

Strategy Analysis for Ballona Creek Watershed

Preferred Strategy - Focus on localized, non-structural and structural "subwatershed based" solutions, limited dry weather diversions, dry weather in-stream solutions and limited use of NOTF.

Alternative Strategy - Focus on dry weather diversions and "end-of-pipe" capture, divert, treat, disinfect, and discharge a targeted storm event

Alternative Strategy

The components included in the Preferred Strategy are:

Component 1 Implement extensive source controls and institutional solutions to reduce dry weather flows (including "smart irrigation") and bacteria from dry and wet weather flows.

Component 2 Divert all dry weather flows to the wastewater system for treatment at Hyperion.

Component 3 New proposed treatment plant constructed to intercept flow from upper watershed (Proposed Treatment Plant 1).

Component 4 New proposed treatment plant built at point downstream of flow coming from West LA and Westwood Village (Proposed Treatment Plant 2)

Component 5 New proposed treatment plant built at point downstream of flow coming from Windsow Hills (Centinella Creek) (Proposed Treatment Plant 3)

General Data

Area: 82,000 acres = 128 sq mi
 Runoff Coeff: 0.47 based on Watershed Protection Division's Pollutant Load Model
 Dry Weather Runoff Rate: 230 gpd/ac (from IRP)
 1 mgd = 1.547 cfs
 Number of rain days per year 13 days, average number of days where rainfall exceeds 0.45 inches, based on 50 yrs of rainfall data as analyzed in the IRP.

DRY WEATHER FLOW

(Based on maximum dry weather flow rate from Technical Memorandum)

North of BCTF:	23 cfs =	15 mgd
Sepulveda & W. LA:	7 cfs =	5 mgd
Centinella:	5 cfs =	3 mgd
Total	35 cfs =	23 mgd

WET WEATHER FLOW

Data for Target Storm Event of 0.45-inches, based on EPA/Tetra Tech Model

Rainfall: 3,075 AFY (82,000 acx.45 in/12)

Maximum Instantaneous Flows (from EPA/Tetra Tech model)

Subwatershed flows:

Hollywood subwatershed	246.7 cfs	159 mgd
Cienega	163.6 cfs	106 mgd
Windsow Hills	77 cfs	50 mgd

Flows within Ballona Creek:

approx. at BCTF	439 cfs	284 mgd
@Westwood Village subwatershed	447.5 cfs	289 mgd
@West LA subwatershed	765 cfs	494 mgd

Total flow from target storm event in Ballona Creek above estuary plus Windsow Hills =

544 mgd (Assumes flow occurs in one day or less)

LAND USE (from the Ballona Creek Metals TMDL)

Land use in Ballona Creek Watershed	
Land Use	Area (acres)
High Density Residential	45,600
Low Density Residential	2,950
Mixed Urban	100
Commercial	12,950
Industrial	4,200
Open Space	14,000
Other	2,200
Total	82,000
Source: Ballona Creek Metals TMDL Land use data	

components OF ALTERNATIVE STRATEGY

Component 1) Source controls and institutional solutions to reduce bacteria from dry and wet weather flows and smart Irrigation.

a) Institutional Solutions

From the Metals TMDL, estimated costs for structural and non-structural compliance measures for the entire Los Angeles Region:

Area of Entire LA Region that costs were based on: 3,100 sq. mi
 Ballona Creek Watershed area: 128 sq. mi
 % area 4.13%

Compliance Approach	Metals TMDL Estimated Costs	Adjusted Ballona Creek Watershed Estimated Costs
Source Control Measures Identified in the Metals TMDL		
Enforcement of litter ordinances.	\$9 M/yr	\$0.37 M/yr
Public education	\$5 M/yr	\$0.21 M/yr
Improved street cleaning	\$8 M/yr	\$0.31 M/yr
Increased Storm Drain Cleaning	\$27 M/yr	\$1.11
Subtotal:	\$49 M/yr	\$2.00 M/yr
Additional bacteria source control measures		\$1.00 M/yr
Total:		\$3.00 M/yr

b) Smart Irrigation

Smart Irrigation installed watershed wide at residential and commercial facilities (assume 70% implementation)

	High Density Res.	Low Density Res.	Commercial	Total
Area (acres)	45,600	2,950	12,950	61,500
70% of area implementing S.I. (acres)	31,920	2,065	9065	43,050
Runoff coefficient (gpd/ac)	230	230	230	NA
Total runoff (mgd):	7.3	0.5	2.1	10
% Effectiveness of smart irrigation (%) ¹ :	30%	71%	20%	NA
Total runoff reduction (mgd)²:	2.2	0.3	0.4	3.0

¹the % effective is the effectiveness of the smart irrigation device at reducing the amount of runoff for a given land use and is based on IRP Smart Irrigation analysis, which was based on Irvine Ranch Water District pilot project data.

²Total Runoff Reduction is the total runoff multiplied by the % effectiveness of the devices.

Number of units required:

Assuming average lot size: 1 acre (see tech memo discussion)
 Total number of lots implementing S.I.: 43,050 lots
 Assuming one device per lot: 43,050 units

Capital Costs

Unit Cost: \$175 per unit (includes installation) - from LAIRP
 Total Capital Cost for Smart Irrigation: \$7.5 Million (number of units x cost/unit)

O&M Cost:

Monthly signal fee: \$4 per unit per month - from LARIP
 Total O&M Cost (#units)*(\$/mo)*(12mo/yr): \$2 \$M/yr

Summary:

Dry Weather Flow Managed 3.0 mgd
 Wet Weather Flow Managed N/A
 Capital Costs (\$M) \$7.5 Million
 O&M Costs (\$M/yr) \$5 Million/yr

Component 2) Divert dry weather flows to the wastewater system for treatment at Hyperion.

Capital Costs:

From the IRP, the average costs for constructing the Santa Monica Bay diversions was - \$1.2 M/mgd.

Adding 30% to account for non-construction costs: PM, design, CM, and startup:

Unit capital cost: \$1.56 M/mgd
 Peak dry weather flow to divert: 20 mgd (flow to divert is total dry weather flow minus flow reduced through smart irrigation implementation)
 Total capital Cost: \$30.68 M

O&M Cost:

(Source IRP)
 Maintenance labor: \$12,000 /mgd/yr
 Debris cleaning: \$2,800 /mgd/yr
 Debris disposal: \$150 /mgd/yr
 Sewer service charge: \$15,800 /mgd/yr
 Utilities (e.g. pumping): \$3,000 /mgd/yr
 Total unit O&M cost: \$33,750 /mgd/yr

Average dry weather flow to divert: 9 mgd
 Total O&M Costs: \$0.32 M/yr

Summary:

Average dry weather flow managed 9.4 mgd
 Wet weather flow managed N/A
 Capital costs (\$M) \$30.7 Million
 O&M costs (\$M/yr) \$0.32 Million/yr



Component 3) New proposed treatment plant built near existing BCTF (Proposed Treatment Plant 1).

Flow upstream of NOTF is captured, stored, treated, disinfected and discharged at a new treatment plant

Treatment plant capacity: 150 cfs = 97 mgd capacity
 Watershed flow at this point: 439 cfs = 284 mgd

Per hydrograph in the City of LA BOE Ballona Creek Treatment Facility Feasibility Study and Preliminary Design, Figure 2-5:
 For a comparable storm event (470 cfs at its peak), the volume of storage required would be:

Assume 150 cfs treated instantaneously
 Per hydrograph, average flow is approximately 250 cfs for 2 hours.
 Storage required = (250cfs-150cfs) * 3600 sec/hr * 2 hrs * 7.48 gal/cf / 1M gal/MG = 5.4 MG

Notes:

Existing treatment plant - North Outfall Treatment Facility (NOTF), also referred to as Ballona Creek Treatment Facility (BCTF), 85 sq.mi. tributary
 Flow from hydrograph metered at Sawtelle Blvd., determined to be within 2% of flow at BCTF and negligible for the purposes of this study.

Capital Costs:

Item	Amount	Unit Cost	Total Cost (\$M)
Proposed treatment plant 1*	97 mgd	4.70 Million/mgd	\$455.7
Additional temporary storage	5.4 MG	1.30 Million/MG	\$7.00
Collection/discharge pipelines (inc. pumping)		Lump Sum	\$60.00
TOTAL COST			\$462.7

*Treatment plant costs included land acquisition & 30% contingency/design/engineering

O&M Cost:

	1996 \$ (\$M/yr)*	2005 \$ (\$M/yr)	Capacity at BCTF (cfs)	Unit cost per cfs (\$M/yr/cfs)	Capacity at Proposed Treatment Plant 1 (cfs)	Total O&M Cost (\$M/yr)
Power	\$0.14	\$0.20	150	\$0.00131	150	\$0.20
Labor	\$0.18	\$0.25	150	\$0.00168	150	\$0.25
Chemicals	\$0.01	\$0.01	150	\$0.00009	150	\$0.01
General maintenance	\$0.05	\$0.07	150	\$0.00047	150	\$0.07
Total	\$0.38	\$0.53		\$0.00355		\$0.53

*1996 dollars for O&M costs are from the City of LA BOE Ballona Creek Treatment Facility Feasibility Study and Preliminary Design report

Summary:

Dry weather flow managed N/A
 Wet weather flow managed 284 MG/event
 Capital costs (\$M) \$462.7 Million
 O&M costs (\$M/yr) \$0.53 Million/yr

Component 4) New proposed treatment plant built at point north of Ballona Creek, downstream of flow coming from West LA and Westwood Village (Proposed Treatment Plant 2)

Watershed flow at this point: 326 cfs = 211 mgd
 Treatment plant capacity: 100 cfs = 65 mgd capacity
 With hydrograph similar to BCTF referenced hydrograph and assuming average flow of 175 cfs for 2 hours:
 Storage required = (175cfs-100cfs) * 3600 sec/hr * 2 hrs * 7.48 gal/cf / 1M gal/MG = 4.0 MG

Notes:

Used same hydrograph curve as for #1 above, with adjusted scale for proposed plant average flow and used same duration (2 hrs).

Capital Costs:

Item	Amount	Unit Cost	Total Cost (\$M)
Proposed treatment plant 2*	65 mgd	\$4.70 Million/mgd	\$303.8
Temporary storage	4.0 MG	\$1.30 Million/MG	\$5.3
Collection/discharge pipelines (inc. pumping)		Lump Sum	\$50.00
TOTAL COST			\$359.0

*Treatment plant costs included land acquisition & 30% contingency/design/engineering

O&M Cost:

	1996 \$ (\$M/yr)*	2005 \$ (\$M/yr)	Capacity at BCTF (cfs)	Unit cost per cfs (\$M/yr/cfs)	Capacity at Proposed Treatment Plant 2 (cfs)	Total O&M Cost (\$M/yr)
Power	\$0.14	\$0.20	150	\$0.00131	100	\$0.13
Labor	\$0.18	\$0.25	150	\$0.00168	100	\$0.17
Chemicals	\$0.01	\$0.01	150	\$0.00009	100	\$0.01
General maintenance	\$0.05	\$0.07	150	\$0.00047	100	\$0.05
Total O&M cost	\$0.38	\$0.53		\$0.00355		\$0.35

*1996 dollars for O&M costs are from the City of LA BOE Ballona Creek Treatment Facility Feasibility Study and Preliminary Design report

Summary:

Dry weather flow managed N/A
 Wet weather flow managed 211 MG/event
 Capital costs (\$M) \$359.0 Million
 O&M costs (\$M/yr) \$0.35 Million/yr

Component 5) New proposed treatment plant built at point south of Ballona Creek, downstream of flow coming from Windsow Hills (Centinella Creek) (Proposed Treatment Plant 3)

Watershed flow at this point: 77 cfs = 50 mgd
 Treatment plant capacity: 25 cfs = 16 mgd capacity
 With hydrograph similar to BCTF referenced hydrograph and assuming average flow of 40 cfs for 2 hours:
Storage required = (40cfs-25cfs) * 3600 sec/hr * 2 hrs * 7.48 gal/cf / 1M gal/MG = 0.8 MG

Notes:
 Used same hydrograph curve as for #1 above with adjusted scale for proposed plant average flow and reduced duration (2 hrs).

Capital Costs:

Item	Amount	Unit Cost	Total Cost (\$M)
Proposed treatment plant 3*	16 mgd	\$4.70 Million/mgd	\$75.9
Temporary storage	0.8 MG	\$1.30 Million/MG	\$1.1
Collection/discharge pipelines (inc. pumping)		Lump Sum	\$10.0
TOTAL COST			\$87.0

*Treatment plant costs included land acquisition & 30% contingency/design/engineering

O&M Cost:

	1996 \$ (\$M/yr)*	2005 \$ (\$M/yr)	Capacity at BCTF (cfs)	Unit cost per cfs (\$M/yr/cfs)	Capacity at Proposed Treatment Plant 3 (cfs)	Total O&M Cost (\$M/yr)
Power	\$0.14	\$0.20	150	\$0.00131	25	\$0.03
Labor	\$0.18	\$0.25	150	\$0.00168	25	\$0.04
Chemicals	\$0.01	\$0.01	150	\$0.00009	25	\$0.00
General maintenance	\$0.05	\$0.07	150	\$0.00047	25	\$0.01
Total O&M Costs	\$0.38	\$0.53		\$0.00355		\$0.09

*1996 dollars for O&M costs are from the City of LA BOE Ballona Creek Treatment Facility Feasibility Study and Preliminary Design report

Summary:

Dry weather flow managed N/A
 Wet weather flow managed 50 MG/event
 Capital costs (\$M) \$87.0 Million
 O&M costs (\$M/yr) \$0.09 Million/yr

Summary Table

SUMMARY TABLE		
Component	Capital Costs (\$M)	O&M Costs (\$M/yr)
Dry Weather		
Non-Structural Source Controls ³	\$8	5.1
Dry Weather Diversions	\$31	0.3
Dry Weather Totals	\$38	5.4
Wet Weather		
Proposed Treatment Plant 1	\$463	0.5
Proposed Treatment Plant 2	\$359	0.4
Proposed Treatment Plant 3	\$87	0.1
Wet Weather Totals	\$909	1.0
Total Cost (Dry & Wet Weather)	\$947	6.4

Notes: ¹The % of flow for dry weather is the percent of the total Dry Weather flow that is managed through diversions.

²The % of total wet weather flow is based on the total wet weather flow from the 0.45-inch storm for Ballona Creek at West LA subwatershed point plus

³Non-structural source controls include programmatic/institutional solutions and smart irrigation implementation.