CITY OF SIGNAL HILL

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August 4, 2014

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Electronic Submission: commentletters@waterboards.ca.gov

Subject: Comment Letter – Trash Amendments

Dear Ms. Townsend:

The City of Signal Hill appreciates this opportunity to comment on the proposed Trash Amendments to the Ocean Plan and forthcoming Inland Surface Waters, Enclosed Bays, and Estuaries Plan ("Amendments"). We also agree with the statement on the original Earth Day poster, "We have met the enemy and he is us." Irresponsible people and a plethora of packaging materials and disposed food and drink containers are the primary sources of trash – not municipal governments. We recognize that municipal separate storm sewer systems (MS4s) transport trash to the receiving waters and must contribute to solving the trash problem. However, we do not agree with the conclusion that there is a need for a consistent statewide approach to controlling trash discharges into waters of the State if a consistent policy means a **one-size fits** all regulatory approach.

The City agrees with the intent of the Trash Amendments. However, we believe they can be modified to create a stronger, fairer program. We have organized our comments around what we see as key elements of the proposed Amendments and the key changes that would make them more cost-effective and fair.

Need for Trash Amendments May not be as Great as Perceived

The City of Signal Hill has become aware of research conducted for the Riverside County MS4 permittees that indicates that the need for a statewide MS4 trash reduction program may not be as great as once thought. The following table indicates that only 2% of inland surface water segments are listed for trash impairments, and all but one of the 72 current 303(d) listings for trash are in one of three coastal metropolitan area Regional Water

Boards – Los Angeles, San Diego, and the San Francisco Bay Area. Furthermore, two of these Regional Water Boards have relatively new MS4 permits that incorporate requirements for watershed management planning and prioritization of pollutants of concern. In other words, these Regional Boards already have measures in place to address trash. In addition, the San Francisco Bay Area Regional Water Board is addressing trash in a different way through its Municipal Regional Stormwater Permit.

Region	# Inland Surface Waters[2]	# Impaired by Trash	% NOT Impaired by Trash
North Coast (1)	151	0	100
San Francisco (2)	533	26	95.12%
Central Coast (3)	490	0	100
Los Angeles (4)	330	42	87.3%
Central Valley (5)	117	0	100
Lahontan (6)	1,085	0	100
Colorado River (7)	52	1	98.1%
Santa Ana (8)	230	0	100
San Diego (9)	561	3	99.5%
Total	**3,549**	**72[1]**	**98.0%**

[1] From review of 2010 California 303(d) list of Water Quality Limited Segments. Differs from total of 73 segments identified in Draft Staff Report

[2] From manual summary of surface waters listed in Basin Plans

Our city is participating in two Watershed Management Programs (WMPs) pursuant to the requirements of Los Angeles Regional Board Order No. R4-2012-0175. One of these is for the Lower Los Angeles River Watershed, and the other is for the Los Cerritos Channel Watershed. The Lower Los Angeles River WMP lists trash as a highest priority pollutant since there is a trash TMDL for the Los Angeles River. The Los Cerritos Channel WMP lists trash as a high priority pollutant because there is a 303(d) listing for trash for the Los Cerritos Channel, but there is not yet a TMDL for trash for this water body. The proposed Trash Amendments would functionally make trash a highest priority pollutant for the Los Cerritos Channel Watershed. **The Trash Amendments would also make trash a priority pollutant for the defined "priority land uses" statewide, even though the receiving waters for land uses might not have been determined to be impaired for trash.**

The fact that the three Regional Water Boards with 71 of the 72 trash listings already have programs in place to address trash indicates that the Trash Amendments, as drafted, are not necessary. There is a need to ensure that where trash TMDLs or other measures to address trash impairments are developed permittees are allowed to focus on truly high trash generation areas and catch basins. The application of a prohibition of discharge of

preproduction plastic by manufacturers of preproduction plastics, transporters of preproduction plastics, and manufacturers that use preproduction plastics in the manufacture of other products is also needed. In addition, there should be statewide definitions of trash and debris.

Unintended Consequences of Draft Trash Amendments

The Trash Amendments, as currently drafted, will likely result in multiple unintended consequences. First, the *de facto* definition of trash as a high priority pollutant will likely result in the diversion of funds away from addressing local water quality issues such as listed impairments and other local pollutants of concern since, in the absence of major stormwater quality funding programs, most local governments have limited money available to address water quality. Secondly, making trash a high priority pollutant in the absence of a 303(d) listing for trash may cause financial hardships, especially for Phase II MS4s, since neither of the specified compliance tracks is inexpensive.

Need to Focus on Areas with High Trash Generation Rates

Our several years of experience with implementation of the Los Angeles River Trash TMDL have reinforced the City's long-held belief that trash reduction programs should be focused on high trash generation areas. In fact, in 2007, the City requested that the Los Angeles Regional Water Board focus the re-issued Los Angeles River Trash TMDL on areas of high trash generation by presenting evidence from a 2006 report entitled "Market-Based Strategies For Reducing Trash Loadings to Los Angeles Area Watersheds, An Initial Assessment." Using data collected by the County of Los Angeles in the Los Angeles River watershed, this study of 258 catch basins showed that 50% of the trash load was generated by 13% of the catch basins and 80% of the trash load was generated by 38% of the catch basins. Approximately 77% of the trash load was from commercial and industrial areas.

This assessment, prepared by the Coalition for Environmental Protection, Restoration and Development, is not listed in the References section of the Draft Staff Report, and it should be reviewed before any action is taken on the proposed Trash Amendments. For the convenience of the Board, it is attached to this comment letter.

The focus of the proposed Trash Amendments on five priority land uses is a good start to focusing on high trash generation areas. By focusing on high density residential (with at least 10 developed residential units per acre), industrial, commercial, mixed urban, and public transportation station land uses, the areas addressed by either Track 1 or Track 2 procedures could be reduced by 50% or more of a municipality's land area, depending on the density and location of transportation stations. However, as noted above, **a small percentage of catch basins in commercial and industrial areas have been demonstrated in a research study to contribute a major portion of the trash load**. Of the 258 catch basins analyzed in the 2006 report, 105 were in commercial and industrial areas, and all but one of the 34 catch basins responsible for generating 50% of the trash loadings were located in commercial and industrial land use drainages.

The draft amendments do allow an MS4 permittee with regulatory authority over priority land uses to request a Water Board allow the permittee to comply with Track 1 or Track 2 requirements with alternate land uses that generate loads of trash equivalent to or greater than one of the priority land uses. However, the draft amendments do not specifically allow targeting of high trash generation areas with priority land uses through the use of such tools as the "Keep America Beautiful Visible Litter Survey." **The draft Trash Amendment should be revised to allow — even encourage — targeting of truly high trash generation areas within the broad priority land uses.**

Source Control

The City of Signal Hill agrees with the California Stormwater Quality Association (CASQA) that regulatory source controls should be developed and implemented. The staff report notes on page 7 that "California is the leader in implementing local ordinances with goals of reducing trash, specifically plastics." However, what is needed is a statewide program to reduce trash to complement the "consistent statewide approach to controlling trash discharges into waters of the state" being developed by the State Water Board. The City agrees with the option of granting time extensions for adoption of regulatory source control ordinances by local governments. Such an incentive will encourage more local, and perhaps regional, source control programs, but State action is also needed. Product and packaging stewardship should be encouraged and/or required by the State. SB 346, the brake pad bill, became law in 2010 and is on track to greatly reduce copper stormwater pollution by 2025. A similar effort is needed to reduce trash. Producers of products and packaging that ends up in the water could be required to design and implement recycling/collection programs and/or redesign products to be biodegradable in water. The State Water Board should work with other state agencies, the legislature, the California Product Stewardship Council, the Governor, and product and packaging manufacturers to reduce trash at the source.

In addition, the State Water Board should consider the market-related approaches to source control assessed in the 2006 report entitled "Market-Based Strategies For Reducing Trash Loadings to Los Angeles Area Watersheds, An Initial Assessment" discussed above.

Relationship to Los Angeles Trash TMDLs

The staff report states on page 4 that "the proposed Trash Amendments would apply to all surface waters in the state, with the exception of those waters with[in] the jurisdiction of the Los Angeles Water Board that have trash TMDLs in effect prior to the Trash Amendments." The staff report goes on to say,

> "While the proposed Trash Amendments do not apply to existing trash TMDLs in the Los Angeles Region, the proposed Trash Amendments direct the Los Angeles Water Board to reconsider the scope of its trash TMDLs within one year of the Trash Amendments' effective date and focus its permittees' trash control efforts on high trash generation areas

rather than all areas within each permittee's jurisdiction. The reconsideration would occur for all existing trash TMDLs, except for the Los Angeles River Watershed and Ballona Creek Trash TMDLs, because those two TMDLs are approaching final compliance deadlines of July 1, 2014 and 2015, respectively."

Actually, the final compliance date for the Los Angeles River Trash TMDL is September 30, 2016. For September 30, 2014, the compliance point is 10% of the baseline load calculated as a rolling 3-year annual average. For July 30, 2015, the compliance point is 3.3% of the baseline load calculated as a rolling 3-year average. The Regional Water Board clarified the final compliance date for the Los Angeles River Trash TMDL in Attachment O of Order No. R4-2012-0175. Section A.2 of the Attachment states, "Permittees shall comply with the final water quality-based effluent limitation of zero trash discharged to the Los Angeles River no later than September 30, 2016 and every year thereafter." Several cities, especially those installing certified full capture devices, have already achieved 90% compliance. **However, achieving full compliance will be very expensive due to the need to retrofit or replace catch basins in which the certified full capture devices could not be installed.**

The City of Signal Hill requests that the phrase, "except for the Los Angeles River Watershed and Ballona Creek Trash TMDLs, because these two TMDLs are approaching final compliance deadlines of July 1, 2014 and 2014, respectively" be deleted and replaced with:

> "The final compliance point for the Los Angeles River and Ballona Creek Trash TMDLs will be delayed until six months after the Los Angeles Regional Water Board completes its reconsideration of the scope of its trash TMDLs. Further, the Los Angeles Regional Water Board should be directed to consider each Permittee that is determined to have achieved 90% compliance with the current Los Angeles River and Ballona Creek Trash TMDLs to be in full compliance with the TMDLs. 90% compliance with a TMDL covering an entire jurisdiction is more than equivalent to compliance with the Trash Amendments. Those jurisdictions determined to be a minimum of 80% in compliance shall be allowed to achieve full compliance through focusing trash control efforts on high trash generation areas."

Appendix C acknowledges that California communities already spend more than $428 million annually to control trash and prevent it from entering waters of the State and that Caltrans spends another $52 million on trash control. The author of the appendix also estimates that an expenditure of between $2.93 and $7.77 more per resident may be required annually for the next 10 years to implement the Trash Amendments. The author also notes that communities implementing a trash and debris TMDL are spending an average of $5.30 per resident more than communities not implementing a trash or debris TMDL. These numbers, when applied statewide, will result in very high costs, and municipal stormwater programs generally do not have dedicated revenues for stormwater implementation.

The greatest assistance that the State Board could provide to local governments is in allowing the use of a certified trash surveys to focus the implementation of this new policy to catch basins that generate significant amounts of trash, irrespective of the land use category.

Thank you again for the opportunity to provide comments on the proposed Trash Amendments. This is an important issue, and it must be addressed carefully and consistently.

Sincerely,

Kenneth C. Farfsing
City Manager, City of Signal Hill

Attachment: CEPRD Trash TMDL Final Report

MARKET-BASED STRATEGIES FOR REDUCING TRASH LOADING TO LOS ANGELES AREA WATERSHEDS

AN INITIAL ASSESSMENT

Prepared by

The Coalition for Environmental Protection,
Restoration and Development

FINAL REPORT

March, 2006

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ACKNOWLEDGEMENTS

The Coalition for Environmental Protection, Restoration and Development ("CEPRD") has been established as a 501 (c) (3) nonprofit tax-exempt educational corporation to promote expanded working relationships among environmental regulatory agencies at the federal, state, regional and local levels. These government officials and agencies are tasked with implementing legislative and judicial mandates at an ever increasing pace. They have neither the resources nor the information necessary to develop policies that are both environmentally protective and economically sound. CEPRD is designed to provide a vehicle through which ideas can be shared and tested in a non-confrontational setting. Regulators have shown that they value the opportunity to better understand what works - and what doesn't - with the regulated community. Through the sponsorship of forums, research and publications, CEPRD is uniquely situated to test cutting edge approaches that will have bottom line impacts.

This study was made possible in part through the generous support of the Los Angeles County Department of Public Works, the United States Environmental Protection Agency (Grant ID# XP-97979001-0), the American Chemistry Council, the Polystyrene Packaging Council and the cities of Arcadia, Bellflower, Cerritos, Downey, Lakewood, Long Beach, Monrovia, Paramount, Sierra Madre, and Signal Hill in Los Angeles County. The California Integrated Waste Management Board and the Watershed Divisions of the City of Los Angeles and County of Los Angeles provided access to trash collection data that was collected from prior studies and analyses.

The views, opinions and recommendations expressed herein do not necessarily reflect those of the parties which have provided support for this project.

EXECUTIVE SUMMARY

This report assesses the potential use of market-based approaches to reduce trash flows into the Los Angeles River, Ballona Creek and other regional watersheds. It also identifies a variety of other measures which seek to encourage the proper handling and disposal of consumer products. While not endorsing any specific option, this report is designed to provide a foundation upon which prudent choices may be made in designing a regional system for trash control consistent with existing regulatory obligations.

Section I summarizes the adoption of three trash total maximum daily loads (TMDLs) and the likely extension of trash control efforts to private sector sellers and consumers of items that are commonly discarded and found in Los Angeles waterways. Other market-based programs, such as the existing regional air emission trading system (RECLAIM), allow regulated entities to achieve load reductions by focusing their efforts on the most efficient compliance opportunities. As such, they provide a cost-effective approach for integrating public and private sector, trash TMDL implementation efforts.

In accordance with U.S. Environmental Protection Agency market development guidelines, Section II analyzes trash load monitoring data, trash source surveys, and TMDL compliance cost estimates to assess whether market-based options may be useful strategies for trash load control. Although most of the available monitoring data and trash control cost estimates are preliminary, the following observations indicate that market-based approaches may be useful to consider as trash source controls:

(1) *Diverse trash sources.* Water-borne trash includes many diverse items, such as beverage and food containers, plastic bottles, cigarette butts, and plastic bags. Control costs are likely to vary for each of these materials and market based-systems can be utilized to focus source management efforts on high-impact, low cost, measures. A substantial amount of the material typically collected from catch basins also includes sediments and degradable vegetation, items that are not regulated under the trash TMDLs.

(2) *Significant redemption potential.* Unlike most beverage bottles made from aluminum, glass, and plastic,, most watershed trash products are not subject to redemption or other disposal avoidance incentives. Extending incentive programs to include these items may significantly reduce trash loads before the wastes enter the regional storm drain system or other public facilities.

(3) *Concentrated entry points.* A relatively small number of drainage inlets appear to account for a disproportionate share of the regional trash load. Significant efficiencies can result from focusing controls at these high trash volume locations.

(4) *Cost-effective option.* Preliminary estimates (see Section II.E), including the initial assessments made in the trash TMDLs indicate that regional watershed trash control costs could range from hundreds of millions to billions of dollars, depending on the equipment required to achieve compliance goals. Costs of this magnitude suggest that trash control compliance obligations will eventually be extended to include consumers, sellers, and manufacturers of frequently discarded items. Market-based approaches may provide a cost-effective option for achieving public and private sector program participation.

Drawing from the experience of other regions and established environmental market efforts, Section III describes the primary elements required to implement a trash discharge exchange (TDE) market in the Los Angeles region. These include: (a) creating market drivers that motivate regulators and the regulated community to pursue TDE development; (b) defining appropriate units of trade, including equivalent trash reduction "credits" applicable to diverse water-borne debris and baseline levels from which tradable credits may be generated; and (c) monitoring the TDE market to assure that credit transactions produce commensurate trash load reductions. Building a TDE market will require substantial and sustained stakeholder and regulatory commitment.

The consideration of market-based approaches often identifies compliance options that incorporate, but do not necessarily implement, full-scale market systems. Section IV discusses four market-related approaches that may, pending further analysis and review of feasibility, expenses, administration and other important issues, potentially help reduce regional trash loads in a cost-effective manner:

(1) *Focus efforts on high trash volume inlets.* Monitoring data indicate that approximately 15% of all storm drain inlets account for 50% of water-borne trash. If verified by additional data, very significant pollutant reductions and cost savings can be achieved by first focusing compliance efforts on controlling trash loads at these locations.

(2) *Extend redemption incentives to frequently discarded trash items.* Many watershed trash items are not currently subject to redemption incentives and the discard rate for these products is relatively high. Municipalities and state agencies are increasingly considering product bans or taxes to address this problem. It is possible that extending the existing redemption program to include high-volume trash items may substantially reduce waterborne loads in a more cost-effective manner. Redemption efforts have historically been subject to significant concerns about administrative costs, the amount and method of redemption payment collection and return, the use or modification of existing program infrastructure to include new materials and products, and possible "leakage" of redemption funds into neighboring areas that do have programs for the affected items. These issues would need to be fully addressed prior to determining that a redemption program could reduce trash loads in a cost effective manner.

(3) *Trash program credit banking*. Entities that make significant, regional contributions to watershed trash control, including public storm system operators or multi-store food or beverage chains, can market and sell compliance "credits" to help offset the costs of their efforts. This approach may facilitate voluntary participation in, and efficiently generate revenue for, regional trash control program.

(4) *Enhanced education and voluntary cleanups.* Survey data collected by the Institute for Applied Research (see Section IV.B) indicates that about 25% of the population never litters, 25% always litters, and 50% can be educated not to litter. Successful highway cleanup programs suggest that continued focused educational and voluntary "adopt-a-highway" programs can significantly reduce trash loads. Similar efforts can be extended to storm drains and high-trash generation rate urban communities.

Beyond the assessments provided herein, further work is required in order to better assess the feasibility of the options presented. Accordingly, it is recommended that the following actions be taken:

(1) Expand the stakeholder base of the current project to include the League of California Cities, the City of Los Angeles and private sector representatives of grocery, restaurant and petroleum marketing businesses;

(2) Obtain the support of environmental regulatory and recycling agencies, including, but not necessarily limited to, the US Environmental Protection Agency, Cal-EPA, the California Integrated Waste Management Board, the Department of Conservation, the Los Angeles Regional Water Quality Control Board, the State Resources Agency and the State Water Resource Control Board

(3) Identify area(s) within the Los Angeles region where a pilot markets based program for litter and trash reduction may be implemented;

(4) Develop recommendations for the potential structure, operational framework, budget and financing mechanisms for this pilot project; and

(5) If indicated, secure necessary funding commitments to implement a pilot markets based mechanism to reduce the flow of improperly disposed consumer products.

I. BACKGROUND

This report assesses the potential use of market-based approaches to reduce trash flows into the Los Angeles River and Ballona Creek. These two waterways are subject to the first federal Clean Water Act (CWA) urban trash total maximum daily load (TMDL) limitations adopted in the nation.[1] As discussed below, market-based strategies are an increasingly important part of the national TMDL program and can reduce the cost of achieving water quality objectives.

A. The Los Angeles River and Ballona Creek Watersheds Trash TMDLs

In California, each of nine Regional Water Quality Control Boards (Regional Board) adopts a Basin Plan that identifies "beneficial uses" for the waters within its jurisdiction. Every two years, the Regional Board assesses whether the designated beneficial uses have been achieved. In the event that water quality conditions are found to "impair" any of these uses, the Regional Board (subject to EPA oversight) is required to: (a) identify the maximum allowable daily constituent discharges that will protect the designated beneficial uses; and (b) allocate the allowable load among point and non-point sources in the affected watershed. The resulting TMDL allocation is adopted as a Basin Plan amendment and enforced, among other means, as a component of the National Pollutant Discharge Elimination System (NPDES) permits issued to the affected waterway's public storm drain owners and operators. Under a 1999 consent decree settlement of lawsuits brought by environmental advocacy groups against the U.S. Environmental Protection Agency (EPA), federal and state regulators agreed to adopt over 90 TMDLs, for Los Angeles region waters by 2012.[2]

During its watershed review process, the Los Angeles Regional Board determined that the designated beneficial uses of certain waterways were impaired by "floatables" primarily consisting of trash. To date, three trash TMDLs, including those for the Los Angeles River and Ballona Creek, have been adopted and are the first such regulations implemented for urban areas of the country.[3] They define "trash" as:

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[1]See, e.g., Los Angeles Regional Water Quality Control Board, "Trash Total Maximum Daily Loads for the Los Angeles River Watershed," (September 19, 2001) and "Trash Total Maximum Daily Loads for the Ballona Creek and Wetland" (January 16, 2004). In California, the CWA is implemented by local Regional Water Quality Control Boards, which adopt Basin Plans pursuant to the Porter-Cologne Water Quality Act . These Basin Plans are equivalent to the "State Water Quality Control Plan" required under the CWA. The federal Environmental Protection Agency has oversight authority over state CWA compliance.

[2]A summary of current Los Angeles area TMDL development is provided on the City of Los Angeles webpage at http://www.lacity.org/SAN/wpd/WPD/program/TMDLs/tmdls.htm (accessed March 2005).

[3] In 1999, a trash TMDL was adopted for the largely rural and recreational stretch of the East Fork of the San Gabriel River. The primary compliance strategy of the San Gabriel River TMDL involved inducing the U.S. Forest Service to enhance trash collection and control activities for the affected waterway. This San Gabriel River TMDL predated the finalization of the Los Angeles River and Ballona Creek TMDLs, but did not directly affect urban areas. For a general description of the San Gabriel River TMDL, see Los Angeles Regional Water Quality Control Board, "Regional Water Board Approves "Zero" Limit for Trash in East Fork of San Gabriel River" November 2, 1999 press release.

> [A]ll improperly discarded waste material, including, but not limited to, convenience food, beverage, and other product packages or containers constructed of steel, aluminum, glass, paper, plastic, and other natural and synthetic materials, thrown or deposited on the lands and waters of the state…. (Cal. Gov't Code Section 68055.1(g))

Under this definition, the trash TMDLs do not regulate sediment or vegetation that occurs in rivers, streams or waterways. The trash TMDLs specify that a "zero discharge" objective must be attained within ten years.[4]

Dozens of public agencies objected to the trash TMDLs. In 2003, the City of Los Angeles (City), the County of Los Angeles (County) reached an out of court settlement with the Regional Board. In general, this agreement includes two elements: (1) expansion of the definition of a full capture system to include alternate trash control technologies; and (2) clarification that the "reopener" language in the trash TMDLs includes reconsideration of the final waste load allocations once a reduction of 50% has been achieved.[5] A continuing lawsuit by 22 other municipalities has invalidated the Los Angeles River TMDL within the jurisdiction of 14 watershed cities.[6] Other legal proceedings and legislative efforts are being pursued throughout the state and in other parts of the country which may eventually affect the trash TMDLs. At present, the Ballona Creek Trash TMDL remains in full effect and the Los Angeles River Trash TMDL is applicable to Caltrans, the County, and thirty cities that are not parties to the continuing litigation.

B. TMDL Regulatory Implications

Trash TMDL compliance obligations and specific reduction measures have not yet been definitively determined. Most of the initial compliance effort has focused on trash interception from public storm drain systems, through the use of catch basin inserts or screens. A very limited number of special studies have evaluated source controls that might reduce trash loads before entry into the drainage conveyance network.[7] The early phases of the compliance process suggests that, for several reasons, the cost and eventual regulatory scope of the trash TMDLs will be extensive:

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[4] Los Angeles Regional Water Quality Control Board, "Trash Total Maximum Daily Loads for the Los Angeles River Watershed," (September 19, 2001) at 28 and "Trash Total Maximum Daily Loads for the Ballona Creek and Wetland" (January 16, 2004) at 18.

[5] See, e.g., California Department of Transportation, "LA Trash TMDL – Settlement Agreement Eases Requirements; Other Court Action Still Scheduled," *Water Quality News Flash* (September 15, 2003).

[6] Statement of Decision*, Arcadia, et al v. State Water Resources Control Board, et al.,* California Superior Court case no. GIC 803631 ((December 23, 2003).

[7] Certain litter control studies sponsored in part by the California Department of Transportation and performed by California State University, Sacramento and other academic researchers have discussed the effectiveness of sweeper, trash insert interception and other litter control methods. These studies do not appear to systematically analyze source control options and remain focused on litter interception techniques. Several of the published litter control studies are available on-line at http://www.owp.csus.edu/research/papers/#Litter>http://www.owp.csus.edu/research/papers/#Litter (accessed March, 2005).

(1) *Significant costs.* Trash TMDL compliance costs estimated by the Regional Board indicate that the initial ten-year capital and operations and maintenance (O&M) expenses could amount to $393 million for Ballona Creek and $1.8 billion for the Los Angeles River, for an approximate total of $2.2 billion. These estimates appear to assume that one "full capture" device, installed in a drain, can serve many upstream catch basins. The projections do not appear to include engineering and construction costs for diverting flows from basins that could not be retrofitted with the advanced trash catchment systems. If each of the basin inlets in the Los Angeles River and Ballona Creek watersheds were fitted with full capture devices, the Regional Board's cost estimates would at least double.[8] County compliance planning efforts, and the initial estimates from certain municipalities, indicate that full capture device installation may be several times more expensive than assumed in the TMDLs (see Section II.E, below). Consequently, even under relatively favorable cost and implementation assumptions, the trash TMDL compliance costs will require significant expenditures. Full capture devices may also incidentally increase concentrations of other impairment-causing contaminants and require further expenditures to protect water quality.

(2) *Alternative compliance strategies are also costly.* Los Angeles County and the City have proposed a set of "best management practices" (BMPs) that may achieve a 50% trash load reduction. According to published reports, the City and County initially agreed to spend approximately $168 million to achieve the 50% reduction level.[9] BMPs generally include such measures as public education and stenciled warnings above an inlet, installing screens in front of basin inlets, regular basin cleanouts, and street and parking lot sweeping.[10]It is possible that achieving the 50% reduction target could be significantly more costly than projected.

(3) *Limited funding options.* To the extent compliance must be achieved by public entities, rate increases and bond financing, supported by user charges or other taxes, are the most likely TMDL implementation options. Although the City of Los Angeles approved Measure O, a $500 million bond authorization, in November, 2004, potential trash and other anticipated TMDL compliance costs for bacteria, metals and similar constituents could significantly strain regional bond financing capacity and rate increases may be politically or legally infeasible. New tax and

[8]The Board's "high-end" estimates relate to installing low capacity sub-grade vortex separation devices in areawide catch basins, an approach that would be deemed to be "full compliance" with the TMDLs. Los Angeles Regional Water Quality Control Board, "Trash Total Maximum Daily Loads for the Los Angeles River Watershed," (September 19, 2001) at 40; "Trash Total Maximum Daily Loads for the Ballona Creek and Wetland" (January 16, 2004) at 37.

[9] California Department of Transportation, "LA Trash TMDL – Settlement Agreement Eases Requirements; Other Court Action Still Scheduled," *Water Quality News Flash* (September 15, 2003).

[10] See, e.g., County of Los Angeles Department of Public Works, *Technical Report On Trash Best Management Practices,* (August 5, 2004).

service cost burdens also have secondary regional employment and economic impacts that affect other sources of tax revenue and the provision of existing public services. Both the Los Angeles region and the State of California are expected to experience significant budget pressures for the next several years.

(4) *Potential private sector and trash source involvement.* As trash and other TMDL costs rise, it is likely that the regulatory focus will increasingly shift to private sector trash sources, including businesses that manufacture, use and sell items that comprise a substantial portion of water-borne trash flows. A 2003 State of California report, for example, characterized plastics as a major contaminant in " in stormwater runoff. The report also identified several potential controls that were being considered to address this issue, including banning the use of certain products and materials found in high volumes in Los Angeles watersheds.[11] Similarly, the City of Los Angeles has initiated a task force to identify ways of reducing high trash volume, water-borne plastic container loads, such as through the imposition of product user fees, taxes, use prohibitions, and other measures.[12] The California State Water Resources Control Board has funded a study by the non-profit Algalita Foundation that is "researching industrial sites and non-point sources responsible for adding plastic debris to the Los Angeles and San Gabriel Rivers' watersheds." The Agalita project summary indicates that "plastic pollution should be considered in its own right in the future and … routinely monitored as other pollutants are."[13] Given public budgetary pressures, programs that are perceived to address the so-called "externalities" generated by private commercial activities, such as cleaning up coffee cups, food wrappers and plastic bags in the watershed, may be politically more feasible to implement than other options. Private sector regulatory compliance mandates could be extended through municipalities and drainage management entities that are subject to TMDL requirements, or by the direct extension of the TMDL to trash sources located in the watershed.

(5) *TMDL compliance burdens may be perceived as not sufficiently affecting trash source manufacturers and retailers.* Under the present TMDL regulatory structure, public storm drain owners and operators, including the County and municipalities, are responsible for eliminating trash loads that they do not create, but only passively convey. It is generally recognized that most stormwater-borne trash results from improper

[11] California Integrated Waste Management Board, "Plastics White Paper," May 2003 at 17.
[12] See, e.g., Interdepartmental Memorandum from Councilmember Ed Reyes to Jan Perry, Chair of the Environmental Quality and Waste Management Committee, "Plastic Bag Initiative," December 28, 2004 at 2.
[13] The $486,000 Agalita Foundation study is scheduled for completion in 2006. For a brief summary of the research effort, see Algalita Marine Research, "California State Water Resources Control Board Project," http://www.algalita.org/state_water_project.html (accessed March, 2005).

consumer disposal.[14] Nevertheless, it is not uncommon for regulators and local government entities to prefer measures that control private sector activities rather than impose costs and legal obligations directly on the voting public, and similar measures have already been proposed throughout California to control trash (see Section III.A and the applicable citations for a summary). In addition, anti-litter law enforcement and similar consumer-oriented control measures could be extremely costly to implement. Under such circumstances, the trash TMDL compliance focus could shift to the sellers and users of trash-producing items that are not properly disposed. Public cleanup efforts may also be perceived as providing a benefit to private sector entities that make or sell high-volume trash items but have few incentives to assist with trash source reduction programs. This so-called "moral hazard" problem can lead to increased trash volumes, even while public entities attempt to intercept and control area trash loads.

In conclusion, even under relatively favorable technical and cost assumptions, trash TMDL compliance will likely generate substantial institutional compliance costs. As these expenses are incurred, pressure to recover at least a portion of the costs from private sector entities that are associated with the manufacture and sale of high-volume trash items will increase. Possible regulatory options include: (a) requiring that trash-generating activities achieve TMDL load reductions each year; (b) specific product use limits or bans; and (c) the imposition of "pollution taxes" or fees on high-generation rate items. Trash TMDL compliance obligations may therefore be extended to businesses and other private activities throughout the Los Angeles region.

C. Potential Use of Market-Based Strategies

In response to the significant costs involved in many environmental protection efforts, regulators and entities responsible for compliance (i.e., "stakeholders") have increasingly considered market-based approaches to achieve water quality goals. A market system can help reduce compliance costs by focusing regional reduction measures on the most efficient and cost-effective solutions.

Market-based water quality programs can be a useful policy option, because the costs required to control constituent discharges from specific sources (e.g., a factory, a farm, or a commercial district) are often very different. A blanket regulatory mandate to cut discharges by some fixed amount affects both high and low cost dischargers to the same extent, resulting in compliance expenditures for both very efficient and highly inefficient control measures. In a market system, stakeholders can exchange discharge allowances to meet the desired reduction goal by investing primarily in the region's lower cost opportunities, achieving the same discharge control at significantly lower expense.

[14] The state's *Plastics White Paper,* for example, states that, "Litter is a pervasive problem involving diffuse sources and human behavior, and there are no easy solutions. The principal tenet of this issue is that litter is not a problem caused by specific materials, such as plastics; rather, litter is caused by human behavior" (California Integrated Waste Management Board, "Plastics White Paper," May 2003 at 16).

Two sources, for example, may each generate 100 gallons of trash per year. It may cost one source $30 to reduce its waste stream by a gallon, compared with $5 dollars per gallon for the second source. If each discharger is individually required to reduce trash loads by 50% — a blanket mandate approach — it will cost $1,750 to meet the regulatory objective. If the high cost discharger is allowed to offset or trade its trash load by paying for and achieving its share of the reduction goal at the lower cost location, the same environmental benefit (a 50% lower load) can be achieved for $500. Under a market system, the same regulatory objective can be attained at an approximately 71% lower cost (see Table 1.1).

Table 1.1
Market System Cost Reduction Illustration

	Discharger 1	Discharger 2	Total Load
Baseline trash load	**100 gallons**	**100 gallons**	**200 gallons**
Load reduction cost per gallon	**$30**	**$5**	
50% reduction-blanket requirement	**50 gallons**	**50 gallons**	**100 gallons**
Cost	**$1,500**	**$250**	**$1,750**
50% reduction with trading	**0 gallons**	**100 gallons**	**100 gallons**
Cost	**$0**	**$500**	**$500**

Market approaches are an increasingly common element of air and water quality protection efforts. Examples include the following:

- *Nutrient controls.* Market exchanges have been increasingly proposed and implemented to address non-point nutrient loads associated with agriculture and other major land uses. Typically, measures that reduce soil runoff containing phosphorous or nitrogen are credited with a load reduction "credit" that can be purchased by a treatment plant or other higher cost discharger located in the affected watershed. Overall loads are reduced at a lower aggregate cost.[15]

- *Power plant discharges.* Market exchanges have been credited with significant sulfur dioxide reductions from power plants in the Northeast in an effort to control acid rain. Power plants that have high compliance costs are allowed to invest in, and be credited with, reductions at lower cost generators in the affected region.[16]

- *Greenhouse gases.* Market exchange is one of the key measures proposed by environmental advocates for reducing greenhouse gases under the Kyoto Treaty. Higher cost dischargers in Europe, for example, would invest in less expensive controls in developing countries and significantly reduce worldwide greenhouse gas emissions more cost efficiently.[17]

- *Southern California air pollution control.* In the mid 1990s, Southern California air quality regulators implemented the RECLAIM program, one of the most successful regional trading programs in the country. Air emission dischargers are allowed to create credits for reductions below a

[15] Paul Faeth, *Fertile Ground: Nutrient Trading's Potential to Cost-Effectively Improve Water Quality*, World Resources Institute (2000).
[16] Paul Portney, "Market-Based Environmental Policies," Resources for the Future (2003) at 17.
[17] Portney, "Market-Based Environmental Policies" at 17.

target level and sell them to higher cost facilities (or new operations in the region). Particularly in its early years, RECLAIM is widely credited with reducing emissions and regional air pollution control compliance costs.[18]

Market exchanges have also been successfully used to facilitate water quality compliance for constituents that arise from non-point (geographically diffuse and runoff-borne) sources. In the Grasslands program, a group of California Central Valley farm operators relied on market-based options to reduce selenium-bearing runoff into a federally maintained drainage system.[19] The program allocates a maximum selenium load among farmers that are organized into seven districts. In accordance with the recently adopted Grasslands region selenium TMDL, total allowable selenium discharges for the group will be lowered each year from 2005 through 2011. Pursuant to contract conditions for the use of the federal drainage facility, the Grasslands group is financially penalized if aggregate load allocations are exceeded and drain use is subject to a complete cutoff, if the total exceedance is greater than 20% of the allowable load.

To help meet discharge objectives, the Grasslands project allows for districts that take steps to reduce loads below applicable targets to sell the "excess" reduction as a credit to other districts that have not yet fully achieved their goals. In the early phases of the program, approximately 39 such trades were completed. These transactions are credited with allowing the Grasslands districts to meet their combined annual load limits, usually by a significant margin and although trading has not been necessary in the most recent compliance periods, market exchanges remain an option for meeting future selenium discharge limits. The Grasslands experience has been cited by environmentalists and the EPA as a model for other non-point source, water quality improvement efforts.[20]

At present, over 40 water quality trading programs are being pursued throughout the United States, including both point and non-point source trades.[21] In 2003, the EPA adopted a CWA-related discharge trading policy initially focused on nutrients, like nitrogen and phosphorous, but the policy specifically contemplates market-based

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[18] RECLAIM is usually credited with having generated significant, positive results during the 1993-1999 period. In 2000-2002, the program experienced certain problems with credit pricing that led to a critical assessment by EPA Region 9. Even that assessment, however, indicated that "[t]he added flexibility of trading under RECLAIM has reduced the costs of compliance for most regulated industries." See, Nicholas, et al, "Market Based Approaches To Environmental Preservation: Environmental Mitigation Fees And Beyond," Natural Resources Journal, Vol. 43, (2003) at 17-20 (manuscript available at www.law.ufl.edu/faculty/pdf/nich.pdf); U.S. EPA, Region 9, *An Evaluation of the South Coast Air Quality Management District's Regional Clean Air Incentives Market - Lessons in Environmental Markets and Innovation* (November, 2002) at 50.

[19] The following discussion is drawn from Breetz, et al., "Water Quality Trading and Offset Initiatives in the U.S.: A Comprehensive Survey," Dartmouth College, (August 5, 2004) at 10-17.

[20] See, e.g., U.S. EPA, Section 319 Success Stories, Vol. III, "Grassland Bypass Project: Economic Incentives Program Helps to Improve Water Quality," http://www.epa.gov/owow/nps/Section319III/CA.htm (accessed January 2005); Environmental Defense, "Nonpoint Source Pollution Control: Breaking the Regulatory Stalemate," (Undated report, circa 2000).

[21] Breetz, et al. "Water Quality Trading and Offset Initiatives in the U.S.: A Comprehensive Survey," Dartmouth College, (August 5, 2004).

solutions for other constituents.[22] EPA Region 10, which encompasses the Pacific Northwest, helped stakeholders along the lower Boise River devise a trading framework for point and non-point dischargers, including publication of the nation's first water quality trading "handbook."[23] In 2004, the national EPA incorporated much of the Region 10 material into a national trading handbook.[24]

Even if fully functioning markets are not ultimately implemented, the market planning effort generates valuable information that can help stakeholders identify costs and compliance options for achieving the new regulatory requirements. As a result, the EPA trading handbook encourages the consideration of market exchanges to realize ancillary benefits:

> Even if [a market trading] assessment ultimately indicates that your watershed has limited or no potential for watershed scale trading, other trading opportunities may exist. **Markets, in and of themselves, can often create opportunities not easily recognized in advance analysis.**[25]

D. Assessing Market-Based Trash Discharge Exchange Options

Market-based strategies have not been systematically integrated with California TMDL development efforts, including the new Los Angeles River and Ballona Creek trash control programs. Given the substantial costs associated with the trash TMDLs, and the likelihood that compliance obligations will be extended to the private sector, it is prudent for stakeholders in the region to assess market-based options as early as possible in the program development process.

The EPA and other resource agencies have identified certain fundamental issues that are generally considered during the assessment of market-based water quality protection strategies. These include: (a) an analysis of the constituent sources and control options; (b) an assessment of whether control costs are likely to vary among different sources; (c) evaluating potential stakeholder interest in trading and the "drivers" that would help stimulate market development; and (d) a consideration of market mechanisms and procedures that are required in each circumstance to facilitate trading activity.[26]

Section 2 of this report summarizes available information about the volume, location, composition and control costs of trash loads into the Los Angeles River and Ballona Creek. Most of this data was developed by public agencies during the first phase of the trash TMDL compliance process and primarily examines trash entrance into the

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[22] U.S. EPA, Office of Water, *Water Quality Trading Policy,* (January 13, 2003).
[23] U.S. EPA, Region 10, "EPA Region 10's Water Quality Trading Initiative," http://yosemite.epa.gov/r10/oi.nsf/d9fbcd8fc7ce1c5d882564640065adff/e061bb2efbef6d54882566950062b816?OpenDocument (January 2005); U.S. EPA, Region 10, *Water Quality Assessment Handbook, EPA Region 10's Guide to Analyzing Your Watershed (*July, 2003).
[24] U.S. EPA, *Water Quality Assessment Handbook, (*November, 2004).
[25] U.S. EPA, *Water Quality Assessment Handbook, (*November, 2004) (emphasis added) at 2.
[26] This basic assessment approach is outlined in the U.S. EPA, *Water Quality Assessment Handbook,* (November, 2004) at 3-4.

drainage system. Surveys of trash recovered from certain catch basins and marine areas affected by storm water drainage, provide additional information about the composition of water-borne trash flows. Almost no systematic information has yet to be developed regarding the sources, reduction options, and related costs for reducing trash loads prior to their entry into storm drains. The data indicates that trash discharge exchanges may be a useful component of the regional source control effort, and that certain intermediate market-based approaches may reduce loads in a cost-effective manner.

Section 3 discusses the institutional requirements that will likely be required to support a discharge exchange program in conjunction with the trash TMDLs. All market-based control efforts must develop information about option costs, build effective exchange and trash reduction monitoring capabilities, and define comparable "units" of reduction that can be exchanged by market participants. Substantial public and private stakeholder effort will be required to create the institutional framework for a trash discharge exchange program in the Los Angeles and Ballona Creek watersheds.

Section 4 discusses four potential market-based control options that utilize economic incentives to achieve reductions in an efficient manner. Additional research is necessary before concluding that any of the identified potential options can cost effectively reduce trash loads. These include: (a) identifying and focusing on the maintenance of high-trash volume flow catch basins early in the compliance effort; (b) establishing a redemption credit or deposit incentive to encourage the proper disposal and third-party collection of high-volume water-borne debris (e.g., cups, food containers, plastic bags); (c) allowing public, or private entities that invest in significant trash compliance measures to sell compliance credits to other trash generators; and (d) implementing additional educational measures to increase public awareness of source control needs and encourage voluntary cleanup sponsorships. Although these potential approaches do not necessitate the implementation of fully established markets, each creates incentives for public and private cooperation that would allocate trash reduction funds in a more efficient manner. They are indicative of the range of potential public and private cooperative approaches that should be considered in conjunction with the assessment of market-based trash TMDL compliance options in regional watersheds.

II. LOS ANGELES RIVER AND BALLONA CREEK TRASH LOADS

This section summarizes available information concerning the location, timing, volume, nature and control costs of trash conveyance and capture along the Los Angeles River and Ballona Creek. The City and County of Los Angeles are undertaking studies designed to help estimate regional trash "generation" levels in anticipation of the trash TMDLs' initial requirements. The studies identify catch basins that predominantly drain one of five major land use types: (1) commercial; (2) industrial; (3) low-density single family residential (LDSFR); (4) high-density single family residential (HDSFR); and (5) open space or parklands. Debris capture devices are installed in locations that represent flows from each of these land use types and periodically emptied, usually after significant rainfalls or extended dry periods. As discussed more fully below, the City and County utilize different basin debris capture devices, and the recovered debris is measured using different methodologies (see below). As a result, the City and County results and are not directly comparable.

In general, after each cleanout, the volume (gallons) and weight (pounds) of (i) litter and (ii) sediment and vegetation is recorded by the County. The City records the total volume and weight of all materials collected, including Trash, sediment and vegetation. The County data records inlet data separately, and the City aggregates data from adjacent inlets into drainage "sites." that were pre-selected on the basis of a 2002 trash collection intensity assessment performed by the City (see below). Both agencies are continuing their studies and refining their monitoring methodologies, and the reported data results should be considered to be preliminary and subject to further revision or analysis. The results reported to date indicate that a small number of basins consistently account for a substantial majority of the measured total trash volume over time. Although commercial and industrial land use areas tend to have larger trash loading rates, the range of observations for different land use categories overlaps significantly and the data does not show a strong connection between land use type and trash loading. The City and County are assessing the effectiveness of the debris capture devices used in the current trash studies, and in some instances there is evidence that trash can bypass or overflow certain devices.[27] As a result, the reported data must be further analyzed before baseline trash loads can be estimated for Los Angeles area watersheds.

The County and City are also developing multi-year trash TMDL compliance plans that identify a range of costs for specific drainage system enhancements and proposed trash control BMPs. Preliminary planning estimates suggest that compliance costs for installing "full capture" basin devices may be substantially higher than originally estimated in the trash TMDLs (see Section II-E). Periodic qualitative surveys

[27]Fro example, the County is assessing the effectiveness of continuous deflection separation (CDS) units located downstream from one or more catch basins fitted with debris capture devices. Certain of the preliminary CDS study results, based on approximately 3-5 CDS unit cases during the 2002-2004 seasons, indicate that catch basin inserts are, under certain circumstances, approximately 50%-60% effective at retaining trash loads in the water that enters the applicable catch basins. To generate baseline trash loads from the City and County data, a comprehensive estimate of capture device bypass will likely be required.

of water-borne trash indicate that paper and plastic, casual dining derived food and beverage containers, including coffee cups, bags and food containers, comprise a significant amount of the trash conveyed from Los Angeles County watersheds.

A. Los Angeles River Monitoring- Los Angeles County Results

Over a two-year period (2002-2004), the County of Los Angeles has assembled trash volume and weight data for approximately 258 catch basins located throughout the Los Angeles River watershed.[28] The basins are distributed nearly equally among commercial, industrial, LDSFR, HDSFR and open space or parkland uses (see Table 2.1).

Table 2.1
Los Angeles River Monitoring (County) Location Summary

Land Use	Number of Monitoring Basins	Drainage Acres
Commercial	55	104
HDSFR	51	114
Industrial	50	120
LDSFR	50	164
Parks	52	129
TOTAL	**258**	**632**

[28] See County of Los Angeles Department of Public Works, *Trash Baseline Monitoring Results: Los Angeles River And Ballona Creek Watersheds,* Supplemental Report (May 3, 2004); County of Los Angeles Department of Public Works, *Trash Baseline Monitoring Results: Los Angeles River And Ballona Creek Watersheds,* (February 17, 2004). In general, the monitoring data is designed to provide information for scaling trash loads in accordance with the primary land uses in the Los Angeles River watershed. A small number of monitoring locations were modified between the 2002-2003 and 2003-2004 monitoring period, and these have been excluded from the two-year dataset to assure continuity over the longer period of time. All of the monitoring results are preliminary and subject to further revision as the County refines the protocols for assessing trash conveyance.

The monitoring data includes basin cleanouts following 17 storms (nine in the 2002-2003 and eight in the 2003-2004 storm seasons) and one dry season (2002-2003) cleanout. Debris captured in each catch basin was removed during each monitoring event and separated into "trash" (human-made litter) and "sediment and vegetation." The aggregate results indicate that commercial and industrial land uses generated the most total trash, and largest proportion of trash per acre or per catch basin, over the two-year monitoring period (see Table 2.2).[29]

Table 2.2
Los Angeles River Monitoring (County) Trash[30] Summary
2002-2004

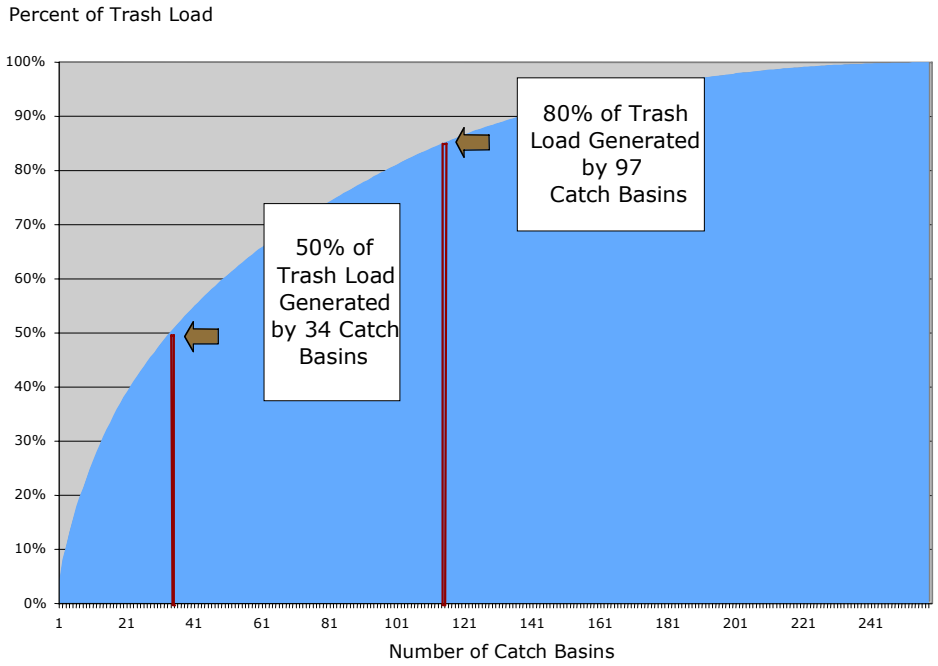
Land Use	Total Gallons of Trash over Two-Year Period	Average Annual Gallons of Trash per Acre	Average Annual Gallons of Trash per Catch Basin
Industrial	3,197	13.5	16
Commercial	2,400	11.5	11
HDSFR	723	3	3.5
Parks	715	3	3.5
LDSFR	278	1	1.5
TOTAL	**7,312**	**6**	**7**

[29] The distribution of trash loads within each land use category is generally uneven. A small subset of inlets account for most of the measured loads (see below). As a result, focusing on land use to generate baseline data does not appear to offer as many efficiency benefits than seeking to reduce trash through high-volume inlets irrespective of land use.

[30] This report focuses on the reported volume, rather than the weight of trash for each monitoring location. In general, weight data may be influenced by the water content of items such as paper, or disproportionate presence of high-density debris, such as metallic substances. The trash TMDLs are aimed at reducing the number of floatable items in the affected waterways, such as Styrofoam coffee cups and food containers, which have low weights. The volume, rather than weight, of trash at any one location appears to provide a better measure of the constituents that the TMDLs are attempting to reduce. A high reported volume suggests that a large amount of trash flowed into the applicable catch basin, while a high reported weight may be consistent with high trash flows or the presence of low volumes of heavier materials . In any event, reported litter weight for each season correlates closely with reported litter volumes. The correlation coefficient (R), a measure of statistical correspondence between two sets of data, was approximately 0.88 for the County's Los Angeles River 2002-2003 and 2003-2004 reported trash volume and weight monitoring results.

Based on the results of the cumulative distribution analysis (see Chart 2.1)the County's Los Angeles River monitoring results indicate that a relatively small number of catch basins account for the substantial majority of the total reported trash load over time. During the 2002-2004 monitoring period, 34 of 258 catch basins (13% of the total) accounted for 50% of the total volume of trash recovered from all of the basins, including the single 2002-2003 dry period cleanout. Approximately97 basins (38% of the total) accounted for 80% of the reported trash flow over the same period.

Chart 2.1
Percent of Total 2002-2004 Los Angeles River (County) Trash Flow Accumulated by Catch Basin (including dry period cleanout)



Of the 258 catch basins reported on in the 2002-2004 Los Angeles River trash load analysis, all but one of the 34 catch basins responsible for generating 50% of the collected trash were located in commercial or industrial land use drainages (see Table 2.3). These 33 high trash volume inlets accounted for approximately 31% of the total number of inlets that were monitored for these two land uses (105). The remaining 69% of commercial and industrial land use inlets were not high volume trash collectors. These results suggest that historical inlet trash volumes, rather than land use, is likely to more accurately identify priority control locations.

Table 2.3
Summary of Catch Basins Accounting for 50% of 2002-2004
Los Angeles River (County) Trash Volume

Land Use	Number	Acres	Total Gallons of Trash over Two-Year Period
Industrial	22	56	2,333
Commercial	11	22	1,282
Parks	1	1	66
HDSFR	-	-	-
LDSFR	-	-	-
Total	34	79	3,681
Monitoring Period Total	**13%**	**12%**	**50%**

Industrial and commercial land uses accounted for 75 of the 97 catch basins that generated 80% of the reported trash volume during 2002-2004, while 21 of the remaining inlets were located in park and high-density single-family housing areas (see Table 2.4). As with the 50% load analysis (see Table 2.3), this data indicates that past trash collection data is a better predictor of priority control areas than land use.

Table 2.4
Summary of Catch Basins Accounting for 80% of 2002-2004
Los Angeles River (County) Trash Volume

Land Use	Number	Acres	Total Gallons of Trash over Two-Year Period
Industrial	43	105	3,079
Commercial	32	51	2,038
HDSFR	11	39	367
Parks	10	17	331
LDSFR	1	1	32
Total	97	213	5,845
Monitoring Period Total	**38%**	**34%**	**80%**

In general, the year to year correspondence between reported loads at specific catch basins was relatively high.[31] High trash volume collection sites appear to remain significant and continuing conduits for watershed trash over time. If verified with additional monitoring or scheduled maintenance data, this result may allow storm system managers to identify the areas that generate the most substantial trash flows and to focus maintenance efforts at these locations (see Section 4.A).

[31] Correlation coefficients (R) for the 2002-2003 and 2003-2004 annual seasonal data by catch basin location were approximately 0.95, and approximately 0.71 for the single dry season result relative to each annual storm season. This suggests that the reported data for the catch basins was relatively consistent over the monitoring period among high and low trash volume basins. Wet and dry weather correspondence was also high, although the single dry season result should be supplemented by additional cleanout data to verify this relationship.

B. Ballona Creek Monitoring—Los Angeles County Results

The County has collected trash volume and weight information after storm events and during a single dry period for approximately 300 catch basins located in the Ballona Creek watershed. The results are currently being verified and the methodology may not be fully comparable from year to year. The preliminary datasets appear generally consistent with those from the Los Angeles River monitoring analysis. Most of the reported trash volume apparently enters Ballona Creek through a relatively small number of basins, and, to a limited extent, commercial land uses tend to produce the greatest amount of trash.

1. The 2003-2004 Monitoring Period

In 2003-2004, the County monitored approximately 300 Ballona Creek catch basins, draining approximately 760 acres. The basins were apportioned among commercial, industrial, HDSFR, LDSFR and park land uses. The reported total trash load recovered from the basins for the 2003-2004 period was approximately 829 gallons. Commercial and industrial uses generated larger trash volumes, although the differential between these and others land use areas appears to have been less significant than in the Los Angeles River monitoring data. The volume of trash per drain and per acre also appears to be approximately two to three times lower than the average annual results reported for the Los Angeles River (see Table 2.5).

Table 2.5
Summary of County 2003-2004 Ballona Creek Monitoring Results

Land Use	Number of Catch Basins	Acres	Total Gallons of Trash	Volume of Trash per Acre	Volume of Trash per Basin
Commercial	47	91	196	2.15	4.2
Industrial	62	216	177	0.82	2.9
HDSFR	73	141	159	1.13	2.2
LDSFR	71	180	154	0.85	2.2
Parks	47	128	143	1.11	3.0
Total	**300**	**757**	**829**	**1.09**	**2.8**

The 2003-2004 Ballona Creek data indicates that relatively few basins account for most of the measured trash loads. About 13% of the basins accounted for 50% of the annual trash recovered, and approximately 39% of the basins accounted for 80% of the collected total. This distribution is very similar to the County's 2002-2004 Los Angeles River monitoring results. Commercial land uses generated the highest loads, but the difference between each land use category was relatively small and roughly comparable in volume (see Tables 2.6 and 2.7).

Table 2.6
Summary of Basin Data Accounting for 50% of
2003-2004 County Ballona Creek Monitoring Data

Land Use	Number of Catch Basins	Trash Volume in Gallons
Commercial	12	115.8
Parks	9	90.8
Industrial	7	90.3
LDSFR	6	60.3
HDSFR	5	55.8
Total	**39**	**412.9**
Percent of Monitoring Period Totals	**13%**	**50%**

Table 2.7
Summary of Basin Data Accounting for 80% of
2003-2004 County Ballona Creek Monitoring Data

Land Use	Number of Catch Basins	Trash Volume in Gallons
Commercial	28	179
HDSFR	23	111
Industrial	25	146
LDSFR	21	109
Parks	19	119
Total	**116**	**663**
Percent of Monitoring Period Totals	**39%**	**80%**

2. The 2002-2003 Monitoring Period.

The 2002-2003 Ballona Creek monitoring effort involved approximately 300 catch basins apportioned among the five major land use categories in the County. The volume of trash reported for the monitoring period was approximately 2,760 gallons and is substantially (over 3 times) higher than during the 2003-2004 period, which did not include a dry-period clean out[32] (see Table 2.8). Adjustments in methodology between the periods may have contributed to these observations. Similar to the 2002-2004 Los Angeles River results, commercial land uses produced the largest proportion of the total reported load, but the reported data did not substantially vary from the levels reported for other land uses. The volume of trash per drain also appears generally consistent with the Los Angeles River monitoring results.

Table 2.8
Summary of County 2002-2003 Monitoring Results for Ballona Creek[33]

Land Use	Number of Catch Basins	Trash Loads in Gallons	Volume of Trash per Basin
Commercial	46	901	19.6
Industrial	68	556	8.2
LDSFR	69	483	7.0
HDSFR	71	427	6.0
Parks	46	391	8.5
Total	**300**	**2,757**	**9.2**

[32]This is generally consistent with the results for the Los Angeles River in which the County obtained 4,858 gallons during 2002-2003, including a dry period cleanout, and 2,454 gallons in 2003-2004 (which did not include a dry period cleanout).

[33] Table 2.8 omits reference to the acreage associated with each inlet as reported for the 2003-2004 season (see Table 2.5) due to differences in the underlying data developed during the two monitoring periods.

Approximately 18% of the catch basins collected 50% of the annual trash recovered, and about 49% of the basins accounted for 80% of the total. Compared with the 2003-2004 Ballona Creek and 2002-2004 Los Angeles River monitoring results, the 2002-2003 Ballona Creek flows appear to have been more evenly distributed among the monitoring basins. Catch basins located in commercial and industrial areas accounted for most of the high-volume locations (see Tables 2.9 and 2.10).

Table 2.9
Summary of Basin Data Accounting for 50% of
2002-2003 County Ballona Creek Trash Volume

Land Use	Number of Catch Basins	Trash Loads in Gallons
Commercial	27	742
Industrial	10	267
Parks	6	142
LDSFR	8	126
HDSFR	4	97
Total	**55**	**1,374**
Percent of Monitoring Period Total	**18%**	**50%**

Table 2.10
Summary of Basin Data Accounting for 80% of
2002-2003 County Ballona Creek Trash Volume

Land Use	Number of Catch Basins	Trash Loads in Gallons
Commercial	40	875
Industrial	26	411
LDSFR	33	340
Parks	25	315
HDSFR	23	261
Total	**147**	**2,203**
Percent of Monitoring Period Totals	**49%**	**80%**

C. Los Angeles River and Ballona Creek—Los Angeles City Results

The City of Los Angeles monitored trash conveyance into portions of the Los Angeles River and Ballona Creek within City boundaries that were selected on the basis of a 2002 trash generation study.[34] The 2002 study identified high, medium, and low trash generation areas based on accumulated catch basin cleaning and debris data (see subsection 1, below). The City's analysis determined that certain areas generated more trash regardless of land use type. Based on these results, the City subsequently prepared a Los Angeles River and Ballona Creek trash TMDL compliance monitoring plans that focused on selected areas, or "sites," that were adjacent to several individual catch basins and that represented different trash generation and land use categories. In anticipation of the results from the County study, and recognizing the effort required to segregate catch basin debris, the City's methodology reported the total trash, sediment, and vegetation (TSV) volume recovered from the study sites. Sediment and vegetation typically comprise a large proportion of catch basin debris, and the City and County monitoring data are not directly comparable. The City's 2002 analysis and monitoring data appears to be broadly consistent with the County results in that: (1) a small number of locations appear to account for most of the reported TSV volumes; and (2) while TSV loads appear generally higher in commercial and industrial areas, TSV collection data is a better predictor of priority control areas than land use.

1. 2002 City Trash Characterization Study

In 2002, the City completed an analysis identifying the locations (by land use type) of catch basins that were frequently full when maintained by City staff. The study's results indicated that commercial and industrial downtown areas, likely produce a majority of the City's total trash flows:

> The citywide land use profile reveals…that the Downtown LA and Central City North consist of mainly commercial and industrial land uses. Residential and commercial developments are commonly seen in Westlake, West Adams area, South Central and Southeast Los Angeles. These communities contribute to the majority of trash collected in catch basins. Furthermore, the summarized data…show that the overwhelming majority (83%) of the full-trash catch basins in Downtown LA are associated with commercial and industrial land uses. In contrast, citywide only about half (52%) of the full catch basins were found in commercial and industrial areas.[35]

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[34] The primary City data sources include: City of Los Angeles, "Compliance Monitoring for the Trash TMDL in the Los Angeles River and Ballona Creek Watershed," Letter and data summary provided to the Los Angeles Regional Water Quality Control Board (April 8, 2004); City of Los Angeles, "Compliance Monitoring Update for the Trash TMDL in the Los Angeles River and Ballona Creek Watershed," Letter and supplemental data summary provided to he Los Angeles Regional Water Quality Control Board (June 2, 2004)

[35] City of Los Angeles, "High Trash-Generation Areas And Control Measures," (January 2002) at 11.

Generally the 2002 report also suggests that residential and commercial uses outside of Downtown, as well as Downtown commercial and industrial areas, generate higher than average trash volumes. These results appear to have been generally confirmed by subsequent City and County catch basin monitoring data and tend to indicate that trash load history, rather than land use, more consistently identified areas that should be subject to increased control efforts. For example, non-Downtown residential area catch basins were reported to be full at almost the same rate (42%) as Downtown commercial basins (46%), and more residential inlets were full throughout the city (36%) than reported for any other land use (see Table 2.11).

Table 2.11
Percent City of Los Angeles
Catch Basins Full, When Surveyed

Land use	Within Downtown	Outside Downtown	Overall
Residential	6%	42%	36%
Commercial	46%	31%	33%
Industrial	27%	18%	19%
Utilities	1%	0%	0%
Transportation	5%	2%	3%
Open / Recreation	1%	2%	2%
Others	14%	6%	7%
Total	100%	100%	100%

Source: City of Los Angeles, "High Trash-Generation Areas And Control Measures," at 12.

The City utilized the 2002 report to design its trash site monitoring program for locations within the Los Angeles River and Ballona Creek watersheds.

2. 2003-2004 Los Angeles River Results

During 2003-2004, the City monitored the volume of TSV at 36 sites, collecting materials from 230 catch basins. These sites were apportioned among high, medium and low trash generating areas (based on the City's 2002 study) and the five major land use types specified in the TMDL program. Approximately 49,000 gallons of TSV was collected from these sites. Commercial and HDSFR land uses generated the largest TSV volumes (see Table 2.12).

Table 2.12
Summary of City Los Angeles River Monitoring Results
2003-2004

Land Use	Number of Sites	Number of Catch Basins	Site Acreage	Site Total TSV Volume (gallons)
Commercial	9	65	228	14,313
HDSFR	9	55	340	13,598
Industrial	9	58	171	8,189
LDSFR	5	29	179	8,334
Parks	4	23	71	4,606
TOTAL	**36**	**230**	**990**	**49,039**

As discussed above, both the volume of debris reported by the City cannot be compared with the County's Los Angeles River monitoring data, primarily because the TSV includes dense leaves and sediment as well as trash. The available City site data also averages the individual catch basin data and utilizes a different type of insert that may retain more debris. However, consistent with the County results, and as anticipated by the City's 2002 study, most of the reported TSV load appears to have been conveyed through a relatively small number of monitoring sites. About 53% of the sites accounted for 80% of the reported trash volume in the Los Angeles River during 2003-2004. Commercial areas accounted for most of the high-volume locations. As predicted from the City's initial selection criteria, some LDSFR and HDSFR areas were more also significant TSV sources than reported in the County data for similar land use types (see Table 2.13)

Table 2.13
Summary of Sites Accounting for 80% of the
City's Reported Los Angeles River TSV Volume, 2003-2004

Land Use	Sites	Basins	Acreage	Volume (Gallons)
Commercial	7	54	206	12,852
HDSFR	4	26	249	11,174
Industrial	2	15	81	4,475
LDSFR	4	23	101	7,546
Parks	2	14	61	3,319
TOTAL	**19**	**132**	**698**	**39,365**
PERCENT OF MONITORING TOTAL	**53%**	**57%**	**70%**	**80%**

3. 2003-2004 Ballona Creek Site Results.

The City's 2003-2004 Ballona Creek monitoring program included 34 sites, and approximately 220 catch basins, selected from among the high, medium and low TSV generation areas indicated in the 2002 study and the five land use categories identified in the trash TMDLs. Approximately 42,000 gallons of TSV was recovered from the monitored sites (see Table 2.14).

Table 2.14
Summary of City Ballona Creek Monitoring Results
2003-2004

Land Use	Number of Sites	Number of Catch Basins	Site Acreage	Site Trash Volume (gallons)
LDSFR	4	23	83	15,681
Commercial	9	59	117	10,297
HDSFR	9	60	140	7,222
Industrial	9	60	145	5,763
Parks	3	18	26	3,287
TOTAL	**34**	**220**	**512**	**42,250**

As the City anticipated based on the 2002 study, most of the 2003-2004 reported Ballona Creek load entered the watershed through a relatively small number of the monitoring sites. About 56% of sites accounted for nearly 80% of the City's reported TSV volume during the 2002-2003 period (see Table 2.15).

Table 2.15
Summary of Site and Basin Data Accounting for 80% of
2003-2004 County Los Angeles River TSV Volume

Land Use	Sites	Basins	Acreage	Volume (Gallons)
LDSFR	4	23	83	15,681
Commercial	6	40	58	8,652
HDSFR	4	28	72	3,897
Industrial	3	22	45	2,695
Parks	2	13	20	2,631
TOTAL	19	126	277	33,556
PERCENT OF MONITORING TOTAL	**56%**	**57%**	**54%**	**79%**

D. Trash Characterization

The County trash monitoring program distinguishes the debris recovered from catch basins as either trash or sediment and vegetation, while the City monitoring data identifies total TSV volumes. In both cases, the trash component is not further characterized to identify the types and likely sources of the trash loads removed from each basin. A variety of public and public interest entities have conducted surveys that provide a more detailed characterization of regional water-borne trash. Despite differing methodologies and collection periods, almost all of the surveys suggest that most of the trash entering Los Angeles watersheds is likely to be comprised of plastic or plastic-impregnated products, such as beverage cups, and food or liquid containers.

Cigarette butts are also frequently reported as occurring in large numbers in marine debris surveys. The persistence of cigarette butts in the watershed is likely explained by the fact that they are partially comprised of cellulose acetate, a form of plastic that is relatively stable in water.[36] The trash TMDLs currently apply to items greater than 5mm (approximately ¼ inch) in size. In some cases cigarette butts may be smaller than this threshold. Based on survey data, the total volume of cigarette butts is generally small in comparison with larger items that are less frequently recovered. Watershed surveys also appear to identify butts in fewer numbers than marine surveys, a result that may result from the direct deposition of cigarette waste by beach visitors. To reflect these issues, cigarette butt recoveries are reported in the notes to each applicable survey referenced below.

In 2003, the California Integrated Waste Management Board (CIWMB) published a "Plastics White Paper" that briefly summarized water-borne debris surveys. The CIWMB concluded that plastic products were a significant component of Los Angeles watershed water-borne waste:

> Currently, plastics is a major contaminant in stormwater runoff. Los Angeles County alone spends $1 million a year on beach cleanups after storm events, when beach litter is at its worst. Los Angeles County could be required to spend as much as $400 million in 12 years to trap litter in its storm system before it reaches the waterways and beaches…. Some cities in the Los Angeles region are actively pursuing stringent solutions for plastics litter stormwater runoff, including banning the sale of some plastic products.[37]

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[36] See Longwood University, Department of Natural Resources, "Are Cigarette Butts Biodegradable?" http://www.longwood.edu/cleanva/cigbuttbiodegradable.htm (accessed February 2005).

[37] California Integrated Waste Management Board, "Plastics White Paper," (May 2003) at 17. Although a caption to a photograph in the White Paper also state's that "Plastics litter is predominant in California's storm drain runoff," other sections of the report urge caution in attempting to regulate a particular material to address trash loads ("Litter is a pervasive problem involving diffuse sources and human behavior, and there are no easy solutions. A principal tenet of this issue is that litter is not a problem caused by specific materials, such as plastics; rather, litter is caused by human behavior. Attributing the litter issue to one particular packaging material does not solve the litter problem, because another type of packaging will take its place as litter unless human behavior changes. However, plastic policies still need to address the issue of

The CIWMB reiterated its concern with watershed debris in 2004, when it began to consider plastic waste controls in support of the trash TMDLs:

> Additionally, illegally discarded plastic products and bags (litter) represent more than visual blight; they pose a real threat to wildlife and result in significant costs to society. In accordance with the Federal Clean Water Act, jurisdictions in the Los Angeles area were issued an [*sic*] "zero tolerance" order by the Los Angeles Regional Water Quality Control Board regarding a Trash Total Maximum Daily Load (TMDL). The TMDL requires jurisdictions to reduce the amount of trash in the storm drains to zero within ten years. Jurisdictions are evaluating different methods of compliance with the Trash TMDL. The Los Angeles Regional Board in their LA River Trash TMDL estimated costs over a ten-year period to range from $373 million to $1.758 billion depending on the technology used. There are numerous studies highlighting the amount of plastic that litters our streets, waterways, beaches and oceans. According to a California Department of Transportation study during 1998-2000, plastic comprised 42 percent (by volume) of litter recovered from studied storm drains. According to the California Coastal Commission, plastic products accounted for 61 percent of the material collected in the 2000 California Coastal Cleanup.[38]

The City of Los Angeles' 2002 trash generation study analyzed data from Caltrans and a 1998 Orange County beach debris survey and also concluded that plastic products comprise much of the urban water-borne trash stream:

> [T]wo recently completed regional studies provided an insight on the composition of the trash. While these studies did not focus on City of Los Angeles areas, the composition and characteristics are noteworthy and applicable for the City. The first study was conducted by the Southern California Coastal Water Research Project (SCCWRP) which examined the composition and distribution of beach debris in Orange County. The study estimates that 106 million items, weighing approximately 13 tons were along the Orange County beaches in the summer of 1998[39]…. The Department of Transportation of the State of California (Caltrans)

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plastics litter entering and persisting in the environment. Litter and plastics are fast becoming synonymous.")(Plastics White Paper at 16).

[38] California Integrated Waste Management Board, "Board Meeting, Agenda Item 14-Revised," (June 2004) at 15.

[39] These results included large numbers of small plastic nodules ("nurdles") used in plastic manufacturing. Most of these nodules would not be subject to the current trash TMDLs because they are smaller than 5mm in size. A nonprofit research organization is currently assessing the impact of plastic manufacturing nodules in area watersheds. See Algalita Marine Research, "California State Water Resources Control Board Project," http://www.algalita.org/state_water_project.html (accessed March, 2005). The survey also included a large number of cigarette butts.

> conducted another regional study. As part of this study, trash collected along freeway catch basins was characterized by trash type…. Both studies show that plastics are the single largest types of trash.[40]

Most trash composition assessments rely on cleanup surveys published by public and public interest entities. One of the most influential was a 1998 EPA summary of a national coastal water cleanup effort that included shorelines affected by urban runoff. The study showed that plastic products account for a significant percentage of the marine debris items recovered along the nation's beaches. This result suggests that Los Angeles and Ballona Creek trash is likely comprised of similar materials (see Table 2.16).

Table 2.16
EPA 1998 Coastal Cleanup Survey

Rank	Item	Number
1	Plastic pieces	349,871
2	Foamed plastic pieces	315,944
3	Food bags/wrappers (plastic)	309,283
4	Paper pieces	243,600
5	Caps, lids (plastic)	238,416
6	Glass pieces	219,195
7	Beverage bottles (glass)	168,264
8	Straws (plastic)	165,714
9	Beverage cans	161,064
10	Beverage bottles (plastic)	155,292
11	Bottle caps (metal)	114,769
12	Other plastic items	113,849
13	Cups (foamed plastic)	109,926
14	Cups, utensils (plastic)	92,225
15	Other metal items	81,654
16	Lumber pieces	78,643
17	Rope (plastic)	75,097
18	Other plastic bags	73,305
19	Packaging material (foamed plastic)	69,460
	Total	**3,135,571**
	Percent Plastics	**66%**

Source: US EPA, International Coastal Cleanup, (September 19, 1998).
The survey also identified 1.38 million cigarette butts.

[40] City of Los Angeles, "High Trash-Generation Areas And Control Measures," (January 2002) at 4-6.

Similarly, a 1998 Orange County debris assessment, performed under the auspices of academic researchers, has frequently been cited to characterize urban trash flows. Consistent with the EPA data, the result indicated that plastic food containers and other products comprised the majority of the identified water-borne debris (see Table 2.17).[41]

Table 2.17
1998 Orange County Marine Debris Survey

Item	Number
Foamed plastics	742,296
Hard plastics	642,020
Paper	67,582
Wood	27,919
Metal	23,500
Glass	22,195
Rubber	10,742
Pet and bird droppings	9,388
Cloth	5,949
Other	10,363
TOTAL	**1,561,954**
PERCENT PLASTICS	**89%**

Source: Moore et al., "Composition and distribution of beach debris in Orange County, California," *Marine Pollution Bulletin*, (1999).
The survey also identified 139,000 cigarette butts.

Annual "coastal cleanup" events also occur throughout California on a regular basis. During these efforts, volunteers collect, identify, and compile tabulations of the debris they recover from the beach areas they traverse. Data for the state of California in 1998 and for Southern California in 2003 are generally consistent with the EPA and Orange County debris study results and suggest that plastic products comprise a substantial share of the urban trash load, although other items, such as "bags," were also found in substantial quantities (see Tables 2.18 and 2.19).[42]

[41] The study also found that the most prevalent item was plastic pellets used in injection molding operation. At the time of the survey, Orange County was a significant injection molding production center compared with other parts of the state. Since 1998 the injection molding industry has instituted several efforts to control pellet releases, including" operation clean sweep" (see www.opcleansweep.org). In any case, these pellets are not regulated under the current (and most proposed) trash TMDLs because they are generally are smaller than the defined size of items subject to the TMDLs and pass through applicable capture devices.
[42] Source for Table 2.16: Moore et al., "Composition and distribution of beach debris in Orange County, California," *Marine Pollution Bulletin*, (1999); Table 2.17: The Ocean Conservancy, "International Coastal Cleanup 2003: California Summary Report," Appendix A (2004)

Table 2.18
1998 California Coastal Cleanup Day Results

DEBRIS ITEM	NUMBER
Hard Plastics	382,380
Foamed Plastics	211,406
Paper	133,335
Metal	110,201
Glass	94,333
Wood	27,136
Rubber	25,666
Cloth	10,620
TOTAL	**995,077**
PERCENT PLASTICS	**60%**

The survey also identified approximately 309,000 cigarette butts.

Table 2.19
2003 Southern California Coastal Cleanup Survey Results

Item	Number
Food Wrappers and Containers	106,111
Caps/Lids	58,863
Straws/Stirrers	34,820
Cups/Plates/Forks/ Knives/Spoons	34,556
Beverage Bottles (Glass)	30,459
Bags	29,207
Beverage Bottles (Plastic) 2 liters or less	23,654
Beverage Cans	19,993
Building Materials	18,306
Clothing/Shoes	9,901
Tobacco Packaging/Wrappers	9,619
Plastic Sheeting/Tarps	9,231
Pull Tabs	9,070
Toys	8,531
Balloons	8,406
Rope	6,149
Fishing Line	5,851
Shotgun Shells/Wadding	4,570
Strapping Bands	4,561
Bait Containers/Packaging	2,479
Six-Pack Holders	2,424
TOTAL	**436,761**
PERCENT PLASTICS	**69%**

The survey also identified approximately 315,806 cigarette butts and cigarette "products."

The Friends of the Los Angeles River conducted two debris surveys. The first involved trash recovery directly within the River in April, 2004, while the second emptied thirty area catch basins in June 2004. In both cases, the recovered debris was sorted and analyzed by volume and weight. In general, plastic products were the most prevalent items recovered during these Los Angeles River trash surveys. The river cleanup also recovered significant amounts of cloth, paper and cardboard/chipboard (see Tables 2.20 and 2.21).

Table 2.20
April 2004 Los Angeles River Cleanup Survey Results

Type	Volume (gal)
Plastic Film	160
Cloth	85
Plastic-Moldable	70
Paper	20
Cardboard/Chipboard	15
Polystyrene foam	15
Wood	8
Glass	4
Total	**377**
Percent Plastics	**65%**

Table 2.21
2004 Los Angeles River Catch Basin Cleanout Survey Results
(30 Basins)

Material	Volume (gal)
Plastic-Film	28
Plastic-Bags	22
Plastic-Moldable	22
Paper	20
Polystyrene Foam	20
Metal	3
Cloth	1
Wood	0.75
Other	0.5
Cardboard	0
Glass	0
Total	**117.25**
Percent Plastics	**78%**

Source: Friends of the Los Angeles River, "Characterization of Urban Litter," (summary of April 30 and June 10, 2004 catch basin and river cleaning events, 2004) (Table 2.18 excludes shopping carts and similar metal items. No cigarette butts were reported at either survey location.)

E. Trash TMDL Compliance Cost Estimates

To date, Los Angeles trash TMDL cost estimates have focused primarily on catch basin detention and trash interception options. Both the City and County are working to identify a range of BMPs to meet the TMDL requirements.[43] These efforts involve both institutional controls, such as anti-litter enforcement and public education, and structural controls, such as end-of-pipe trash capture nets, cages and similar full capture devices. Systematic trash source control cost assessments, for measures that might reduce the release of trash prior to catch basin entry, have not yet been developed.

Most of the reported implementation cost estimates are derived from projections that were included in the Los Angeles River and Ballona Creek trash TMDLs. The TMDL approach assumed that 183,710 catch basins in both basins could require some form of trash discharge control. One possible solution explored in the TMDLs was retrofitting each of these basins with inserts. The TMDLs assumed that inserts would each cost approximately $800 and require O&M expenses of $400 per year. Costs were estimated to include (a) $147 million to buy 183,100 inserts and (b) approximately $73.5 million per year in O&M expenses after full installation. Over a ten-year period, the total retrofit and O&M cost was estimated to be approximately $550 million and could be significantly higher depending on the actual insert type materials utilized. The Regional Board, however, does not consider inserts to be "full capture" devices. As a result, even if fully implemented, the insert approach would not achieve full TMDL compliance.[44]

To illustrate a "full compliance" alternative, the TMDLs attempted to consider costs associated with installing variously-sized vortex separator (VSS) units in watershed drains. VSS units, which subject storm flows to rotational water movement that isolate and capture suspended solids including trash, are defined as "full capture" devices for TMDL compliance purposes. The TMDLs assumed that the entire Los Angeles River and Ballona Creek watershed could be divided into subdrainage areas ranging from 5 to 100 acres. Then estimated that the capital costs of installing VSS units sufficient to treat storm flows would range from approximately $12,000 to $90,000 depending on unit size and capacity (i.e., a 5-acre unit versus a 100-acre unit). The TMDLs further assumed that each VSS unit, irrespective of size, would incur O&M costs of $2,000 per year. Based on these assumptions, the TMDLs estimate that VSS installation, capital, and O&M costs could range from about $460 million (if the entire Los Angeles River and Ballona Creek watersheds were served by 100-acre VSS units) to about $2.2 billion (if 5-acre VSS units were installed) over ten years.

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[43] See. e.g., County of Los Angeles Department of Public Works, *Technical Report On Trash Best Management Practices,* (August 5, 2004); County of Los Angeles Department of Public Works, "Los Angeles River And Ballona Creek Trash TMDL BMP Compliance Plan," Two-part report (undated circa 2003); Shahram Kharaghani, "Stormwater Program Funding Challenges," City of Los Angeles powerpoint presentation (May 9, 2003); City of Los Angeles, "Trash Reduction Pilot Study #A1 End-of-Pipe Trash Systems," (August 22, 2002); City of Los Angeles, *Technical Report: Best Management Practices for Implementing the Trash Total Maximum Daily Loads,* (January 2004)

[44] Los Angeles Regional Water Quality Control Board, "Trash Total Maximum Daily Loads for the Ballona Creek and Wetland" (January 16, 2004) at 34.

The TMDL cost estimates assume that a single VSS unit can be installed at a downstream drainage system collection point to serve multiple catch basins. The most extensive VSS installation considered in the TMDLs (the 5-acre unit approach), would install about 90,000 units a various locations downstream of the region's 183,710 catch basins. The high-volume (100-acre unit) option would install units in 4,500 drains to serve the region's 183,700 inlets by means of larger vortex units.[45] Significant planning, engineering, construction and related expenses would be incurred to restructure the watershed drainages to be certain that the VSS units intercept all of the trash loads that may enter the watershed through each inlet and do not reduce the hydraulic capacity of the system. The TMDLs do not appear to have considered these expenses.[46] VSS and similar units may also increase the concentration of other pollutants (e.g. indicator bacteria) that would require additional control measures and generate standing water in some locations that might stimulate mosquitoes or other disease vector organisms. The TMDLs did not account for, or estimate, these additional implementation costs.

Los Angeles City has estimated various costs associated with BMP and TMDL compliance options. According to the City's projections, the installation and operation of 1,576 full capture devices (CDS units) would be required to service the City-owned portion of the Los Angeles River and Ballona Creek Watersheds and would cost approximately $1.08 billion, an average of approximately $686,480 per installation. This cost is approximately seven to fifty times higher than the TMDLs' VSS unit installation estimates. Catch basin inserts, and screens along the mouth of each basin, were estimated to cost $1,000 per unit, and require $100 of O&M expense per year. End-of-Pipe Baskets located at the storm drain outfalls would cost approximately $10,000 per unit and require $1,000 of operational and maintenance expenses per year. The City's analysis notes that several catchment devices may also generate surface flooding, are prone to fouling, or may not be feasible to install due to the size of catch basin piping and other physical characteristics.[47] These secondary effects generate additional engineering and management costs that have yet to be fully analyzed.

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[45] Los Angeles Regional Water Quality Control Board, "Trash Total Maximum Daily Loads for the Ballona Creek and Wetland" (January 16, 2004) at 35-36.

[46] Engineering, planning and related installation costs for full capture devices can be substantially greater than the equipment procurement expenses used to generate the TMDLs' cost estimates. For example, during 2001, SEAACA installed a "Stormceptor" device in the City of Downey to serve approximately two (2) acres of a mixed landscaped, building and parking area drainage. The 900 gallon unit cost approximately $12,000 to procure, but another $28,000 to install, including plumbing, grading, and construction management. The total unit installation cost was approximately $40,000. In contrast, the TMDLs assumed lower per-unit costs ranging from approximately $12,700 for a 5-acre unit to $90,000 for a 100-acre unit. The SEAACA unit cost from 7.8 to 22 times higher than estimated in the TMDLs on a per-acre basis. (Data supplied by the City of Downey, April, 2005).

[47] Shahram Kharaghani, "Stormwater Program Funding Challenges," City of Los Angeles powerpoint presentation (May 9, 2003) at 20-22; City of Los Angeles, "Trash Reduction Pilot Study #A1 End-of-Pipe Trash Systems," (August 22, 2002).

The County is developing conceptual, multi-year BMP-based workplans to comply with the trash TMDLs. The estimated costs associated with various structural and institutional controls are summarized in Table 2.22.[48]

Table 2.22
Estimated Litter Control Measure Costs

Litter Control Measure	Estimated cost per unit	Annual Operation and Maintenance cost per Unit
Catch Basin Inserts	$500	$500
CDS units	$500,000	$133,333
End of pipe nets	$100,000	$50,000
Catch Basin Excluders	$2,000	$40
Increased public education		$1,000,000
Trash Receptacles	$300	$300

Source: County of Los Angeles Department of Public Works, "Los Angeles River And Ballona Creek Trash TMDL BMP Compliance Plan," Part 1, at 15.

The costs associated with full-capture device installation and O&M (approximately $633,000) are approximately seven times higher than the per-unit costs assumed in the TMDLs. The County estimated costs associated with other controls, such as excluders and basin inserts, are also consistent with the City's estimates. In general, the City and County full-capture device cost estimates suggest that installations of full capture units will be significantly more expensive than estimated by the Regional Board in the trash TMDLs. If a full capture unit costs approximately $500,000 to install per drain and incurs an annual $100,000 O&M expense (the approximate County and City estimate), and each drain conveys flow from about 20 of the 183,000 watershed catch basins (or approximately 10,000 units), the TMDLs would cost $5 billion in capital costs and incur O&M expenses of $1 billion per year after full deployment. The initial ten year installation and O&M costs associated with full capture devices under these assumptions would be approximately $10.5 billion, assuming an annual phase-in of approximately 1,000 units over that period. These expenses range from approximately 5 to 22 times higher than estimated in the TMDLs.

[48] See the conceptual cost and reduction presentation in County of Los Angeles Department of Public Works, "Los Angeles River And Ballona Creek Trash TMDL BMP Compliance Plan," Two-part report (undated circa 2003) at 15-20. The report notes that the estimates are conceptual and will be substantially refined as specific trash reduction work plans are discussed with the Regional Board.

F. Trash Data Summary

The analysis of available Los Angeles area watershed trash information indicates the following conclusions:

- *A small number of basins account for significant trash volumes.* The bulk of trash in all County-monitored areas, and the reported TSV recovered from City monitored inlets, appears to consistently enter regulated waters through a relatively small number of catch basins. Future monitoring efforts should seek to confirm this result and identify these locations.

- *Commercial land uses tend to generate the most trash, but land use is a poor predictor of trash loads.* On average, commercial areas appear to generate the highest loads per acre among the five watershed land use types. However, this result is not consistent at all inlets and high trash loading also occurs at specific inlets located in other land use areas. Future monitoring efforts should seek to confirm whether land use is reliably associated with trash loads. Assessment methods should also be standardized to assure comparability and consistency from location to location and over time.

- *Trash flows may have a temporal and geographic focus.* There is some evidence that trash loads are highest early and late in each storm season and may be concentrated in certain (e.g. Downtown) areas. However, these assertions, are not conclusive and further research should be conducted to determine if additional efficiencies may be achieved through focusing cleanup efforts at specific times or within specific high-volume areas or land use types in the watershed.

- *Food and beverage products appear to comprise a significant source of trash loads.* Surveys of water-borne trash indicate that certain consumer products—cups, utensils, bottles, and bags—comprise a substantial amount of the Los Angeles area water-borne trash flow. This is likely due to the low-density and insolubility of these materials and the relative ease with which consumers can improperly dispose of them. Additional analyses of debris recovered from monitored catch basins should be performed to identify the specific items and materials that comprise area loads. This information will help define potential source cleanup options and identify approaches, including enhanced consumer awareness programs and litter enforcement, that can reduce overall compliance costs.

- *Available cost information focuses on storm drain system institutional and structural controls.* In conjunction with the trash TMDLs, the costs of certain structural and institutional measures are being estimated with increasing precision. County and City experience with the installation of "full capture" devices have demonstrated consistently and significantly

higher costs than were estimated as a component of the trash TMDLs. Little or no current information has been developed correlating source control costs and effectiveness.

- *The diversity of trash sources may allow for significant market efficiencies.* Water quality discharge exchange markets work best when the sources of the constituents of concern are varied and have different control costs.[49] Although control cost estimates are mostly unavailable, debris surveys suggest that regional trash loads are comprised of a diverse range of products originating from a variety of sources and uses. It is likely that these diverse sources will have different control costs, a result that may provide the basis for conducting trash discharge market exchanges within Los Angeles area watersheds.

[49] See, e.g., National Association of Conservation Districts, "The Conservation Marketplace," (http://www.nacdnet.org/special/market.htm, (January 2005); State of Oregon, Department of Environmental Quality, "Water Quality Credit Trading: Frequently Asked Questions" (March 11, 2004).

III. TRASH DISCHARGE EXCHANGE MARKET INFRASTRUCTURE REQUIREMENTS

Establishing and maintaining water quality exchange market rules and procedures is a substantial undertaking, but may offer options that are preferable to other approaches, such as banning the use of certain materials or product-specific taxes. This section describes the basic market infrastructure that would be required to implement a trash discharge exchange (TDE) market in the Los Angeles region. It focuses on:

(a) Regulatory drivers to motivate stakeholders to participating in a TDE market;

(b) Information necessary to define a tradable, "unit" of trash reduction; and

(c) Monitoring and performance-assurance requirements.

As discussed in Section 2, detailed source generation and reduction cost information has yet to be developed in the relatively short time since the trash TMDLs were adopted. However, drawing on the experience of other areas, the essential elements of a TDE market program can be identified to help formulate the region's TMDL compliance effort.

A. TDE Market Drivers

Trading programs depend on the participation of motivated private and public sector stakeholders.[50] The most successful efforts have been sustained by a general realization that alternative, potentially more restrictive and costly mandates may be imposed if the affected stakeholders do not identify flexible, effective discharge control options.

The Grasslands program, for example, was stimulated in part by the recognition that CWA and related requirements, including a pending selenium TMDL, could significantly impinge on farming. Agricultural districts proactively sought to develop their own response options and incorporated trading as part of the control approach. Similarly, stakeholders in the lower Boise River worked with state and federal officials to propose a trading system designed, in large measure, to reduce the likelihood that CWA regulations might be explicitly extended to non-point (agricultural) operations. The resulting program allowed non-point sources to trade under the auspices of a privately organized market entity, rather than being directly regulated by state or federal water

[50] See, e.g., State of Oregon, Department of Environmental Quality, "Water Quality Credit Trading: Frequently Asked Questions" (March 11, 2004) ("Circumstances favorable to trading include …there is a "driver" that motivates facilities to seek pollutant reductions, such as more stringent permit limits [and] watershed stakeholders and the state regulatory agency are willing to try an innovative approach and engage in trading design and implementation issues."); U.S. EPA, *Water Quality Assessment Handbook, (*November, 2004) at 73 (stakeholder readiness assessment).

protection agencies.[51] Substantial compliance costs associated with blanket reduction mandates have also helped generate interest in nutrient market trading systems along the eastern seaboard and in the Midwest.[52]

Eliminating Los Angeles area watershed trash releases will be expensive, and the additional expenses that will be required to comply with future watershed TMDLs, may potentially generate many of the same incentives that have stimulated market-based system development in other parts of the country. Municipalities and drainage agencies that are subject to trash TMDL requirements, and their state government regulators, face chronic budgetary pressures, which affect how they meet their public safety and service responsibilities. To the extent that trash originates from improper consumer disposal, moreover, public entities may well resist substantial litter law enforcement that would significantly and directly impact the voting public, particularly since enforcement on a scale that sufficient to measurably reduce trash loads could be prohibitively expensive.

Under these circumstances, it is reasonably foreseeable that public entities will seek to shift at least some of the trash TMDL cost burdens to private sector commercial and industrial operations that utilize or manufacture items commonly found in water-borne debris (e.g., coffee cups, plastic bags, and food and liquid containers)(see Section I.B, above). If adopted, these measures will likely extend well beyond employee lunchroom activities that generate trash loads to include controls that affect business customers and suppliers. Several of these forms of control are under consideration or implementation in the Los Angeles region and other parts of California including product (particularly plastics) bans, use or "pollution" taxes imposed on high volume items, expanded state and local anti-litter and anti-nuisance law enforcement, and the extension of state and federal water quality control regulations to trash generators.[53]

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[51] Idaho Division of Environmental Quality, "Lower Boise River Effluent Trading Demonstration Project: Summary of Participant Recommendations For a Trading Framework," (September 2000).

[52] See, e.g., Connecticut Department Of Environmental Protection, "Connecticut's Nitrogen Control Program: Nitrogen Credit Exchange, (April 2001); Joseph Kramer, "Lessons from the Trading Pilots: Applications for Wisconsin Water Quality Trading Policy" Fox-Wolf Watershed Alliance (July 8, 2003); Kieser & Associates, *Preliminary Economic Analysis of Water Quality Trading Opportunities in the Great Miami River Watershed, Ohio*, The Miami Conservancy District (July 2004).

[53] For a discussion of possible water-borne waste product bans, see California Integrated Waste Management Board, "Plastics White Paper," May 2003 at 17. For a discussion of levying fees on plastic bags in the Los Angeles area, see Interdepartmental Memorandum from Councilmember Ed Reyes to Jan Perry, Chair of the Environmental Quality and Waste Management Committee, "Plastic Bag Initiative," December 28, 2004 at 2. The City of San Francisco has proposed levying a 17 cents tax on plastic bag use within the city (City of San Francisco, San Francisco Commission on the Environment November 18, 2004 Bag Fee Resolution, Resolution No. 007-04-COE (available at http://sfgov.org/site/sfenvironment_page.asp?id=28305, accessed February 2005). In March, 2005, the City of Malibu voted to ban all foamed plastic containers, including coffee cups, coffee cup lids and clamshell food containers by July 1, 2005. See, http://www.malibutimes.com/articles/2005/03/04/news/news2.txt) (accessed March, 2005). The extension of CWA or Porter-Cologne oversight to trash source generators or "dischargers" would likely trigger substantial legal and political opposition. However, to the extent that state and federal regulators are able to assert authority to regulate non-point source discharges—a position that each has vigorously asserted—a legal basis for seeking to control trash sources as non-point "dischargers" impairing water quality could

Stakeholders can reasonably anticipate that the trash TMDLs will eventually result in regulatory efforts to reduce flows prior to their entry into regulated municipal separate storm sewer systems. A TDE market can provide an anticipatory response that identifies a more flexible, less expensive regulatory option. Market systems have also been utilized to foster non-point source participation in constituent control programs without conceding that such sources are subject to state or federal water quality protection and oversight.[54] This form of source control may represent a more attractive regional option than potentially less flexible mandates or litigation.

The following structural elements will likely be required to stimulate TDE market development in the Los Angeles watershed:

(1) *Flexibility.* As is common in other contexts, TDE trades and related operational activities should be conducted through private contracts monitored by a dedicated non-profit entity, or possibly a dedicated unit within the public drainage management agencies. Participants should be free to opt into, or out of, the TDE program (subject to the completion of any existing commitments), if other compliance options become more attractive. Regulatory oversight would be directly extended to the market coordination entity, but not to the trading participants unless a participant desires a direct regulatory agency relationship.

(2) *Compliance safe harbor.* The TDE program should provide participants meeting their obligations with a regulatory "safe harbor," insulating cities and private sector participants from additional litigation or compliance exposure, based on the presumption that participation will be treated as satisfying applicable reduction requirements. The California State Water Resources Control Board, and various Regional Boards, have adopted this concept as part of the recent statewide conditional irrigated lands waiver program. In 2004, California began to require that irrigated land operators either complete and provide detailed site-specific water quality monitoring information, or join a regional monitoring program to qualify for a waiver of "waste discharge requirements" affecting their runoff.[55] Under program rules, participants in the regional effort are deemed to be in full

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arguably be made. The judicial treatment that such an assertion might receive cannot be predicted with certainty.

[54]U.S. EPA, Region 10, "EPA Region 10's Water Quality Trading Initiative," http://yosemite.epa.gov/r10/oi.nsf/d9fbcd8fc7ce1c5d882564640065adff/e061bb2efbef6d54882566950062b816?OpenDocument (accessed January 2005) (non-point (agricultural) source intended to be "voluntary" in nature).

[55]See, e.g., California Regional Water Quality Control Board, Central Valley Region, "History of the Conditional Waivers of Waste Discharge Requirements for Discharges from Irrigated Lands," (2003); California Regional Water Quality Control Board, Central Coast Region, "Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands," Order R3-2004-0117 (June, 2004) (establishing individual monitoring or regional safe harbor for waste discharge requirement waiver qualification).

compliance with waiver requirements. To stimulate TDE market participation, trash generators, and the municipalities in which they operate, should be provided with similar assurances that by participating in the trading system and properly offsetting trash loads during the applicable participation period, they will be not be subject to additional regulatory obligations.

(3) *Development phase incentives*. Even if a TDE market is not fully implemented, the EPA and other agencies recognize that market planning efforts can generate valuable information about source controls related costs. Developing this information, however, requires substantial stakeholder commitment and involvement. TDE market stakeholders that willingly participate in the early phases of the development process, should receive some form of regulatory credit that can be utilized to meet future obligations. This credit might include a percentage reduction in any subsequently enacted source control goals for the certain periods (e.g., the first year of the program). Incentives of this nature will motivate stakeholders to support the identification of possible source control options and develop the related cost information.

B. Defining the Units of Trade

Environmental trading systems require units of exchange that represent equivalent discharge benefits produced from varied sources and control methods. Nutrient trading programs, for example, typically evaluate diverse load reduction strategies involving factories, treatment plants and farmers, to identify a common trading unit. If farmers do not till a certain acreage of crops, then a predictable amount of nutrient-bearing soil will not be pulverized or fertilized and subsequently eroded into the regional receiving waters. That share of the nutrient load reduced by not tilling a specific area, can be estimated and used to define a non-point source reduction "credit" representing the specific load reduction. Once a trading unit is established in this fashion, other nutrient dischargers can purchase the amount of load reduction credits they need to offset their own discharges.[56] In the Grasslands system, trading units are generally defined in terms of runoff volume. Measures that reduce agricultural runoff below a target level are treated as "surplus" reductions that generate a corresponding credit. Higher marginal cost dischargers, or those that failed to predict their discharge concentrations, can then compete to buy these surplus credits to meet their own selenium objectives.[57]

Consistent with approaches developed in other areas of the country, a TDE market will likely be required to address the following exchange unit issues:

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[56] For an example of the extensive analysis required to identify units of trade in phosphorous, see Kieser & Associates, *Preliminary Economic Analysis of Water Quality Trading Opportunities in the Great Miami River Watershed, Ohio*, The Miami Conservancy District (July 2004).

[57] See Breetz, et al., "Water Quality Trading and Offset Initiatives in the U.S.: A Comprehensive Survey," Dartmouth College, (August 5, 2004) at 10-17.

(1) *Equivalence.* Each "unit" of trash reduction must be defined in comparable terms, such as volume or weight, and apply as broadly as possible to stimulate widespread market participation. For TDE trades, it will be necessary to identify an equivalent reduction level for various forms of water-borne debris. In general, since the trash TMDLs seek to eliminate "floatables" that impair beneficial uses, an equivalent volume reduction of similar water-borne trash, such as coffee cups, plastic bottles or foamed plastic containers, would appear to provide comparable water quality benefits. Certain trash items, such as oil, pesticide or medical product containers, may generate different health or environmental concerns that preclude their inclusion in a TDE system. All TDE watershed stakeholders must reach agreement regarding the specific levels of trash reduction by item that will be treated as an equivalent unit.

(2) *Reduction efficiency*. The specific benefit achieved by a certain actions, such as redemption programs, passive interception devices, education, or basin cleaning and exclusion devices, must be carefully identified to allow for verifiable credit creation and certain trash control measures will likely be more effective than others. To operate a TDE market, a catalog of the reduction efficiencies associated with each reduction measure must be developed so that participants can establish the level of load reduction they are achieving and the amount of any credit (or offset) they may buy. Trash reduction efficiencies will be affected by geography, social demographics, and other factors that can vary significantly between different locations. Considerable effort will be required to account for this variability and determine the applicable reduction benefit achieved by each control measure. Many water quality market programs incorporate margins of safety factors into each measure to assure that the reduction represented by each credit will actually be realized. Any such safety margin must be carefully established so that credit costs do not rise to the point that trading incentives are inhibited or excessively duplicate those already incorporated in the trash TMDLs.[58]

(3) *Establish a credit threshold.* In many cases, stakeholders are allowed to trade or sell "surplus" credits that result from reductions below a specific cap. A tradable credit is created when a control action reduces loads below an applicable target. If market participants are subject to a 30% reduction cap, for example, and a discharger achieves a 70% reduction, an amount equal to 40% of the discharger's load would be available as a credit in most TDE systems. The selenium TMDL annual reduction requirement, for example, is used to set the applicable selenium threshold

[58] High safety margins have been cited to explain limited trading in a Colorado phosphorous reduction effort. See Richard Woodward, "Lessons about Effluent Trading from a Single Trade," Texas A&M University, http://agecon2.tamu.edu/people/faculty/woodward-richard/paps/CaseStudy.pdf. (accessed January 2005) (2:1 credit ratio inhibits trading incentives).

for the Grasslands program. Reductions below the annual target generate tradable credits. A similar approach may be useful to set trash load thresholds that count as exchangeable credits within each of the Los Angeles County watersheds.

(4) *Credit pricing.* High credit, information, and transaction prices frustrate exchanges. Market bottlenecks can occur if the supply of credits is overly restricted or trading ratios are so high that credit purchases approximate the cost of less efficient compliance alternatives. Provided that the overall reduction goal is achieved, credit supply and pricing should be allowed to develop as flexibly as possible, in response to market supply and demand forces.

(5) *Timing*. Most trading systems allow for exchanges during a single season or year, but surplus credits are usually not carried forward to later years on the theory that credits developed in an earlier period should not allow for a higher discharge in a later year. Although credit carry-forward prohibitions might, in theory, frustrate particularly beneficial, one-time reductions, a 12 to 24-month period, approximating seasonal weather cycles, appears to be the most natural approach for the TDE market. If necessary, exceptional circumstances can be defined that might justify multiple-year trading, such as a unique reduction opportunity that achieves a particularly large and sustained early benefit. This consideration may be particularly applicable if the early action is likely to develop valuable reference information that can benefit other stakeholders.

(6) *Applicable area*. In general, a water quality exchange program should encompass at least an entire watershed, and ideally a complete region, to promote widespread and equitable participation. Trash reductions throughout the drainage should improve overall water quality and benefit the entire community. To the extent cleaning up the Los Angeles River, Ballona Creek, and the portions of the San Gabriel River already subject to trash TMDL controls benefit the entire region, the TDE market should extend throughout the area of benefit. In certain cases, such as outfalls near locations where high cost generators have traded for TDE credits, above-average concentrations or "hotspots" may occur. Any such areas can be efficiently cleaned on a case by case basis or the generators can join together to purchase excluders that facilitate trash collection and drainage system maintenance at those locations

C. Monitoring and Performance Assurance

A TDE system must be able to communicate trading opportunities among potential buyers and sellers, monitor exchanges, and ensure that the transactions result in the anticipated load reductions. Market obligations, including payment, achieving load cutbacks, and submitting accurate transaction and monitoring reports, must also be

enforced. These transactional overhead and enforcement requirements, however, must not be so excessive that they substantially reduce incentives to participate in a TDE market. Key elements of a monitoring, enforcement and transactional management system include the following:

(1) *Trade system management.* In current practice, trading programs have been managed by public entities, dedicated non-profit corporations and stakeholder groups. The Grasslands system, for example, is managed by the Grassland Basin Drainage Steering Committee, a management entity established by area farmers. The RECLAIM program is primarily coordinated by the South Coast Air Quality Management District, a regional air quality oversight agency. As initially proposed, the lower Boise River exchange program would be managed by a non-governmental entity that contracts with private sector participants. In the Los Angeles watershed, TDE market coordination functions might be most easily accomplished by either a unit of a regional storm system management agency or a special purpose, private or public/private non-profit. A special purpose entity is often desirable to induce voluntary private sector market participation. Management entity costs would be incorporated into the credit pricing structure and recovered from each completed trade.

(2) *Transactional information and reporting.* Many trading programs depend on a notification system administered by the management entity to communicate between buyers and sellers and track exchanges. Sellers provide information regarding the extent of their available credits. Credit information is then distributed to potential buyers. If an exchange is completed, the management entity receives a transaction summary that is logged for future monitoring. This approach is similar to the self-monitoring report (SMR) system that is often used to document CWA and Porter-Cologne compliance throughout California. TDE market participants would be required to submit a trading SMR to the management entity at regular intervals. The SMRs would include information about: (a) the load level for the reporting entity during the reporting period; (b) actions taken to reduce the load to the applicable level; (c) surplus load reductions available for credit; (d) excess loads for which credits must be obtained; and (e) any transactions between a credit seller and buyer during the applicable reporting period. The SMR information can be obtained in an electronic format and posted on an internet-based exchange. Credit exchanges would be reported to the monitoring entity within a fixed period and the exchange would be regularly updated to identify current credit availability. During TDE market development, stakeholders should be consulted to identify the most convenient and accurate information reporting system.

(3) *Audits and remedial action.* The TDE market management entity would be empowered to enforce reporting obligations and to audit and verify the

substance of any information provided in an SMR. Consistent with other non-point source markets, enforcement functions could be defined by contracts between market participants and the management entity, or potentially supplemented with procedures to delegate enforcement in certain circumstances to water quality oversight agencies. Credit sellers and buyers would be liable for actually implementing the credit reductions and meeting offset requirements. Compliance and SMR liability should extend for a specific period of time. A system of penalties or specific performance procedures (e.g., steps taken to achieve the actual trash load reductions represented by a credit transaction) could be established to allow for the rapid remediation of discharge exceedances and to provide for long-term compliance incentives.

(4) *Flow reduction monitoring.* A TDE market must be able to document the water quality benefits it achieves. As discussed in Section 2.A-C, trash load monitoring protocols are still being refined by the City, County and other storm system operators. In general, market monitoring must: (a) verify the baseline, pre-program load subject to reduction; (b) accurately measure the increment of load reduction achieved by market efforts; and (c) account for land use, population, demographics and weather (rainfall) variations that affect monitored flows. The development of monitoring protocols sufficient to support a TDE market should be integrated with the Los Angeles region's ongoing effort to assess baseline flows in conjunction with the trash TMDLs.

D. Summary

A TDE market-based approach requires an effective operational infrastructure and regulatory accommodation. A coordinated set of market drivers must be established to stimulate and sustain stakeholder interest. Appropriate information must be developed to establish equivalent trading units, terms, and geographical extent of the trading activity. A system for accomplishing transactional information exchanges and monitoring must be implemented, and market rights and obligations must be allocated and enforced in accordance with a simple, effective legal framework. TDE market contributions to watershed trash reductions must be confirmed with monitoring protocols that accurately assess baseline and post-program implementation flows. Building a TDE market will require a substantial and sustained stakeholder and regulatory commitment.

IV. OTHER POTENTIAL MARKET-RELATED CONTROLS

Trash generation baselines are still being developed for the Los Angeles River and Ballona Creek watersheds and are subject to additional confirmation and refinement. Nevertheless, available data indicates that certain market system based approaches could efficiently reduce trash discharge volumes. These potential market-based measures include:

(a) Initially prioritizing trash control efforts on high-volume basins;

(b) Creating incentives to more effectively redeem high-volume consumer products and control their entry into the regional watershed trash stream;

(c) Allowing public storm system operators, and possibly private entities, to sell trash compliance credits to trash sources in the watershed; and

(d) Expanding public education and volunteer efforts to reduce the incidence of litter in area watersheds.

These options do not involve fully implemented markets, but each is based on using economic incentives and to reduce trash loads and watershed debris control costs.

A. Initially Focus on High-Volume Catch Basins

As discussed in Sections 2.A-C, Los Angeles watershed trash discharges appear to be concentrated among a relatively small number of catch basins. Approximately 15% of the Los Angeles River basins monitored by the County, for example, accounted for 50% of the total measured loads during 2002-2004. Approximately 40% of all catch basins accounted for 80% of the measured loads over the same period. If a similar distribution of high-volume basins exists throughout the watershed, it may be possible to realize substantial compliance and cost savings by focusing initial controls efforts at these particular locations.

The potential cost savings can be illustrated by considering a purely hypothetical installation of approximately 45,000 full capture units over a ten year period within the Los Angeles watershed. For discussion purposes, this illustration assumes per unit procurement and installation costs are $40,000 and O&M expenses are $15,000.[59] If the total implementation effort is phased-in over ten years, without regard to location or trash volumes, (i.e., 4,500 units are installed per year to achieve until all units are operational), the total installation and O&M costs over that period would be $5.5 billion (see Appendix A).

[59]These assumed costs are hypothetical and used solely for illustration purposes. As discussed in Section II.E, above, full capture device installation costs do not yet appear to have been fully documented and the actual expenses will likely vary from preliminary estimates by a significant margin. The discussion in this section is applicable to any per-unit installation and O&M parameters.

A potentially more cost-effective method would be to initially place the hypothetical full capture units in the 15% of the total basins that, as indicated by County and City monitoring data, account for 50% of the trash. This approach would deploy the devices in high-trash areas in sufficient numbers to achieve a 10% annual trash reduction until year 5 of the ten-year phase-in process. In the illustration, the objective would be achieved by installing 1,350 units per year during years 1-5 (see Appendix A). During the next three years, the program would focus on the additional 25% of the areas that account for the next 30% of the load, and require installation of approximately 3,750 units per year until year 8 of the program. The remaining 60% of units would be installed in the lowest volume areas over the final two years of the phase-in (see Appendix A).

Due to reduced early period O&M expenses, the high-volume approach would install the same number of units, and achieve the same annual trash reduction levels as the annual percentage approach but reduce overall costs by approximately $1.6 billion, a 30% savings. Adjusted for time, the net savings would be nearly 39% (see Table 4.1).

Table 4.1
Comparison of Annual Percentage and High-Volume Area Full Capture Installation Costs (Based on Hypothetical Unit Values)

For Illustration Purposes Only

Annual Percentage Installation Approach		
	Cost	**Percent Savings**
Number of Full Capture Devices Installed	45,000	
Capital Cost	$1,800,000,000	
O&M Costs	$3,712,500,000	
Total	**$5,512,500,000**	
NPV @ 10%	$3,065,945,951	
High-Volume Basin Approach		
Number of Full Capture Devices Installed	45,000	
Capital Cost	$1,800,000,000	
O&M Costs	$2,092,500,000	
Total	**$3,892,500,000**	-30%
NPV @ 10%	$1,874,421,433	-39%

"NPV" means "net present value," a measure of the time value of money. In general, programs that require larger early-year investments cost more than those that defer expenditures to later periods.

The potential cost savings are more substantial over the first five years of the compliance period. By focusing on high-volume basins, the compliance costs required to reach a 50% load reduction can be reduced by 70% (see Table 4.2).

Table 4.2
Comparison of Annual Percentage and High-Volume Area Full Capture Installation Costs (Based on Hypothetical Unit Values) to 50% Reduction Level

For Illustration Purposes Only

Annual Percentage Installation Approach		
	Cost	**Percent**
Number of Full Capture Devices Installed	22,500	
Capital Cost	$900,000,000	
O&M Costs	$1,012,500,000	
Total	$1,912,500,000	
NPV @ 10%	$1,401,391,329	
High-Volume Basin Approach		
Number of Full Capture Devices Installed	6,750	
Capital Cost	$270,000,000	
O&M Costs	$303,750,000	
Total	$573,750,000	-70%
NPV @ 10%	$420,417,399	-70%

"NPV" means "net present value," a measure of the time value of money. In general, programs that require larger early-year investments cost more than those that defer expenditures to later periods.

Irrespective of the remedial approach, trash TMDL costs can generally be reduced in both nominal and real terms by focusing on high-volume entry points early in the compliance process. This approach helps assure that significant load reductions will be realized with lower costs early in the reduction program and affords provides greater flexibility in subsequent periods. Current trash collection efforts should confirm the extent and persistence of high-volume basins in the Los Angeles watersheds for compliance prioritization.

B. Enhancing High-Volume Trash Redemption Rates

Available data regarding trash flow composition (see Section 2.D) indicates that certain consumer products, including paper and plastic bags, beverage cups and food containers, comprise a substantial portion of Los Angeles watershed debris. This result may reflect the fact that, unlike the majority of aluminum, glass and plastic beverage bottles, relatively few of these products are redeemed after use. Also plastic products do not degrade or assimilate in comparison to other materials, such as paper, in area waterways.

Most consumer containers, other than glass, aluminum and certain plastic beverage bottles, appear to be discarded rather than reused or recycled. The California Plastics White Paper, for example, indicates that in 2000 approximately 77%-88% of all plastic (PET and HDPE) containers were discarded, rather than recovered, while glass bottle discard rates were 56% and a relatively low 42% for aluminum cans.[60] More recent data suggests that the redemption rates for plastic containers rose from 2000, but are still substantially lower than redemption rates for aluminum and glass. CIWMB data for 2004 show that the California redemption rate for aluminum cans was 80% and 67% for glass containers. In contrast, the redemption rate for all forms of plastic containers tracked in the state data was 47%, and reported redemption rates were below 1% for certain plastic product categories.[61] State Division of Recycling 2003 data indicates that most plastic products—many of which contribute to the reported debris volumes identified in watershed surveys (see Section II.D, above)—were redeemed at rates substantially below the overall average value (see Table 4.3).

Table 4.3
2003 Container Return Rates by Material

Material	Sales	Returns	Percent Returned
Aluminum	9,595	6,682	69.64%
Glass	3,389	1,723	50.84%
Bimetal	68	4	6.00%
#1 PETE	5,554	1,947	35.06%
#2 HDPE	525	176	33.57%
#3 PVC	1.20	0.05	4.17%
#4 LDPE	7.30	-	0.00%
#5 PP	1.80	0.01	0.56%
#6 PS	74.40	0.03	0.04%
#7 Other	25.50	0.29	1.14%
Total	19,242	10,533	55%

Source: California Department of Conservation, Division of Recycling, "California's Beverage Container Recycling and Litter Reduction Program Fact Sheet" (July 1, 2004) at 2.

The redemption rate disparities among various consumer product groups may reflect California's incomplete redemption incentive program coverage. Several products that appear to comprise a significant proportion of water-borne waste, including fast food containers, plastic bags, coffee cups, and non-potable liquid containers, are not included in current deposit and redemption programs. In contrast with aluminum, glass and the most popular plastic drink containers, consumers or third parties within the watershed

[60] California Integrated Solid Waste Management Board, "Plastics White Paper," (May 2003) at 11.
[61] California Department of Conservation, "Biannual Report of Beverage Container Sales, Returns, Redemption, and Recycling Rates," (November 10, 2004). "Plastics" includes plastic container codes 1-7, including HDPE, PET, PS, PP and "other" plastics.

have few economic incentives to collect and redeem these items. Residual redemption amounts held by the state could be used to initiate new incentive programs for these other materials or to encourage the use of materials that are redeemed at higher rates.

If the watershed trash composition data is reasonably accurate, a program that created more comprehensive product redemption incentives, such as a point-of-purchase deposit based on existing California practice, might significantly reduce the volume of debris that enters the region's storm drain system.[62] As is common practice in jurisdictions that have implemented deposit incentive programs, revenue collected on the sale of high-volume items would be placed in a revolving fund and paid out in successive sales and product redemptions. Program overhead expenses would be defrayed from deposit interest payments and the difference between redemption program collections and payouts. California bottle bill data from 2003, for instance, indicates that such a program would likely generate a 30% spread between revenues and deposit payouts. The residual funds would be available for a variety of programs that could help reduce water-borne trash loads.[63]

Research suggests that point-of-purchase deposits ranging from 5-10 cents per item can stimulate redemption rates exceeding 90% of product sales.[64] These redemption incentives would also motivate third parties to collect and redeem items improperly discarded in regional drainages or appropriate solid waste collection devices. If a high-volume redemption program could achieve a 20%-40% reduction in watershed waste conveyance, trash interception compliance costs would be reduced by hundreds of millions of dollars per year.[65]

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[62] It is possible that increased redemption rates could stimulate recycling, but this function is often costly and reduce incentives to establish a redemption program. Reference, see 57?

[63] Data for 2003-2004 shows that California beverage container deposits generated $669 million of which $440 million was paid out in redemptions. The balance funded program overhead (approximately $30 million), grants and other services. See, California Department of Conservation, Division of Recycling, "California's Beverage Container Recycling and Litter Reduction Program Fact Sheet" (July 1, 2004) at 2.

[64] See Oregon Department of Environmental Quality, "Bottle Bill Turns 30," available at http://www.deq.state.or.us/wmc/solwaste/BottleBill30.HTML, (February 2005) ("There is some evidence that the size of deposits does affect the return rate of containers. Michigan, which has a minimum 10-cent deposit, has the highest return rate of all the states with bottle bills. California's redemption value per container is only 2 1⁄2 cents. While California's redemption rate is much higher than the national recycling rate for beer and soft drink containers, it is lower than the rate for states with 5 cent and 10 cent deposits.")

[65] An alternative approach is to impose a use tax on high-volume trash items. The San Francisco environmental quality committee has proposed, for example, a 17 cent tax on plastic bag use within the city. See City of San Francisco, San Francisco Commission on the Environment November 18, 2004 Bag Fee Resolution, Resolution No. 007-04-COE (available at http://sfgov.org/site/sfenvironment_page.asp?id=28305, accessed January 2005). A redemption program is likely to produce greater benefits than a use tax because deposits both reduce demand for high-trash item and generate significant incentives for post-use redemption and third party cleanups. As result, the volume of on-the-ground trash subject to watershed entry appears more likely to be reduced by redemption incentives than use taxes. Use taxes are also generally regressive; they consume a greater portion of a lower income person's resources than a wealthier individual. Since redemption programs allow for full deposit recoveries, it generates far less disparities among different income groups.

Redemption programs are not costless, and many question their overall effectiveness. California's recycling program is reported to cost from $20-$30 million per year and require 200 State employees to administer.[66] Furthermore, deposits can reduce the value of scrap recovered by municipalities from curbside and waste recovery programs, and may shift consumption to jurisdictions that do not require point-of-sale redemption fees.[67] If products are redeemed in locations other where redemption deposits are collected, communities might be required to divert resources that could support a local TDE market or other trash control measures. Data collected by the American Beverage Association indicates that states with "comprehensive litter controls," including curbside recycling, are better able to control roadside litter than those that rely on container deposits.[68] However, as public service program budgets, including those dedicated to litter enforcement, continue to face fiscal challenges and there is little expectation that additional nuisance control funding will become available within the greater Los Angeles region, or other areas of the state.

Deposit programs may also shift consumer use from targeted items to other products that are not subject to redemption fees, but which contribute a similar, or even more difficult to control, trash load to the watershed. After rainfall events foamed plastics and plastic-coated coffee cups can predictably be observed along the banks of the Los Angeles River and Ballona Creek. A deposit fee that specifically focused on foamed coffee cups and food containers would create incentives for manufacturers to substitute new products, such as reinforced paper goods, that would not be subject to deposit requirements, but are still covered by the applicable regulations. If consumers were just as likely to improperly dispose of the new containers, then the deposit program would not meaningfully or efficiently contribute to watershed trash reduction.[69] The altered trash load might also not be as efficiently intercepted, since some significant fraction of floatable materials are now captured by trash booms, and these devices might be less effective in collecting saturated paper goods.

Several issues should be examined to address these concerns prior to implementing a high-volume product deposit program:

- *TMDL based coverage.* A watershed based deposit program should be applied to all forms of the consumer products that have been found to

[66] See, American Beverage Association, "Why Forced Deposits Don't Work," http://www.ameribev.org/environment/bottlebills.asp (accessed March, 2005) ("Operating costs of deposit programs are at least four times the cost of comprehensive recycling and newer programs such as those in California and Hawaii have high state costs as well. California's bureaucracy has 200 workers and costs $20 million per year just for oversight"); California Department of Conservation, Division of Recycling, "California's Beverage Container Recycling and Litter Reduction Program Fact Sheet" (July 1, 2004) at 2 (administrative expenses for 20003 recycling program listed at $30 million).
[67] See, American Beverage Association, "Why Forced Deposits Don't Work," http://www.ameribev.org/environment/bottlebills.asp (accessed March, 2005).
[68] See, American Beverage Association, "Why Forced Deposits Don't Work," http://www.ameribev.org/environment/bottlebills.asp (accessed March, 2005).
[69] See, e.g., California Integrated Waste Management Board, "Plastics White Paper," (May 2003) at 16 (" Attributing the litter issue to one particular packaging material does not solve the litter problem, because another type of packaging will take its place as litter unless human behavior changes").

generate a high proportion of the regulated trash, rather than focus on specific materials. Beverage cups, for example, appear to comprise a significant proportion of the watershed trash load and the deposit incentive should be applied to any form of retail coffee container, including plastics, paper, or other materials. The redemption program can be adjusted to address the possibility that TMDL compliance monitoring may identify certain products that have significantly greater assimilative rates and to possibly focus deposits on low-assimilative trash sources. At present, however, the TMDLs assume that all water-borne debris has the same inherently limited assimilative capacity.

- *Assess program costs relative to alternative approaches.* Expenses associated with reducing improperly disposed trash by means of deposit incentives should be estimated and compared with alternative measures. The net trash reduction achieved by a deposit program may be less than allocating the same level of funds to catch basin controls or enhanced curbside recycling. A pilot program focused on high-priority consumer items could be implemented to estimate the anticipated effectiveness and expenses associated with a deposit approach relative to other trash control options. These alternative programs or trash control grants could be funded from unclaimed redemption values or consumption taxes.

As noted above, redemption program reviews have generally identified several practical issues regarding administrative costs, program infrastructure needs (such as the number and location of redemption centers) and other concerns related to feasibility and effectiveness. These issues must be further analyzed before the potential utility and cost-effectiveness of a trash-load reduction redemption effort can be adequately assessed.

C. Trash Reduction Credit Banking

Market-like efficiencies may be obtained without developing a full market infrastructure by allowing public (or certain private) entities that make significant investments in trash reduction measures to package and sell "credits" to generators that benefit from these activities. Costs associated with identifying and implementing specific source reduction measures may be prohibitive in the case of diverse constituent flows such as water-borne debris. To avoid these expenses, storm drain system operators could allow generators to buy credits as part of their regional trash interception efforts. This approach could be most effective as a compliance option that generators may elect in lieu of site-specific or other regulatory obligations (see, e.g. Section 3.A). In turn, credit sales would help defray storm system trash TMDL compliance costs and reduce public financing burdens.

The banking entity would be responsible for achieving the reductions each credit represents, and credit buyers would be insulated from monitoring and compliance risks. Credit purchase requirements could be scaled to the volume of high-flow items placed into commercial use by a given activity. If the number of credit buyers is large, and

pricing is allowed to reflect demand, the credit market could realize substantial efficiencies. A banking concept has been specifically proposed as a potentially effective strategy for controlling constituents and managing trash reduction programs for non-point constituents.[70]

Banking and credit sales could also be extended to private interests that achieve significant watershed load reductions. Trash composition surveys, for example suggests that retail coffee shops, supermarkets, and fast food retailers utilize products that may significantly contribute to watershed loads. Many of these entities are global businesses that operate a large number of outlets in the Los Angeles watershed. It is possible that certain of these businesses may voluntarily discover particularly effective means for reducing water-borne trash on a large scale. The regional trash TMDL compliance effort should include incentives that would reward private sector trash control innovators, including the opportunity for such firms to bank and sell TMDL compliance credits.

D. Educational and Voluntary Cleanup Initiatives

High-volume trash manufacturers and commercial users frequently contend that interception and redemption programs are less desirable than educational or voluntary efforts that modify consumer behavior. Surveys suggest that about 25% of the population never litters, while another 25% will always improperly discard trash in places that are tributary to the watershed. Data further indicates that the remaining half of all consumers can be persuaded to be more careful with their trash. The Texas highway department, for example, is generally credited with significantly reducing roadside litter by means of advertisements aimed at the "persuadable" portion of the populace. Other reportedly successful strategies include volunteer "adoption" and cleanup of certain portions of the watershed, such as roads or parks.[71]

Many of these measures are presently considered as BMPs to be implemented by regulated public agencies or local governments. To the extent they significantly reduce trash loads, educational and volunteer cleanup efforts also provide opportunities for trash generators to fund educational outreach and adopt and manage high-volume catch basins. These activities could be coupled with the provision of regulatory compliance credits for participants (see Section 3.A.(3), above) or integrated with drainage management agency trash control banking programs (see Section 4.C, above), to provide generators with further financial and legal incentives. Popular "adopt-a-highway" programs throughout the country, and in California, provide participants with small signs that allow for public recognition.[72] A similar recognition system could be implemented at each storm drain

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[70] For an excellent discussion of a possible bank structure to control nitrogen, see National Association of Conservation Districts, *Report of the Conservation Innovations Task Force (CITF)- Appendix III—Water Quality Trading—Nonpoint Credit Bank Model* (December 2003).

[71] See, e.g., the sources and studies cited in the American Beverage Association, "Effective Litter Prevention," http://www.ameribev.org/environment/litter.asp (accessed March, 2005).

[72] The California Department of Transportation "recognizes donations made through the Adopt-A-Highway Program by identifying contributors via Adopt-Highway courtesy signs." See, California Department of Transportation, *Adopt-A-Highway Program Guidelines and Coordinators Handbook* (August 2003) at 4-1.

location subject to adoption by a trash generator. The relative costs and benefits of educational and voluntary cleanup activities should be assessed and compared with other options to determine the most effective program options for the watershed.

A similar program of recognition at adopted catch basins or other high-volume cleanup locations may significantly enhance the desirability of generator participation in source control programs.

V. RECOMMENDATIONS FOR FUTURE ACTION

This report provides an initial assessment of the potential use of market-based mechanisms to achieve trash TMDL compliance objectives in Los Angeles region. It is also designed to help provide an initial analytical template that can be adapted to assess the utility of market-based approaches to control other regulated constituents. Fully operational examples and models do not exist in substantial numbers. With the exception of the air-oriented RECLAIM programs, no other significant market-based pollution control system is being currently implemented in Southern California.

As noted in this report and in other published materials, regional and local governments face significant fiscal, technical and legal challenges in achieving source reduction requirements. As a result, the identification of more cost effective strategies is a significant priority. Potential subsequent efforts consistent with this report include, but are not necessarily limited to, the following:

(1) Expand the stakeholder base of the current project to include the League of California Cities, the City of Los Angeles and private sector representatives of grocery, restaurant and petroleum marketing businesses;

(2) Obtain the support of environmental regulatory and recycling agencies, including, but not necessarily limited to, the US Environmental Protection Agency, Cal-EPA, the California Integrated Waste Management Board, the Department of Conservation, the Los Angeles Regional Water Quality Control Board, the State Resources Agency and the State Water Resource Control Board

(3) Identify area(s) within the Los Angeles region where a pilot markets based program for litter and trash reduction may be implemented;

(4) Develop recommendations for the potential structure, operational framework, budget and financing mechanisms for this pilot project; and

(5) If indicated, secure necessary funding commitments to implement a pilot markets based mechanism to reduce the flow of improperly disposed consumer products.

Markets based approaches have often been controversial in environmental regulatory contexts. However, the Los Angeles region will incur very significant costs to develop and implement TMDLs as required by the 2001 federal consent decree. The analysis of market-based options has, at the least, repeatedly proven useful in the identification of the most cost effective methods to achieve compliance goals throughout the country. In the final analysis, given the increasing demands placed on the public

sector, all regulatory programs must be able to show that every effort was expended to achieve program goals as efficiently as possible. Exploring market-based approaches may significantly help regulated localities and regional governments meet this challenge.

APPENDIX A
FINANCIAL COMPARISON OF FULL CAPTURE DEVICE DEPLOYMENT OPTIONS

FOR ILLUSTRATION AND DISCUSSION PURPOSES ONLY
ALL COST AND INSTALLATION PARAMETERS HYPOTHETICAL

	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ANNUAL PERCENTAGE INSTALLATION APPROACH											
Number of Full Capture Devices Installed	45,000	4,500	9,000	13,500	18,000	22,500	27,000	31,500	36,000	40,500	45,000
Capital Cost	$1,800M	$180.00M	$180.00M	$180.00M	$180.00M	$180.00M	$180.00M	$180.00M	$180.00M	$180.00M	$180.00M
O&M Costs	$3,713M	$67.50M	$135.00M	$202.50M	$270.00M	$337.50M	$405.00M	$472.50M	$540.00M	$607.50M	$675.00M
Total	$5,513M	$247.50M	$315.00M	$382.50M	$450.00M	$517.50M	$585.00M	$652.50M	$720.00M	$787.50M	$855.00M
Trash Reduction	100%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Net Present Value	$3,066M										
HIGH VOLUME BASIN APPROACH											
Number of Full Capture Devices Installed	45,000	1,350	2,700	4,050	5,400	6,750	10,500	14,250	18,000	31,500	45,000
Capital Cost	$1,800M	$54.00M	$54.00M	$54.00M	$54.00M	$54.00M	$150.00M	$150.00M	$150.00M	$540.00M	$540.00M
O&M Costs	$2,093M	$20.25M	$40.50M	$60.75M	$81.00M	$101.25M	$157.50M	$213.75M	$270.00M	$472.50M	$675.00M
Total	$3,893M	$74.25M	$94.50M	$114.75M	$135.00M	$155.25M	$307.50M	$363.75M	$420.00M	$1012.50M	$1215.00M
Trash Reduction	100%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Net Present Value	$1,874M										

Note: "Capital Cost" includes hypothetical procurement and installation expenses.

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