Memorandum

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Project: HUX069

To: Shane Phillips

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Subject: Trip Generation and Operational Analysis for the Redwood Marine Terminal Replacement Project

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To support the initial design efforts of the project team, W-Trans has prepared an analysis of circulation system needs relative to the proposed Redwood Marine Terminal Replacement project adjacent to the unincorporated community of Samoa in the County of Humboldt. The purpose of this letter is to address the potential need for modifications to the intersection of New Navy Base Road/Cookhouse Road with construction of the proposed project but without the planned buildout of Samoa as well as the controls needed at Vance Avenue/Cookhouse Road based on this analysis.

Project Background

Previous Analysis

W-Trans previously assessed a version of this project in *Samoa Industrial Waterfront Transportation Access Plan*, July 2013, including intersection operation under the following scenarios:

- Existing 2013
- Future 2033
- Existing plus Samoa Town Plan
- Existing plus Samoa Town Plan plus Industrial Waterfront Development
- Future plus Samoa Town Plan
- Future plus Samoa Town Plan plus Industrial Waterfront Development

Installation of a traffic signal system or conversion to a roundabout was recommended for New Navy Base Road/Cookhouse Road under Existing or Future conditions with the Samoa Town Plan and Industrial Waterfront Development. It was concluded that the intersection would operate acceptably under Existing or Future conditions without or with the Samoa Town Plan alone. Existing or Future conditions with the project but without the Samoa Town Plan were not assessed.

Existing Conditions

The intersection of New Navy Base Road/Cookhouse Road is a tee intersection with stop control on the Cookhouse Road approach and no controls on the New Navy Base Road approaches. There is a through lane in each direction on New Navy Base Road in addition to separate right-turn and left-turn lanes onto

Cookhouse Road and acceleration lanes from Cookhouse Road onto New Navy Base Road in both directions. There is one approach and one departure lane on Cookhouse Road. A copy of Figure 1 from the Samoa Town Master Plan EIR is enclosed for reference; New Navy Base Road/Cookhouse Road is Intersection 2.

Project Description

The proposed project would result in the construction of manufacturing facilities for the fabrication of offshore wind turbines as well as port facilities to transport the completed turbines via ship. The project is split into multiple phases, with Phase 1 comprising site access improvements, Phase 2 consisting of one or two vessel berths and some manufacturing, and Phases 3 and 4 resulting in the construction of one additional berth and the remainder of the manufacturing space. As specific information regarding the anticipated building space each phase would occupy was uncertain, the trip estimate was instead based on anticipated employee counts. Based on the data provided, it is assumed that Phase 1 would result in zero permanent employees, Phase 2 would have 150 employees, and completion of Phases 3 and 4 would increase the total to 324 employees, for a net increase of 174 employees over Phase 2. It is noted that these employment levels were used for estimating purposes; it is anticipated that the number of employees would change as the design of the project becomes more detailed.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 11th Edition, 2022 for "Manufacturing" (ITE LU 140). The expected trip generation potential for the proposed project is indicated in Table 1. Upon completion of all phases, the proposed project is expected to generate an average of 814 trips per day, including 104 trips during the a.m. peak hour and 101 during the p.m. peak hour.

Table 1 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Proposed											
Phase 2	150 employees	2.51	377	0.32	48	35	13	0.31	47	17	30
Phases 3+4	174 employees	2.51	437	0.32	56	41	15	0.31	54	20	34
Total	**324 employees**		**814**		**104**	**76**	**28**		**101**	**37**	**64**

It is noted that the 2013 iteration of this analysis used "Waterport/Marine Terminal" (ITE LU 10) from the 8th Edition of the *Trip Generation Manual*; however, this land use was eliminated in subsequent editions of the Manual. The previous analysis was based on 110 a.m. peak hour and 106 p.m. peak hour trips; therefore, it was concluded that the updated land use and assumed employment totals are reasonable as the total trip generation of Phases 2 through 4 is within a few trips of what was used in the previous analysis.

Operational Analysis

New Navy Base Road/Cookhouse Road

In lieu of collecting new counts, the Future 2033 volumes from the *Samoa Industrial Waterfront Transportation Access Plan* were used to conservatively approximate "Existing" conditions given that these projected volumes would account for an additional 11 years of background growth, whereas actual volumes likely increased less than anticipated given the effects of the COVID-19 pandemic.

For New Navy Base Road/Cookhouse Road, the Phase 2 traffic was assumed to route between New Navy Base Road and the project site via Cookhouse Road, while the traffic for Phases 3 and 4 was assumed to use LP Drive. This means that at New Navy Base Road/Cookhouse Road, Phase 2 inbound trips were assigned to the westbound left-turn movement and outbound trips to the northbound right-turn movement, and Phase 3 and 4 inbound trips were assigned to the westbound through movement and outbound trips to the eastbound through movement.

Operations at New Navy Base Road/Cookhouse Road were assessed under Existing conditions without the project, with the addition of Phase 2 traffic, and with the addition of traffic from Phases 2 through 4 using the "Two-Way Stop-Controlled" intersection capacity method from the *Highway Capacity Manual*, 6th Edition, 2017. This methodology determines a level of service for each minor turning movement by estimating the level of average delay in seconds per vehicle. Results are presented for individual movements together with the weighted overall average delay for the intersection in Table 2.

Table 2 – Intersection Levels of Service

Study Intersection ***Approach***	**Existing Conditions**				**Existing plus Phase 2**				**Existing plus Phases 2-4**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
New Navy Base Rd/ Cookhouse Rd	2.9	A	1.6	A	3.6	A	2.6	A	3.1	A	2.3	A
NB (Cookhouse Rd) Approach	9.0	A	9.1	A	*9.0*	*A*	*9.2*	*A*	*9.1*	*A*	*9.4*	*A*

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Findings – New Navy Base Road/Cookhouse Road would operate at LOS A under the assumed Existing volumes without the project, with the addition of traffic associated with Phase 2 of the project, or with full buildout of Phases 2 through 4. This includes the overall intersection operations as well as the northbound approach of Cookhouse Road.

Other Intersections and Roadways

Consideration was also given to the controls needed at the intersection of Vance Avenue/Cookhouse Road (Intersection 17 in the enclosed graphic). While volumes for this intersection were not available from the prior analysis, the volumes on Cookhouse Road were estimated based on those at its intersection with New Navy Base Road. Upon adding trips associated with the project to either the northeast or southeast approaches indicates that the intersection could operate acceptably with all-way stop-controls.

Construction of a roundabout at this location would not be warranted to accommodate project-generated trips.

Similarly, it is anticipated that the intersections internal to the Town of Samoa could accommodate any project-generated traffic in their current or planned configurations, without needing additional lanes or controls as a result of the project. It is noted that truck trips associated with the project would not be expected to affect the street network in the Township as they would be restricted to the routes directly into and out of the site.

Roadways serving the project were evaluated to determine the minimum cross-section required under the County's standards. The General Plan adopted in 2017 indicates that a rural collector street should have 12-foot lanes and either 5-foot bike lanes plus a 4-foot shoulder or else an 8-foot shoulder (Ch. 7, Page 7-17, Table 7-B). This translates to a minimum width of 40 feet assuming the 8-foot shoulder. For those roadways providing access to the site for trucks, a minimum width of 40 feet is therefore recommended.

Conclusions and Recommendations

- The project would be expected to generate 377 daily trips upon completion of Phase 2, including 48 trips during the a.m. peak hour and 47 trips during the p.m. peak hour. With full buildout of Phases 2 through 4, the project would be anticipated to generate 814 daily trips, including 104 morning peak hour trips and 101 evening peak hour trips.

- The intersection of New Navy Base Road/Cookhouse Road would operate acceptably under Existing volumes. With the addition of traffic for only Phase 2 or for Phases 2 through 4, the intersection would continue to operate acceptably.

- No modifications to the intersection of New Navy Base Road/Cookhouse Road are warranted to accommodate project-generated trips. It is suggested that the need for future improvements be addressed as development assumed in the Samoa Town Plan is proposed.

- Use of all-way stop controls at the intersection of Vance Avenue/Cookhouse Road can reasonably be expected to result in acceptable operation until such time as there is a substantial amount of new development in the Town of Samoa.

- The remaining intersections in the Town of Samoa are expected to operate adequately as either existing or proposed in the Master Plan.

- A minimum width of 40 feet is recommended for the roadways providing truck access to the site.

Thank you for giving W-Trans the opportunity to provide these services. Please call if you have any questions.

DJW/krc/HUX069.M1

Attachments: Figure 1, Level of Service Calculations

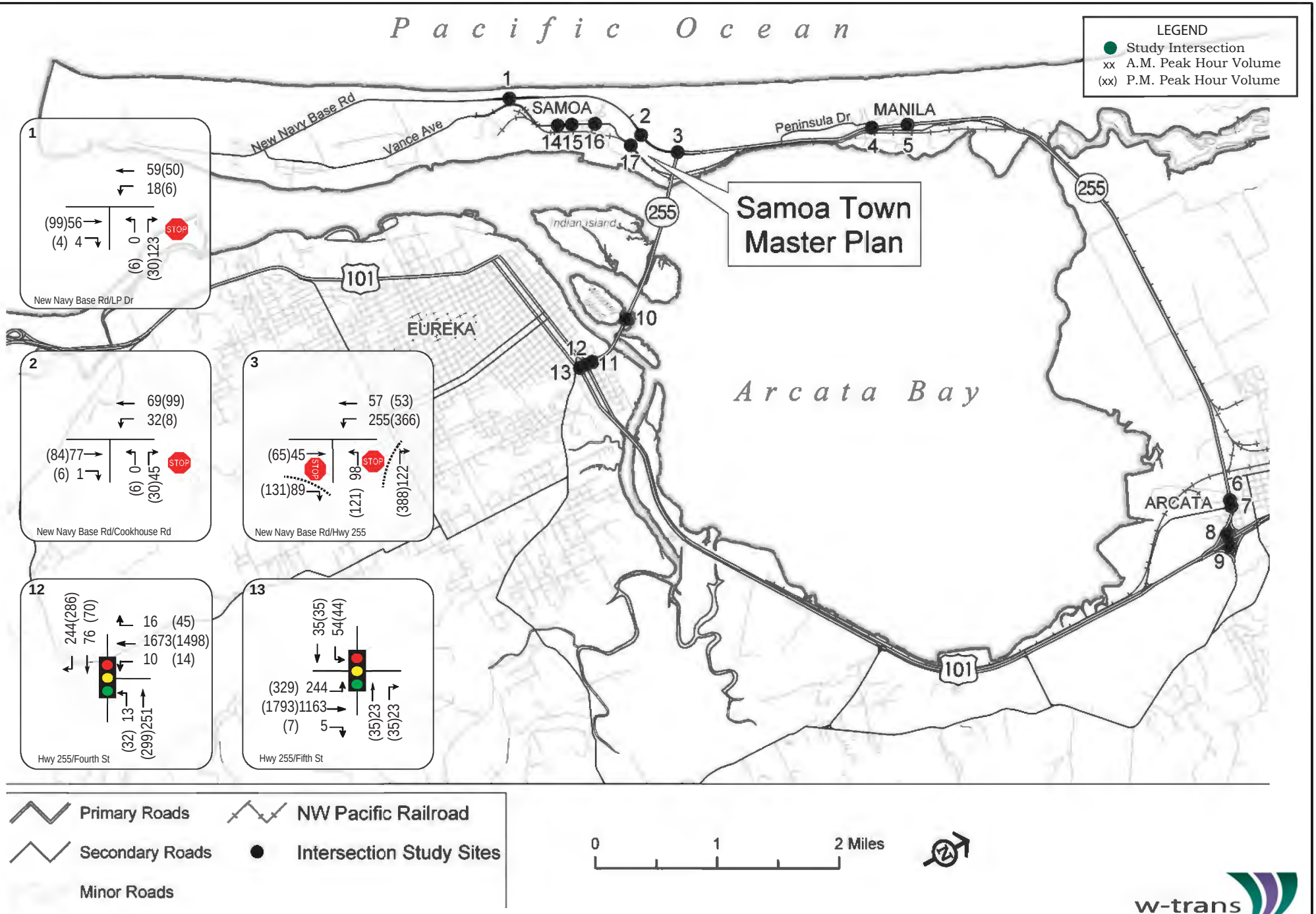

Figure 1 Existing 2013 Traffic Volumes

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	238	0	0	0	0	0	0	13	0	0	35	377
Future Vol, veh/h	238	0	0	0	0	0	0	13	0	0	35	377
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	238	0	0	0	0	0	0	13	0	0	35	377
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.6	0	8.1	10.5
HCM LOS	B	-	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	100%	0%	0%
Vol Thru, %	100%	0%	100%	8%
Vol Right, %	0%	0%	0%	92%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	13	238	0	412
LT Vol	0	238	0	0
Through Vol	13	0	0	35
RT Vol	0	0	0	377
Lane Flow Rate	13	238	0	412
Geometry Grp	1	1	1	1
Degree of Util (X)	0.018	0.332	0	0.462
Departure Headway (Hd)	4.992	5.015	5.151	4.033
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	715	714	0	894
Service Time	3.039	3.068	3.218	2.054
HCM Lane V/C Ratio	0.018	0.333	0	0.461
HCM Control Delay	8.1	10.6	8.2	10.5
HCM Lane LOS	A	B	N	B
HCM 95th-tile Q	0.1	1.5	0	2.5

Intersection	
Intersection Delay, s/veh	12.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	434	0	0	0	0	0	0	30	0	0	17	242
Future Vol, veh/h	434	0	0	0	0	0	0	30	0	0	17	242
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	434	0	0	0	0	0	0	30	0	0	17	242
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.3	0	8.7	9.7
HCM LOS	B	-	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	100%	0%	0%
Vol Thru, %	100%	0%	100%	7%
Vol Right, %	0%	0%	0%	93%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	30	434	0	259
LT Vol	0	434	0	0
Through Vol	30	0	0	17
RT Vol	0	0	0	242
Lane Flow Rate	30	434	0	259
Geometry Grp	1	1	1	1
Degree of Util (X)	0.045	0.578	0	0.325
Departure Headway (Hd)	5.357	4.791	5.147	4.514
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	664	751	0	795
Service Time	3.425	2.848	3.232	2.556
HCM Lane V/C Ratio	0.045	0.578	0	0.326
HCM Control Delay	8.7	14.3	8.2	9.7
HCM Lane LOS	A	B	N	A
HCM 95th-tile Q	0.1	3.7	0	1.4