HOKUA PLACE

Kawaihau District, Kapa‘a, Kaua‘i, Hawai‘i

TMK (4) 4-3-003:001 (por.)

Sea Level Rise Assessment

Prepared By:

HG Kaua‘i Joint Venture LLC
9911 S. 78th Avenue
Hickory Hills, IL 60457

July 2020

Petitioner’s Exhibit No. 8

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Applicant:

HG Kaua‘i Joint Venture LLC
9911 S. 78th Avenue
Hickory Hills, IL 60457

Submitted To:

State of Hawai‘i
Land Use Commission
235 S Beretania Street
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July 2020

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Project Information Summary

Type of Document:	Sea Level Rise Assessment
Project Name:	HoKua Place
Applicant:	HG Kaua‘i Joint Venture LLC 9911 S. 78th Avenue Hickory Hills, IL 60457
Agent:	G70 111 S. King St., Suite 170 Honolulu, HI 96813
Approving Agency:	Hawai‘i State Land Use Commission 235 S Beretania Street Suite 406, Honolulu, HI 96813
Project Location:	Kawaihau District, Kapa‘a, Kaua‘i
Tax Map Keys (TMK)	(4) 4-3-003:001 (por.)
State Land Use District:	Agriculture
Kaua‘i General Plan:	Neighborhood General
Kaua‘i County Zoning	Agriculture
Special Management Area:	Outside SMA
Flood Zone:	X: Area determined to be outside the 100-year floodplain with minimal flooding

1.2 Report Purpose and Scope

The purpose of this report is to evaluate the potential sea level rise (SLR) impacts associated with the implementation of the planned HoKua Place Project (Project). This assessment was triggered by the Project's petition to the Land Use Commission (LUC) for a State Land Use Boundary Amendment. Specifically, the petition is to change the State's Land Use District from Agricultural Land Use District to Urban Land Use District. Per Hawai'i Administrative Rules (HAR) Chapter 15-15-50(c)(24): Application Requirements for Boundary Amendment Petitions, *the petitioner shall prepare a statement and analysis addressing* (A) *the impacts of SLR on the proposed development* and (D) *the location of the proposed development and the threat imposed to the proposed development by SLR, based on the maps and information contained in the Hawai'i Sea Level Rise Vulnerability Adaptation report and the proposed mitigation measures taken to address those impacts.*

This SLR Assessment describes the existing setting of the project site, describes the relevant regulatory setting, and discusses the methodology used to evaluate SLR impacts related to the Project. Measures the Project will take to mitigate potential impacts will also be discussed.

1.3 Regional and Local Setting

The Project site is located in the residential/resort town of Kapa'a along the eastern coast of the Island of Kaua'i (*Figure 1-1*). The Project area consists of an approximately 96-acre portion of the 163-acre parcel (TMK (4) 4-3-003:001). The site is located within the traditional moku of Kawaihau and the ahupua'a of Kapa'a.

The Project site is situated at the north-west corner of the Kapa'a Bypass Road and Olohena Road. The Kapa'a Bypass Road, located south and east of the property, separates the Project site from the Kapa'a' town center. Olohena Road runs along and adjacent to the northern boundary of the property. The Kapa'a Middle School is located on the northern end of the subject parcel, fronted by Olohena Road. The western boundary of the Project site is bordered by a small intermittent stream. The stream flows from north to south along the boundary, passes under a bridge on the Kapa'a Bypass Road at the southwest corner of the property, and empties into the Waiākea drainage canal downstream from the property.

The lands surrounding the Project to the north and east are designated as "Residential Community" and "Neighborhood General" by the Updated Kaua'i General Plan. The Property is contiguous to existing urban lands, to the south and across the Kapa'a Bypass Road. These existing lands are classified Urban by the State Land Use Commission and zoned Residential by the County of Kaua'i.

1.4 Proposed Project Description

HG Kaua'i Joint Venture LLC is planning to develop a residential community consisting of a mix of single-family and multi-family residential, market and affordably priced homes, commercial, community park, and open green space. The Project is designed as a sustainable community that aims to preserve the rural character of Kapa'a while accommodating Kaua'i's growing housing needs.

Approximately 96-acres will be subdivided into single family and multifamily lots providing for a total of 683-multi-family units and 86-single family lots and homes. Approximately 30 percent of the housing units are designated as affordable. The Project also includes open space encompassing 13.25-acres; a 3.1-acre park adjacent to the existing Kapa'a Middle School with an area for the county's proposed

relocation of the Kapa‘a county swimming pool; and 1.4-acres for commercial use. In accordance with County and State Department of Transportation requirement, improvements will include an intersection on Kapa‘a Bypass Road, bus stops, sidewalks and bike and walking paths to the existing Kapa‘a Middle School.

The Project plans to share a portion of the infrastructure with the adjacent and adjoining HoKua Farm Lots. A 4-acre solar farm, located within the Farm Lots, generates 1.18 MW of electricity that feeds into the Kaua‘i Island Utility Cooperative’s (KIUC) distribution grid.

A Project’s planned land uses are summarized in *Table 1-1* below and shown conceptually in *Figure 1-2*.

Table 1-1: Summary of Project Land Uses

Land Use	Acreage	Number of Units	Population*
Large Lot Single Family Homes (10,000 sf)	8.26	36	113
Medium Lot Single Family Homes (7,500 sf)	8.60	50	157
Multi-Family Dwelling (4 Plex)	45.82	452	1,415
Affordable Housing Dwellings (low-rise)	15.63	231	723
Commercial	1.40		
Community Park and Pool	3.10		
Open Space	13.25		
Total	96.06	769	2,408

*Populations estimates derived from average Kaua‘i household size from 2008-2014, https://www.census.gov/quickfacts/kauaicountyhawaii

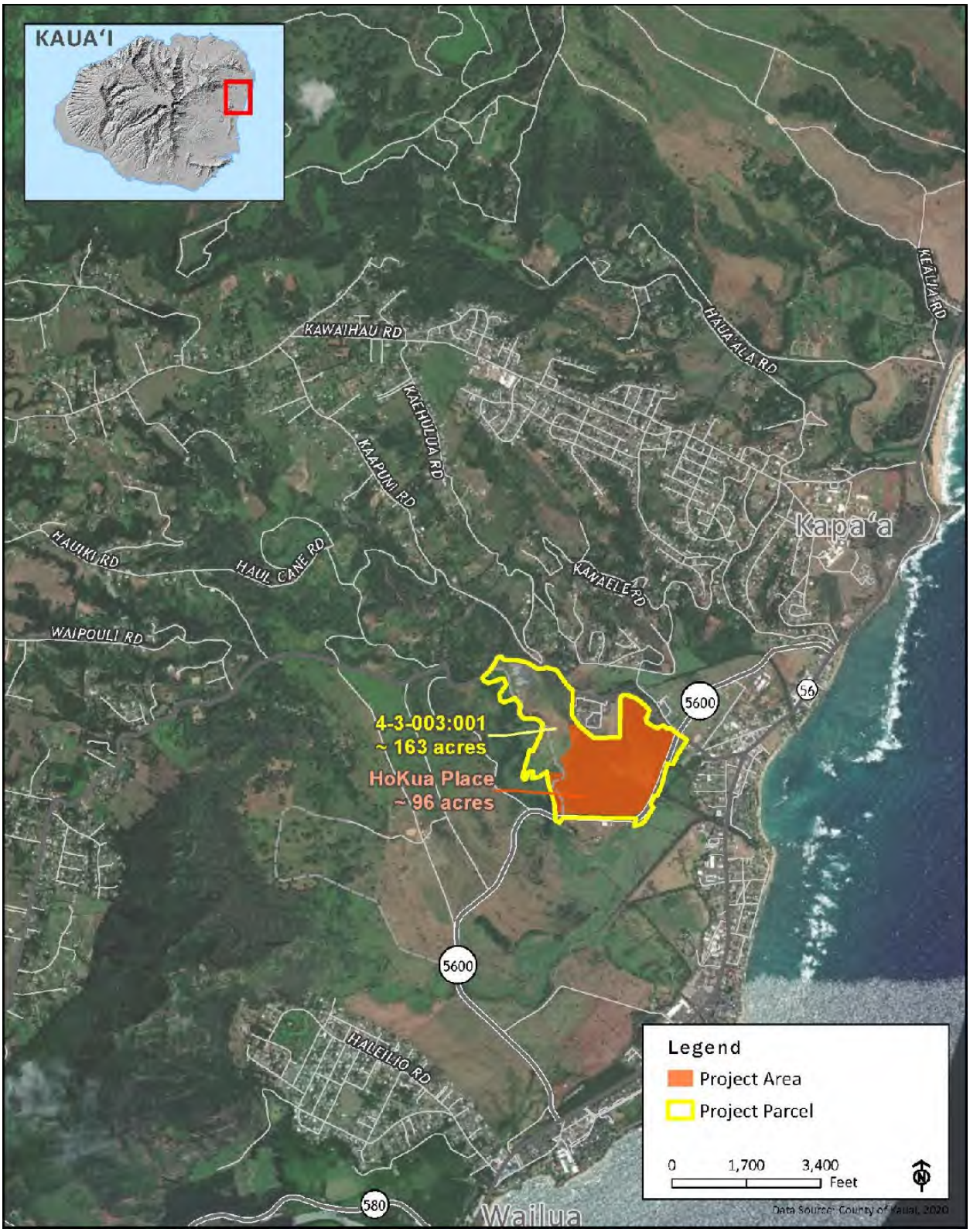

Figure 1-1 **County of Kaua'i, TMK Parcel Map of Project Area**

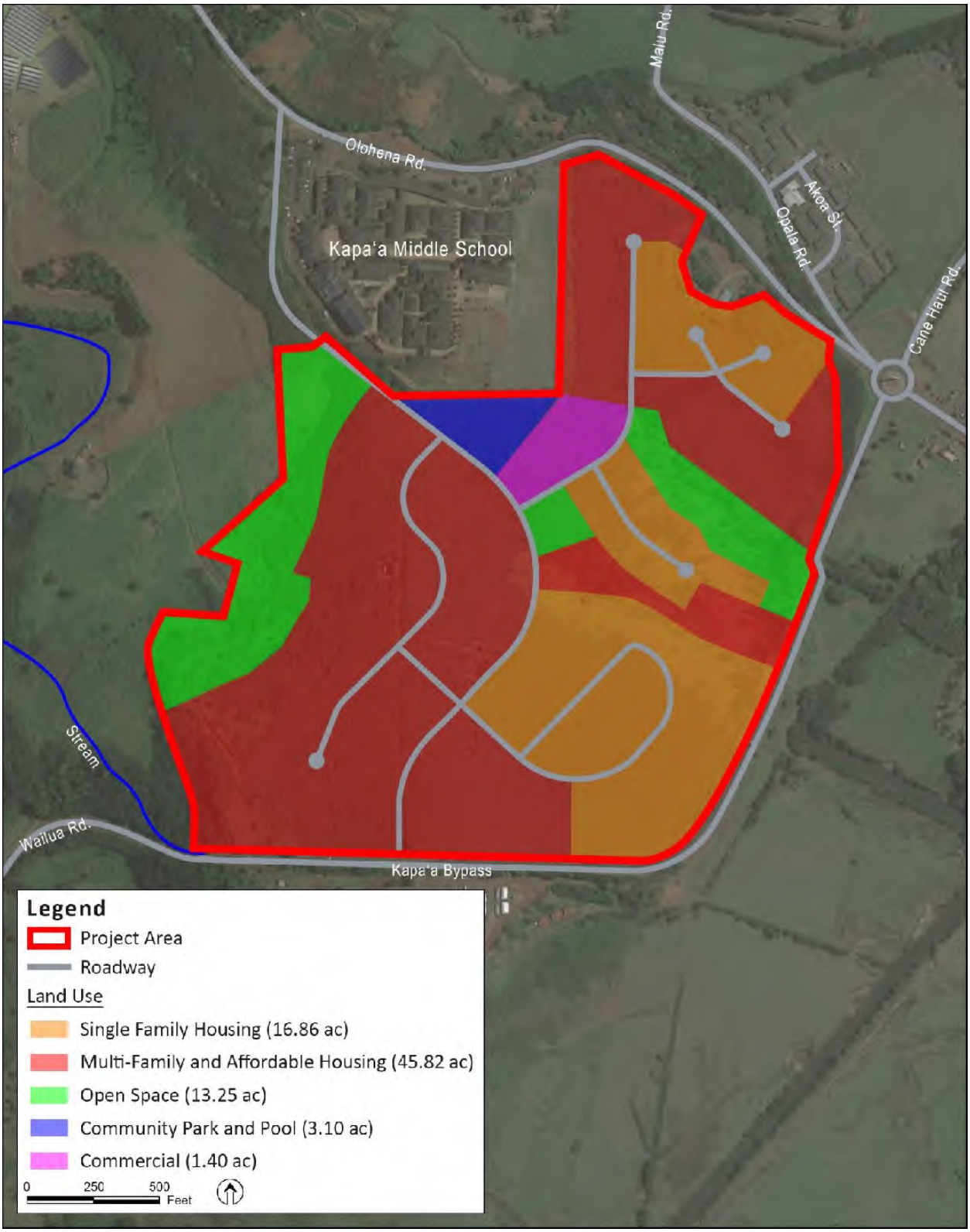

Figure 1-2 **Conceptual Land Use Plan of the Project Area**

Chapter 2

Environmental Setting

2.1 Sea Level Rise Overview

The ocean is the largest solar energy collector on Earth. Not only does water cover more than 70 percent of our planet's surface, but it can also absorb large amounts of heat without a large increase in temperature. The ability to store and release heat over long periods of time gives the ocean a central role in stabilizing Earth's climate system.

Rising amounts of greenhouse gases (GHG) are preventing heat radiated from Earth's surface from escaping into space as freely as it used to. Most of the excess atmospheric heat is passed back to the ocean. As a result, upper ocean heat content has increased significantly over the past two decades. Presently, warming of ocean water is raising global sea level because water expands as it warms.

Land-based ice, such as glaciers and ice sheets, are also greatly affected by global warming. These reserves of ice are located in places like Greenland and Antarctica. Typically, they experience melt during the warmer months of the year and the ice is replenished in colder months. With the average year-round global temperatures rising, however, ice caps and glaciers are experiencing a disproportionate amount of melting at an accelerated rate.

SLR is an inevitable outcome of global warming that will continue through many centuries even if human-generated GHG emissions were stopped today. Rising ocean levels will increasingly threaten natural ecosystems and human structures near coastlines around the world.

2.2 Historic Shoreline Trends

SLR at specific locations may be more or less than the global average due to local factors such as land subsidence from natural processes and withdrawal of groundwater and fossil fuels, changes in regional ocean currents, regional ocean temperatures, and flexure of the underlying crust from the compressive weight of glaciers or vulcanism. According to the University of Hawai'i School of Ocean and Earth Science and Technology (SOEST), sea levels in the central western Pacific Ocean may reach approximately 1 to 2.5 ft higher than the global average sea level rise by the end of the century.

The National Oceanic and Atmospheric Administration (NOAA) records water level information at tidal stations throughout the state. Long-term records from tide stations around Hawai'i show that sea level is rising around the islands. Relative rates of sea level rise, however, vary among the islands. In fact, the relative rate of SLR on the Island of Hawai'i is almost twice the rate on Kaua'i (NOAA, 2017).

The nearest tidal station to the Project area is located at the Nawiliwili Harbor, approximately ten miles away. For each tidal station, NOAA provides a set of standard sea level elevations (datums) defined by certain phases of the tide. Tidal datums are used as references to measure local water levels. The tidal datums defined for the Nawiliwili Station are presented in Table: 2-1 below.

Table 2-1: Water Level Data for Nawiliwili Station 1611400 (NOAA, 2017)		
Datum	**Elevation (feet, MLLW)**	**Elevation (feet, MSL)**
Mean Higher High Water (MHHW)	1.83	1.01
Mean High Water (MHW)	1.42	0.60
Mean Sea Level (MSL)	0.82	0.00
Mean Low Water (MLW)	0.20	-0.62
Mean Lower Low Water (MLLW)	0.00	-0.82

Historic records from NOAA's tidal station show that sea levels have been gradually rising along Kaua'i's eastern coast (Figure 2-1). The sea level values are relative to the MSL datum established at the station. The relative sea level trend is approximately 0.067 inches per year based on monthly mean sea level data from 1955 to 2019 which is equivalent to a change of approximately 0.56 feet over 100 years.

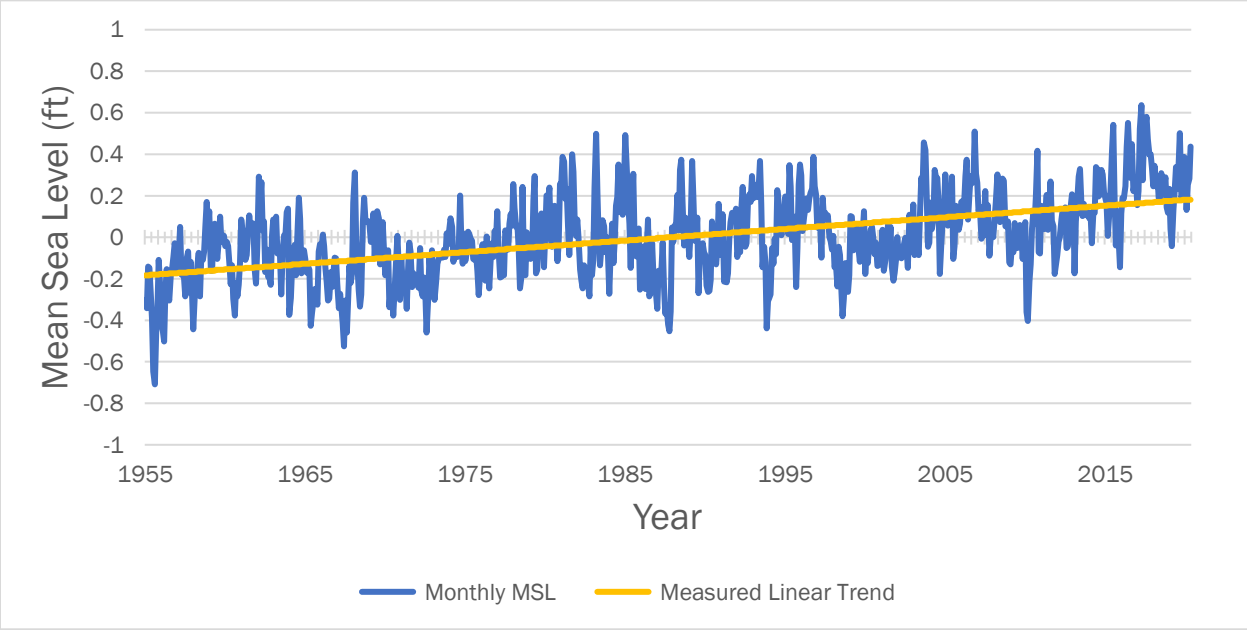

Figure 2-1 **Measured MSL Trends at Nawiliwili Station 1611400 (NOAA, 2017)**

2.3 Hawai‘i Sea Level Rise Predictions

The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) provides projections of global mean sea level rise for four GHG emissions scenarios (2014).These scenarios are called representative concentration pathways (RCPs). The RCPs describe possible climate futures based on how much GHGs are emitted.

The “business as usual” (RCP8.5) scenario is regarded as the most likely scenario and is used in modeling coastal hazards in the 2017 Hawai‘i Sea Level Rise Vulnerability and Adaptation Report. The RCP8.5 scenario predicts a rise of 0.5 feet in 2030, 1.1 feet in 2050, 2.0 feet in 2075, and 3.2 feet in 2100.

According to a 2017 NOAA report looking at the most up-to-date scientific literature on SLR projections, global mean SLR in the range of 6.4 feet to 8.8 feet is “physically plausible” by the end of this century. These high-end projections are based on observations and models of potential rapid ice melt in Greenland and Antarctica. Further, the 2017 NOAA report indicates that SLR in the area around Hawai‘i will exceed projections of global mean SLR due to mass and gravitational changes with the melting of the Greenland and Antarctic ice sheets.

The 2017 NOAA report provides six SLR scenarios ranging from “low” to “extreme” The predicted SLR scenarios for the state of Hawai‘i are presented in Table 2-2 and Figure 2-2 below.

Table 2-2: Hawai‘i Sea Level Rise Scenarios (adapted from NOAA, 2017)

Scenario (feet)	2000	2010	2020	2030	2040	2050	2060	2070	2080	2090	2100
Low	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.0	1.1	1.2	1.3
Int-Low	0.1	0.2	0.4	0.5	0.7	0.9	1.1	1.3	1.4	1.6	1.8
Intermediate	0.1	0.3	0.5	0.7	1.0	1.4	1.8	2.3	2.8	3.3	4.0
Int-High	0.1	0.4	0.6	0.9	1.4	2.0	2.6	3.4	4.3	5.2	6.4
High	0.1	0.4	0.7	1.1	1.8	2.5	3.5	4.6	5.9	7.2	8.9
Extreme	0.1	0.4	0.7	1.3	2.0	3.0	4.1	5.5	7.0	8.7	10.9

2.4 Sea Level Rise Anomalies

Hawai‘i is subject to periodic extreme tide events due to large oceanic eddies and other oceanographic phenomena that propagate through the islands. Mesoscale eddies produce tide levels that can be up to 0.5 feet higher than normal for periods up to several weeks (Firing and Merrifield, 2004). An additional temporary sea level rise on the order of 0.5 feet has also been associated with phenomena related to the El Niño / Southern Oscillation.

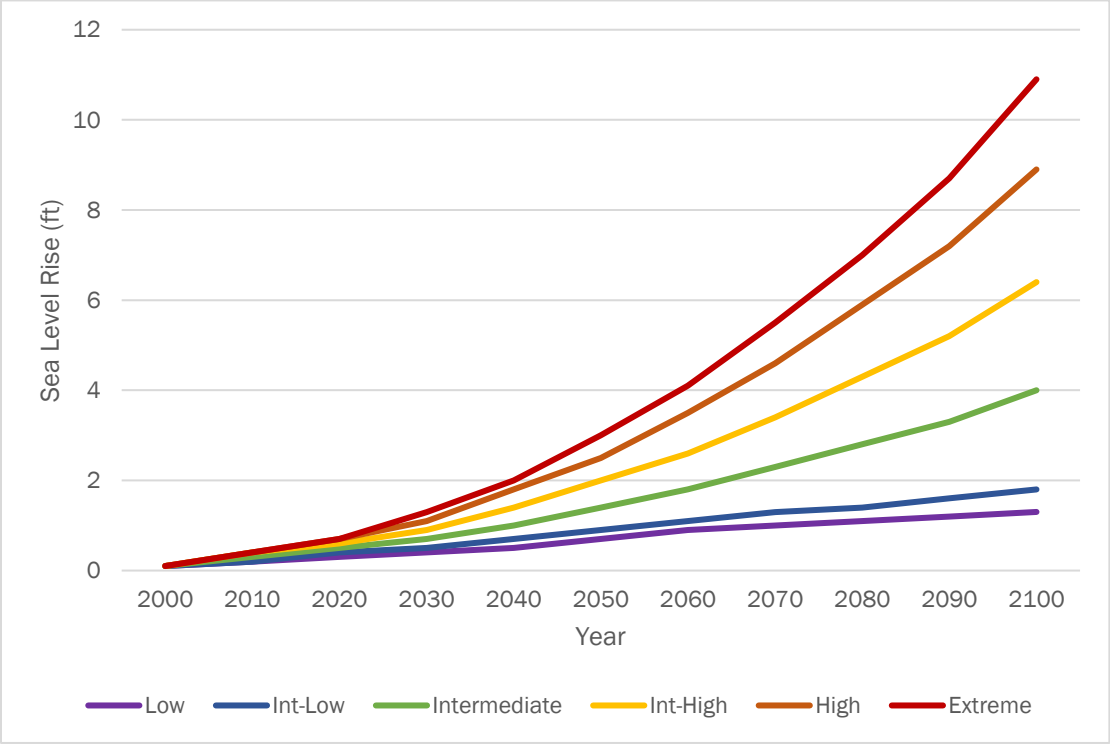

Figure 2-2 **Hawai'i Sea Level Rise Scenarios (adapted from NOAA, 2017)**

2.5 Coastal Hazards

2.5.1 Passive Flooding

SLR exposes coastlines to greater risks of flooding. Passive flooding includes marine flooding over the shoreline by still water flow into the lands that lie below the water level. It also depicts low-lying areas indirectly flooded by SLR through water table rise. Passive flooding is exacerbated by rainfall as it prevents drainage and as such, runoff and marine waters combine to produce larger impacts.

2.5.2 Wave Inundation

In addition to passive flooding, SLR allows more wave energy to reach the shoreline. This results in higher wave runup and overtopping of the beach berm that can cause flooding.

2.5.3 Storm Surge

When severe storms such as hurricanes move toward land from the ocean, low pressure and strong winds can push abnormally high water levels onto the coast. Along ocean coasts, storm surges can produce water levels much higher than normal high tide, resulting in extreme coastal and inland flooding.

Figure 2-3 shows the historical tracks of tropical storms and hurricanes in the central Pacific from 1949 to 2018. While direct hits to the Hawaiian Islands are rare, hurricane tracks to the north or south

of the islands are not infrequent and can generate large, damaging waves which can have impacts along the shorelines throughout Hawai'i. The historical tracks of hurricanes that have passed near the Hawaiian Islands from 1948 to 2018 are shown in Figure 2-4. The tracks of tropical storms and tropical depressions that have passed near Hawaii are shown in Figure 2-5.

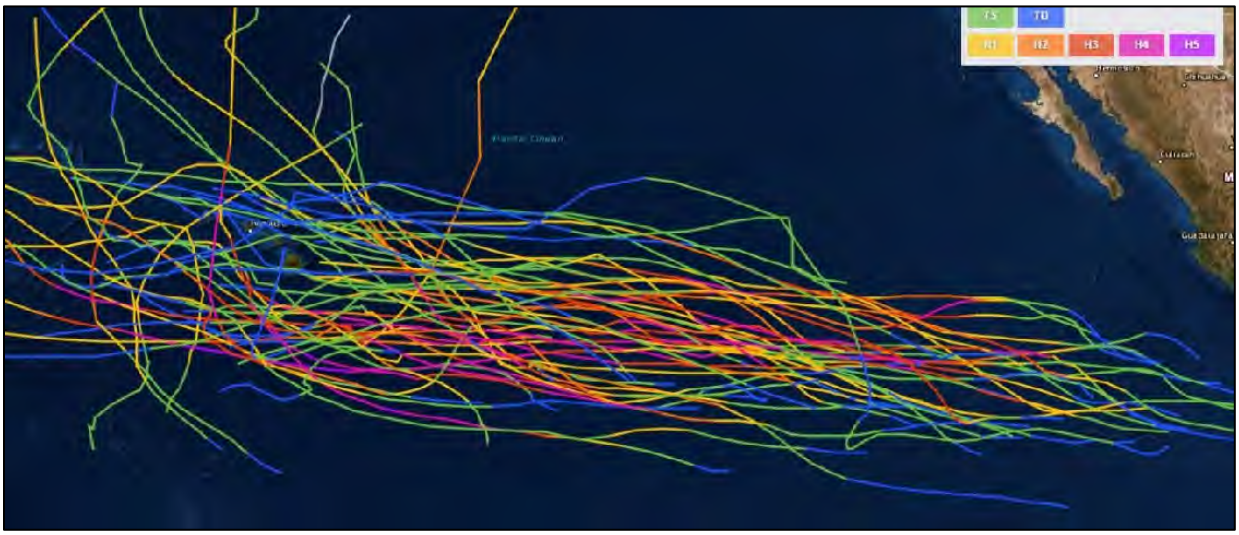

Figure 2-3 **Central Pacific Historical Hurriane Tracks (1949-2018)**

***Source:** https://coast.noaa.gov/hurricanes/

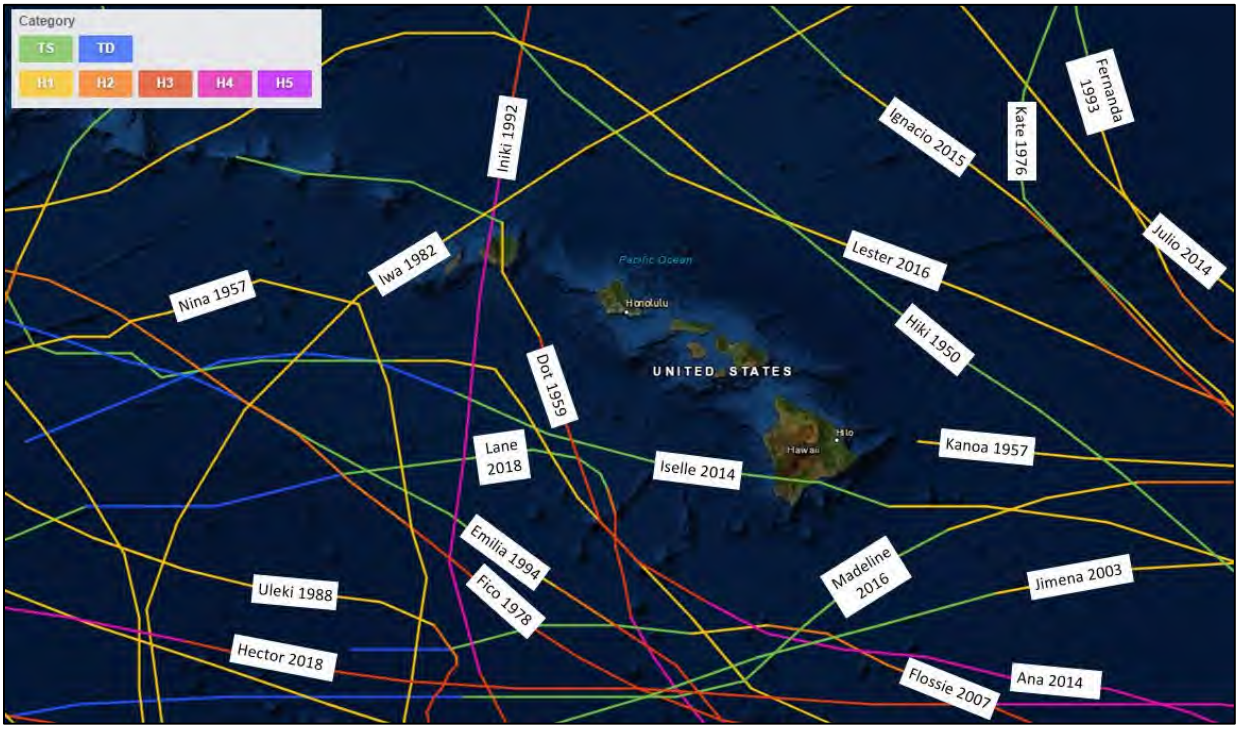

Figure 2-4 **Hawai'i Historical Hurricane Tracks (1949-2018)**

***Source:** https://coast.noaa.gov/hurricanes/

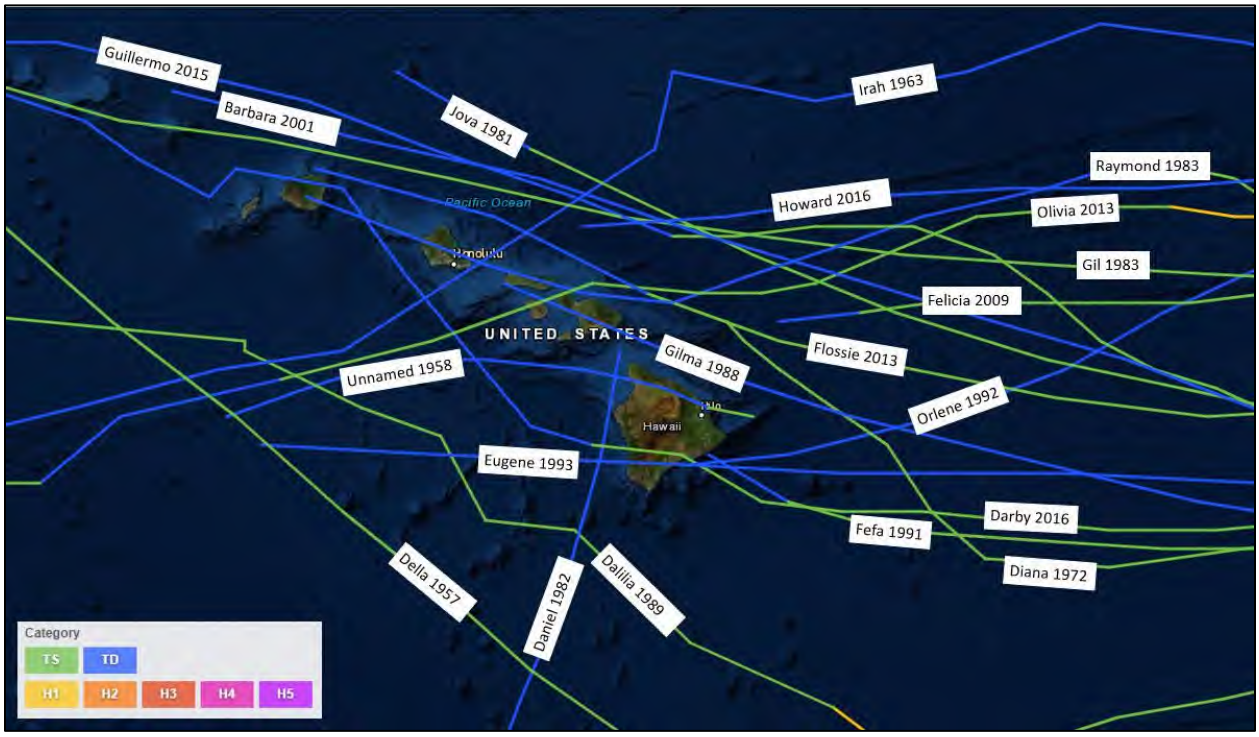

Figure 2-5 Hawai‘i Historical Tropical Storm and Depression Tracks (1949-2018)

***Source:** https://coast.noaa.gov/hurricanes/

2.5.4 COASTAL EROSION

Coastal erosion is the process by which local SLR, strong wave action, and coastal flooding wear down or carry away rocks, soils, and sands along the coast. Erosion threatens the integrity of structures and infrastructure located along the coast. Studies of historical shoreline change using aerial photographs and survey maps show that 70% of beaches on Kaua‘i, O‘ahu, and Maui shoreline are eroding (Fletcher et al. 2012).

2.5.5 SALTWATER INTRUSION

Saltwater intrusion is the movement of saline water into freshwater aquifers, which can lead to groundwater quality degradation. Saltwater intrusion decreases freshwater storage in the aquifers, and, in extreme cases, can result in the abandonment of supply wells.

2.6 Existing Conditions

2.6.1 FLOODING

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), the Project Area is located in Zone X, an area determined to be minimal flood risk (Figure 2-6). The site is not located within a FEMA Special Flood Hazard Area (SFHA).

The HoKua Place property is located atop a plateau mauka of the Kapa‘a Bypass Road. The southern border of the Property, along the Bypass Road, is elevated approximately 55 feet above MSL. The property rises in elevation to the northern border approximately 130 feet above MSL. The property is not vulnerable to flooding or subject to any flood regulations.

2.6.2 SEA LEVEL RISE EXPOSURE AREA

The Hawai‘i Sea Level Rise Vulnerability and Adaptation Report (2017) uses modeling to identify the potential exposure of each island to multiple coastal hazards resulting from SLR. Three chronic flooding hazards were modeled inclusive of passive flooding, annual high wave flooding, and coastal erosion. The footprints of these three hazards were combined to define the projected extent of chronic flooding due to SLR, called the sea level rise exposure area (SLR-XA). Each of these hazards were modeled for four future sea level rise scenarios: 0.5 feet, 1.1 feet, 2.0 feet and 3.2 feet based on the upper end of the IPCC AR5, RCP8.5, or “business as usual” sea level rise scenario.

The Project site is located entirely outside of the maximum 3.2 ft SLR-XA area (Figure 2-7). Much of the land located makai of the Project would be inundated with flooding. Although the Project would not be directly impacted by chronic flooding, it would likely be impacted indirectly by the inundation of the surrounding land.

2.6.3 SHORELINE CONDITIONS

The coastline along the Kapa‘a and Wailua region is composed primarily of carbonate sand interrupted by basalt headlands, hardened shoreline and boulder groins with a fringing reef offshore. This stretch of coast is experiencing chronic coastal erosion due to persistent tradewinds and rough seas throughout the year. On average, erosion is occurring at a rate of approximately -1.1 ft/year (Figure 2-8 and Figure 2-9). Although erosion will not impact the Project area directly within the next century, it could have indirect impacts to site access and infrastructure.

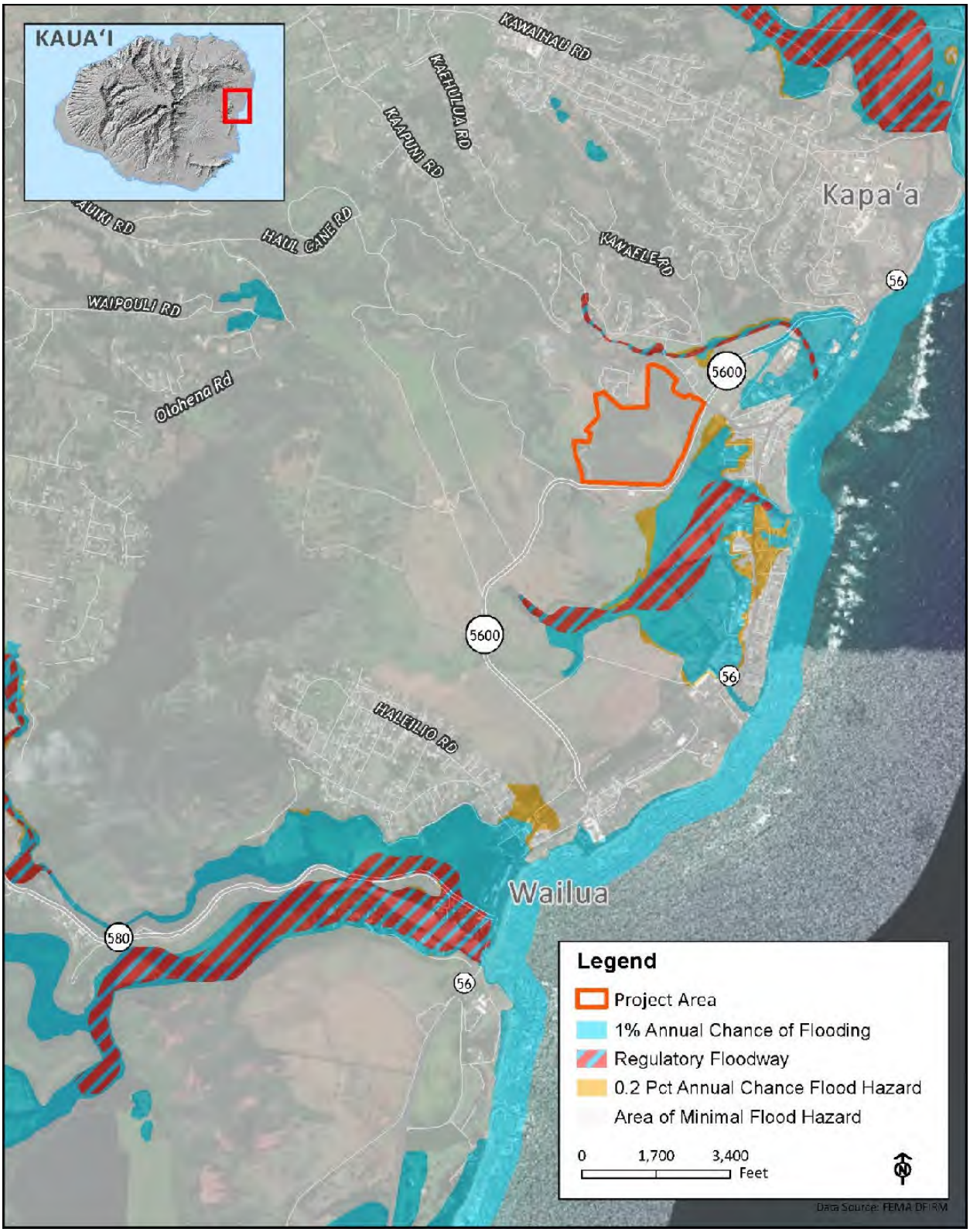

Figure 2-6 **FEMA Flood Insurance Map Designation, 1500020204F**

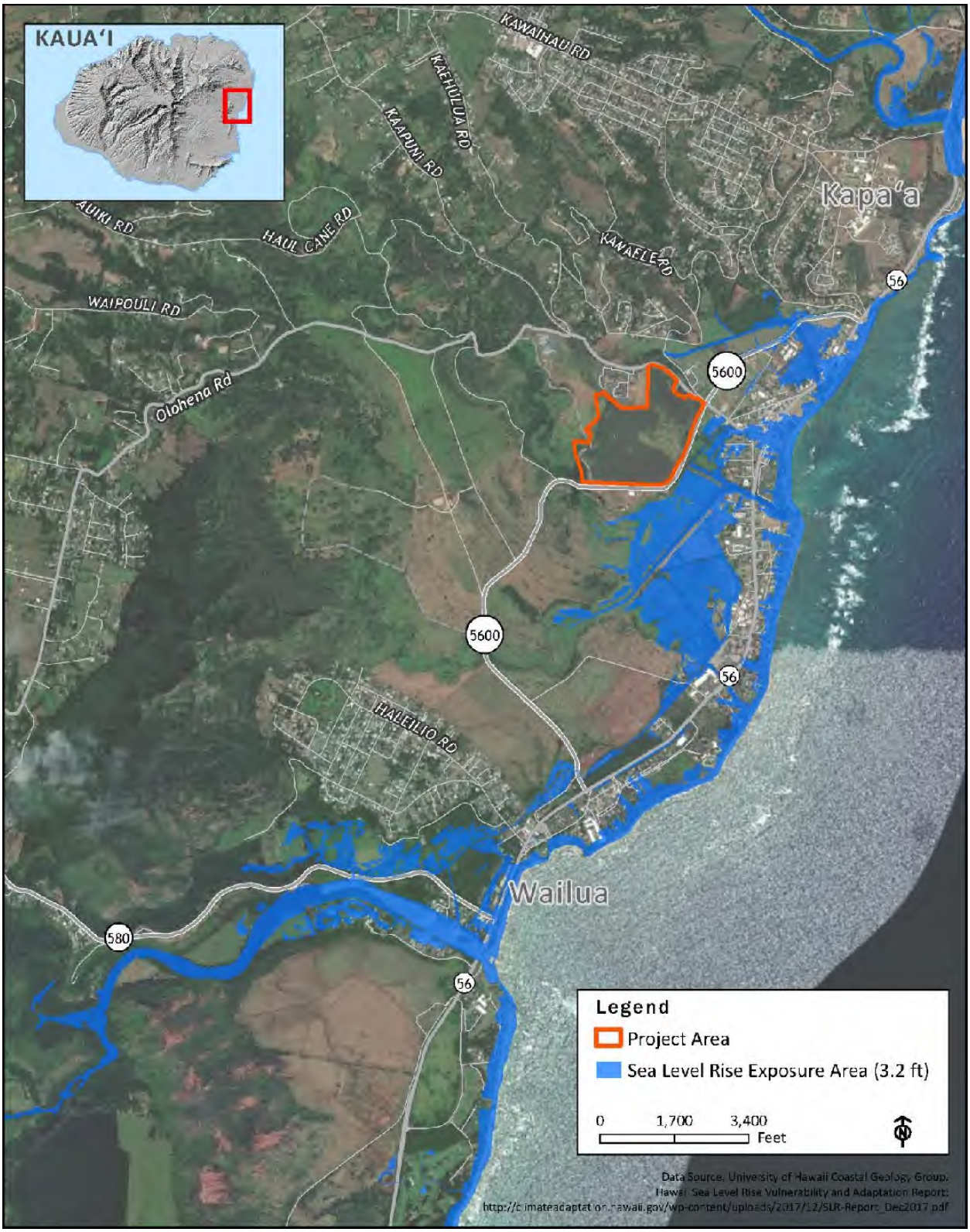

Figure 2-7 **Sea Level Rise Exposure Area (3.2 ft rise scenario)**

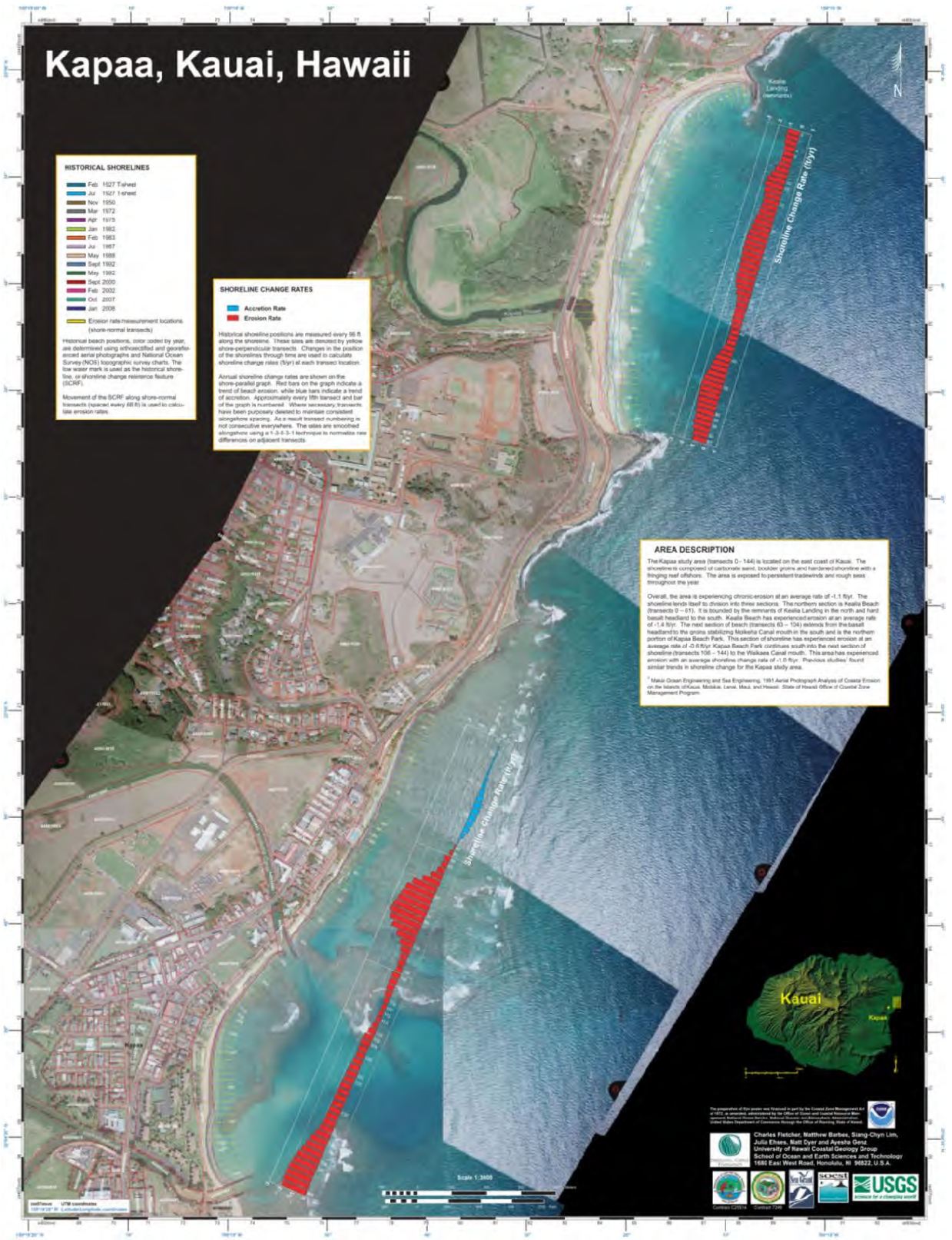

Figure 2-8 **Erosion Rates Along Kapa'a Coastline (Fletcher, 2009)**

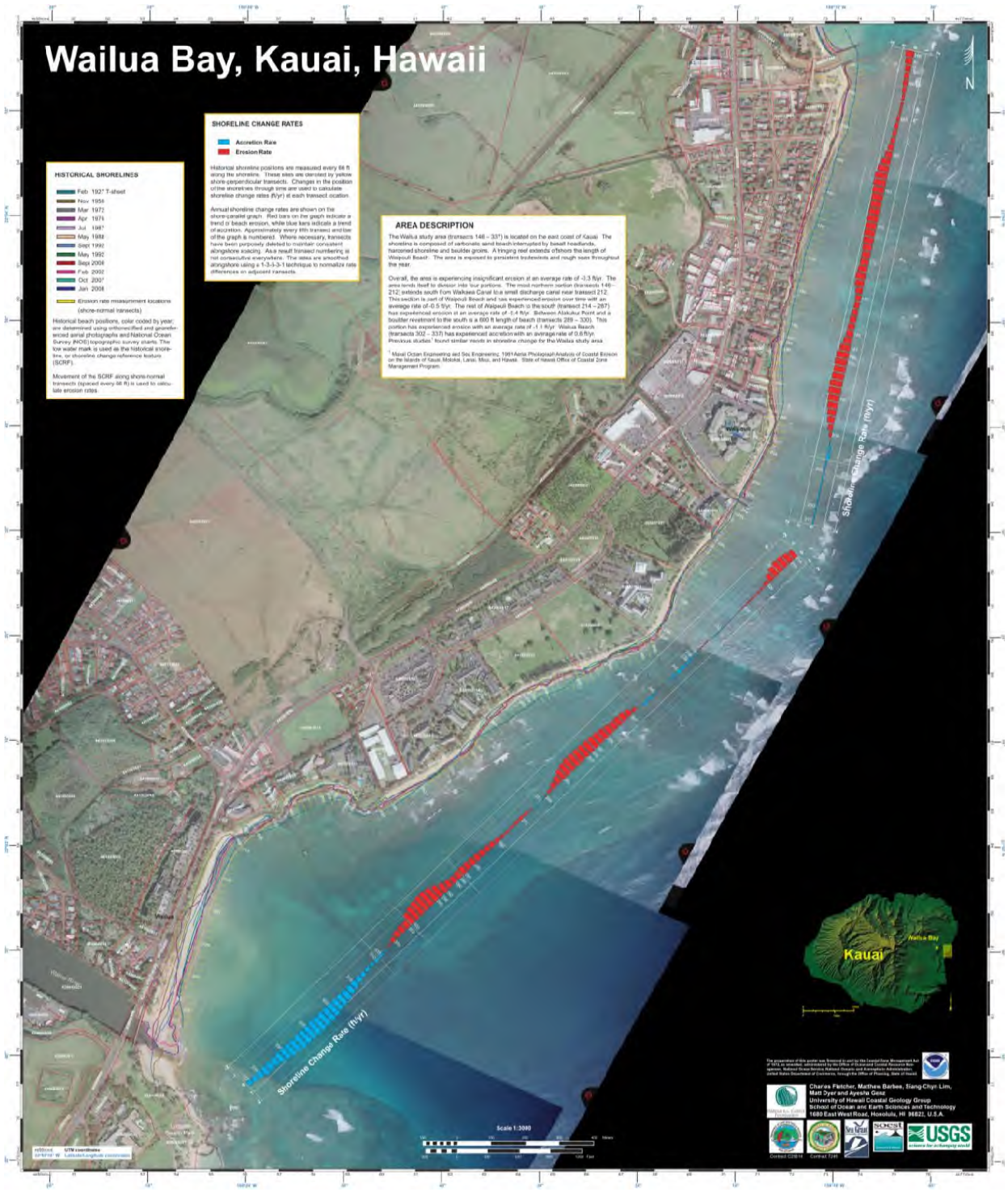

Figure 2-8 **Erosion Rates Along Wailua Coastline (Fletcher, 2009)**

Chapter 3

Regulatory Setting

3.1 Hawai‘i’s Climate Change Mitigation and Adaptation Initiative

In 2014, the Hawai‘i State Legislature passed the Hawai‘i Climate Adaptation Initiative Act (Act 83, Session Laws of Hawai‘i) declaring that climate change poses both an urgent and long-term threat to the state’s economy, sustainability, security, and way of life. This legislation created an Interagency Climate Adaptation Committee, housed within the State Department of Land and Natural Resources (DLNR), and called for the development of a statewide Sea Level Rise Vulnerability and Adaptation Report. This report, completed in December 2017, includes recommendations to reduce exposure to SLR along with recommendations to increase the state’s capacity to adapt. The report is also intended to serve as a model for future efforts to address other climate related threats and climate change adaptation priorities, ultimately leading to a Climate Adaptation Plan for the State of Hawai‘i.

3.2 Land Use Commission Rules HAR Chapter 15-15-50(c)

The Project has submitted a petition to LUC for a boundary amendment. The petition is to change the State’s Land Use District from Agricultural Land Use District to Urban Land Use District. Per HAR Chapter 15-15-50(c)(24): Application Requirements for Boundary Amendment Petitions*, the petitioner shall prepare a statement and analysis addressing* (A) *the impacts of SLR on the proposed development* and (D) *the location of the proposed development and the threat imposed to the proposed development by SLR, based on the maps and information contained in the Hawai‘i Sea Level Rise Vulnerability Adaptation report and the proposed mitigation measures taken to address those impacts.*

This SLR assessment has been developed in support of the Project’s petition for State Land Use District Boundary Amendment, and to satisfy the intent of HAR Chapter 15-15-50(c)(24).

3.3 Kaua‘i General Plan

The 2017 Kaua‘i General Plan expresses the island’s commitment towards mitigating the impacts of climate change and SLR. An overarching goal of the plan is to reduce the island’s overall carbon footprint by promoting higher density residential development near job centers and amenities, while strongly discouraging development that will require residents to commute via automobile to jobs in other areas of the Island. The Project’s goal of developing a sustainable residential community near the Kapa‘a town center is in alignment with this objective. Various planned elements inclusive of bicycle routes, pedestrian pathways, bus stops, and local destinations are designed to reduce automobile dependence and reduce vehicle miles traveled.

The General Plan outlines nine permitting actions and code changes aimed at minimizing the risk of coastal hazards associated with SLR.

1. Use the best available climate and hazard science to inform and guide decisions. Determine a range of locally relevant (context specific) sea level rise (SLR) projections for all stages of planning, project design, and permitting reviews. At the time of this General Plan Update publication, the science suggests planning targets of at least one foot by 2050 and three feet by 2100.

2. Regularly review and refine relevant policies, rules, and regulations based on the most currently available climate and hazard science and projections

3. Identify lands/areas that may serve as buffers from coastal hazards and restrict development within them.

4. Periodically update the shoreline setback and coastal protection article of the comprehensive zoning ordinance to allow for adjustments in the setback calculations based upon best-available SLR data.

5. Update the Floodplain Management Program to incorporate sea level rise planning information, utilizing options detailed in the Kaua'i Climate Change and Coastal Hazards Assessment or other relevant resources.

6. Within the special management area (SMA) and Zoning Permit program: (a) Require applicants to analyze coastal hazard impacts and include mitigation in permit applications; (b) impose development conditions upon permits that minimize the impacts of exacerbated flooding, storm surge, and erosion due to sea level rise; (c) strengthen rebuilding restrictions for nonconforming structures such that these structures are relocated a safe distance from the shoreline in hazardous areas; and (d) add conditions that prohibit shoreline armoring.

7. Update the subdivision standards to: (a) restrict residential subdivisions in areas prone to current and future coastal hazards, including sea level rise; (b) outside of these natural hazards areas, provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources.

8. Periodically update the building code to ensure that the standards for strengthening and elevating construction to withstand hazard forces in hazardous areas utilize the best available science and planning information.

9. When considering project alternatives during the environmental review process, evaluate relocation outside of hazardous areas, elevation of structures, and "soft" hazards such as beach nourishment. When considering environmental mitigation, incorporate climate resilience measures.

This SLR assessment supports the county's effort to determine the hazard risk to the planned Project and evaluates the SRL exposure area above the 3ft recommended planning target. The Project area is located entirely outside of the identified natural hazard areas and does not include any type of shoreline hardening. Structures will be constructed in compliance with state and county building codes and will be designed to withstand the anticipated hazard forces along the coastal region.

Chapter 4

Project SLR Analysis

For the planned HoKua Place project, sea level impacts to the property were estimated using the SLRXA model results presented in the 2017 Hawai'i Sea Level Rise Vulnerability Adaptation report (Figure 2-7). According to the SLRXA, the Project will not be inundated by flooding as a result of SLR. The Project's location was selected due to the proximity to the Kapa'a Town Center as well as its elevation above the hazard area and sufficient regional access.

4.1 Roadways and Access

The Project site is located at the mauka convergence of the Kapa'a Bypass Road and Olohena Road (State Highway 581). The Kapa'a Bypass Road, located south and east of the property, separates the Project site from the Kapa'a' town center. Olohena Road runs along and adjacent to the northern boundary of the property. Regional access to the site is primarily via Kūhīo Highway. The location of the Project site in the mauka area of Kapa'a has the benefit of avoiding the direct impacts of SLR and coastal erosion. With an elevation ranging between 55 ft to 130 ft, the Project area is well above the 3.2 ft projected SLR scenario (*Figure 2-7*).

The 2017 Hawai'i Sea Level Rise Vulnerability Adaptation report estimates that 6.5 miles of major roads island-wide would be flooded with 3.2 ft of sea level rise. This includes portions of Kūhīo Highway that could become chronically flooded and eroded away. This could result in wide-spread regional issues such as loss of commerce and increased traffic on other roads and highways.

Access to the Project site from Kūhīo Highway could be compromised by chronic inundation and erosion by 2100. Most of the flooding locally would be generated by passive flooding caused by groundwater inundation and spillover of the Waikāea Canal into low-lying areas mauka of Kūhīo Highway. It is possible that the Kapa'a Bypass Road could become the major inland roadway in the future. Olohena Road offers an additional route from Kapa'a to Wailua at an even higher elevation.

To ensure the continued usage of the existing Kapa'a Bypass Road, the Project will donate the area along the property frontage for State Department of Transportation (DOT) dedication and future improvements. Widening of the north leg of the Kapa'a Bypass Road between Olohena Road and Kūhīo Highway Place (North Junction) to provide at a two-way, two-lane roadway would provide additional capacity in the northbound direction.

To accommodate the potential for an increase in traffic on the surrounding roadways, the Project will construct a new connector road between the Kapa'a Bypass Road to Olohena Road above the Kapa'a Middle School. This new road is expected to mitigate the traffic impacts at the roundabout intersection of the Kapa'a Bypass Road and Olohena Road. A new roundabout will also be constructed at the intersection of the new road and the Kapa'a Bypass to increase intersection capacity in anticipation of the increase demand resulting from the future widening of the Kapa'a Bypass Road.

4.2 Drainage

The topography of the Project site varies from gently sloping, bluff top property, to steep areas that drop off into drainage gullies. A stream exists within the Project site flowing from north to south along the western border of the property. The stream flows along the boundary, passes under a bridge on the Kapa'a Bypass Road at the southwest corner of the property, and empties into the Waiākea drainage canal about 800 feet downstream from the property.

According to the Natural Resource Conservation Service (NRCS) soil survey the soils on the property are Ioleau and Puhi silt clay loams. The NRCS hydrologic classification for these soils is Group C for the Ioleau soils and Group B for the Puhi soils. Group B soils have a moderately low runoff potential, while the Group C soils have a moderately high runoff potential. Both soils are in Group I erosion resistance classification, which is the least erodible of the NRCS classifications.

SLR can push salty water upstream in coastal areas, threatening surface water supplies and ecosystems. According to the SLRXA model, the rising oceans will overwhelm the capacity of the Waiākea drainage canal causing overflow and inundation of the surrounding low-lying area. Portions of the land makai of the Project site could become chronically flooded by as early as 2050. If left unmitigated, this low-lying area could transform into a salt marsh environment

HoKua Place is committed to keeping the flow of the stream consistent to prevent any potential health and mosquito problems associated with streams when not flowing naturally. Per the County of Kaua'i's Storm Water Runoff System Manual (2001), all developments of this scope are required to maintain the existing storm water flows and patterns as feasibly possible so that downstream properties are not subject to any additional storm water flows that are created by the increases in impervious surfaces of the watershed by the proposed Project.

To mitigate the stormwater increases from the new neighborhood and streets, a variety of strategies utilizing practices of Low Impact Development (LID) and stormwater detention ponds will be integrated into the Project. The key component of LID is to minimize impervious surfaces on the property. The Project will cluster development to maximize use of flat areas on the property and not allow development in the natural drainageways. Greenbelts will be established surrounding the nature drainageway and infiltration will be enhanced through the use of bio-swales, trees, and detention basins.

Post construction Best Management Practices (BMPs) will be implemented to prevent storm water runoff and sedimentation from impacting coastal waters, groundwater resources, or newly formed marshlands resulting from elevated sea levels. The Project's drainage improvements include the installation of drain inlets and shallow drywells, landscaping, and grassing of disturbed areas. The water table is not expected to elevate to levels that could impact the on-site drywells or interfere with their ability to dispose of stormwater into the ground.

4.3 Water Supply

The source of water for the Project is in the Anahola Aquifer System. The state's 2019 updated Water Resource Protected Plan (WRPP) indicates a Sustainable Yield of 21 million gallons per day (MGD) for the aquifer. The WRPP of 2008 indicates that the pumpage for the Anahola Aquifer was at 2.8 MGD. The County of Kauai Department of Water Supply (DOW) assessment of demand for the Anahola Aquifer in 2014 stated that the demand for full built-out under the County Zoning is 5.5 MGD and for the General Plan 10.85 MGD.

The Project has proposed two alternatives to furnish potable water for the property. First, under the Project's Water Master Plan, the Project's well site will be dedicated to the DOW to furnish water to the Department's storage tanks and existing water system. In return, the Department will provide HoKua Place with storage for water. In the event the Department does not approve of the Project's Water Master Plan, then the petitioner will develop a private water system, using the well to furnish water to the Project.

With the implementation of either alternative, the onsite well and water delivery system will not be impacted with a 3.2 rise in SLR. The Project site is located at an elevation safety above the anticipated SLR exposure area. Although water pipes will be buried below ground level, the groundwater is not anticipated to rise to levels that could intrude utility trenches.

SLR, in combination with increased groundwater pumping, has the potential to increase saltwater intrusion into groundwater aquifers. When groundwater is pumped from a coastal aquifer, lowered water levels can cause seawater to be drawn toward the freshwater zones of the aquifer. Saltwater intrusion into groundwater aquifers can increase treatment costs for drinking water facilities or render groundwater wells unusable.

Geologic studies in the region have concluded that an impermeable layer of strata over 100 feet thick rest above the Anahola Aquifer. This underlying layer of dense rock could act as a natural barrier to saltwater intrusion. It will be important for the future well operator to routinely monitor and assess the groundwater resources. Water-quality monitoring networks are important to serve as early-warning systems of seawater movement toward freshwater supply wells, as well as providing information on the rates of seawater encroachment.

4.4 Wastewater

The Project will connect to the County's existing sewer system to be treated at the Wailua Wastewater Treatment Plant (WWTP). The WWTP is located in Wailua adjacent to the Lydgate Beach Park. The existing collection system is centered in the coastal area along the Kūhīo Highway and consists of gravity lines, pump stations, and force mains. The Project is not expected to adversely impact the capacity of the Plant.

As the Project site is located above the 3.2 ft SLR exposure area, there are no anticipated impacts to the on-site wastewater system, however, SLR could impact the county collection system and treatment plant. Wastewater treatment plants are often located at low elevations near the coastline to minimize the cost of collecting wastewater and discharging treated effluent. The location of the collection system and treatment plant along the active eastern coastline make it potentially vulnerable to future nuisance flooding and storm surge.

To mitigate potential impacts to the County wastewater system, the HoKua Place Project will be contributing funds to upgrade the deferred maintenance and repairs to the WWTP. Improvements may include elevating or waterproofing pump stations or other facilities to protect them from flooding and storm surge. It will also be important to monitor sewer infiltration and inflow as it could change from groundwater level fluctuations. It may be necessary to implement pipe lining in susceptible areas to reduce that infiltration into gravity sewers.

4.5 Power and Communications

The Kaua‘i Island Utility Cooperative (KIUC) is the sole electric utility on Kuau‘i, serving over 23,300 customers. According to the Kaua‘i General Plan, the Kawaihau region is served via a tap off the mauka transmission line that connects the Wainiha Hydroelectric Plant with Port Allen. This tap provides power via the Kapa‘a Switchyard at Kapa‘a Town and other developed coastal areas. The Kapa‘a Switchyard is also linked to the Lydgate Substation and the Līhu‘e Switchyard. Numerous cell towers across the island provide cellular phone service to the area. The Project site will also be served by Hawaiian Telcom telephone lines.

There currently are high voltage electrical lines around part of the Project area’s perimeter. Strong hurricane or tropical storm force winds can topple electrical lines and lead to power outages and wildfire risk. The Project will replace these electrical lines with underground lines thru the Project.

Although SLR will not directly impact power or communication infrastructure at the Project site, flooding of electric and telecommunication transmission lines along the coast could result in service disruptions. Incorporating renewable energy systems and energy conservation measures at the Project site will help mitigate potential service disruptions that arise from SLR.

The Project is designed to be a sustainable residential community that incorporates photovoltaic (PV) systems and other on-site renewable energy sources. Energy conservation and efficiency measures will also be implemented and emphasized where applicable. Energy-efficiency technologies to be considered include:

- Solar energy for water heating
- Photovoltaic systems, fuel cells, biofuels and other renewable energy sources
- Optimal utilization of daytime sunlight
- High efficiency light fixtures
- Roof and wall insulation, radiant barriers and energy efficient windows
- Optimized airflow
- Installation of heat resistant roofing
- Intelligent Landscaping to provide for shading, dust control, and heat-mitigation
- Portable solar lighting (i.e. parking lots)

The Project is also designed to share a portion of the electrical infrastructure with the HoKua Farm Lots, an adjoining agricultural community. To date, the HoKua community has already been developed with an operational four-acre solar facility on the adjacent Farm Lots. The PV system spreads over five acres and includes 5,376-solar panels mounted on posts and piers. The system produces 1.18 megawatts of energy that feeds into the KIUC distribution grid.

4.6 Conclusions

Overall, the Project site is an ideal location for accommodating Kaua'i's growing housing demand while anticipating and adapting to the threats of SLR. The Project is not anticipated to experience direct impacts from SLR, however indirect impacts could occur due to flooding and erosion of the nearby coastal area. These impacts will be mitigated through the Project's design elements and through funding for public road and infrastructure improvements.