

**APPENDIX B**  
**TRAFFIC ASSESSMENT REPORT**

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# TRAFFIC ASSESSMENT REPORT

## **NĀ PUA MAKANI WIND FARM**

Kahuku, O'ahu, Hawai'i

Tax Map Keys: 5-6-006:018, 047, 051, 055, 5-6-005:018, and 5-6-008:006

January 2015

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Prepared for:

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2014-33-1000

# 1 INTRODUCTION

This report summarizes the analysis and findings of a traffic assessment for the Nā Pua Makani Wind Farm. This traffic assessment describes the potential traffic impacts during construction and when the project is completed under seven (7) different scenarios, which are based upon the type and quantity of wind turbine generators (WTG) that could be installed.

## 2 PROJECT DESCRIPTION

The Nā Pua Makani Wind Farm project (Project) is located at the northeast coast of O‘ahu, in Kahuku Town, Tax Map Key (TMK) 5-6-006:018, 047, 051, 055, 5-6-005:018, and 5-6-008:006. See Figure 1 – Location Map. The 707 acre project area is approximately 9,000 feet inland from the coast on a steep sloping ridge with elevations ranging from 13- to 400-feet above mean sea level. There are two proposed access points to the project site off the mauka side of Kamehameha Highway; one will be off an existing paved road owned by the State of Hawai‘i, Department of Agriculture, just south of Ki‘i Stream Bridge (Proposed Access 1) and the other off a private dirt road between Enos Road and the Mālaekahana Stream Bridge (Proposed Access 2).

Three alternatives evaluated in the Project EIS: Alternative 1 – No Action, Alternative 2 – Proposed Action Wind Project of up to 10 turbines (up to approximately 25 megawatts (MW)), and Alternative 3 – Larger Generation Wind Project of up to 12 turbines (up to 42-MW). Under Alternative 1, there will be no new construction of wind turbines, meteorological towers, supporting structures, and access roadways. Thus, the main focus of this report will only discuss Alternative 2 and 3.

Alternative 2 entails the construction and operation of an approximately 25 MW wind generation facility, consisting of 8 to 10 wind turbines, meteorological tower, operations and maintenance facility, electrical collections system, transmission line, and 16 foot-wide internal access roads. This alternative evaluates construction traffic impacts for three different scenarios (scenarios 1-3), each of which use a specific WTG. Construction would begin in the fourth quarter of 2016 and would be in full operation by the end of 2017. In response to public comments, the Project proponent also evaluated a Modified Proposed Action option (Scenario 2a), which reduces the maximum number of turbines to 9 based on usage of an uprated Siemens turbine model with greater generating capacity. All other project components and details would be the same as under the Proposed Action. The following lists the quantity and models to be evaluated under all 4 scenarios.

Scenario	WTG Manufacturer	Model	Quantity
1	General Electric (GE)	GE 2.85-103	10
2	Siemens	3.0-108	10
2a	Siemens	3.3-130	9
3	Vestas	V110	3
		V117	5

Alternative 3 entails the construction and operation of an approximately 42 MW wind generation facility, consisting of up to 12 wind turbines, meteorological tower, operations and maintenance

facility, electrical collections system, transmission line, and 16-foot-wide access roads using compacted gravel. It evaluates the impacts for a phased build out plan, whereby phase 1 would begin construction on one of the scenarios by 2016 similar to Alternative 2; then phase 2 would construct additional WTG's of the same manufacturer. Construction of the second phase would start at the beginning of 2020 with operation of those WTGs starting towards the end of 2020. The following lists the number and model of each WTG constructed in each phase for the four scenarios.

Scenario	WTG Manufacturer	Model	Phase 1 Quantity	Phase 2 Quantity	TOTAL
1	General Electric (GE)	GE 2.85-103	10	2	12
2	Siemens	3.0-108	10	2	12
2a	Siemens	3.3-130	9	0	9
3	Vestas	V110 V117	3 5	0 4	12

### 3 EXISTING TRAFFIC CONDITIONS

Kamehameha Highway (Highway 83) is a two-lane undivided State highway that provides the only access around the north side of O'ahu from Hale'iwa to Kahalu'u. The lanes on this highway are 12' wide and have mostly grassed shoulders with some paved shoulders. Posted speed limits along the roadway vary between 25 and 45 miles per hour (mph) and generally have lower speed limits near towns and schools. The posted speed limit at the entrance to the project site is 35 mph.

Existing traffic volume data was retrieved from the State of Hawai'i Department of Transportation (HDOT), which collects 24-hour traffic count volumes at various locations throughout the island. The nearest HDOT count station to the project site is along Kamehameha Highway at the Mālaekahana Stream bridge and was conducted in 2013. The following table provides the morning and afternoon peak hour volumes as well as the 24 hour volumes at this station. The morning peak hour was between 7:00 to 8:00 a.m. and the afternoon peak was between 3:45 and 4:45 p.m.

#### Existing 2013 Traffic Counts

Time	Total Traffic Volume (Both Directions)
AM Peak Hour (7:00 – 8:00 a.m.)	1,095
PM Peak Hour (3:45 – 4:45 p.m.)	1,012
24 hour	12,187

Source: State of Hawai'i, Department of Transportation, Highways Division.

Traffic volumes taken by HDOT on previous years are also included in Appendix A and shows that the 2013 data is in line with previous years. The morning peak has also been consistent, while the afternoon peak is trending later. The 24 hour volumes are also showing the modest increase in traffic over the 12 years of available data.

## 4 FUTURE BASELINE TRAFFIC CONDITIONS

Future baseline conditions have been established for the year 2017 and 2020, when full operations of the project alternatives are expected. Based on the O’ahu Regional Transportation Plan, other Traffic Impact Reports obtained from projects in the area, and the historical HDOT traffic data the average regional traffic for Kahuku is expected to increase 1.23% annually. Therefore, the future baseline traffic volumes, which are also considered Alternative 1, at the Mālaekahana Bridge are anticipated to be the following:

**Future Baseline Traffic**

<b>Time</b>	<b>2017 Total Traffic Volume (Both Directions)</b>	<b>2020 Total Traffic Volume (Both Directions)</b>
AM Peak Hour (7:00 – 8:00 a.m.)	1,150	1,193
PM Peak Hour (3:45 – 4:45 p.m.)	1,063	1,102
24 Hour	12,797	13,275

## 5 PROJECT TRAFFIC

The proposed project would generate vehicle traffic on roadways in the vicinity throughout the estimated 6 to 12 month construction period as well as once the WTGs are in full operation. Access to the project site is from the mauka side of Kamehameha Highway just south of Ki’i Stream Bridge (Proposed Access 1) as well as just north of the Mālaekahana Stream Bridge (Proposed Access 2). The first 5 WTG’s would likely use the access just south of Ki’i Stream Bridge, while the rest of the WTG’s would utilize the access north of Mālaekahana Stream Bridge.

### 5.1 CONSTRUCTION RELATED TRAFFIC

Construction related traffic to build the proposed project would include the transporting of the major components to build the WTGs from Kalaeloa Harbor, hauling in cement and aggregate for the foundations, other miscellaneous deliveries, and employee related traffic.

The major components to build the WTGs include the blade, tower, nacelles, and electrical transformer. These will be transported by sea and offloaded at Kalaeloa Harbor, which is a heavy lift berthing facility located on the Western Coast of O’ahu. Due to the size and weight of these components permits to transport these oversized and/or overweight loads would need to be obtained from both HDOT and the City and County of Honolulu. The following are anticipated requirements of the permit:

- The roundtrips must be performed Monday through Saturday between the hours of 9:00 p.m. and 5:00 a.m. with all equipment off the roadways between the hours of 5:00 a.m. and 9:00 p.m.
- No oversized loads are allowed to be transported on Sundays or holidays.
- A minimum of 4 police escorts per load are required to help the oversized load navigate turns.

- Police escorts and/or flagmen must provide traffic direction at the entrance to the wind farm site during construction.

The following is a table noting the number of nighttime roundtrips and how many days it would take in order to get all the equipment to the project site.

### Anticipated Nighttime Roundtrip Oversized Truck Trips

Alternative	Construction Related Oversized Truck Trips between 9 p.m. to 5 a.m.	Total Days
Alternative 1 – No Action	0	0
Alternative 2 – 10 GE WTGs	100	20
Alternative 2 – 10 Siemens WTGs	90	18
Alternative 2 – 8 Vestas WTGs	77	16
Alternative 2a – 9 Siemens WTGs	108	22
Alternative 3 – 12 GE WTGs	Phase 1 – 100 Phase 2 – 20	Phase 1 – 20 Phase 2 – 4
Alternative 3 – 12 Siemens WTGs	Phase 1 – 90 Phase 2 – 20	Phase 1 – 18 Phase 2 – 4
Alternative 3 – 12 Vestas WTGs	Phase 1 – 77 Phase 2 – 40	Phase 1 – 16 Phase 2 – 8

Note: Assume an average of 5 truck trips could be made each day.

Three proposed routes from Kalaeloa Harbor to the project site were identified by ATS International in transporting the WTG's oversized nacelle component, the tower section or nacelle components, and the blade components (see Figure 2 – Proposed Truck Routes).

The following directions for route 1 would be used to transport the oversized nacelle components, which would be transported using a 19-axel trailer. In their January 2016 route study update ATS concluded that this route could be eliminated unless a 19 axel truck is required to transport a part, otherwise the tower and nacelle parts could utilize route 2.

1. Continue straight out of the Grace Pacific gate onto Hanua Street
2. Turn left on Kauhi Street toward Kalaeloa Boulevard
3. Turn left on Kalaeloa Boulevard
4. Merge onto H-1 East
5. Take Exit 5 to Kunia Waipahu/'Ewa
6. Turn left onto Kunia Road
7. Continue on Kunia Road to Wilikina Drive
8. Turn left on Wilikina Drive
9. Turn right on Kamananui Road
10. Continue north on Kamehameha Highway
11. Continue on Kamehameha Highway to Joseph P. Leong Highway (Highway 99)
12. Continue on Highway 99 to Kamehameha Highway East (Highway 83)

13. Continue on Highway 83 to proposed entrance to the wind farm

The following direction for route 2 would be used to transport the taller tower section and nacelle components.

1. Continue straight out of the Grace Pacific gate onto Hanua Street
2. Turn left on Kauhi Street toward Kalaeloa Boulevard
3. Turn left on Kalaeloa Boulevard
4. Merge onto H-1 East
5. Continue on H-1 East and stay in the right lane
6. Take Exit 8C for Kamehameha Highway North
7. Turn right on Ka Uka Boulevard
8. Turn left onto H-2 North
9. Continue on H-2 North to Wilikina Drive
10. Continue on Wilikina Drive to Kamananui Road
11. Turn right on Kamananui Road
12. Continue north on Kamehameha Highway
13. Continue on Kamehameha Highway to Joseph P. Leong Highway (Highway 99)
14. Continue on Highway 99 to Kamehameha Highway East (Highway 83)
15. Continue on Highway 83 to proposed entrance to the wind farm.

And finally, the following directions for route 3 would be used to transport the wind turbine blade components.

1. Continue straight out of the Grace Pacific gate onto Hanua Street
2. Turn left on Kauhi Street toward Kalaeloa Boulevard
3. Turn left on Kalaeloa Boulevard
4. Merge onto H-1 East
5. Continue on H-1 East and stay in the left lane to merge onto the H-2 North
6. Take Exit 8B for H-2 North to Mililani and Wahiawā
7. Continue on H-2 North to Wilikina Drive
8. Continue on Wilikina Drive to Kamananui Road
9. Turn right on Kamananui Road
10. Continue north on Kamehameha Highway
11. Continue on Kamehameha Highway to Joseph P. Leong Highway (Highway 99)
12. Continue on Highway 99 to Kamehameha Highway East (Highway 83)
13. Continue on Highway 83 to the proposed entrance to the wind farm.

Transport of the oversized components would require tree trimming, sign relocation, and overhead utility lines adjustments in order to provide a clear route. ATS has identified Kalaeloa Boulevard, Kauhi Street, Ka Uka Boulevard, and Kamehameha Highway as having trees that may need trimming to a clearance height minimum of 16 feet and 6 inches prior to transport of the equipment. The left turn onto Kamehameha Highway at Kamananui Road, the left turn onto Wilikina Drive, and the right turn at Ka Uka Boulevard would require police escorts to block traffic

in order for the truck to make the turns. Additionally, based upon the type of WTG chosen, some temporary roadway improvements like asphalt curb removal, guardrail relocation, or relocation of a traffic signal and roadway signs may be required since transport dimensions of each part vary by manufacturer and model. After all deliveries are made all temporary improvements shall be restored to previous existing conditions. ATS also recommended that prior to transport of the oversized components that a “high pole” survey be conducted to confirm and identify any new trees or wires that need to be trimmed or raised, respectively, that were not identified in their January 2016 report.

ATS was also informed by HDOT that the Paumalu Bridge along Kamehameha Highway near Sunset Beach had been derated and no overweight loads would be allowed to cross the structure. Per further discussions with HDOT a longer truck with more axels to spread the load or a structural analysis on the bridge would need to be analyzed further for use of the Paumalu Bridge. At the access roads to the proposed site additional improvements to the entrance roadways to clean,fill, and smooth out the grades would be needed along with tree trimming.

Traffic estimates that include passenger vehicles, such as those due to construction workers arriving or departing the work site, as well as cement or aggregate deliveries, and building component or substation deliveries were developed based upon estimated quantities for materials. Cement and aggregate deliveries would come from Hālawā, while other deliveries are also expected to originate from Honolulu. Construction workers are also expected to work between the hours of 7:00 a.m. and 3:30 p.m. with approximately 90% arriving to the site before the morning peak hour and the remaining 10% during the peak. It was also assumed that approximately 90% of the construction trips would occur just before the pm peak hour at 3:30 p.m. when they would be leaving work and 10% during the peak. During daylight hours the following average and maximum daytime round trips are anticipated during construction for all scenarios of Alternatives 2 and 3.

### Anticipated Average Daytime Trips

Construction Trips	Average Number of Round Trips Per Day	AM Peak Hour Trips (7-8am)	PM Peak Hour Trips (3:45-4:45pm)
Cement	50	5	5
Aggregate	50	5	5
Substation	1	0	0
Building Components	2	1	0
Miscellaneous Deliveries	1	0	0
Construction Workers	40	4	4
<b>TOTAL TIRPS</b>	<b>144</b>	<b>15</b>	<b>14</b>

Note: Assumed 10% of the daytime truck trips would occur during the peak hours.

## Anticipated Maximum Daytime Trips

Construction Trips	Average Number of Round Trips Per Day	AM Peak Hour Trips (7-8am)	PM Peak Hour Trips (3:45-4:45pm)
Cement	50	5	5
Aggregate	50	5	5
Substation	1	0	0
Building Components	2	1	0
Miscellaneous Deliveries	1	0	0
Construction Workers	100	10	10
<b>TOTAL TIRPS</b>	<b>154</b>	<b>21</b>	<b>20</b>

Note: Assumed 10% of the daytime truck trips would occur during the peak hours.

Assuming the rate at which the WTGs are constructed is the same for 2016 and 2019, all scenarios in both alternatives would have similar anticipated average and maximum daytime construction trips. The following table provides a comparison of the anticipated volumes to the baseline traffic volumes in the morning and afternoon peak hours and for a 24 hour period for construction in 2017 and 2020.

### Percentage of Peak Project Construction Trips to Baseline Traffic

Time	2017	2020
AM Peak Hour (7:00 – 8:00 a.m.)	1.8%	1.8%
PM Peak Hour (3:15 – 4:15 p.m.)	1.9%	1.8%
24 Hour	2.4%	2.3%

Based upon the HDOT’s Best Practices for Traffic Impact Reports (TIR), a typical trigger for preparing a TIR is 100 or more new peak hour trips or 500 daily trips. Based upon the trip numbers calculated and the percentage of the total traffic along Kamehameha Highway, the project will not meet this trigger and is therefore not expected to cause a significant impact.

## 5.2 PROJECT TRAFFIC

When the WTGs are in full operation there will be approximately three to six full time operations and maintenance employees on the site. Their typical work hours would be between 7:00a.m. and 5:00 p.m. and at the most would result in 6 round trips per day. These employees were estimated to be sufficient manpower to handle daily maintenance for up to 12 WTGs on the site. Their total daily trips would account for less than 0.6% of the future 2017 and 2020 traffic loads on Kamehameha Highway for all alternatives.

## Percentage of Project Trips to Baseline Traffic

Time	2017	2020
AM Peak Hour (7:00 – 8:00 a.m.)	0.52%	0.50%
PM Peak Hour (3:45 – 4:45 p.m.)	0.56%	0.54%
24 Hour	0.09%	0.09%

## 6 CONCLUSION

The proposed project will result in minor construction related impacts due to the transportation of large equipment and materials. The net effects of these impacts were found to be minimal because the oversized WTG components would be delivered at night. A less than 3% increase in traffic on Kamehameha Highway due to construction during the morning and afternoon peaks would not result in a significant increase and would be temporary. Project related traffic once the WTGs are in full operation is also not expected to have any significant impacts to Kamehameha Highway due to the low volume of employees that would access the site. The following table summarizes the traffic impacts showing the percentage of project trips to the estimated base year traffic volumes.

### Summary of Impacts – Percentage of Project Trips to Baseline Traffic

		Alternative 1 No Action	Alternative 2 (All 4 scenarios)	Alternative 3 (All 4 scenarios)
Construction Impacts	AM Peak	0	1.8%	Phase 1 – 1.8% Phase 2 – 1.8%
	PM Peak	0	1.9%	Phase 1 – 1.9% Phase 2 – 1.8%
	24 Hour	0	2.4%	Phase 1 – 2.4% Phase 2 – 2.3%
Project Impacts	AM Peak	0	0.53%	Phase 1 – 0.52% Phase 2 – 0.50%
	PM Peak	0	0.57%	Phase 1 – 0.56% Phase 2 – 0.54%
	24 Hour	0	0.09%	Phase 1 – 0.09% Phase 2 – 0.09%

## 7 REFERENCES

Anderson Trucking Services, Inc, *Nā Pua Makani Transport Route Review*, June 6, 2014.

Anderson Trucking Services, Inc, *Nā Pua Makani Wind Farm*, January 19, 2016.

Hawai'i Department of Transportation, *Hawaii Department of Transportation Best Practices for Traffic Impact Reports*, May 2011.

O'ahu Metropolitan Planning Organization, *Oahu Regional Transportation Plan 2035*, April 2011.

The Traffic Management Consultant, *Revised Traffic Impact Analysis Report for the Proposed Turtle Bay Resort Master Plan*, November 2012, amended May 2013.

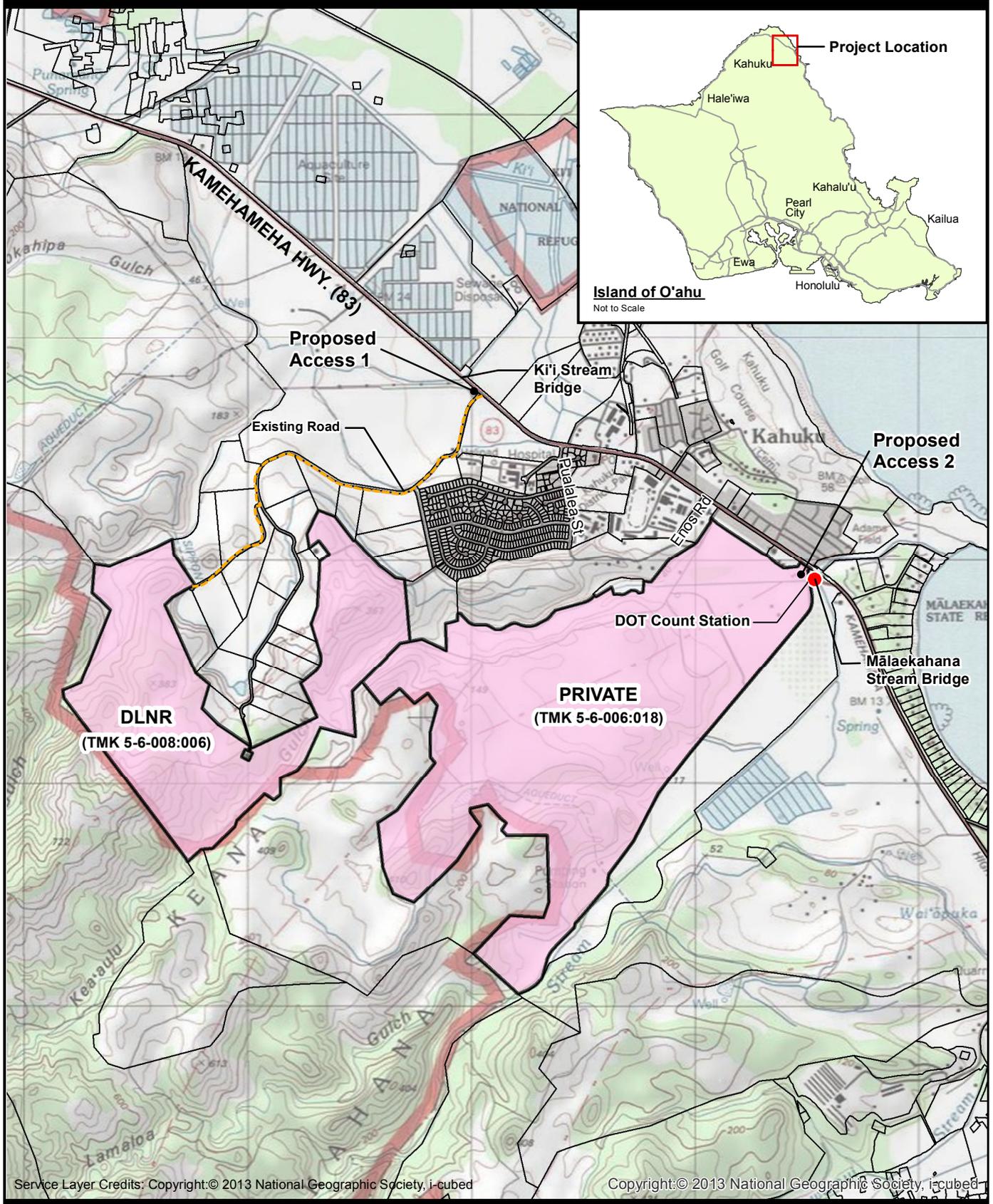
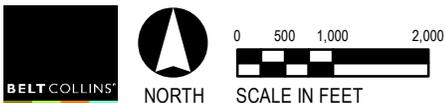
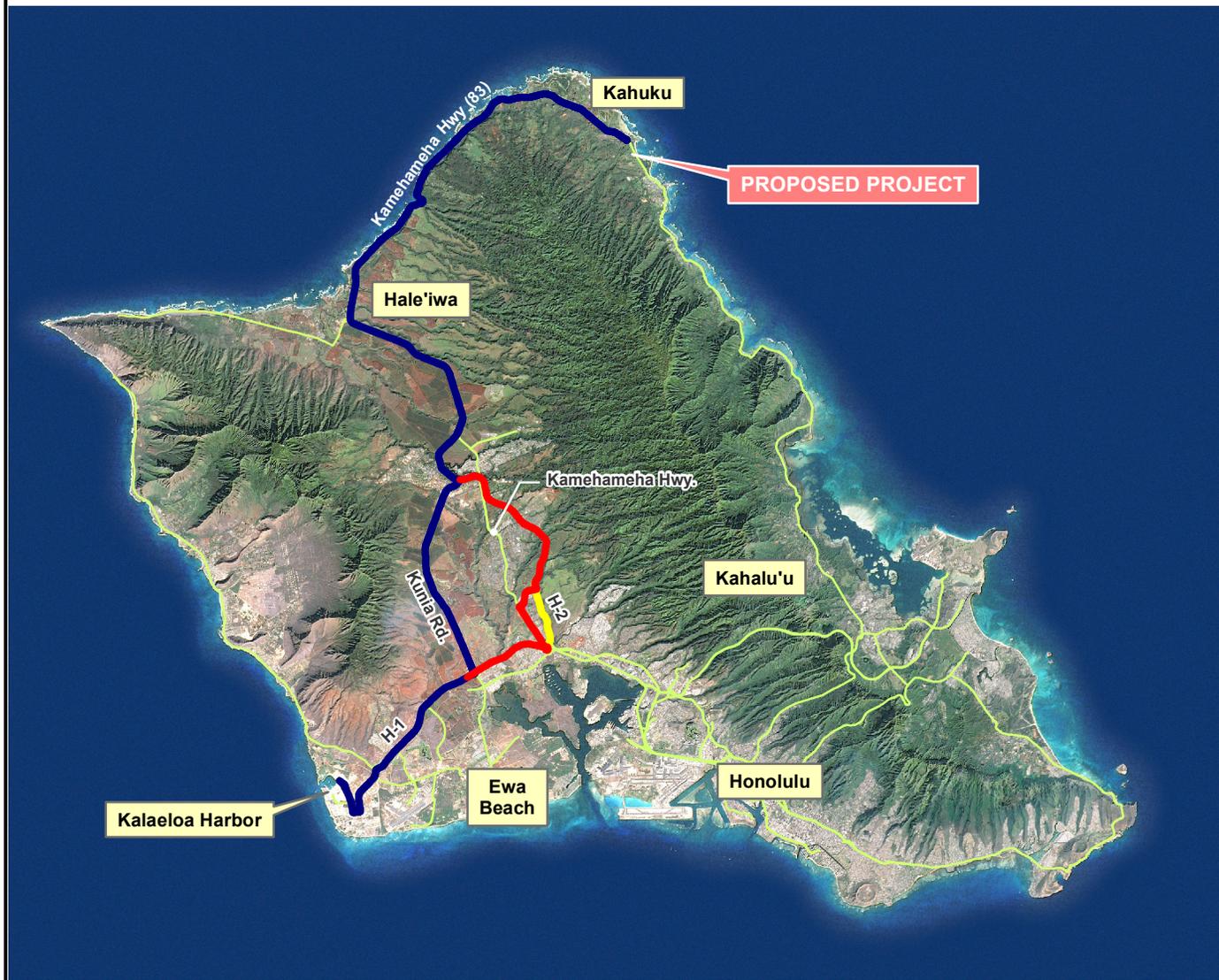


Figure 1  
LOCATION MAP

Nā Pua Makani Wind Farm  
Champlin Hawaii Wind Holdings LLC  
January 2015



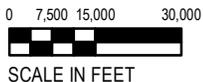


**LEGEND**

-  Route 1
-  Route 2
-  Route 3

**Figure 2**  
**PROPOSED TRUCK ROUTES**

Nā Pua Makani Wind Farm  
Champlin Hawaii Wind Holdings LLC  
January 2015



# **APPENDIX A – DOT TRAFFIC COUNT DATA**

<b>BELT COLLINS</b>	PROJECT:	Nā Pua Makani Wind Farm			JOB NO:	2014-33-1000	
	CLIENT:	Champlin Hawaii Wind Holdings LLC			DATE:	7-May-14	
	SUBJECT:	DOT Count Data			BY:	LN	
	FILE:	M:\Na Pua Makani Wind Farm\2014331000 Traffic Study\05 Basis of Design\Reference Docs\DOT Traffic Count Stations\DOT Count Data.xlsx\Malaekahana Bridge					
Site ID:	B72008301618, 26-E						
Location:	Kamehameha Highway at Malaekahana Bridge						
	AM Peak		PM Peak		24 Hour		
YEAR	Volume	Peak Hour	Volume	Peak Hour	Volume	Rate/year	
2001	617	n/a	764	n/a	9,240		
2004	685	n/a	1,018	n/a	11,340	7.6%	
2005	845	n/a	1,070	n/a	12,112	6.8%	
2006	654	n/a	934	n/a	10,867	-10.3%	
2007	689	7:00am	865	3:00pm	10,640	-2.1%	
2009	875	7:15am	944	3:15pm	10,943	1.4%	
2011					12,200	5.7%	
2012	1,055	7:00am	1,014	3:30pm	12,335	1.1%	
2013	1,095	7:15am	1,012	3:45pm	12,187	-1.2%	
					Average growth per year=	1.1%	