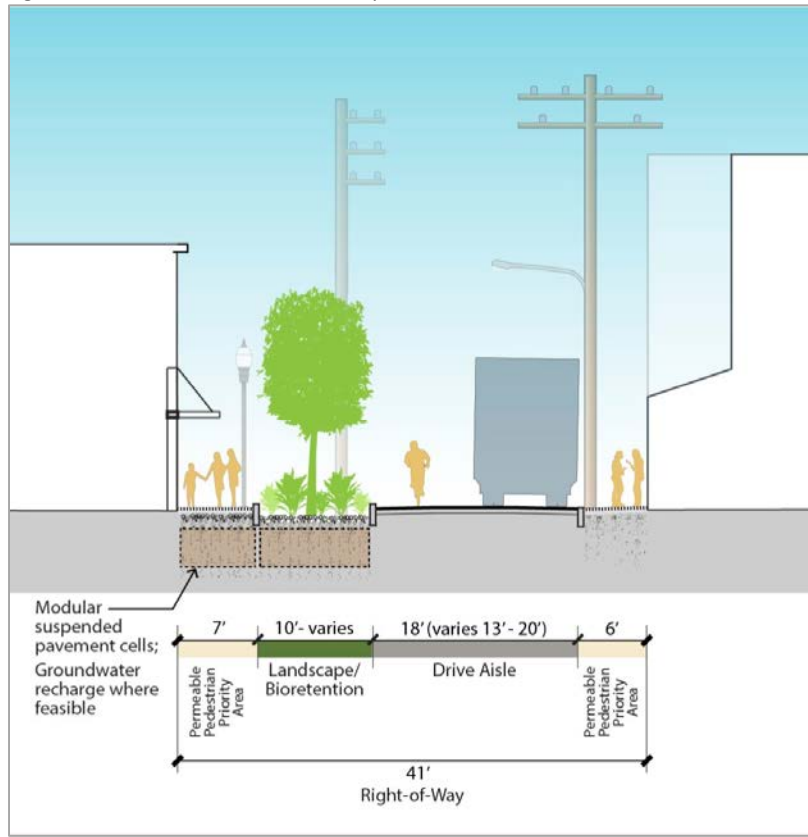


Major flooding tends to impact several areas following heavy rainstorms, such as near the North King Street/Dillingham Boulevard/Liliha Street intersection, Iwilei Road, and the area fronting Honolulu Community College along Dillingham Boulevard. The flooding problem in Iwilei is currently being studied for potential solutions through the Iwilei Drainage Study by the City's DDC. Recommended improvements and cost estimates are anticipated in 2018.

In addition, this assessment estimated the costs for including drainage systems with the construction of the proposed roads, as mentioned in Section 5.2. The new drainage systems, which will connect to the existing system, consist of catch basins and reinforced concrete pipes (18-inches and 24-inches) and the cost is estimated to be \$10.6 million in 2017 dollars.

It is anticipated that redevelopment will reduce the amount of impervious surface cover in the district because all major developments are now required to address stormwater quality and on-site detention/retention and treatment of stormwater according to new City standards, which should gradually reduce the amount of stormwater that needs to be handled by the storm drainage system. Green infrastructure strategies should be part of the toolbox of strategies on private property, as well as within the public realm. The EPA's "Greening Iwilei and Kapalama" report recommended design concepts that include permeable paving and stormwater planters to slow down, capture, and treat stormwater to improve water quality, reduce localized flooding, and add greenery and shade. Figure 18 illustrates how a crowned street can direct stormwater runoff to adjacent permeable pavement areas, rain gardens, landscape areas (where grades or other constraints prevent the ability to collect runoff for treatment in a planter), and modular suspended pavement cells. These curbless, or shared street, designs can be more cost effective than standard street designs (e.g., with curbs, gutters, storm drains, and sidewalks) for the narrow streets in mixed industrial/residential neighborhoods that are informally shared for loading, parking, and walking. City standards should be developed to allow this type of design in public rights-of-way; on private streets, the green infrastructure features would require private maintenance.

Figure 18: Green Shared Street Concept

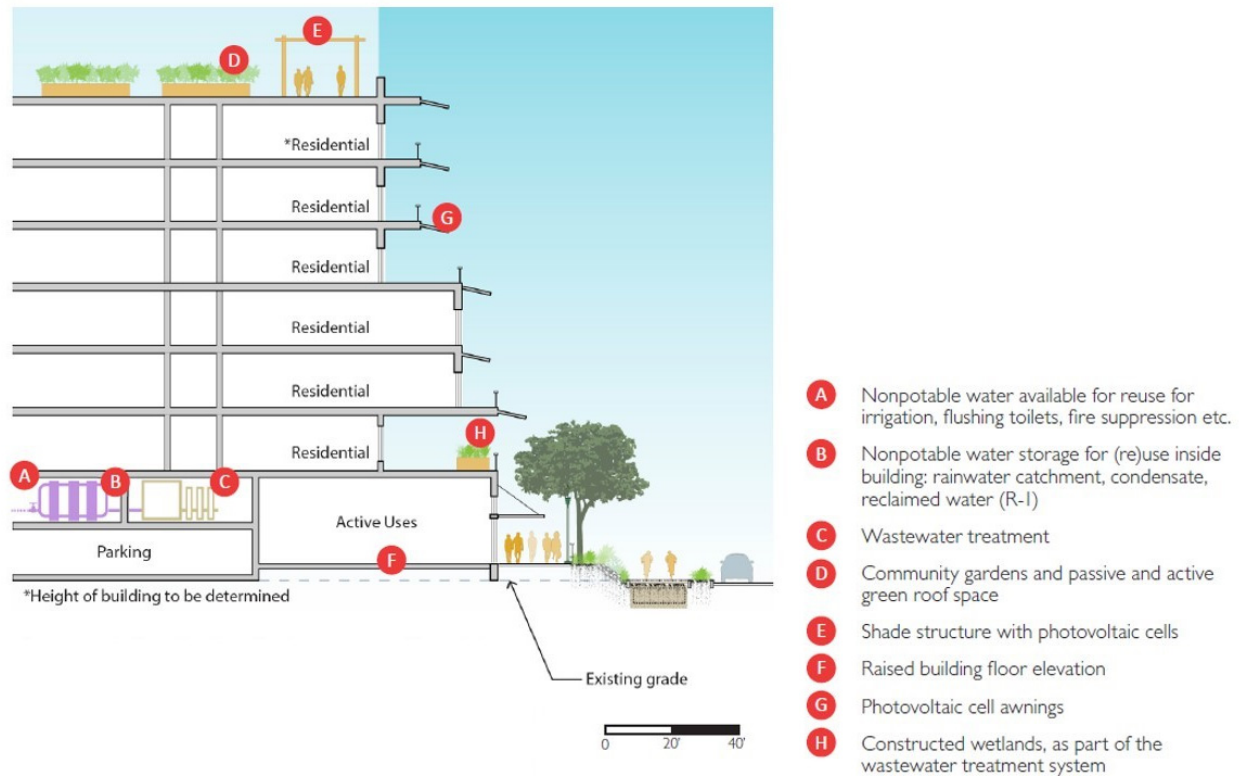


The drainage issues in the Iwilei/Kapalama area will also need to address potential long-term implications of climate change, such as heavy rainfall events, sea-level rise, rising groundwater, and increased frequency of tidal flooding. In the future, existing problems will likely be exacerbated, posing risks to private development, infrastructure, and public safety.

Figure 19 depicts building strategies that incorporate higher base elevations and decentralized water and energy infrastructure for new structures in areas susceptible to flooding due to sea-level rise or natural disasters. The example demonstrates the protection of critical infrastructure and building systems by raising them onto higher floors, as well as green roofs and water catchment and storage solutions. This type of “Ecoblock” approach for new development would build resiliency, reduce the energy and water footprints of developments, create community spaces, and prepare the district for future climate change adaptation strategies, such as elevating public streets or installing centralized interconnected storm/sea water pumping stations and drainage outlets.

Since Iwilei/Kapalama is an area identified for a significant amount of future growth, it is strongly recommended that the City do advanced planning to produce a Drainage/Topography Master Plan. The purpose of an area-wide drainage plan would be to identify the stormwater infrastructure needed to mitigate existing and future flooding, and determine the elevations of future developments and streets. This analysis should take into consideration climate change impacts and green infrastructure strategies. Additionally, the TOD Special District land use regulations for this area should include standards related to stormwater management and impervious surfaces.

Figure 19: Building with Ecoblock Features



6.4 Electrical/Communications Systems

6.4.1 Existing System

HECO is the main supplier of electricity on Oahu. Most of the island's power is generated by plants located on the west side of the island and delivered through two primary transmission corridors, and then from transmission and distribution substations to utility customers. In general, overhead electric utility lines supported by wood joint poles serve the Iwilei/Kapalama TOD area. HECO also has several overhead lines through the district that are part of their regional transmission and sub-transmission systems. These regional facilities interconnect HECO substations interspersed throughout the island of Oahu. Hawaiian Telcom and Spectrum also provide telecommunications services via these overhead lines.

There are some existing underground electric and communications duct systems within the Iwilei/Kapalama TOD area that have been redeveloped, such as along Alakawa Street, or that were installed by the respective utility companies to serve as regional infrastructure. These latter underground facilities do not generally provide service to individual customers. In the future, however, all TOD areas will be part of the TOD Special District, and new electric and telecommunications facilities are currently required to be installed underground in Special Districts (Revised Ordinances of Honolulu, Chapter 22). Existing overhead facilities installed prior to the addition of a station area to the TOD Special District may remain overhead and, if necessary, may be repaired and supplemented if such actions do not alter the character of such lines (e.g., HECO may replace or "up conductor" their lines but the voltage of these HECO distribution lines must remain the same).

HECO presently serves its residential, commercial and governmental customers in the Iwilei/Kapalama TOD area from their 12-kilo-volt (kV) distribution system. The power source for the 12-kV system are HECO's existing Iwilei, Waiakamilo, Kalihi and Kapalama Substations.¹² Due to the size of the electrical lines in the Dillingham corridor, currently there is only capacity for roughly 200 to 600 new residential units; based on the information from area landowners, 1,300 to 1,800 new units are expected to be built in the next 10 years in that corridor.

Standard Development Scenario

For new developments, Hawaiian Telcom and Spectrum typically require developers to provide underground telecommunications duct system infrastructure ("support structures") but will provide the cabling at their cost. Similarly, HECO also typically requires developers to provide underground electrical duct system infrastructure. In the most common scenario, the cost of new electrical facilities that are triggered by specific development projects, while nominally the responsibility of HECO, are paid for with funds advanced by the developers of projects requesting service. Over a ten-year period after construction of such projects, HECO reimburses, on a year-by-year basis, the project developers for a sum equivalent to the electricity usage charges paid by the energized development during that year; HECO will only reimburse up to the equivalent amount of overhead line extension. For relocation work, project developers are assessed 100% of the cost for the relocation work by all utility companies.

The funding mechanisms and responsibilities for local electrical improvements initiated by the City, State, or HECO vary, depending on what the project entails and what type of electrical facility is being improved.

6.4.2 Proposed Improvements

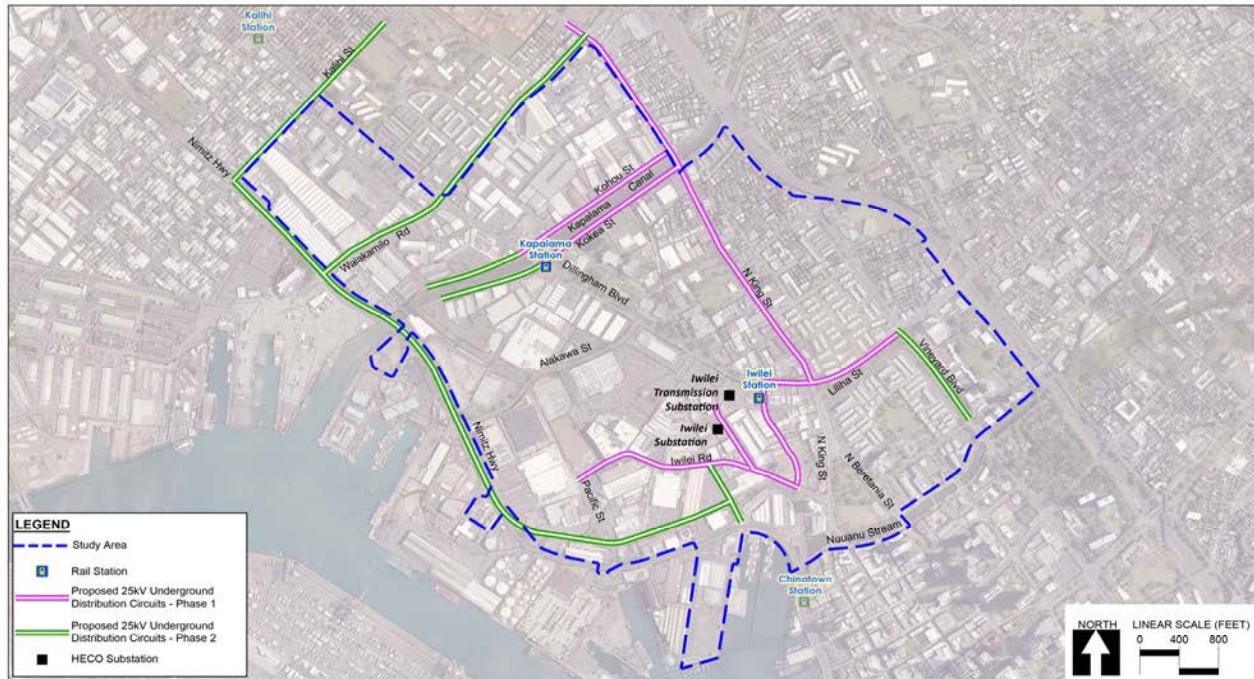
The improvements proposed in this section focus primarily on electrical capacity because current telecommunication technology generally allows Hawaiian Telcom and Spectrum to provide additional capacity to accommodate growth without new infrastructure. These utility companies can also replace the existing overhead and underground legacy trunking¹³ facilities with fiber optic cables and supplement existing fiber optic cable facilities with additional structures where they deem necessary. Additionally, the Department of Information Technology is working to incorporate broadband fiber optic into the rail guideway to increase communications capacity in the rail station neighborhoods. The City should also explore a "dig-once" policy that requires anyone doing roadway work to install conduit for carrying fiber optic cable.

The necessary electrical improvements identified by this analysis are to extend 25-kV distribution circuits throughout Iwilei/Kapalama, provide an additional 46-kV transmission line, and provide additional transmission station and distribution substation capacity.

¹² While the Iwilei, Kalihi, and Kapalama stations appear to be fully build out, a request has been made to HECO for verification of the remaining capacity in these substations and a response is pending.

¹³ In this context, the term "trunking" indicates regional utility company facilities as opposed to local facilities serving individual customers, parcels, and development.

Figure 20: Proposed 25-kV Underground Distribution Circuits



25-kV Distribution Network

Except for the existing 25-kV duct system and circuiting that extends from the Iwilei Transmission Substation eastwards along Nimitz Highway (serving Downtown and parts of Kakaako), there are currently no 25-kV distribution lines serving the Iwilei/Kapalama TOD area. New underground infrastructure must be built to allow for the extension of 25-kV circuits throughout the district. It is also recommended that any project to install underground electric duct systems may also consider including duct system for telecommunications utilities as well. The streets proposed to serve as the backbone 25-kV duct system are shown in Figure 20 and listed in Table 8. Areas anticipating Phase 1 development may need these improvements immediately.

Creating this network would entail constructing underground duct lines along various streets serving the Iwilei/Kapalama area. The proposed network intentionally avoids Dillingham Boulevard between Kaaahi and Kokea Streets due to its highly constrained underground right-of-way. To serve properties along Dillingham Boulevard, a 25-kV line is proposed to run under North King Street and then branch off to serve Kokea and Kohou Streets. Another alternative, not costed out in this assessment, would incorporate the 25-kV line into the rail guideway itself.

This assessment estimated costs for the 25-kV network improvements¹⁴, since these improvements will either be triggered by specific projects and will have to be covered by developers, or an assessment district will be set up to share costs among landowners, HECO, and the City. For the purpose of cost estimating, the major thoroughfares are: Nimitz Highway, Kalihi Street, Waiakamilo Road, North King Street, Liliha

¹⁴ The cost models also include budgets for prorations for appropriately sized utility handholes and manholes, trenching and backfilling, pavement saw cutting and repair work, patching, shoring, dewatering and traffic control, and HECO cabling and equipment.

Street, Iwilei Road, and Dillingham Boulevard. Also targeted for installation of new duct infrastructure are Kuwili Street, Kaaahi Street, and Sumner Street since these roadways provide access to the other roadways for extension of 25-kV circuits from HECO’s Iwilei Transmission Substation.

The 25-kV upgrades can be installed in stages, as noted in the phasing section below, based on the needs of development in the area. The total estimated cost for the 25-kV improvements ranges from \$62.1 to \$68.1 million for improvements along the following streets:

Table 8: 25-kV Distribution Network

	Roadway Name	25-kV Underground Infrastructure Cost
1	Nimitz Highway	\$27,000,000
2	Kalihi Street	\$4,500,000 - \$5,000,000
3	Waiakamilo Road	\$5,000,000
4	North King Street	\$6,000,000 - \$10,000,000
5	Kohou Street	\$3,300,000
6	Kokea Street	\$3,000,000
7	Liliha Street	\$2,000,000
8	Vineyard Boulevard	\$1,800,000
9	Iwilei Road South	\$1,500,000
10	Iwilei Road North	\$1,100,000 - \$1,600,000
11	Kaaahi Street	\$1,100,000 - \$1,400,000
12	Dillingham Boulevard	\$800,000 - \$900,000
13	Kuwili Street	\$3,500,000 - \$3,600,000
14	Sumner Street	\$1,500,000 - \$2,000,000
	Total Estimated Cost	\$62,100,000 - \$68,100,000

In addition, this assessment estimated the cost for including underground electric and telecommunications lines with the construction of the new proposed roads, as mentioned in Section 5.2, at \$11.5 million in 2017 dollars.

46-kV Transmission Upgrades

This assessment found that in the mid to long term an additional 46-kV¹⁵ transmission alignment would likely be needed, and the assessment analyzed three alternate underground routings for the 46-kV duct: Dillingham Boulevard, North King Street, or Nimitz Highway. The alternatives vary on costs, constraints, and relevant stakeholders.

The cost for installation of HECO 46-kV infrastructure and circuits is considered to be a “system” cost, which is typically borne by HECO, and depends on which alternative is deemed to be the most viable and cost efficient. The Dillingham alternative is the most inexpensive at \$13.4 million, however the Dillingham corridor is already very congested since the rail guideway will go through Dillingham Boulevard and HART is planning on undergrounding all the utilities in that corridor (See Table 9 for cost estimates). The Nimitz alternative is the most expensive at approximately \$45.6 million since the alignment route is very long.

¹⁵ The HECO 46-kV underground infrastructure cost model is based on 4-5” HECO conduits which would accommodate one 46-kV circuit. For each 46-kV infrastructure alternative alignment paralleling a 25-kV infrastructure route, consideration is given to synergistic cost sharing.

Table 9: 46-kV Transmission Upgrades

Underground Roadway Infrastructure	New 46-kV Infrastructure Alignment Alternatives		
	Nimitz Highway	North King Street	Dillingham Boulevard
Nimitz Highway	\$33,000,000	-	-
Kalihi Street	\$6,500,000	\$3,000,000	\$1,500,000
North King Street	-	\$12,000,000	-
Iwilei Road North	\$1,600,000	\$900,000	-
Kaaahi Street	-	\$1,600,000	\$900,000
Dillingham Boulevard	-	\$1,100,000	-
Kuwili Street	\$2,500,000	\$2,400,000	\$2,500,000
Sumner Street	-	-	\$11,000,000
Total Estimated Cost	\$45,600,000	\$21,000,000	\$13,400,000

6.4.3 Phasing of Improvements

In the near-term, the expansion of 25-kV distribution circuits from the Iwilei Transmission Substation along the following streets should be pursued to increase electrical capacity in the areas anticipating Phase 1 development: North King Street, Kohou and Kokea Street between Dillingham and King, Dillingham Boulevard, Liliha Street, Iwilei Road, Kuwili Street, and Kaaahi Street. This system may be expanded in increments and funded by an individual redevelopment project, or large landowners undertaking redevelopment of a number of their parcels, or the City may organize a regional improvement project to benefit all area landowners where funding could be determined through a cost-sharing agreement, such as an Improvement District.

For medium-term electrical capacity improvements, further expansion of the 25-kV Iwilei circuits should be prioritized to continue to expand capacity to serve the parcels anticipated for redevelopment. Additional mid-term steps are to provide an additional substation transformer at the Waiakamilo substation and add a 46-kV sub-transmission circuit to this substation. HECO should also consider the development of a new distribution substation site somewhere within the Iwilei/Kapalama TOD area.

In the long term, HECO will have to look into developing a new transmission station, similar to the existing one along Kuwili Street, near the corner of Dillingham and Kaaahi Street. A 2-acre parcel on the western edge of the Kapalama area will need to be secured for this purpose. This facility would provide additional capacity required to support TOD, not only in the Iwilei/Kapalama area, but in other surrounding TOD areas as well. A new transmission station would provide additional capacity for the 25-kV distribution system and also provide additional capacity for the 46-kV sub-transmission circuits, which feed the 12-kV substations. HECO will need to seek approval from the Public Utilities Commission for any capital investment that exceeds \$2.5 million.

6.5 Other Utilities

Although not studied in detail in this infrastructure assessment, it should be noted that other utilities can be found in the Iwilei/Kapalama TOD area, including, but not limited to, the following:

- Gas transmission pipelines run along Nimitz Highway from Middle Street to Kapalama Canal, and hazardous liquid pipelines run makai of Nimitz Highway from Sand Island Access Road through Iwilei.
- HECO's Iwilei pipeline is buried underground along a one-mile stretch of Nimitz Highway from Iwilei to Downtown, transporting low-sulfur fuel oil to the Honolulu Power Plant.
- AT&T and AT&T Government Solutions own a duct line that is routed within Dillingham Boulevard from Middle Street to the North King Street/Liliha Street intersection, which carries fiber optic cables used in their transpacific telecommunications system.
- The Network Enterprise Center–Hawaii (formerly known as Army Signal Corps) has direct buried communications cables within the Nimitz Highway right-of-way.

6.6 Community Facilities

6.6.1 Parks

Given the predominantly industrial and commercial character of the Iwilei/Kapalama area, there has not been a long-standing need for community park facilities. As Figure 21 below shows, most nearby parks are on the periphery of the planning area, leaving a majority of the planning area without access to a park within easy walking distance. Additionally, the neighborhood TOD plan community surveys for Kalihi and Downtown showed that the quality of parks in this area are generally poor compared to other rail station communities, and residents use parks less frequently.

Figure 21: Areas within ¼ Mile of a City Park



There are five parks in the district, totaling 16.4 acres (see Table 10), that vary in size, use, and facilities. In addition, Kalakaua District Park and Smith-Beretania Park are within ¼ mile of the project area; Keehi Lagoon Beach Park, Ala Moana Regional Park, and Sand Island State Recreation Area are within 5 miles. The significant anticipated increases in area population will result in higher recreational demands that need to be addressed in the Iwilei/Kapalama area; new urban parks should be created to service the new and existing resident population.

Table 10: Existing Parks in Iwilei/Kapalama

Park Name	Park Type	Park Acreage
Aala Park	Urban Park	6.7
Beretania Community Park	Community Park	5.4
Kanoa Street Mini Park	Mini Park	0.4
Kauluwela Community Park	Community Park	2.5
College Walk Mall	Mall	1.4
Total		16.4

Although acknowledging that there is an uneven distribution of community-based park land in older areas of Honolulu, the 2004 Department of Parks and Recreation (DPR) “City and County of Honolulu Standards and Precepts for Future Park Development” did recommend community-based facilities at a ratio of 2 acres per 1,000 resident population. In recent years, however, both DPR and national parks associations have pulled back from recommending specific standards or ratios because every park and recreation agency and community is unique. Nevertheless, if we were to use that standard as a planning tool for the anticipated housing growth, with an assumption of 2.23 residents per unit, the Iwilei/Kapalama district would be in need of 55 additional acres of park space.

Achieving that standard will be very challenging in the urban core, however, there is no doubt that a number of new facilities will be needed. Innovative strategies, such as using drainage detention areas as “floodable parks” and requiring that new spaces provided to satisfy Park Dedication requirements be made publicly accessible, will help achieve that ambitious goal.

The City is in the planning and design phase of a project to create a linear park along Kapalama Canal (Figure 22), which will add about 6 acres of green and recreational space in the western half of the district. The project includes features to improve the drainage canal’s water quality, a promenade along both sides of the canal between Nimitz Highway and the H-1 Freeway, new gathering spaces for community events, recreational amenities, Complete Streets improvements to Kokea and Kohou Streets (Figure 22), and new pedestrian bridges at Kalani and Kaumualii Streets. In addition to providing recreational space in an underserved community, the goals of the project include beautification, improving connectivity to the future Kapalama rail transit station, and catalyzing new urban development and broader neighborhood improvements consistent with area TOD plans. Active uses planned for the facility include walking/jogging, biking, exercising, and skating; play courts and sports fields are not included in the conceptual design.

The improvements, including dredging, is estimated to cost roughly \$108 to \$122 million, including \$6.7 million for Kohou and Kokea Streets and depending on the method of dredging disposal. The project will be phased in over time: phase 1 includes dredging and bank stabilization; phase 2 includes the linear park and promenade on both sides of the canal between Dillingham Boulevard and North King Street; phase 3 includes improvement of Kohou and Kokea Streets in this initial segment; and future phases have yet to be determined. The anticipated impacts of sea-level rise are being incorporated into the project design to make the linear park, as well as surrounding streets and developments, adaptive over time.

Figure 22: Kapalama Canal Open Space Plan



Additional community parks are also needed for sports and events and activities requiring more space. These are being planned as part of the Mayor Wright Homes redevelopment and in Kapalama by Kamehameha Schools. A community park (preferably 5 acres in size) is also needed in central Iwilei to address the geographic deficiency identified in Figure 21; for planning purposes, a very rough cost for this facility, including land acquisition, is assumed to be \$50 million.

6.6.2 Public Schools

The public school system is overseen by the State Department of Education (DOE). The DOE schools servicing this area are: Kalihi Kai Elementary, Puuhale Elementary, Kaiulani Elementary, Likelike Elementary, Kauluwela Elementary, Kalakaua Middle, Central Middle, Farrington High, and McKinley High.

The DOE utilizes Student Generation Rates (SGRs) to determine the number of expected DOE students, on average, per unit within a particular area. For example, a SGR of 0.2 for a place or project would mean that on average there would be 0.2 DOE students per housing unit, or 2 students per 10 housing units. The DOE recommended a SGR of 0.12 for the Iwilei/Kapalama area, which translates into a SGR of 0.06 for elementary school, 0.03 for middle school, and 0.03 for high school.

According to these SGRs and the anticipated number of new housing units at full build out, 1,482 additional public school students are expected. Table 1 represents the breakdown by school level.

Table 11: Estimated Additional Public School Students by Level

Grade Level	Estimated Additional Students
Elementary School	741
Middle School	371
High School	371
Total Students	1,482

The DOE is conducting a Facility Inventory, Assessment, and Capacity Study (known as the Jacob’s Study), and as part of that study they are measuring school capacity and utilization¹⁶. Analyzing long-term school capacity is a complex matter because there are different variables that can influence capacity, and a quantitative assessment might not reflect the needs of each individual school and how school staff utilize their facilities from one year to another. The following are the school capacity estimates for Spring 2017 from the Jacob’s Study.

Table 12: Area Public School Capacity (Spring 2017)

School	Total Student Capacity (Spring 2017)
Kalihi Kai Elementary	752
Puuhale Elementary	344
Kaiulani Elementary	491
Kauluwela Elementary	304
Likelike Elementary	457
Kalakaua Middle	1,019
Central Middle	609
Farrington High	2,008
McKinley High	1,695

Ultimately, the DOE summarizes that the additional students that will be generated through TOD redevelopment in this area cannot be accommodated by excess classroom space in existing schools. This is also the case in other TOD neighborhoods, which is why the Board of Education approved a “school impact district” from Middle Street/Kalihi to Ala Moana where the DOE anticipates growth that will create the need for one or more new schools, or expansion of existing school facilities. This district will charge \$3,864 (if no land is provided) on each new residential unit, including those in the Iwilei/Kapalama area. Due to the developed nature of this area and the lack of large vacant land parcels, new school facilities will need to be designed using creative and possibly vertical solutions.

6.6.3 Other Community Facilities

Other community services will also be needed to support this growing urban community. It appears that the area is well served by fire stations in Chinatown and at the foot of Waiakamilo Street, but Kalihi has long desired its own police station. The Liliha Public Library is nearby on Liliha Street, and the Kalihi-Palama Public Library is on Kalihi Street just mauka of the H-1 Freeway. Both public and private community centers currently exist in the planning area, including at Beretania Community Park and Palama Settlement, and others are nearby such as Susannah Wesley Community Center and the Kalihi YMCA. A new community center is planned with the redevelopment of Mayor Wright Homes, and additional facilities will be needed closer to the rail transit stations to house community programs, in combination with one of the proposed parks or other development opportunities.

¹⁶ Preliminary information on classroom capacity can also be found in the DOE’s Draft Analysis of the Kalihi to Ala Moana School Impact District (2016), however the DOE recommended use of the data from the Jacob’s Study.

7 Project Phasing

This report presents an ambitious effort on behalf of the City, State, and private landowners to grow the Iwilei/Kapalama district into an urban, mixed-use district, as envisioned in the Kalihi and Downtown Neighborhood TOD Plans. To achieve that vision, infrastructure investments are needed in the district both immediately and over time as development progresses and resources become available. The following is a breakdown of needed infrastructure projects by development phase.

7.1 Phase 1 (2018 to 2028)

Given the long lead time for capital projects, it is unlikely that the City will be able to deliver a significant amount of new infrastructure during the first phase of development. Catalytic projects being planned for this phase will largely be accommodated by existing infrastructure, capital projects already underway, or localized improvements constructed as part of specific development projects. For instance, improvements to the City's Awa Street Wastewater Pump Station, Force Main, and Sewer System are already funded and will open up sewer capacity by 2020. The projects identified as necessary in the next ten years are listed below in Table 13.

Table 13: Phase 1 Infrastructure Improvements/Projects

Improvement/Project Description	Cost Estimate	Jurisdiction	Status
Awa Street Wastewater Pump Station, Force Main, and Sewer System Improvements – Phase 1 (incl. Waiakamilo Road relief sewer)	\$120 M	City (ENV)	funded; construction complete in 2020
Awa Street Wastewater Pump Station, Force Main, and Sewer System Improvements – Phase 2 (incl. pump station upgrades)	\$100 M	City (ENV)	programmed; in planning/design
Upsize North King Street sewer main	\$2.2 M	City (ENV)	not programmed; may be built by State to support area development
Upsize Subdistricts 2 & 4 sewer lines	TBD	City (ENV)	being studied; planning to begin in FY19
Kalihi Water Pump Station Renovation	\$10 M	City (BWS)	in construction
42-Inch Water Mains – Liliha to Moiliili (Phases 1 and 2)	\$68.1 M	City (BWS)	programmed for construction in 2024-2028
Kaaahi Street extension	\$1.3 M	City/State/HART	multi-use path may be provided with rail construction; roadway may be built with State redevelopment
Alakawa Street – Iwilei Road Connector	\$10 M	Private/City	not yet planned
North King Street Complete Street Upgrade, including Liliha/Dillingham/King intersection	\$24.3 M	City	planning contract funded; potential to combine with installation of new underground electrical
Underground new 25-kV electrical line from Kaaahi Street substation to Mayor Wright Homes	\$8 M	State/Private	needed for first phase of Mayor Wright Homes redevelopment

Underground new 25-kV electrical line along North King Street from Liliha Street to Kokea and Kohou Streets	\$14 M	City/Private/HECO	needed for Kamehameha Schools redevelopment; coordinate with King Street and Kapalama Canal improvements
Iwilei drainage improvements	TBD	City/State/Private	in planning
Develop sea-level rise adaptation strategies, including new Drainage/Topography Master Plan, to guide development and infrastructure improvements	\$2 M	City/State/Private	preliminary consultant services engaged through 100 Resilient Cities network
Kapalama Canal – dredging, bank stabilization, and linear park between Dillingham Boulevard and North King Street, including Complete Street upgrade of Kohou and Kokea Streets	\$75 M	City (DDC)	conceptual design and draft environmental impact statement (EIS) being revised for higher sea-level rise scenario
New parks and community centers provided with new development	TBD	Private	currently anticipated at Mayor Wright Homes and on Kamehameha Schools property in Kapalama

7.2 Phase 2 (2029 to 2043)

Continued buildout of new development and the infrastructure systems identified in this assessment will proceed in Phase 2. Both private and public investments will need to be consistent with the sea-level rise adaptation strategies and new base elevation requirements from the Drainage/Topography Master Plan developed in Phase 1. Table 14 lists the improvements that will need to be implemented in that timeframe.

Table 14: Phase 2 Infrastructure Improvements/Projects

Improvement/Project Description	Cost Estimate	Jurisdiction	Status
Hart Street Wastewater Pump Station – Phase 3	\$20 M	City (ENV)	programmed; in planning/design
Continued expansion of sewer collection system	TBD	City (ENV)	being studied; not programmed
Nimitz Highway/Waiakamilo Road Area Water System Improvements	\$2.8 M	City (BWS)	programmed for construction in 2032
Kokea Street/Auld Lane Water System Improvements	\$2.7 M	City (BWS)	programmed for construction in 2037
Dillingham Boulevard at Kohou Street 12-Inch Water Main	\$11.0 M	City (BWS)	programmed for construction in 2038
Aala Street/North Vineyard Boulevard Water System Improvements	\$6.8 M	City (BWS)	programmed for construction in 2039
Nimitz Highway 16-Inch Water Main	\$11.0 M	City (BWS)	programmed for construction in 2041

Upsize Subdistrict 1 & 2 water lines	\$12.4 M	City (BWS)	not programmed
Waiakamilo Road Complete Street Upgrade	\$11 M	City	planning contract funded
Liliha Street and Vineyard Boulevard Complete Street Upgrades	\$12.8 M	State (HDOT)	not programmed
Interim Complete Street upgrade of Nimitz Highway	TBD	State (HDOT)	concepts developed by US EPA study
Continue buildout of street network	\$49 M	City/Private	implementation plan being developed
Continue buildout of underground 25-kV electrical distribution network	\$40 M	City/Private/HECO	implementation strategies being explored
New/upgraded electrical distribution substation	TBD	HECO	City is working with HECO to better understand future needs
New 46-kV electrical sub-transmission line	\$13.4 - 45.6 M	HECO	need to determine alignment
Continue implementation of drainage and sea-level rise adaptation strategies	TBD	City/State/Private	strategies to be identified in Phase 1
Kapalama Canal – Linear Park makai of Dillingham Boulevard and mauka of North King Street, including Complete Street upgrade of Kohou and Kokea Streets	\$50 M	City (DDC)	conceptual design and draft environmental impact statement (EIS) being revised for higher sea-level rise scenario
New gathering spaces and community facilities provided with new development	TBD	Private	facilities provided to satisfy Park Dedication or Community Benefit Bonus requirements
Acquire land for new Iwilei Community Park	\$15 M	City	need to identify and secure site
New or expanded public schools	TBD	State (DOE)	assisted by revenues from new school impact district

7.3 Phase 3 (2044 and beyond)

By Phase 3, most of the backbone infrastructure to support buildout of the district should be in place. Proposed infrastructure upgrades in this timeframe include new community facilities dependent on new development, such as new streets proposed where buildings exist today, and improvements related to regional systems and facilities. A list of anticipated projects is listed in Table 15, however, given the long time horizon, this list may vary significantly over the next several decades.

Table 15: Phase 3 Infrastructure Improvements/Projects

Improvement/Project Description	Cost Estimate	Jurisdiction	Status
New Electrical Transmission Station	TBD	HECO	land needs to be secured for future station
Full Complete Street upgrade of Nimitz Highway	TBD	State (HDOT)	concepts developed by US EPA study

Additional H-1 On/Off-Ramps	TBD	State (HDOT)	needs planning study
Complete buildout of street network	\$49 M	City/Private	implementation plan being developed
Continue implementation of drainage and sea-level rise adaptation strategies	TBD	City/State/Private	strategies to be identified in Phase 1
New gathering spaces and community facilities provided with new development	TBD	Private	facilities expected to satisfy Park Dedication or Community Benefit Bonus requirements
Construct new Iwilei Community Park	\$35 M	City	need to identify and secure site
New or expanded public schools	TBD	State (DOE)	assisted by revenues from new school impact district

8 Implementation and Funding Strategy

Given the magnitude of current infrastructure deficiencies, it is critical that the City and State commit to proactively investing in the Iwilei/Kapalama district over the next several decades. Without this commitment, and given early development interest by several area landowners, there is a risk that projects will be built with only the most basic, piecemeal infrastructure upgrades—resulting in a dysfunctional district with traffic congestion, frequent flooding, brownouts, sewer backups, and more. Buildout of a new urban district takes time and money, but done right, the Iwilei and Kapalama districts can truly become livable, convenient, and transit-oriented neighborhoods.

The infrastructure projects recommended by this assessment will be implemented by the City, the State, private utilities, and/or private developers. A close collaboration between public and private partners will be necessary to ensure the timely and efficient provision of infrastructure. This collaboration will take place in the City’s TOD Subcabinet, through the State’s Hawaii Interagency Council for TOD, and regular meetings with private utilities, landowners and developers.

The City is developing an implementation strategy for these improvements, working closely with state agencies and other landowners. This strategy will address infrastructure by type and phase, with a focus on improvements needed to support affordable and workforce housing production.

New TOD zoning and land use regulations for the area, which will be adopted by the City, will require streetscape upgrades on a project-by-project basis and incentivize private provision of community benefits, such as open space, multimodal connectivity, affordable housing, and regional infrastructure, in exchange for higher building heights and densities. Existing development requirements, such as Park Dedication, will also contribute to the district’s needs. And new policies, such as a roadway connectivity requirement, will be explored to change the conventional practice of prohibiting access between adjacent properties, thereby forcing all travel onto existing, overtaxed area streets.

The strategy is also exploring a wide range of funding sources, including the City’s CIP, impact fees, grants, other public contributions, public-private partnerships, and district-based funding tools. The City is evaluating the potential revenue that might be generated through a CFD and/or an ID for improvements that are beyond the means or responsibility of any individual private development. Selection of the appropriate mechanism depends on the nature of the improvement. For example, development impact fees place the burden on the developers (and ultimately the occupant of the home or business being constructed); whereas assessment districts place the financial burden on existing and future property owners; and funding through the CIP distributes the costs citywide.

Assessment districts have the potential to raise critical funds for district-wide improvements if property owners see the value to their properties, but the relatively low rate of real property taxes in Honolulu, particularly for residential properties, is a challenge to their implementation. A special tax levied in addition to the existing property tax could be felt by taxpayers as a large percentage increase over the low base rate. Additionally, the State owns almost a quarter of the land in the area, and further discussions with the State are required to determine the extent to which state-owned properties can contribute to a CFD or ID.

Fortunately, the State Interagency TOD Council has recently begun development of a TOD Master Plan and Implementation Strategy for state lands along the rail corridor. This effort will focus on three priority

areas: East Kapolei, Halawa/Aloha Stadium, and Iwilei/Kapalama. The implementation plan will build on the City's efforts, including this needs assessment, and identify specific infrastructure and funding options to support TOD on state properties. The City is an active participant in this process and appreciates the State's shared vision for long-term buildout of the Iwilei and Kapalama rail station areas.

Appendices *(available upon request)*

Appendix A: Anticipated Development Methodology

Appendix B: Infrastructure Modeling and Cost Assumptions

Appendix C: Engineering Analysis and Cost Estimates

Appendix C.1: Conceptual New Roadway Cost Estimates

Appendix C.2: Conceptual Fire Protection Water System Improvement Cost Estimates

Appendix C.3: Electrical and Telecommunications Conceptual Analysis