COST SUMMARY - Infiltration Trenches and Sand Filters

	Infiltration Trench Construction	Infiltration Trench Maintenance ($ mill/year)	Austin Sand Filter Construction	Austin Sand Filter Maintenance ($ mill/year)	Delaware Sand Filter Construction	Delaware Sand Filter Maintenance ($ mill/year)	Total Construction Costs ($ million)	Total Maintenance Costs ($ million)
EPA	544	109	553	28	329	16	1426	153
FHWA	519	NR	102	NR	418	NR	1039	
Caltrans	5,051	91	4844	58	9279	117		

Assumptions

40% of the urbanized portion of the watershed to be treated with structural BMPs.
20% treated by infiltration trenches and 20% treated by sand filters.

Urbanized portion of LA River Watershed is assumed to be 467 sq miles or 298,880 acres (1 acre = 0.0015625 square mile)
The Los Angeles River Watershed is 834 square miles. Open Space comprises 44% of the watershed or 367 square miles. The urbanized portion of the watershed or portion of the watershed served by storm drains is therefore 467 square miles.

Total area to be treated:

Infiltration trences: **59,776** (urbanized portion of watershed multiplied by 20%)
Sand filters: **59,776** (urbanized portion of watershed multiplied by 20%)

Low FHWA estimate of Austin Sand Filter cost was reported based on a drainage areas > five acres.

Cost of Caltrans Infiltration trench includes biofiltration strip pretreatment.

EPA and FHWA Infiltration Trench Cost Estimates

	FHWA*					EPA **			
BMP	Cost per device	Number of acres served	Number of Devices Needed	Total FHWA Construction Cost	Cost per device	Number of acres served	Number of Devices Needed	Total EPA Construction Cost	EPA Estimated Maintenance $/year
Infiltration Trench	$ 43,439	5	11,955	$ 519,318,105	$ 45,489	5	11,955	$ 543,830,093	$ 108,766,019

Urbanized portion of LA River Watershed is assumed to be 298,880 acres
Total area to be treated = **59776** (urbanized portion of watershed multiplied by 20%)

***For FHWA Calculations: C = $1317.1V^{0.63}$ per device** (Young et al., 1996, Schueler, 1987)

where, V = storage volume in cubic meters

Assume	**0.5**	**inches runoff**
	0.0127	meters runoff
	5	**acre drainage area**
	20235	sq meter drainage area
	1	runoff coeficient
Then, V =	257	cubic meters

1 acre = 4,047 square meter
1 inch = 0.0254 meter
1 cubic foot = .0283168 cubic meters

****For EPA Calculations: C = $5/ft^3** (SWRPC, 1991; Brown and Schueler, 1997)

C= $ 177 /m^3

Assume V= 257 cubic meters produced by 5 acre drainage area and 0.5 inches runoff

Size Constraints:

1300 square feet of trench bottom area is needed to treat 0.5 inches of runoff per acre.
For five acres: 6500 square feet of trench bottom area

Caltrans Infiltration Trench and Biofiltration Strip Cost Estimates

BMP	Drainage Area (acre)	Avg. Adjusted Const. Cost	Cost per Acre	Number Needed for urbanized portion of watershed	Total Construction Cost	Maintenance $/year
Infiltration Trench + Biofiltration Strip	1.7	$ 146,154	$ 84,495	34,558	$ 5,050,774,543	$ 91,198,284

Urbanized portion of LA River Watershed is assumed to be 298,880 acres
Total area to be treated = **59776** (urbanized portion of watershed multiplied by 20%)

SAND FILTERS COST ESTIMATES

Filter Type	Drainage Area (acre)	Adjusted Const. Cost	Cost Per Acre	Number Needed for urbanized portion of watershed	Total Const. Cost Based on CalTrans estimate	CalTrans Estimated Maintenance $/year	EPA Const. Cost/ acre *	Total Const. Cost Based on EPA estimate	EPA Estimated Maintenance $/year	FHWA Const. Cost/ acre (< 2 acres) **	FHWA Const. Cost/ acre (> 5 acres) ***	Total Const. Cost Based on FHWA estimate (< 2 acres)	Total Const. Cost Based on FHWA estimate (> 5 acres)	FHWA Estimated Maintenance $/year
		From CalTrans BMP Retrofit Study												
Austin	1.5	$ 203,484	$ 137,245	20159	$ 4,101,987,544									
Austin	1.7	$ 259,156	$ 149,824	17279	$ 4,477,942,880									
Austin	2.7	$ 314,346	$ 115,647	10996	$ 3,456,452,354									
Austin	2.7	$ 213,261	$ 78,458	10996	$ 2,344,952,649									
Austin	0.7	$ 223,748	$ 301,826	40318	$ 9,020,969,796									
Avg Austin	1.9	$ 242,799	$ 156,600	19949	**$ 4,843,677,405**	**$ 57,952,804**	$ 18,500	**$ 552,928,000**	**$ 27,646,400**	$ 16,000	$ 3,400	**$ 478,208,000**	**$ 101,619,200**	not reported
Delaware	0.7	$ 230,145	$ 310,455	40318	**$ 9,278,881,123**	**$ 117,122,465**	$ 11,000	**$ 328,768,000**	**$ 16,438,400**	$ 14,000	NA	**$ 418,432,000**	**NA**	not reported

Urbanized portion of LA River Watershed is assumed to be 298,880 acres

Total area to be treated = **59776** (urbanized portion of watershed multiplied by 20%)

Area to be treated by Austin Filters = **29888** (Half of the 20% to be treated by Austin)

Area to be treated by Delaware Filters = **29888** (Half of the 20% to be treated by Delaware)

*High end of EPA range (U.S. EPA 1999) used to estimate cost of Delaware ($6,600 - $11,000)

** Per impervious acre for facilities serving less than two acres.

*** Per impervious acre for facilities serving greater than five acres

(Construction cost estimates exclude real estate, design, and contingency costs. (Schueler, 1994).)

1 acre = 4,047 square meter

1 inch = 0.0254 meter

1 hectare = 2.47105 acres

Austin size constraints:

Full sedimentation design requires 100 sq feet to treat 0.5 inches of runoff per impervious acre

For 50 acre area: 5000 sq feet

Delaware size constraints (size and shape flexible b/c below ground):

Assume a storage depth of 3 ft.

Then 150 sq ft req'd for sediment chamber and 200 sq ft for sand filter area to treat 0.5 inch runoff per impervious acre

For 50 acre area: 17,500 sq feet