

Increasing Problems?

- **Condition of Existing Drainage Infrastructure**
 - Operation and maintenance needs
 - Improvement needs
- **Hydrological Effects of Development**
 - Disruption of natural water balance
 - Increased runoff
 - Increased flood peaks
 - More frequent flooding

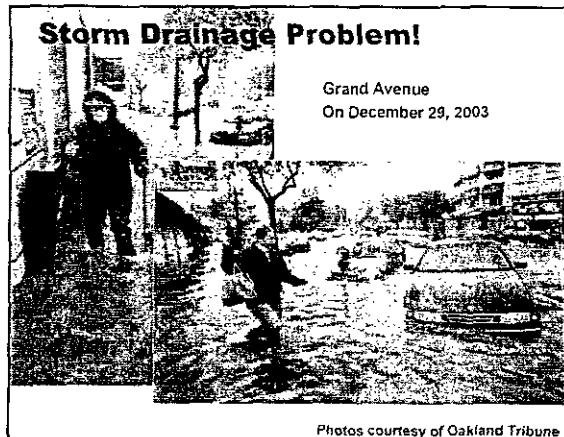
Sanitary or Storm Problem?

Separate Systems (Not Combined)

Source	Sanitary	Storm
	Domestic, Commercial & Industrial	Land, Roofs & Street Runoff
Treatment	Yes	No
Discharged To	Treated & Released TO SF BAY (EBMUD)	Creeks, Lake Merritt, Estuary, SF Bay
Miles Pipe	1,000	370 + 40 miles of creek
Median Pipe Size	8-inch	24-inch
Peak Flow (cfs)	670	4,400

4,400 CFS will fill a tank as big as the Oakland Coliseum Arena in 50 minutes.





Oakland Storm Drainage System

- 15 Watersheds
- 15 Main Creeks and 30 Tributaries
- Approximately 40 Miles of Open Creeks
- Approximately 370 Miles of Storm Drains
- Approximately 14,000 Structures
 - Inlets, manholes, pumps, etc.
- Existing Asset Value = \$ 1.1 Billion

Why Storm Drain Master Plan - History

- Growing Complaints through the 1990's about Storm Drainage Problems
 - Flooding
 - Erosion
 - Landslides
 - Property Damage
- In 1997 City Council Formed Task Force

Two-year study by Task Force

- Most of the City's Infrastructure is Aging
- Identified Significant Problems and Funding Needs
- Recommended
 - Increased Review of New Developments
 - Increased Maintenance
 - Funding a Capital Improvement Program
- Council Actions – Study Financing Options

Finance Committee Findings

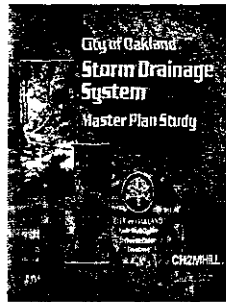
- Several funding alternatives available
- Recommended Storm Drainage Master Plan
- Council actions – Master Plan

Why Storm Drain Master Plan?

- Prevent Recurring Storm Related Problems
 - Comprehensive
 - Cost-Effective
- Protect and Preserve \$ 1.1 Billion Asset
 - Mayor/Council Goal and Citywide Objective— Maintain and Enhance Oakland's Physical Assets and Implement Programs that Protect and Conserve Natural Resources

Storm Drain Master Plan Study

- Request for Proposals (RFP) Process
- Contracted with CH2MHILL
 - Berkeley
 - Palo Alto
 - Burlingame



Master Plan Findings Capital Need Summary

- Increase Capacity to Reduce Flooding
 - 100,000 feet of under-capacity pipe
- Replace Pipes & Structures
 - 30,000 feet of failing pipe network
- New Facilities
 - 10,000 feet of new construction
- Increased Maintenance Program
 - Inspection & Preventive Maintenance

Master Plan Summary

Master Plan Findings Capital Need Summary

Needs	\$ million
System Expansion	\$ 11.0
Increase Capacity-High Priority	\$ 18.1
Increase Capacity-Medium Priority	\$ 53.4
Increase Capacity-Low Priority	\$ 75.4
Increase Capacity-Growth	\$ 4.6
Replacement	\$ 32.0
Creek Revitalization	\$ 5.2
Total	\$ 199.7

Master Plan Summary

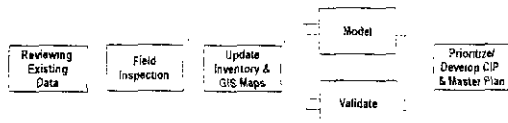
Master Plan Findings

- Investment at Risk
 - Protect and preserve public asset
- Foundation for the Future
 - Safe & sufficient infrastructure to meet the current and future needs
- Invest Now or Pay Later
 - Prolong the 'useful life'
 - Avoid paying more in repair costs later

Master Plan Summary

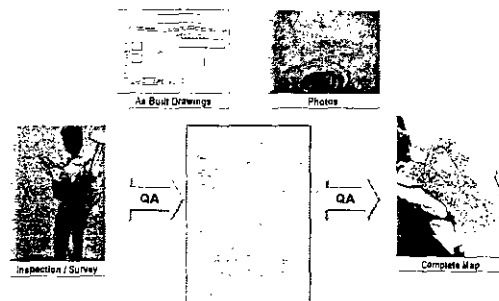
Master Plan Overview

- Coordination with County
- Advisory Committee
 - ↳ PWA, CEDA, OCA, Port, County



Master Plan Overview

Field Work - Compiling Comprehensive Inventory



Master Plan Overview - Field Investigation

Field Work Condition Assessment



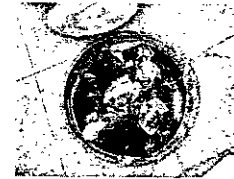
Good Condition



Poor Condition

Master Plan Overview - Field Investigation

Field Work Physical Inspection



Trash in Inlet and Manhole

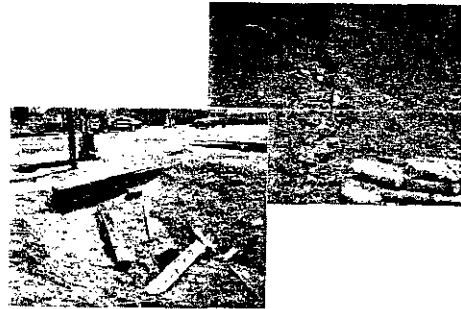
Master Plan Overview - Field Investigation

Field Work - Closed Circuit Television Inspection



Master Plan Overview - Field Investigation

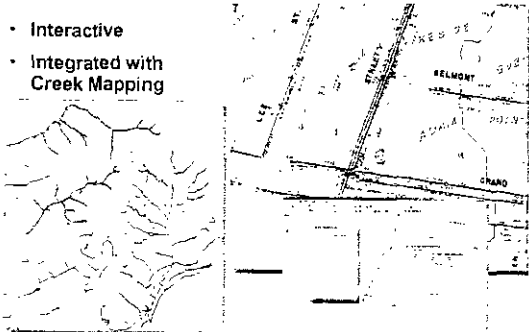
Field Work Identify Problems



Master Plan Overview - Field Investigation

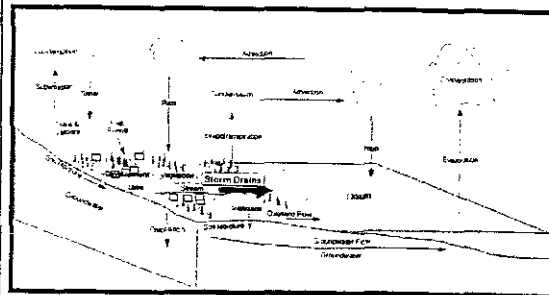
Inventory Database Geographical Information System (GIS)

- Interactive
- Integrated with Creek Mapping



Master Plan Overview - Field Investigation, GIS Mapping

Hydraulic Modeling Simulating Rain Events in Watershed



Master Plan Overview - Modeling

Hydraulic Model Foundation

- Inventory Database (pipe network)
- Watershed and Catchments (sub-watershed) Delineation
- Hydrology (rainfall data)
- Ground Conditions, Zoning & Land Use
- Hydraulics (pipe flow characteristics)



Master Plan Overview - Modeling

City-Wide Storm Drainage System



Master Plan Overview - Modeling

Basin 7 Watershed



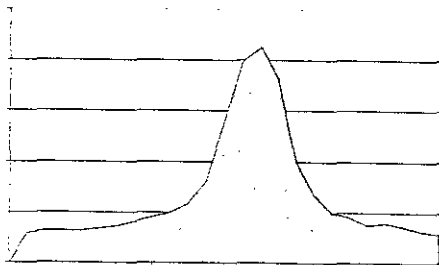
Master Plan Overview - Modeling

Basin 7 Digital Terrain Model

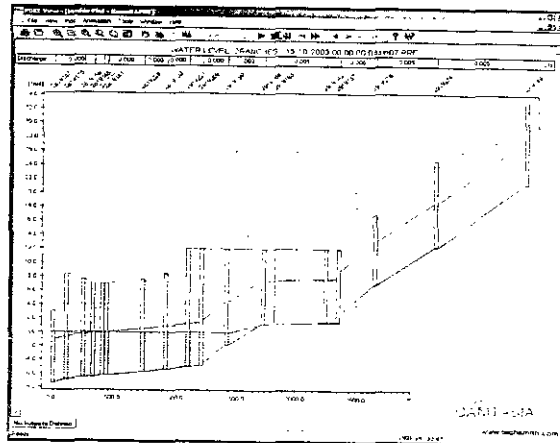


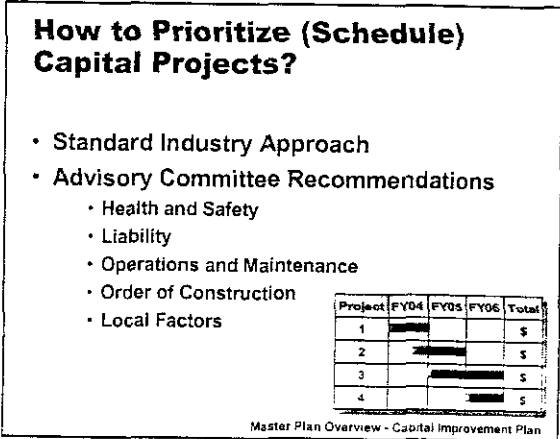
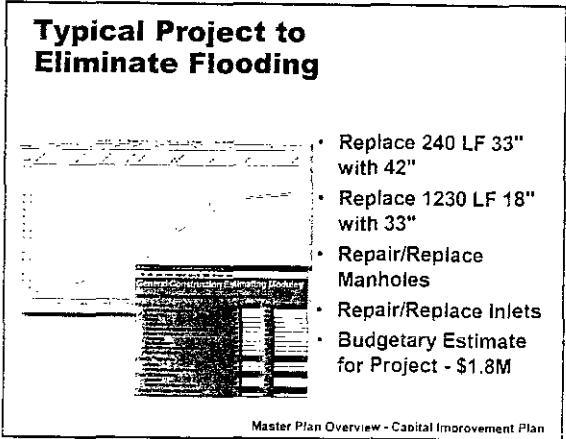
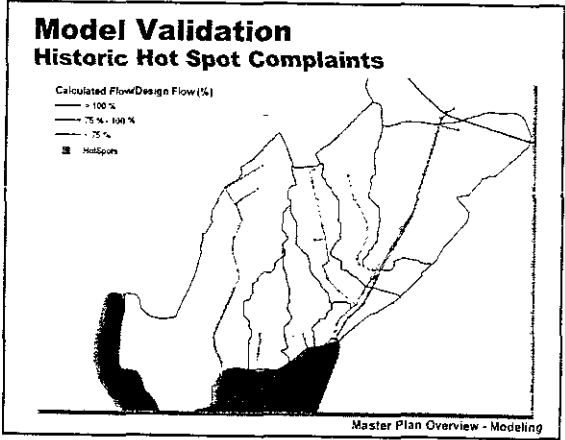
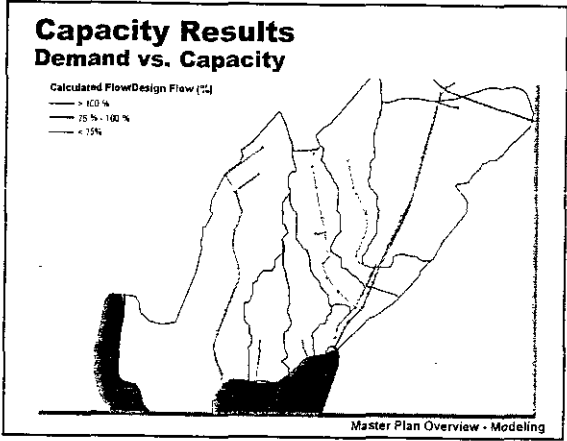
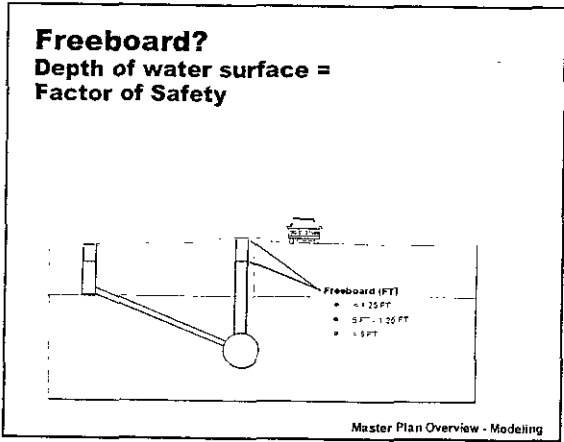
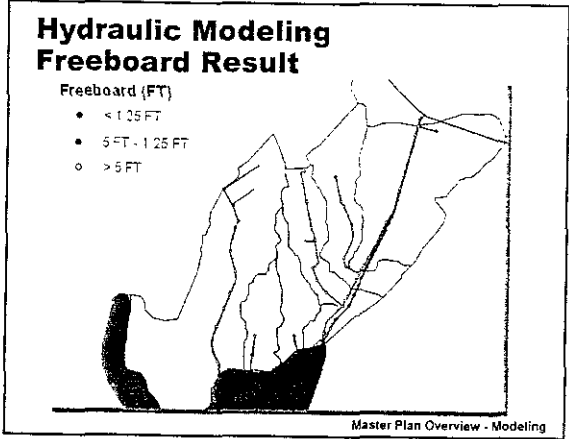
Master Plan Overview - Modeling

Standard "Synthetic" Design Storm - 15-yr 6-hr



Master Plan Overview - Modeling





Advisory Committee Recommendation Prioritization Matrix

Infrastructure	Score	Problem	Score	Impact	Score
Public System	4	Actual Flooding	5	Essential Public Buildings (including Schools) within 200 feet	5
Natural Creek	2	Insufficient Infrastructure (including Sediment Failure)	3	Streets	4
No Existing System, Natural Water Courses or Streamflows	2	Creeks within 200 feet	4	Landside Area	3
Private System	1	Predicted Flooding	3	Residential	2
		Hydrograph consideration (construct downstream prior to upstream, evaluate type of construction, velocity, etc.)	2	Unimproved Private Property and Parks	1
		Potential Infrastructure Failure	1		

Master Plan Overview - Capital Improvement Plan

Master Plan Findings Capital Need Summary

- Increase Capacity to Reduce Flooding
 - 100,000 feet of under-capacity pipe
- Replace Pipes & Structures
 - 30,000 feet of failing pipe network
- New Facilities
 - 10,000 feet of new construction
- Increased Maintenance Program
 - Inspection & Preventive Maintenance

Master Plan Overview - Summary

Master Plan Findings Capital Need Summary

Needs	\$ million
System Expansion	\$ 11.0
Increase Capacity-High Priority	\$ 18.1
Increase Capacity-Medium Priority	\$ 53.4
Increase Capacity-Low Priority	\$ 75.4
Increase Capacity-Growth	\$ 4.6
Replacement	\$ 32.0
Creek Revitalization	\$ 5.2
Total	\$ 199.7

Master Plan Overview - Summary

Master Plan Findings Capital Need Summary

Needs	Affected Value (%)
System Expansion	1.0%
Increase Capacity-High Priority	1.7%
Increase Capacity-Medium Priority	4.9%
Increase Capacity-Low Priority	7.1%
Increase Capacity-Growth	0.5%
Replacement	2.9%
Total	18.2%

Master Plan Overview - Summary

Recommended Practices for New Development Drainage Management

- Construction BMPs
- Creek-side Property Standards & Guidelines (in development)
- Sand filters or Filter Strips
- Energy Dissipation Devices
- Detention and Retention
- Landscaping Requirements
- Pervious Pavers
- Bioengineering

Master Plan Overview - Capital Improvement Plan

Creek, Watershed Protection & Water Quality Program Needs (1)

- Creek and Watershed Protection and Enhancement
 - Illegal dumping prevention & enforcement
 - Post-construction monitoring & maintenance
- Water Quality Resources Protection and Pollution Prevention
 - Clear water regulatory inspection, enforcement, monitoring, maintenance, planning & permitting

Master Plan Overview - Water Quality Needs

Creek, Watershed Protection & Water Quality Program Needs (2)

- Community Watershed Improvement Education and Assistance
 - Technical assistance & community education
- Development Compliance
 - Design, review, oversight, & monitoring
- Capital Projects
 - Hydrograph management
 - Creek restoration
 - Stabilization & erosion prevention

Master Plan Overview - Water Quality Needs

Storm Drain Program Overall Annual Funding Need

	Annual \$
System Maintenance	2,885,000
Creek and Watershed Protection & Enhancement	275,000
Water Quality Resources Protection and Pollution Prevention	700,000
Payment to Alameda County, Clean Water Program Fees	500,000
Community Watershed Improvement Education & Assistance	225,000
Development Compliance	460,000
Total	5,045,000

Master Plan Overview - Capital Improvement Plan

Next Steps to Complete Project

- Finalize & Adopt Master Plan
 - Inventory & Maps
 - Maintenance Needs
 - Capital Project Descriptions
 - Funding Requirements
 - Schedule
 - Tools (GIS & Modeling)
- Evaluate Funding Opportunities



Master Plan Overview - Capital Improvement Plan

Next Steps (Cont'd)

- Funding Options in May
- Master Plan complete in June
- Discussion of Funding June – November

Master Plan Overview - Funding Opportunities