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Figure 3-11
OFFSITE SEWER SYSTEM
CONCEPTS B & C—LA'IO'OPUA ROUTE

Keahuolu Affordable Housing
Civil Infrastructure
December 2007

Appendix A

Roads

**HHFDC Keahuolu Lands
Off-Site Road System Costs**

OFF-SITE ROAD SYSTEM

Item No.	Estimated Quantity	Description	Unit Price	Total
<u>Ane Keohokalole Highway</u>				
1- 1	1	Lump Sum, Clearing and Grubbing	\$ 40,000.00	\$ 40,000
1- 2	1	Lump Sum, Water Pollution and Erosion Control Measures	\$ 200,000.00	\$ 200,000
1- 3	83,000	Cu. Yds., Excavation	\$ 43.00	\$ 3,569,000
1- 4	83,000	Cu. Yds., Embankment	\$ 29.00	\$ 2,407,000
1- 5	17.2	Acres, Grading	\$ 8,000.00	\$ 137,600
1- 6	186,800	Sq. Ft., AC Pavement for Roadways	\$ 8.00	\$ 1,494,400
1- 7	4,670	Lin. Ft., Concrete Curb	\$ 30.00	\$ 140,100
1- 8	4,670	Lin. Ft., Concrete Curb and Gutter	\$ 60.00	\$ 280,200
1- 9	44,365	Sq. Ft., 4" Concrete Sidewalk with Base Course	\$ 12.70	\$ 563,436
1- 10	6	Each, Centerline Monuments	\$ 600.00	\$ 3,600
1- 11	1	Lump Sum, Striping and Marking	\$ 20,000.00	\$ 20,000
1- 11	30	Each, Sign, Post and Footing	\$ 450.00	\$ 13,500
1- 11	1	Lump Sum, Traffic Signal Modification	\$ 200,000.00	\$ 200,000
1- 11	16	Each, Catch Basin with Dry Well	\$ 20,000.00	\$ 320,000
1- 11	16	Each, Dry Well	\$ 12,000.00	\$ 192,000
1- 11	16	Each, Drain Inlet and piping	\$ 8,000.00	\$ 128,000
1- 11	1	Lump Sum, Traffic Control	\$ 30,000.00	\$ 30,000
1- 11	1	Lump Sum, Construction Surveys	\$ 40,000.00	\$ 40,000
1- 12	1	Lump Sum, Mobilization/Demobilization	\$ 100,000.00	\$ 100,000
		Subtotal for Ane Keohokalole Highway		\$ <u>9,878,836</u>
		Contingency (20%)		\$ 1,975,767
		Subtotal		\$ 11,854,603
		Design and Construction Services (15%)		\$ 1,778,190
		Total		\$ 13,632,793
		SAY		\$ 13,633,000

Note: 4,670 Linear feet of Ane Keohokalole Highway.
For water and sewer improvements, see separate costs.

**HHFDC Keahuolu Lands
Off-Site Road System Costs**

OFF-SITE ROAD SYSTEM

Item No.	Estimated Quantity	Description	Unit Price	Total
<u>Palani Road Intersection</u>				
1- 1	1	Lump Sum, Clearing and Grubbing	\$ 7,000.00	\$ 7,000
1- 2	1	Lump Sum, Water Pollution and Erosion Control Measures	\$ 15,000.00	\$ 15,000
1- 3	0	Cu. Yds., Excavation	\$ 43.00	\$ 0
1- 4	1,700	Cu. Yds., Embankment	\$ 29.00	\$ 49,300
1- 5	1.7	Acres, Grading	\$ 8,000.00	\$ 13,600
1- 6	59,500	Sq. Ft., AC Pavement for Roadways	\$ 8.00	\$ 476,000
1- 7	2,000	Lin. Ft., AC Curb	\$ 20.00	\$ 40,000
1- 8	3	Each, Centerline Monuments	\$ 600.00	\$ 1,800
1- 9	1	Lump Sum, Striping and Marking	\$ 15,000.00	\$ 15,000
1- 10	10	Each, Sign, Post and Footing	\$ 450.00	\$ 4,500
1- 11	7	Each, Dry Well	\$ 12,000.00	\$ 84,000
1- 12	1	Lump Sum, Traffic Control	\$ 150,000.00	\$ 150,000
1- 13	1	Lump Sum, Construction Surveys	\$ 10,000.00	\$ 10,000
1- 14	1	Lump Sum, Mobilization/Demobilization	\$ 80,000.00	\$ 80,000
		Subtotal for Palani Road Intersection		\$ 946,200
		Contingency (20%)		\$ 189,240
		Subtotal		\$ 1,135,440
		Design and Construction Services (15%)		\$ 170,316
		Total		\$ 1,305,756
		SAY		\$ 1,306,000

Notes: 1,410 Linear Feet of new Acceleration and Deceleration Lanes with
12' Median with AC curbs
10' AC paved shoulder
8' AC paved swale
Taper = 150', Deceleration = 275', Storage = 50'
Curve Radius = 150'
Acceleration = 360', Taper = 300'

**HHFDC Keahuolu Lands
On-Site Road System Costs**

ON-SITE ROADS

Item No.	Estimated Quantity	Description	Unit Price	Total
<u>On-Site Roads</u>				
1- 1	5,600	Lin. Ft., 80' Right-of-Way Roads	\$ 2,250.00	\$ 12,600,000
1- 2	24,200	Lin. Ft., 60' Right-of-Way Roads	\$ 1,930.00	\$ 46,706,000
1- 3	16,550	Lin. Ft., 50' Right-of-Way Roads	\$ 1,790.00	\$ 29,624,500
		Subtotal for On-Site Roads		\$ <u>88,930,500</u>
		Contingency (20%)		\$ 17,786,100
		Subtotal		\$ 106,716,600
		Design and Construction Services (15%)		\$ 16,007,490
		Total		\$ 122,724,090
		SAY		\$ 122,725,000

Notes: Lengths of On-Site Roads based on Keahuolu Land Use Plan Concept, dated June 2007.
Cost is 2007 dollars

**HHFDC Keahuolu Lands
On-Site Road System Costs**

Item No.	Estimated Quantity	Description	Unit Price	Total
80' Right-of-Way Roads				
2- 1	1	Lin. Ft., Clearing and Grubbing	\$ 32.14	\$ 32.14
2- 2	1	Lin. Ft., Erosion Control Measures	\$ 48.21	\$ 48.21
2- 3	1	Lin. Ft., Roadway Excavation/Embankment	\$ 200.00	\$ 200.00
2- 4	1	Lin. Ft., Roadway Pavement	\$ 480.00	\$ 480.00
2- 5	1	Lin. Ft., Concrete Curb and Gutter	\$ 60.00	\$ 60.00
2- 6	1	Lin. Ft., Concrete Sidewalk	\$ 133.50	\$ 133.50
2- 7	1	Lin. Ft., Signing, Striping and Marking	\$ 8.08	\$ 8.08
2- 8	1	Lin. Ft., Catch Basin with Sediment Trap	\$ 200.00	\$ 200.00
2- 9	1	Lin. Ft., Dry Well	\$ 233.33	\$ 233.33
2- 10	1	Lin. Ft., Sewer System	\$ 202.67	\$ 202.67
2- 11	1	Lin. Ft., Water System	\$ 201.29	\$ 201.29
2- 12	1	Lin. Ft., Construction Surveys, Testing, Field Office	\$ 200.00	\$ 200.00
2- 13	1	Lin. Ft., Electrical System	\$ 250.00	\$ 250.00
		Subtotal		\$ 2,249.21
		SAY		\$ 2,250.00
60' Right-of-Way Roads				
3- 1	1	Lin. Ft., Clearing and Grubbing	\$ 25.71	\$ 25.71
3- 2	1	Lin. Ft., Erosion Control Measures	\$ 38.57	\$ 38.57
3- 3	1	Lin. Ft., Roadway Excavation/Embankment	\$ 128.00	\$ 128.00
3- 4	1	Lin. Ft., Roadway Pavement	\$ 336.00	\$ 336.00
3- 5	1	Lin. Ft., Concrete Curb and Gutter	\$ 60.00	\$ 60.00
3- 6	1	Lin. Ft., Concrete Sidewalk	\$ 115.70	\$ 115.70
3- 7	1	Lin. Ft., Signing, Striping and Marking	\$ 8.08	\$ 8.08
3- 8	1	Lin. Ft., Catch Basin with Sediment Trap	\$ 166.67	\$ 166.67
3- 9	1	Lin. Ft., Dry Well	\$ 194.44	\$ 194.44
3- 10	1	Lin. Ft., Sewer System	\$ 202.67	\$ 202.67
3- 11	1	Lin. Ft., Water System	\$ 201.29	\$ 201.29
3- 12	1	Lin. Ft., Construction Surveys, Testing, Field Office	\$ 200.00	\$ 200.00
3- 13	1	Lin. Ft., Electrical System	\$ 250.00	\$ 250.00
		Subtotal		\$ 1,927.12
		SAY		\$ 1,930.00
50' Right-of-Way Roads				
4- 1	1	Lin. Ft., Clearing and Grubbing	\$ 22.50	\$ 22.50
4- 2	1	Lin. Ft., Erosion Control Measures	\$ 33.75	\$ 33.75
4- 3	1	Lin. Ft., Roadway Excavation/Embankment	\$ 98.00	\$ 98.00
4- 4	1	Lin. Ft., Roadway Pavement	\$ 256.00	\$ 256.00
4- 5	1	Lin. Ft., Concrete Curb and Gutter	\$ 60.00	\$ 60.00
4- 6	1	Lin. Ft., Concrete Sidewalk	\$ 115.70	\$ 115.70
4- 7	1	Lin. Ft., Signing, Striping and Marking	\$ 8.08	\$ 8.08
4- 8	1	Lin. Ft., Catch Basin with Sediment Trap	\$ 157.89	\$ 157.89
4- 9	1	Lin. Ft., Dry Well	\$ 184.21	\$ 184.21
4- 10	1	Lin. Ft., Sewer System	\$ 202.67	\$ 202.67
4- 11	1	Lin. Ft., Water System	\$ 196.29	\$ 196.29
4- 12	1	Lin. Ft., Construction Surveys, Testing, Field Office	\$ 200.00	\$ 200.00
4- 13	1	Lin. Ft., Electrical System	\$ 250.00	\$ 250.00
		Subtotal		\$ 1,785.08
		SAY		\$ 1,790.00

Appendix B

Water

Appendix - Water System

Criteria

The water system criteria for the HHFDC Keahuolu Lands follows the Hawaii County Department of Water Supply's Standards dated 2002 and revised per discussions with the Department of Water Supply. The applicable criteria are shown below:

1. Water Consumption

<u>Land Use</u>	<u>Average Daily Demand</u>
Single Family (market)	800 gallons per day (gpd) per unit
Single Family (affordable)	400 gpd per unit
Multi-Family	400 gpd per unit
Commercial	3,000 gpd per acre
Schools	4,000 gpd per acre
Parks	4,000 gpd per acre

Notes:

Analysis utilizes the single family (market) consumption of 800 gpd per unit.

DWS indicated that market homes have a higher average daily demand than affordable.

DWS indicated that the project should minimize the use of water for landscaping.

2. Demand Factors:

- a. Maximum daily demand = 1.5 x average daily demand
- b. Peak hour demand = 5.0 x average daily demand

3. Fire Flow Requirements:

- a. 500 gallons per minute (gpm) for two hours for single family homes with a lot size of 10,000 square feet or larger.
- b. 1,000 gpm for one hour for single family homes with a lot size of 10,000 square feet or less.
- c. 1,500 gpm for one hour for multi-family
- d. 2,000 gpm for two hours for schools.

4. Pipeline sizing:

- a. Maximum daily demand plus fire flow with a residual pressure of 20 pounds per square inch (psi) at critical fire hydrant.
- b. Peak hour demand with a residual pressure of 40 psi.
- c. In determining the carrying capacity of the mains, the "C" values to be applied are:

<u>Pipe Diameter</u>	<u>"C"</u>
8", 12"	110
16", 20"	120
24" and larger	130