



# BIG ISLAND'S WASTEWATER COLLECTION SYSTEM

*Presented by:*

Dora Beck, P.E., Wastewater Division Chief

# SYSTEM INFRASTRUCTURE

- 5 Treatment Plants

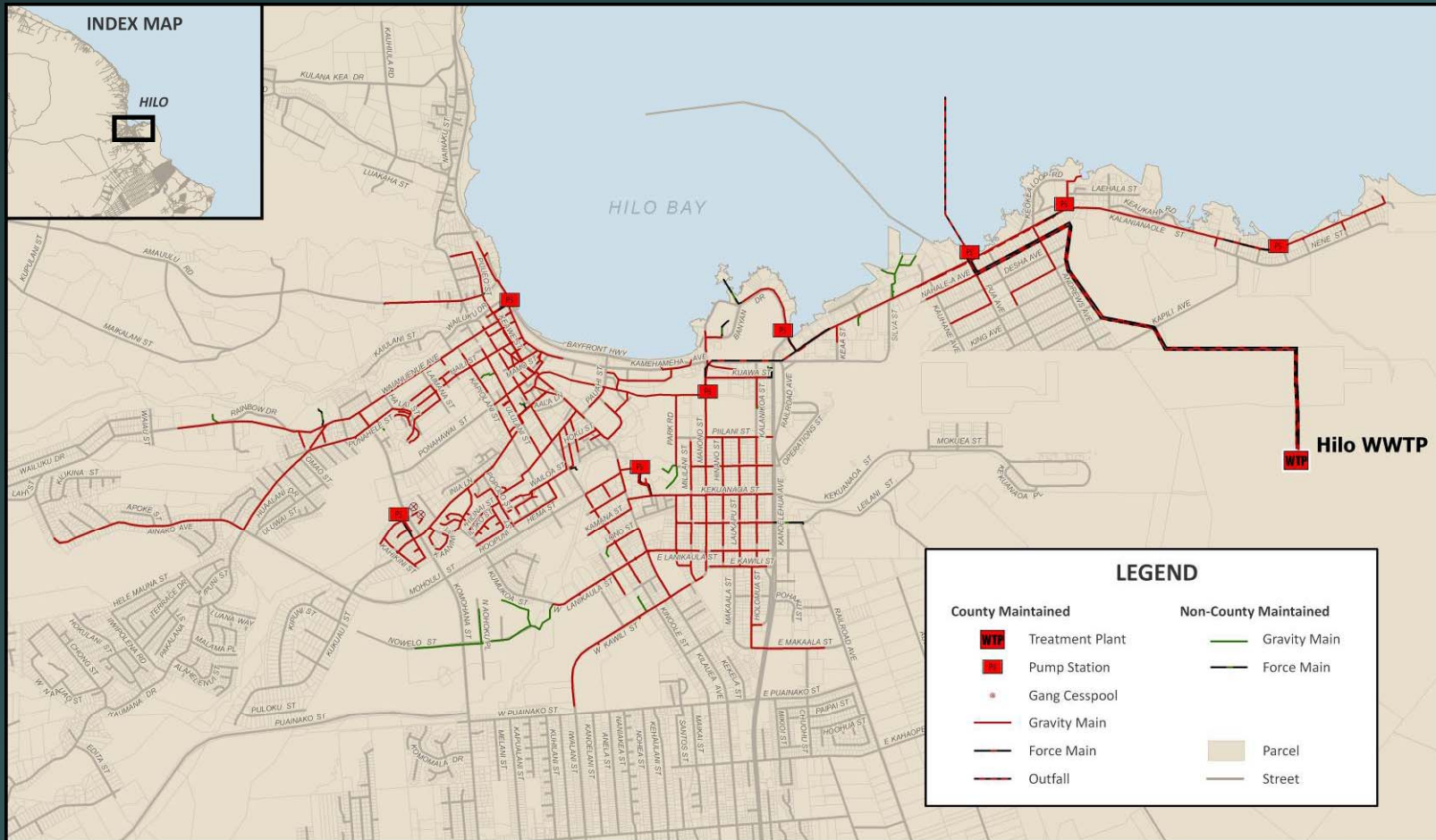
- East Side: *Hilo WWTP* (5 mgd)  
*Papaikou WWTP* (0.35 mgd)  
*Kulaimano WWTP* (0.5 mgd)  
*Kapehu WWTP* (0.016 mgd)
- West Side: *Kealakehe WWTP* (5.3 mgd)

- 17 Pump Stations

- 90 Miles of Gravity Mains

- 11 Miles of Force Mains

# System Network - Hilo



**COUNTY OF HAWAI'I SEWER NETWORK**

HILO, HAWAI'I



County of Hawai'i  
Dept. of Environmental Management  
Wastewater Division

November 2009

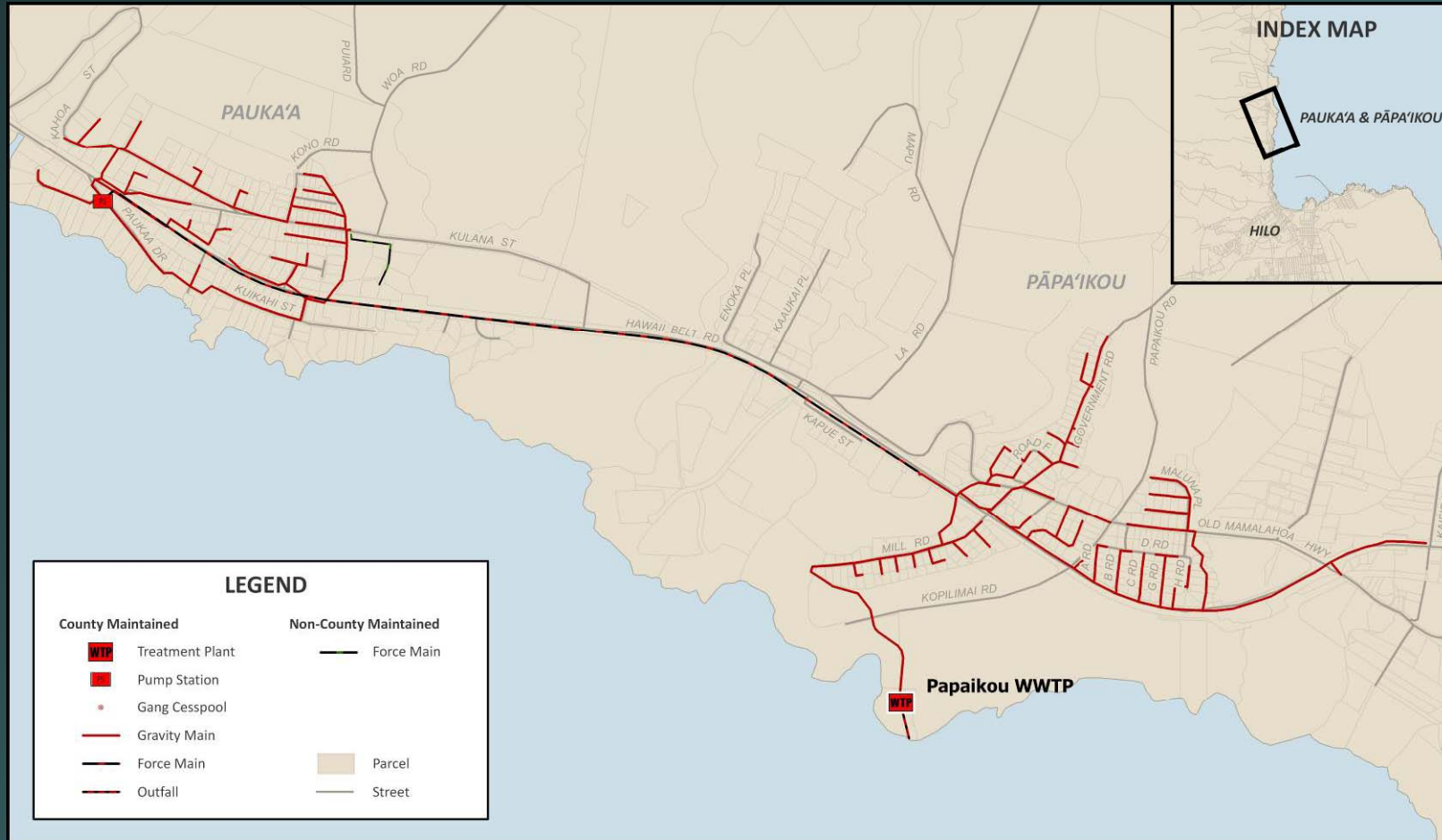
# Hilo WWTP



# Pua SPS

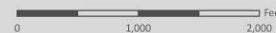


# System Network - Paukaa & Papaikou



**COUNTY OF HAWAI'I SEWER NETWORK**

PAUKA'A & PĀPA'IKOU, HAWAII

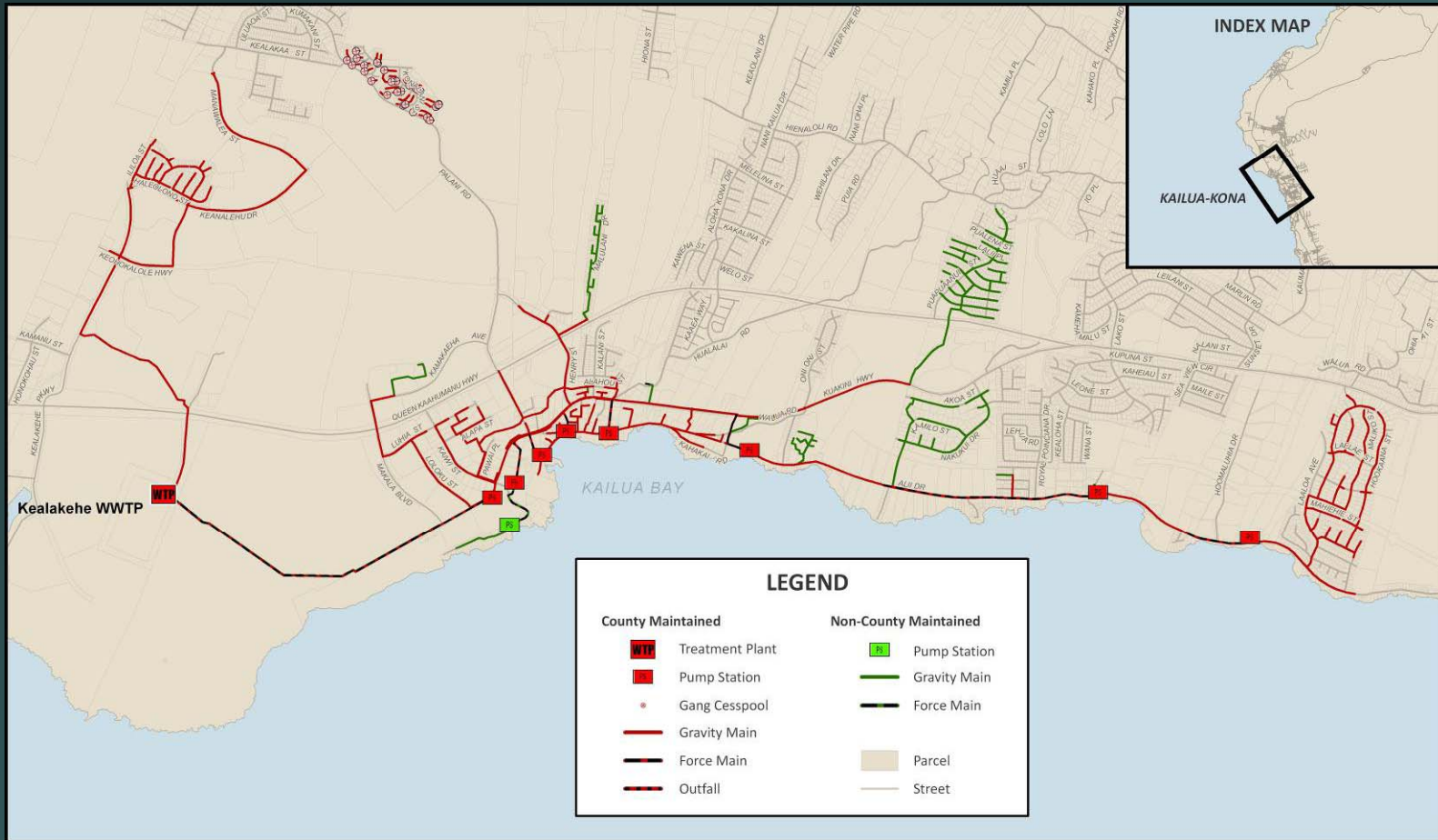


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November 2009



# System Network - Kailua-Kona



**COUNTY OF HAWAI'I SEWER NETWORK**  
KAILUA-KONA, HAWAI'I



County of Hawai'i  
Dept. of Environmental Management  
Wastewater Division

November 2009

# Kealakehe WWTP



# Kealakehe SPS



# PERSONNEL

- 57 Positions, 9 Vacancies
- 17 Grades of Employees
- 21 Certified Operational Positions
- Crew Structure
  - *Superintendents*
  - *Operators*
  - *Maintenance Mechanics*
  - *Sewer Maintenance (aka “Line Crew”)*
  - *Electricians*
  - *Chemists*

# WASTEWATER DIVISION BUDGET (FY 09-10)

- Annual Operating Cost (Budgeted): \$10M
- CIP for New Sewers: \$7M
  - FY 08-09: \$17M (Large Capacity Cesspool Replacement Projects)
- CIP repairs of existing sewers - none

# SEWER MAINTENANCE

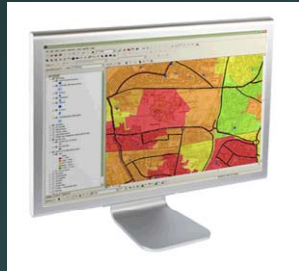
- 90% - Preventive Maintenance Issues
- 8% - One Call Response
- 1% - Assisting Mechanics and Operators
- 1% - Emergency Issues

# ASSET MANAGEMENT SYSTEM (AMS)

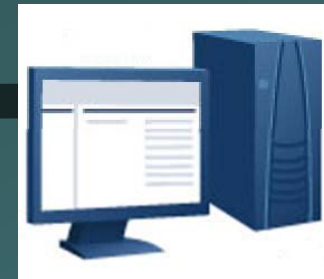
- The County of Hawaii Wastewater Division initiated an AMS program in mid-2008
- AMS Definition
  - Sustainable collection of *asset management tools*
  - Applied to *key (sewer) assets*
  - Seeking to *minimize total costs* of operating, maintaining, and renewing assets
  - Within an environment of *limited* resources
  - While *continuously* delivering a *level of service* desired by customers and required by regulators
  - At an *acceptable level of risk* to the organization

# Current AMS Setup

GIS



CMMS

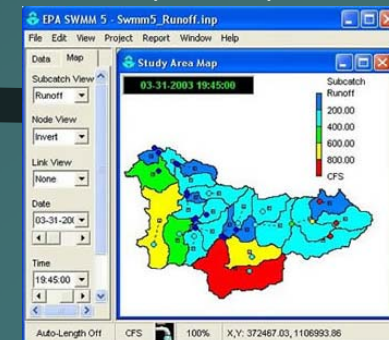


AMS

Risk-Consequence  
Analysis



Sewer Hydraulic  
Modeling  
(Future)



# Overview of Current AMS

(A work in progress...)

- GIS
  - Identify *and Inventory key assets*
- Risk-Consequence Analysis
  - Rank assets by risk level and determine frequency of inspection
- CMMS
  - Assess asset condition, identify repeat problem areas, identify repair or replacement where necessary, or recommend reconfiguration
- Sewer Hydraulic Modeling
  - Verify sewer capacity by collecting flow data from the collection system to ensure service and reduce overflows

**Goal:** Extend life of assets, reduce emergency situations & estimate cost to replace, rehabilitate, or reconfigure during budget planning for future CIP/ERF projects

*“It is not the goal of asset management to keep facilities in ‘like-new’ condition. The driving criteria are reliability, life-cycle cost-effectiveness and providing a <sup>16</sup> satisfactory level of customer service for the long term.”*

# GIS – Inventorying Infrastructure

- Completed GIS database of key Sewer assets
- Attributes include pipe location, length, size, material, inverts, age, etc.
- Used as-built and design construction plans
- Collected missing data by conducted GPS surveys and field inspections



# Risk-Consequence Analysis

## Consequence of Failure Classification

Classification	Consequence (Examples)
Very Low	<ol style="list-style-type: none"> <li>Will not impact public health &amp; safety</li> <li>Will not pollute groundwater or affect sensitive environmental areas</li> <li>Low cost to repair</li> </ol>
Low	↓
Moderate	
High	
Very High	<ol style="list-style-type: none"> <li>Will impact public health &amp; safety enormously</li> <li>Will pollute groundwater and/or affect sensitive environmental areas</li> <li>High cost to repair</li> </ol>

## Probability of Failure Classification

Classification	Failure Time	Example (based on NASSCO)
Very Low	Not expected to fail	<ol style="list-style-type: none"> <li>No deformation</li> <li>No fractures or cracks at joints</li> <li>No root intrusion</li> <li>No I/I</li> <li>New pipe</li> </ol>
Low	May fail within 20 years	↓
Moderate	May fail within 10 years	
High	May fail within 5 years	
Very High	May fail within 3 year	<ol style="list-style-type: none"> <li>Deformation exceeds 10%</li> <li>Large fractures and joints</li> <li>Heavy root intrusion</li> <li>Excessive I/I</li> </ol>

## Risk Classification (Risk = Probability x Consequence)

Lowest Risk →

Code	Consequence of Failure	Probability of Failure	Example	Inspection Frequency
A	Very Low - Low	Very Low - Low	4 year old PVC pipe in a residential area	At least once every 3 years
B	Very Low - Low	Moderate – Very High	60 year old steel pipe in a residential area	At least once every year
C	Moderate – Very High	Very Low - Low	Encased pipe under a major arterial road	At least once every 6 months
D	Moderate – Very High	Moderate – Very High	60 year old steel pipe under a major arterial road	At least once every 3 months

Highest Risk →

# CMMS – Condition Assessment

- Created a work order system using MS Access database program.
- Besides scheduling maintenance and inspection activities
- Goal is to record frequency of repairs or replacement and man hours spent, maintain parts inventory AND use this data in continually assess asset condition.
- Inspection frequency & repairs or replacement is based on assigned Risk Classification

**Work Orders List**

**Work Orders** Find New Copy Modify Delete Manage Repeating Work Orders Create Report

**FILTER BY:**  
 All Dates From Date: 9/1/2009 To Date: 9/15/2009  
 Date Range

Line Crew: West Hawaii Task: (All) Priority: (All) System: (All) Status: Completed

**Sort BY:**  
 Sort 1: Due/Completed Date  
 Sort 2: Priority

WO No.	Due/Completed	Status	System	Task	Pty	Description	Location	From MH	To MH
CSW-09-0373	9/1/2009	Completed	KEAL	CLN	2	Line Cleaning	Project 19 - Sewer lines	23779	15781
CSW-09-0368	9/1/2009	Completed	KEAL	CLN	2	Line Cleaning	Hanama Pl	13877	13903
CSW-09-0353	9/2/2009	Completed	KEAL	MSC	2	Assist Operators in pouring cen	KWWTP	0	0
CSW-09-0352	9/3/2009	Completed	KEAL	RPR	2	Install Link Sleeves	Alii Dr.	0	0
CSW-09-0357	9/4/2009	Completed	KEAL	MSC	2	Fabricate screen for SMH - 8" L	KSPS	0	0
CSW-09-0358	9/4/2009	Completed	KEAL	MSC	2	Wash county vehicles	KSPS	0	0
CSW-09-0354	9/4/2009	Completed	KEAL	MSC	2	Line check and maintain road at	Kuakini Hwy., Old Indus., Alii C	0	0
CSW-09-0359	9/8/2009	Completed	KEAL	MSC	2	Line check & maintain road @	Alii Dr., Kuakini Hwy., Old Ind	0	0
CSW-09-0360	9/8/2009	Completed	KEAL	MSC	2	Line check & maintain road @	Alii Dr., Kuakini Hwy., Old Ind	0	0
CSW-09-0381	9/9/2009	Completed	KEAL	MSC	2	Line check & maintain road @	Alii Dr., Kuakini Hwy., Old Ind	0	0
CSW-09-0382	9/9/2009	Completed	KEAL	MSC	2	Line check & maintain road @	Alii Dr., Kuakini Hwy., Old Ind	0	0
CSW-09-0380	9/9/2009	Completed	KEAL	MSC	2	Line check & maintain road @	Alii Dr., Kuakini Hwy., Old Ind	0	0

**Work Order Form**

**WORK ORDER: CSW-09-0360** Print Work

Emergency Work

Line Crew: West Hawaii Task: Video Priority: 2 Due Date: 9/8/2009

Description: Camera Line - check Link Sleeve

Street Name / General Area: Palani Rd./Alii Dr. System: Kealakehe

Collection System Location:  
 Manhole Numbers: Start 13659 End 13666  
 Entire distance between manholes  
 Distance from Manhole: 0 ft 252 ft Calculate Distance Between Manholes

Comments:

**Status**

Status: Completed Number of Workers: 3  
 Completed Date: 9/8/2009 Hours of Work: 1.50 h(s)

Other Comments:

Save Close



# Future Planning of CIP & ERF Projects

- Project priorities are prioritized based on risk and funding/staffing availability
- Risk (Consequence of Failure x Probability of Failure) classification plus maintenance and inspection information are used to identify and prioritize assets that require rehabilitation or replacement
- Construction cost estimates based on GIS information (e.g., length depth, invert elevations)
- Future sewer hydraulic modeling to improve assessment of available sewer capacity

Main Asset ID	Consequence of Failure	Probability of Failure	Risk Classification
1345	Very High	Very High	D
5462	High	Moderate	D
1832	Low	Very Low	A
3325	High	High	D
2352	Very Low	Moderate	B
13415	Very High	Very Low	C

The screenshot shows a software window titled "Selected Attributes of Main" with a table of pipe asset data. The table has columns for Asset ID, Material, Main Type, Length (ft), Diameter (in), Up Invert (ft), and Down Invert (ft). The data is as follows:

Asset ID	Material	Main Type	Length (ft)	Diameter (in)	Up Invert (ft)	Down Invert (ft)
7879	Vitrified Clay Pipe	Gravity	298.00	15	-3.13	-4.20
7881	Vitrified Clay Pipe	Gravity	308.00	15	-4.20	-5.31
7883	Vitrified Clay Pipe	Gravity	330.00	15	-5.31	-7.84
7884	PVC Pipe	Gravity	472.78	36	-11.35	-11.82
7922	Vitrified Clay Pipe	Gravity	198.00	12	-3.93	-4.41
7970	Reinforced Concrete Pipe	Gravity	310.00	36	0.58	-0.29
7972	Reinforced Concrete Pipe	Gravity	310.00	36	-0.29	-1.16
7973	Reinforced Concrete Pipe	Gravity	301.64	36	-1.16	-2.00
9620	High Density Polyethylene Pipe	Gravity	282.00	20	0.19	-0.35
9673	High Density Polyethylene Pipe	Gravity	288.00	20	-0.35	-0.69
9674	High Density Polyethylene Pipe	Gravity	107.00	20	-0.69	-1.80
15252	Vitrified Salt Glazed Pipe	Gravity	152.97	15	-1.25	-1.57
18349	Reinforced Concrete Pipe	Gravity	98.65	48	-2.50	-2.80
18420	Vitrified Clay Pipe	Gravity	214.44	8	-0.46	-1.40
18422	Vitrified Clay Pipe	Gravity	236.12	8	-1.43	-2.76
18424	Vitrified Clay Pipe	Gravity	267.85	8	-2.76	-3.30
18457	PVC Pipe	Gravity	27.00	8	0.24	-1.36
18708	Vitrified Clay Pipe	Gravity	191.50	10	-7.05	-7.55

The window also includes a status bar at the bottom showing "Record: 0", "Show: All Selected", and "Records (63 out of 3617 Selected)".

# REGULATORY ACTION

- Enforcement Actions (i.e. sewer overflows): None
- Lawsuits: None

# FUTURE PLANS (SHORT -TERM)

- Address I/I Issues
  - Accelerate I/I program for the Hilo Sewer System to reduce influent flow to treatment plant by 400,000 gallons per day
  - Accelerate I/I program for the Kona Sewer System to reduce chloride concentrations to less than 800 ppm in preparation of establishment of an effluent reuse system
  - CCTV monitoring of corroded interceptor of Kalanianaʻole Avenue
  - Flow metering of Wailoa Sewer System to analyze flow

# FUTURE PLANS (LONG-TERM)

- Address I/I Issues
  - Develop action plan to close old plantation lines in Papaikou system
  - Remove and replace worn cast iron sewer laterals within Hilo town
- Maintain New Collection Systems
  - UHH – Kawili and Lanikaula Street Extensions
  - Komohana Heights LCC Replacement
  - Honokaa LCC Replacement
  - Queen Liliuokalani Village LCC Replacement

# FUTURE PLANS (LONG-TERM)

- **Develop New Projects**
  - Develop new collection systems for Naalehu and Pahala LCC projects
  - Develop North Kona Sewer & Effluent Reuse Project
  - Expand collection system in Kailua-Kona and Hilo (especially near shoreline areas)
- **Continue Connection Compliance Efforts**

# MAHALO TO MY CREW

*Lyle Hirota (WWD Deputy Chief)*

*Jon Tokuuke (GIS Analyst)*

*Toni Nakatani (Engineering Technician)*

*Gene Quiamas (WW Project Manager)*

*Hilo Operations*

*Kona Operations*

# MAHALO FOR LISTENING

*Questions?*

