FINAL REPORT

California Department of Transportation

Public Education Research Study
Literature Review

Contract No. 43A0054, Task Order No. 21
Caltrans Document No. CTSW-RT-01-045

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August 27, 2001

TABLE OF CONTENTS

1.0 INTRODUCTION

The California Department of Transportation (Caltrans) is currently conducting a three-year Public Education Research Study in order to evaluate the effectiveness of a public education campaign in reducing the amount of pollution (i.e., litter) along the freeway and highway systems in the Fresno Metropolitan Area (FMA). Caltrans is concerned that these pollutants are being collected in their storm drain systems and are subsequently discharged into adjacent waterways. As a part of this research effort, Caltrans designed and implemented a litter monitoring program entitled the Public Education Litter Monitoring Study (PELMS). The goal of the PELMS program is to identify and quantify the storm water litter loads associated with the Caltrans facilities in the FMA and in the City of Stockton (Stockton). The purpose of the PELMS program is to establish a system of measurement to indirectly evaluate the effectiveness of the public education element. Caltrans' hypothesis is that the total mass of the direct deposition of litter onto the area's freeway and highway systems would decrease proportionally to an increase of the public education element. During its first year (storm season 2000-2001), the PELMS program quantified the litter that was collected from the storm events from a total of seventeen sites. Fifteen of these sites were located within the FMA and the remaining two sites were located in Stockton. The first year's objectives included storm water monitoring in order to establish a litter baseline for the Caltrans Public Education Research Study (PERS). In order to ascertain the most effective method used by other agencies throughout the country to reduce littering behavior, Caltrans initiated a literature search. This search reviewed a variety of litter programs that were developed as anti-litter campaigns and not necessarily as litter measurement or assessment programs. These anti-litter campaigns had either been conducted or are currently ongoing within the FMA; the City of Stockton; the state of California; in other states; within the federal government; and similar international programs.

1.1 METHODOLOGY

The literature search was conducted by using computerized methods to identify potentially useful articles and reports that were published by cities, states, countries and other organizations. This resulted in approximately eighty references that were evaluated and four follow-up telephone interviews. A summary of the sources utilized in this search is provided in Table 1. The subsequent literature was classified and evaluated based on the effectiveness of an agency's public education program's ability to prevent litter pollution associated within a storm water runoff collection system. Each article or report was evaluated against a series of three questions. The questions asked and answered were:

- What were the objectives of the study/report?
- What were the conclusions and recommendations?
- Were there any public education elements in the study?

Table 1. Internet Sources and Web Sites

Internet Source	Web Site
Caltrans District 7	www.dot.ca.gov/dist07/
Caltrans District 11	www.dot.ca.gov/dist11/
Caltrans Adopt-A-Highway	http://adopt-a-highway.dot.ca.gov
Department of Public Works, County of Los Angeles	www.dpw.co.la.ca.us
The Department of the Environment and Local Government, Ireland	www.environ.ie
Cooperative Research Centre for Catchment Hydrology (Australia)	http://www.catchment.crc.org.au/
California Integrated Waste Management Board	www.ciwmb.ca.gov
California Department of Conservation	http://www.consrv.ca.gov/
USDA Forest Service	http://www.fs.fed.us/spf/woodsy/
City of Chicago	www.ci.chi.il.us and www.ci.chi.il.uc/Environment/Litter/
Natural Resources Defense Council	www.nrdc.org
Keep American Beautiful	www.kab.org
Keep California Beautiful	http://www.keepcaliforniabeautiful.com/
Clean Virginia Waterways	www.lwc.edu/cleanva
Virginia Department of Environmental Quality	www.deq.state.va.us
Georgia Department of Community Affairs	www.dca.state.ga.us and www.dca.state.ga.us/solidwaste/kgb/litterflyer.html
Water Environment Research Foundation	http://www.werf.org/
Texas Department of Transportation	http://www.dot.state.tx.us/ and www.dontmesswithtexas.org
Oklahoma Department of Transportation	http://www.okladot.state.ok.us/hwyinfo/index.htm
Arizona Clean and Beautiful Programs	http://aspin.asu.edu/acb/programs.html
Cigarette Litter Organization	www.cigarettelitter.org
No Butts About It Litter Campaign	http://hometown.aol.com/teamstein/myhomepage/index.html
Environmental Health Perspectives "The Price of Cigarettes"	http://ehpnet1.niehs.nih.gov/docs/1999/107-12/forum.html
Daily Nebraskan Litter Article	www.unl.edu/DailyNeb.arch/zzzzz/11-96/22/
Public Relations Society of America (PRSA) Silver Anvil Awards	www.silveranvil.org
TES Consulting Engineers	http://www.tesltd.ie/

1.2 CONCLUSIONS

The results of this literature review indicated that, in general, highway litter is a national problem. A majority of states have reported that people tend to litter: if litter already exists; when they feel no connection with the community; and when they feel that others are hired for the sole purpose of cleaning up their mess. For example, in Los Angeles County, nine percent (9%) of the County's population is

responsible for 41% (by volume) of all the litter dropped on the ground each month. These litterers are predominantly single males in their teens and twenties from large families, most with households of four or more members. Results from a 1998 survey indicated that, like Los Angeles County, litterers in Texas tend to be young, single people between the ages of 16 and 24.

Regarding types of litter, the Texas Department of Transportation reported that cigarette butts are the most commonly littered item, making up half of all roadside litter. The Cigarette Litter Organization considers cigarettes to be the most littered item in America. Furthermore, the Clean Virginia Waterways organization reports that every year during the International Coastal Cleanup, which is sponsored by the Center for Marine Conservation, cigarette butts top the list as the most abundant item collected.

The most effective public education campaigns utilized billboards, radio, television and web sites as the key sources of pollution prevention information for the general public. Other communication tools including Public Service Announcements, entertainment industry tie-ins, and corporate partnerships were also successful when used in conjunction with these key communication sources. Also, the support from public agencies such as the California Highway Patrol, Flood Control Districts, and local municipalities can be utilized to enforce and relay the pollution prevention message.

This report provides a summary of each source document. Each summary highlights the objectives, conclusions and public education components. This review is not a comprehensive review of all the existing anti-litter campaign literature; however, this review is a representative sample of articles and reports that were identified as being potentially useful in the development of the Caltrans PERS.

2.0 FRESNO

Fresno Metropolitan Flood Control District. September 1994. Public awareness study: storm water quality public involvement and education.

Objectives. This report was prepared as a part of a public awareness study conducted in May and June, 1994 for the Fresno Metropolitan Flood Control District to develop baseline information on citizen attitudes, opinions, and behaviors related to storm water quality management. The two components of the study were a public awareness survey and focused interviews. The public awareness survey consisted of a telephone survey of a representative sample of 500 residents in the Fresno area. The focused interviews consisted of qualitative interviews of 37 key community leaders to gain insights into the attitudes and perceptions of specific elements of the community.

Conclusions. The conclusions from the public awareness survey indicated that while residents have a concern for environmental issues, the general public has minimal understanding of the function of the storm drain system and has very little awareness of the District. The conclusions from the focused interview survey indicated that there was a lack of awareness of the storm drain system and storm water quality concerns and management. Storm water quality did not invoke the same level of concern as other community problems. However, all the leaders interviewed demonstrated a willingness to become better informed and to provide the District with opportunities to educate their groups.

Public Education. Several recommendations were made to increase general public awareness. They included promoting pollution prevention behaviors, increasing knowledge and awareness of the storm drain system, generating positive awareness of the district, and communicating through a mixed media approach to reach a broad audience.

Comments. Forty eight percent (48%) of respondents in the public survey did not know where rainwater eventually went. Eleven percent (11%) believed rainwater flows to a wastewater treatment plant; eighteen percent (18%) thought rainwater flows into a ponding basin; while sixteen percent (16%) said it goes into groundwater or flows into a river.

Fresno Metropolitan Flood Control District. June 1997. Storm water quality management program; phase II public awareness survey, "clean storm water is everybody's business".

Objectives. The objective of this study was to compare the results of this 1997 survey with those of the baseline 1994 Public Awareness Study. The study was implemented through a telephone survey of a representative sample of residents (414) of the Fresno-Clovis Metropolitan area.

Conclusions. The following were the most significant findings of the Phase II survey. Fewer people reported changing their motor oil at home for this study (36%) than in the 1994 study (43%). Of those who do, the vast majority (72%) reported recycling their used motor oil, compared to only 53% who reported recycling in 1994. The findings of this survey also indicated that a very small minority (12%) of the general public reported using oil based paints. Of these, 83% of the respondents reported using a proper disposal method.

Public Education. As a result of the Phase II Survey, several recommendations were made regarding public education including the following: continuing to design and implement the general outreach program as a broad-based and District wide communication effort; designing broadcast public service announcements to focus on where storm water goes, how it becomes polluted, and pollution prevention behavior; developing newspaper advertisements and implementing outdoor advertising to build recognition of the District and its services; making presentations to business groups and neighborhood associations; and using events as a means to involve the media in providing editorial coverage of the storm water quality management program.

Comments. The majority of respondents (57%) were able to give a correct answer when asked where storm water runoff goes compared to 35% in 1994. In addition, in 1994 a large percentage of the general public (48%) stated they "didn't know," while in 1997 this figure had been reduced to 18%. Needless to say, this change in results was due to an increase in the public's education regarding storm water and storm water pollution.

Fresno Metropolitan Flood Control District. 1999. Public involvement and education element assessment. In Fresno-Clovis Storm Water Quality Management Report, by Fresno Metropolitan Flood Control District.

Objective. The primary goal of the Public Involvement and Education (PIE) Element of the Storm Water Quality Management Plan (SWQMP) is to educate residents about storm water pollution and to encourage public participation in pollution prevention. The review summarized by this report was done to determine the effectiveness of the SWQMP.

Conclusions. The SWQMP review indicated that the PIE Element activities currently being implemented are effective in addressing and eliminating sources of pollutants and reducing pollutants in storm water runoff and therefore should be continued. The following are some of the recommendations that were made:

- Annually organize a community wide event that links air, storm water quality and ground water quality pollution.
- Educate elementary age school children about storm water quality issues and practices that prevent storm water quality pollution.
- Develop materials and implement activities related to proper management and disposal of pesticides and herbicides.
- Expand culturally and linguistically appropriate communication efforts with the non-English speaking public.
- Solicit support and participation from the media to highlight storm water quality issues in a televised town hall meeting.
- Cooperate with co-permittees in public education efforts to reduce litter and promote graffiti removal.
- Develop materials to enhance the public's understanding of the differences between the storm drain system and the sewer system.

- Develop a web site from where residents can access information about the SWQMP, the storm drain system and water quality.

Public Education. The objectives of the PIE Element were to educate the public about the storm drain system, the sources of storm water pollution, and the proper use and disposal of products and materials that contribute to storm water pollution. These objectives also included involving the public in practices to reduce storm water pollution at the source. The objectives were met by developing communication tools appropriate to target audiences, implementing mixed media campaigns, coordinating activities among co-permittees and providing the public with opportunities to reduce pollution at its source.

Brian, Patrick, Fresno Metropolitan Flood Control District. 2001. Telephone interview by Timothy Whyte, 29 June, Santa Ana, CA.

The district uses a combination of commercials or public service announcements (PSAs) and counter materials at retail outlets. The district gives presentations to students on Earth Day and to the construction industry about disposal techniques. They recommend the use of 3x5 tear sheets or posters at auto locations such as Pep Boys. The district suggested that Panagraph, a survey firm that does most of the research in Fresno, be contacted for further information.

Fresno Metropolitan Flood Control District. Biannual mass-media campaign, California. Natural Resources Defense Council. http://www.nrdc.org/water/pollution/storm/chap9.asp

The Flood Control District runs biannual television, radio, and print advertisements in both English and Spanish to educate the community about storm water management. The most recent campaign cost $7.82 per thousand impressions for the target audience. This campaign achieved its threshold for recall and understanding for 84% of the target audience. A telephone survey revealed that 76% of respondents recalled seeing the television ads, 23% had unaided recall of messages discouraging dumping into storm drains, and 40% had unaided recall of proper waste disposal.

3.0 STOCKTON

City of Stockton, California-Municipal Utilities Department. Stormwater management division community outreach. <http://www.ci.stockton.ca.us/mud/pages/Divisions/Storm/Community Outreach.htm**> (26 July 2001).**

Objectives. The purpose of Stockton's Stormwater Outreach Program is to get the message out to everyone in the community that stormwater is never treated before entering local waterways and that it is the number one cause of urban water pollution in California today.

Conclusions. No conclusions were made.

Public Education. This web site provides a short description of stormwater pollution prevention activities and information on how to become involved.

City of Stockton, California Municipal Utilities Department. Stormwater management division frequently asked questions. < http://www.ci.stockton.ca.us/mud/pages/divisions/faqs.htm**> (26 July 2001)**

Objectives. The objective of this web site is to answer some of the most frequently asked questions about stormwater pollution and Stockton's Stormwater Program.

Conclusions. No conclusions were made. The web site is strictly informative.

Public Education. The web site provides answers to the most frequently asked questions by the public. The department is providing information about stormwater pollution prevention that the public has asked for.

City of Stockton. Stockton kicks off beautification program with earth day event. <http://www.ci.stockton.ca.us/pages/news/archives/erthday.htm**> (7 April 2000)**

Objectives. The goal of Stockton's "Keep Our All-American City Clean" Program is to get all citizens more involved in making and keeping Stockton beautiful.

Conclusions. No conclusions were made. The web site was strictly informative.

Public Education. Stockton is organizing an ongoing "Keep Our All-American City Clean" Program that includes educational materials for K-12 classes and a series of brochures (in several languages) on topics such as recycling, garbage pick-up, disposal of old cars and graffiti removal. Stockton is also working on television and radio public service announcements as well as messages for the City's web site.

City of Stockton. Adopt-Our-City. <http://www.ci.stockton.ca.us/parks/adoptinform.htm**> (26 July 2001)**

Objectives. The objective of this web site is to inform the reader of Stockton's Adopt-Our-City Program and encourage involvement in the beautification of the city. The Adopt-Our City Program encourages

citizens to choose an area of the city and remove litter and graffiti; paint park tables and benches; remove weeds or rake leaves; plant shrubs, flowers and trees; and report hazards and areas in need of repair. Stockton's Department of Parks & Recreation will dispose of collected trash, pay for and install a recognition sign, and assist with technical advice.

Conclusions. No conclusions were made. The web site was strictly descriptive.

Public Education. The Program accomplishes public education by encouraging hands-on clean up activities.

4.0 CALTRANS

Woodward-Clyde Consultants. 1997. Literature review in support of the litter management pilot study. 23 December. Sacramento, CA: California Department of Transportation.

Objectives. The purpose of the Literature Review was to determine what was known at the time in the field of litter management and to provide background for development of the Litter Management Pilot Study (LMPS). The LMPS was designed to test current and potentially new litter management practices to improve quality of runoff from Caltrans highway drainage facilities. The focus was on manual pick-up programs, mechanical street sweeping, and structural modifications to drainage facilities.

Conclusions. Very limited data on litter pick-up management practices were available at that time. Data available were not relevant to the LMPS. Pick-up programs, while beneficial, do not alone solve the litter problem. Most discussions of street sweeping were not relevant to the LMPS. Little information on structural controls for litter prior to its entering the storm drain was found.

Public Education. The report identified law enforcement, signage, advertising, and the maintenance items reviewed as the known efforts to reduce litter. The report stated that targeted advertising on a continual basis appeared to be the most cost-effective effort to reduce litter.

One report (Syrek 1997) discussed the effectiveness of twelve litter control measures. These measures included packaging modification; mandatory deposits; the Adopt-A-Highway program; landfill surcharges; trash receptacles; anti-litter signs; law enforcement; education; pickup by paid government and private workers or inmates; beautification; unlimited trash collection; and paid radio and television advertising. It was determined that paid radio and television advertising is the quickest, most effective way to achieve substantial statewide or regional reductions in litter. On average, there was a twenty percent (20%) decrease in litter collected per year after the implementation of litter control programs in Texas, Oklahoma, Bermuda, Newfoundland, and Evansville. These programs achieved reductions twice as fast at one half the per capita cost of conventional programs.

Syrek (1991) measured litter rates at 126 street and highway locations. It was found that a six-year advertising based litter control program reduced litter by seventy two percent (72%). The Adopt-A-Highway program reduced litter an additional 16% at adopted sites over non-adopted sites, and was deemed not cost effective. Adopt-A-Highway cost $0.39 more per litter item than the advertising program.

In the document entitled *Highway Litter in Pennsylvania* (1991) it was found that the Adopt-a Highway areas ranged from 17% to 371% cleaner than non-Adopt-A-Highway areas. Based on this result a recommendation was made to expand the Adopt-A-Highway program.

California Department of Transportation. Trash in the bins – litter generation study. <http://www.dot.ca.gov/dist07/trash_in_bins/trash_bin.htm> **(5 July 2001)**

Objectives. The objective of this three-phase Litter Generation Study is to increase public awareness and education along the westbound San Bernardino Freeway (I-10) off-ramp from Eastern Avenue to Campus Drive near downtown Los Angeles.

Conclusions. Highway workers stand adjacent to moving traffic to remove highway litter and are therefore subjected to hazardous situations. Missed litter invades storm drains, bays and ultimately the ocean. Litter removal costs $4.6 million annually and Caltrans also spends an additional $5 million annually cleaning storm drains in Los Angeles and Ventura Counties. Caltrans District 7 removes approximately 33,600 cubic yards of litter annually, of which the predominant component of freeway litter was cigarette butts.

Public Education. This article was a public education announcement. The article did not present results from the Litter Generation Study. It was written to educate the public about why individuals should care about highway litter.

California Department of Transportation. 2000. Caltrans seeing mountain of orange. <http://www.dot.ca.gov/dist11/news/2000news/38.htm> **( )**

Objectives. The objectives of this news release was to call attention to the growing problem of litter on the freeways in San Diego, California.

Conclusions. Caltrans relies on probationary workers that are sentenced to do community service to remove trash along the freeways. During the last three fiscal years, the number of probationary workers has fallen from 18,000 to less than 12,000 and the amount of litter has increased from approximately 10,000 to more than 14,000 cubic yards. In order to address the problem of highway litter, Caltrans has had to reassign staff from other projects to pick up trash. During fiscal year 1999-2000 the Caltrans San Diego District spent more than $2 million to remove litter from the region's freeways.

Public Education. Caltrans officials showcased a 12 ft x 30ft mountain of orange trash bags containing a week's worth of litter collected from the San Diego metropolitan area freeways in order to emphasize the area's growing freeway litter problem.

California Department of Transportation. 2000. Media advisory
<:http://www.dot.ca.gov/dist11/2000news/37.htm>

Objectives. The objectives of this media advisory was to call attention to the growing problem of litter on the freeways in San Diego, California.

Conclusions. Caltrans officials have found that in the last three years the amount of freeway litter is increasing while the number of people available to remove it is decreasing.

Public Education. Caltrans organized a media event at the Caltrans Maintenance yard in Kearny Mesa to show the public the extent of the freeway litter problem. They also unveiled new strategies toward solving this problem along with a plea for motorists' help.

California Department of Transportation. 2000. District 11 litter program fact sheet, January 2000. <http://www.dot.ca.gov/dist11/facts/litter.htm>

Objectives. The objective of this fact sheet is to highlight the cost of removing litter and large debris from Caltrans' roadways and how the Adopt-A-Highway program can help defray these costs.

Conclusions. Last year's estimate to clear litter from area freeways including the use of probationary workers, state costs to pick up bagged litter, and transport fees to local landfills was in excess of $1.3 million.

Public Education. There was no pertinent information regarding public education in this document other than program costs.

Comments. Mattresses were the most common household item found on freeways (approximately 50 per month). Aside from paper, bottles and cans, more tires are collected than any other litter. An average of one rug per day is removed from area highways. More trash is left on Interstate 5 than on any other highway in District 11, and Interstate 15 ranks second. There are more than a dozen refrigerators and stoves removed from the highways each month along with twenty ladders.

California Department of Transportation District 6. Welcome to Caltrans district 6. <http://www.dot.ca.gov/dist6/> **(20 June 2001)**

Objectives. The objective of this web site was to introduce the reader to a brief geographical and economic summary of Caltrans District 6.

Conclusions. No conclusions were made. The document was strictly descriptive.

Public Education. There was no pertinent information regarding public education in this document.

Comments. Caltrans District 6, headquartered in Fresno, CA, is the second largest district stretching from the southernmost part of Yosemite National Park north to the Mojave Desert. District 6 consists of 476 miles of freeway and 1,554 miles of rural and urban highway. The District has the largest portion of the state highway system to maintain totaling 2,030 miles. There are more than 250 different crops grown in the Central Valley.

California Department of Transportation. 2000. Caltrans adopt-a-highway introduction. <http://adopt-a-highway.dot.ca.gov/intro.htm>

Objectives. The objective of this web site was to introduce the reader to the Adopt-A-Highway Program.

Conclusions. The Adopt-A-Highway Program has been a truly successful government-volunteer partnership.

Public Education. There was no pertinent information regarding public education in this document.

Comments. The Adopt-A-Highway program permits individuals, organizations and businesses to collect litter, remove graffiti and pay maintenance costs for roadside rest areas as well as plant trees and wild flowers on State Highways. Since its inception in 1989, more than 120,000 Californians have cleaned 6,000 miles of roadside collecting 540,000 cubic yards of trash. Graffiti is cleaned from more than 270 locations and trees and wild flowers have been planted on more than 350 sites.

California Department of Transportation. 2001. Caltrans adopt-a-highway, April is keep California beautiful month, 2001. <http://adopt-a-highway.dot.ca.gov/Summary.htm>

Objectives. The objective of this study was to provide a litter survey for the state of California.

Conclusions. The average percentage of accidental and deliberate litter across the Caltrans districts is 30% and 64% respectively. The average percentage of illegal dumping is 6% and the average percentage of beverage containers found along the highways is 27%. On a statewide basis, the Adopt-A-Highway program includes 358 volunteer groups with 2,931 participants that removed 8,100 bags of litter; 192 bags of recyclables; planted 2,026 trees and shrubs; controlled 8.6 acres of vegetation and removed 5,050 square feet of graffiti.

Public Education. There was no pertinent information regarding public education in this document.

Ruano, Jose, member, Association for the Highway 99 Beautification, Caltrans District 6. 2001. Telephone interview by Timothy Whyte, 29 June, Santa Ana, CA.

This group has many ideas to help prevent litter such as increasing the number of litter pickup days, distributing tarps for trucks, using slogans such as "don't be a litterbug," using California Highway Patrol (CHP) to enforce litter laws for a week, and using the media. Meetings are held every 3rd Friday. The group suggested checking with the Fresno Beautiful Coalition and the Fresno Clean and Green group.

Estrada, Ivy, public affairs, Caltrans District 7. 2001. Telephone interview by Timothy Whyte, 29 June, Santa Ana, CA.

"Trash in the Bins" and "Don't Tarnish the Golden State" litter education programs are conducted in conjunction with the CHP and the Regional Water Quality Control Board. The media is the primary source for relaying their pollution prevention message. The programs held an inaugural press conference about a year ago. They also distribute literature, handouts, and posters at fairs and expos. They found that the public is not really interested in the litter literature but preferred handouts. Key chains were suggested as a handout. The CHP initially issued warnings and distributed flyers at freeway on/off ramps at areas near fast food restaurants. Further information and a flash presentation can be found at the web site: www.dot.ca.gov/dist07/.

5.0 LOS ANGELES

California Regional Water Quality Control Board, Los Angeles Region. 2000. East Fork San Gabriel River trash TMDL. Los Angeles, CA.

Objectives. The East Fork of the San Gabriel River, located north of the City of Azusa, California, has been impaired by litter. The 8,000 people who visit four informal picnic areas in the summer months generate over 400 32-gallon bags of trash each day. The United States Forest Service, who has jurisdiction over the areas, was only able to collect half of the trash.

Conclusions. The TMDL (total maximum daily load) report establishes a target of zero trash in the river in order to meet applicable Water Quality Objectives as defined in the California Water Code.

Public Education. The report developed a list of suggested best management practices (BMPs) to help meet the target TMDL. The BMPs include trash receptacles; increased staff; bilingual anti-litter signs; and enforcement of existing anti-litter laws. Guidelines for monitoring are also established.

Comment. It is estimated that the BMPs will cost the Forest Service $75,000 per year. The Forest Service must demonstrate compliance by April 1, 2003.

California Regional Water Quality Control Board, Los Angeles Region. 2001. Trash total maximum daily loads for the Los Angeles River watershed. Los Angeles, CA.

Objectives. The objective of this report is to define the Trash TMDL for the Los Angeles River Watershed. This Trash TMDL was based on existing, readily available information concerning the watershed; the beneficial uses of the watershed; water quality objectives; impairment of beneficial uses; and extent of the trash problem in the Los Angeles River.

Conclusions. Storm drains were identified as a major source of trash in the Los Angeles River. The strategy for meeting the water quality objective focuses on reducing the trash discharged via municipal storm drains.

The report provides general baseline monitoring plan requirements and information regarding the calculation of default baseline waste load allocations and refined baseline waste load allocations. The report also provides compliance strategies in order for permitees may meet the progressive reductions in their waste load allocations.

Regarding costs associated with this Trash TMDL, the report concluded that the enforcement of existing litter ordinances could be used to achieve the final waste load allocation at minimal or no additional cost. The most costly approach in the short-term is the installation of full-capture structural treatment devices on all discharges to the river. Furthermore, the report provides a cost analysis for use of Catch Basin Inserts; Full Capture Vortex Separation Systems (VSS); and End of Pipe Nets.

Public Education. Public education was not discussed as a best management practice for reducing litter loads to the Los Angeles River. The report did discuss the implementation of institutional controls and

specifically stated that institutional controls can provide several advantages over structural full capture systems.

Los Angeles County, Department of Public Works, Environmental Programs Division. n.d. County of Los Angeles five-year stormwater public education plan..<http://dpw.co.la.ca.us> (22 June 2001).

Pelegrin Research. 1997. Los Angeles County segmentation study – resident population. Los Angeles, CA: Los Angeles County Department of Public Works. 1997.

Objectives. The 1996 National Pollutant Discharge Elimination System (NPDES) Los Angles County Municipal Stormwater Permit mandates that a comprehensive educational stormwater and urban runoff outreach approach be undertaken to reach as many Los Angeles County residents as possible. The development and implementation of this Five-Year Public Education Plan, allows Los Angeles County and its 85 Co-permittees to meet the basic requirements outlined in the Permit. The goals of the program are to measurably increase target audiences' knowledge of the impacts of stormwater pollution and to measurably change their behavior by encouraging appropriate solutions. The program includes anecdotal, qualitative and quantitative measurements to assess effectiveness.

Conclusions. A precampaign segmentation study (Los Angeles County Department of Public Works 1997), was conducted to prioritize audiences and activities to target those most likely to pollute. This study identified target audiences who would also be the most likely to adopt behavioral changes and could be reached in a cost-effective manner. Based on the results of the segmentation study, the public outreach program was designed to reach:

- The general public identified as wanting "to do the right thing;"
- "Do-it-yourselfers;" and
- A harder-to-reach, younger, and rebellious segment of the population that was found to be motivated by actions that would protect children or water sports areas.

The segmentation study indicated that the largest target audience – the segment of the general public that intends to do the right thing – gets most of its instructional information from the mass media. Newspapers, radio, and billboards are used as the three key sources to disseminate program information. To a lesser degree, the outreach program also uses public service announcements, instructional materials, corporate and entertainment industry tie-ins, displays, community events, a speakers bureau, and an existing hotline number.

The segmentation study was a major research effort. Several hundred people throughout Los Angeles County were interviewed by telephone and asked a series of questions designed to identify the following:

- Characteristics that allowed researchers to determine "segments" of the population (groups with common profiles);
- How much different segments of the population pollute stormwater and urban runoff (knowingly or unknowingly);
- How much of an effort it would take to motivate the different segments of the population to make changes that would clean up urban runoff pollution; and

- The key motivating factors for each segment.

The segmentation study identified the following:

- Top candidates for outreach because they pollute and generally are willing to change their behavior: people who want to do the right thing; do-it-yourselfers; and young men (late teens and early twenties) who are generally rebellious and tend to "trash" but who also possess a "soft spot" for kids.
- Poor candidates for outreach because they already do the right thing: people who are middle age or older, are avid recyclers, and identify themselves as being environmentally responsible. These individuals were considered poor candidates for outreach because they basically have no bad behaviors to change.
- Poor candidates for outreach because of the level of effort it would take to motivate them to change behaviors: people who will not change unless Los Angeles County "proved" the need, and people who are so "down and out" that they are focused on basic life needs such as a job, food, and shelter. (The segmentation study also indicated that people who are down and out typically do not pollute stormwater.)

Public Education. At $100,000, the segmentation study was quite costly and may only be applicable for public education programs with large population centers. More specifically, the segmentation study is a good tool to help education program managers prioritize their outreach/education efforts to the target audiences that will produce the greatest results.

Los Angeles County's Public Education Program also used traditional telephone surveys and focus groups to determine base line data about awareness and behaviors that could indicate the effectiveness of the outreach being conducted.

It is anticipated that eighty-three percent (83%) of Los Angeles County's population could be reached through a single, integrated, multi-faceted communications campaign. In order to achieve maximum effectiveness, the communications program developed in the Five-Year Public Education Plan had an overarching approach that provided consistent verbal and visual cues to the targeted audiences. For example, successful school education programs already exist in Los Angeles County. The most cost effective and cost efficient method of communicating with school children was to form an alliance with one or more of these programs. This plan recommended the use of the City of Los Angeles' school assembly show and coordinating youth events in order to teach Los Angeles County's 886,000 K-6 children to reduce, reuse and recycle. The County's more than 621,000 middle school and high school children would gain an understanding of environmental issues and be motivated to take action by utilizing the County-sponsored Secondary Student Environmental Education Program which was presented by TreePeople.

Mass media like newspapers, radio and billboards were and still are the three key sources of pollution prevention information for the general public. Other General Public/Residents communications tools – media relations, PSAs, instructional materials, corporate and entertainment industry tie-ins, displays, community events, speakers and experts bureau, and the existing 1-888-CLEAN-LA hotline number – are planned to work in concert with the radio, newspaper and billboard advertising.

Comments. The segmentation study was one of the most important components of Los Angeles County's 5-year public education plan. Nearly all strategies in the 5-year plan were designed to target segments of the population that the study showed would produce the greatest results in terms of reducing pollution.

To assess overall effectiveness of the targeted outreach/education efforts, research was conducted at the 3-year (1999) and 5-year (2001) marks. Quantitative studies were also to be conducted for the general public/residents at years 3 and 5 and for businesses (e.g., automobile repair, restaurant, and construction) at year 5 only. The studies will have components to assess why and how the program is working to help refine and improve the program over the life of the plan. Other anecdotal qualitative and quantitative measurements will be implemented periodically to assess effectiveness among specific audiences in different media channels.

Fifty percent (50%) of the County's population contributes twenty four (24%) of the litter that is found on the streets.

Nine percent (9%) of the County's population contributes forty one percent (41%) by volume of all litter dropped on the ground each month.

6.0 KEEP CALIFORNIA BEAUTIFUL

Keep California Beautiful. 2001. April is keep California beautiful month. <:http://www.keepcaliforniabeautiful.com/> (3 July 2001).

Objective. The objective of this web site was to introduce the reader to the Keep California Beautiful organization.

Conclusions. No conclusions were made. The web page was strictly descriptive.

Public Education. Keep California Beautiful is a nonprofit environmental education organization. They actively develop and coordinate business, government and public partnerships encouraging grassroots responsibility for California's environment.

Keep California Beautiful. 2001. What is litter? <:http://www.keepcaliforniabeautiful.com/litter.htm> (3 July 2001).

Objectives. The objective of this web site is to educate the reader about what litter is and the impact of litter.

Conclusions. Litter comes from seven primary sources: pedestrians, drivers, household garbage cans, commercial dumpsters, construction sites, demolition sites, loading docks and trucks with uncovered loads. It can be a precursor to systemic community decline, and it is preventable.

Public Education. The organization proposes that education and awareness building be the first step in addressing litter. They propose working with grassroots civic groups and organizations, schools, businesses and local community leaders and addressing the issue through community presentations, education and follow-up. Through education in schools, this organization helps communities develop systematic, measurable means of changing attitudes and behaviors regarding littering, graffiti, vandalism, illegal dumping, etc.

Keep America Beautiful. n.d. Keep America beautiful programs get results, June 21, 2001. <http://www.kab.org/litter1.cfm>

Objective: The objective of this web site is to educate the reader about the causes of littering, where litter comes from and what can be done about it.

Conclusions. Litter is the result of careless attitudes and improper waste handling.

Public Education. This literature was a public education announcement.

Keep America Beautiful. n.d. A look at the litter index, July 27, 2001. <http://www.kab.org/litterindex1.cfm>

Objective: The objective of this web site is to educate the reader about the Keep America Beautiful "Litter Index"

Conclusions. Assessing the presence of litter in a community is the starting point in the litter prevention education process.

Public Education. The Litter Index is a tool for determining the types of litter prevention and community improvement programs needed to address current conditions and achieve long-term sustainable results. It is designed to measure progress over time and to help identify what is effective in positively changing littering attitudes and behaviors.

Keep America Beautiful. California affiliates June 21, 2001.
<http://www.kab.org/viewaffl.cfm?searchitem=USA%7CCalifornia>

Objectives. The objective of this web site is to inform the reader of the Keep America Beautiful affiliates in California.

Conclusions. No conclusions were made. The document was strictly descriptive.

Public Education. There was no pertinent information regarding public education in this document other than to inform the reader of California Keep America Beautiful affiliates.

7.0 CIGARETTE PROGRAMS

Cigarette Litter Organization. 2001. The facts about cigarette butts and litter. <:http://www.cigarettelitter.org/index.asp?pagename=NewsQ201> (21 June 2001).

Objectives. The objective of the organization CigaretteLitter.Org is to run educational campaigns aimed at significantly reducing the amount of cigarette litter.

Conclusions. Once people know the truth about cigarette butt litter, they will be much more hesitant to unthinkingly flick their cigarette butts on the ground.

Public Education. The purpose of the organization is to increase public awareness. Their web site and other educational efforts are designed to get the facts out about cigarette litter to both smokers and non-smokers.

Cigarette Litter Organization. 2001. Cigarette litter news spring 2001. <http://www.cigarettelitter.org/index.asp?pagename=NewsQ201> (21 June 2001).

Objectives. This newsletter was designed to introduce the reader to the organization's philosophy, to expose the reader to current cigarette butt litter issues in the news and to offer suggestions and resources on how to become involved in the solution.

Conclusions. Education and awareness is the key to solving the cigarette butt litter problem. Cigarette litter is a unique problem and therefore requires a unique approach. It should be addressed on an individual basis as well as grouped with other litter. Cigarette industry involvement is crucial to the success of solving this litter problem.

Public Education. The goal of this organization and its newsletter is to educate the public on the issue of cigarette butt litter. The organization recommends that cigarette manufacturers post information on their web sites regarding the lack of biodegradability of cigarette butts and proper disposal. They recommend that these companies print standard "Please Don't Litter" information on packs and that they set aside a reasonable budget towards education efforts.

Clean Virginia Waterways, Department of Natural Sciences. 2001. Cigarette butts as litter. <http://www.lwc.edu/cleanva/butts.html> (21 June 2001).

Objectives. The objective of the web site is to provide information to the reader regarding the extent of the cigarette litter problem around the world and its effects on the environment.

Conclusions. Cigarette butts are not only aesthetically unpleasing, they also present a threat to wildlife. Recent studies conducted by Clean Virginia Waterways indicate that the chemicals in cigarette butts easily leach out and are toxic to water fleas. Cigarette butts are composed of cellulose acetate, a form of plastic, and can persist in the environment as long as other forms of plastic.

Public Education. The web site was designed to educate the public on the issue of cigarette litter and provides links to other related web sites

Steinmetz, Allie, Amy Steinmetz, David Steinmetz. n.d. The no butts about it litter campaign. <http://members.aol.com/_ht_a/teamstein/myhomepage/index.html?mtbrand=AOL_US**> (21 June 2001*).***

Objectives. Three children started a campaign to spread information about the detrimental effects of cigarette litter. Their goal is to put an end to the habit of littering cigarette butts worldwide.

Conclusions. They recommend that legislation be passed that would require cigarette companies to include a disposable ashtray in each pack of cigarettes to make the smoker aware of the problem and provide a solution at the same time.

Public Education. The children provide information on their web site as well as distribute posters and ashtrays to more than 30 states.

Carlson, Brian. 1996. Cigarette clean-up costs thousands. Daily Nebraskan, 22 November.

Objectives. The objective of the article is to make readers aware of the cigarette litter problem taking place at the University of Nebraska at Lincoln (UNL).

Conclusions. A litter task force was created in early 1996 in order to study the problem of campus litter. The task force found that cigarette ends account for 35 percent of all campus litter. If smokers would dispose of cigarette ends in ash urns, then the University" Landscape Services could save 726 hours of employee labor or approximately $7,000 per year. According to the task force's findings, cigarette butt litter increased significantly after UNL implemented its clean indoor air policy prohibiting smoking in all campus buildings.

Public Education. Another task force purpose was to make individuals aware of the costs associated with campus litter and how litter is an unattractive and noticeable problem on the campus. One of the best management practices developed by the task force was to place ash urns in convenient locations for smokers. However, the task force noted that most cigarette ends fall within 10 feet of campus ash urns.

8.0 STATE OF CALIFORNIA AGENCIES

California State Parks. n.d. April is keep California beautiful month! <http://www.parks.ca.gov/education/kcb/april01.htm> (3 July 2001).

Objectives. The objective of this web site is to inform and encourage the reader to participate in the seventh annual Keep California Beautiful month including Earth Day and California Trail Days.

Conclusions. No conclusions were made. The document was strictly descriptive.

Public Education. The public is encouraged to participate in community cleanup and beautification events.

California Department of Conservation. 2001. Dramatic drop in beverage container recycling rate sparks concern by state officials; more containers than ever part of bottle bill program, but billions still end up in trash. < http://www.consrv.ca.gov/news/2001_News_Releases/2001-46.htm> (2 July 2001).

Objectives. The objective of this report is to inform the reader about the decline in California's beverage container recycling rate during 2000 and the California Department of Conservation's efforts to improve recycling participation.

Conclusions. California's beverage container recycling rate declined from 74% to 61% in 2000. The addition of new California Refund Value (CRV) containers (many of them plastic, which historically have been recycled at lower rates than aluminum) is cited by the department as a primary reason for the decline. Another reason is believed to be the on-the-go lifestyle of many Californians since they are more mobile than ever and less likely to recycle while away from home (the average recycling rate during the 1990s was 77%).

Another reason cited was the fact that many people do not realize that a plastic beverage container is redeemable for the same value as an aluminum or glass container.

Public Education. The Department of Conservation's public education campaign utilizes television, print, radio advertisements, billboards and an Internet site and is designed to motivate Californians to recycle more.

California Department of Conservation. n.d. Recycle. it's good for the bottle. it's good for the can. <http://www.consrv.ca.gov/dor/index.htm> (2 July 2001).

Objective. The objective of this web site is to inform the reader of the previous success of the California recycle program; to introduce the Department of Conservation, Division of Recycling; and to give information regarding the recycling program.

Conclusions. No conclusions were made. The document was strictly informative.

Public Education. This web site is designed to provide the public with information about the Department of Conservation's recycling program.

Dahmen, Carol, communications director, California Dept. of Conservation. 2001. Telephone interview by Timothy Whyte, n.d., Santa Ana, CA.

The California Department of Conservation is responsible for "It's Good for the Bottle. It's Good for the Can" recycling campaign. The department conducted brand planning, focus groups across the state, and interviews of stakeholders during the planning stages. The department used a combination of TV, radio, print (in ethnic markets), billboards, and kiosks. These efforts have resulted in a great deal of positive feedback. The next TV ad is coming out soon. The department suggested contacting Californians Against Waste; Senator Byron Sher's office; and the California Integrated Waste Management Board.

California Integrated Waste Management Board. n.d. California waste prevention information exchange.

Objective. The exchange's objective is to provide a free service to assistant businesses, industries, government organizations and others on all aspects of waste prevention as well as serve as a network to share information among these parties.

Conclusions. No conclusions were made. The document was strictly informative.

Public Education. The goal of the exchange is to provide information on waste prevention to all who are seeking it.

California Integrated Waste Management Board. n.d. Public education campaigns that promote waste reduction. <http://www.ciwmb.ca.gov/WPW/Coordinator/media.htm> (5 July 2001).

Objectives. The objective of this web site is to provide an overview of several public education campaigns in place around the United States and to encourage the public to send less waste to landfills.

Conclusions. No conclusions were made. The web site was strictly informative.

Public Education. The web site focuses on several techniques that educate the public about waste reduction: 1) special events, such as America Recycles Day; 2) program that target a specific activity such as purchasing items that come with less packaging; 3) programs that target materials such as yard waste, paper products and packaging; 4) community participation in airing PSAs; 5) programs that encourage the use of reusable products; 6) guidebooks on reduce, reuse, recycle and buy recycled; and 7) activities such as environmental roundtables that encourage involving others.

California Integrated Waste Management Board. 2000. Board meeting, November 14-15, 2000, agenda item 12.

Objectives. This agenda item refers to the board's Trash Cutter Awards Program for local governments. The objective of the program is to recognize local governments for their outstanding efforts in

implementing integrated waste programs and to provide an opportunity to share their successes with other local governments that may benefit from their experiences.

Conclusions. No conclusions were made. The agenda was strictly descriptive.

Public Education. The Trash Cutter Awards Program encourages local governments to educate the public about waste reduction.

Comments. Award applications are judged on the following criteria: 1) reduction in tons diverted to the landfill; 2) cost-effectiveness; 3) participation rate; 4) demonstration of a cooperative approach to reducing waste; 5) program comprehensiveness and flexibility; 6) use of innovative ideas and/or technologies; 7) contribution to job creation and market development; and 8) positive effect on other local environmental impacts.

California Integrated Waste Management Board. 1998. State funds cleanup operations in two rural counties. <http://www.ciwmb.ca.gov/pressroom/1998/mar/nr013.htm> (5 July 2001).

Objectives. The objective of this news release is to inform the reader of the $205,000 expenditure of state funds that was used for the elimination of unlawful accumulations of trash and debris within the counties of Lake and Tuolumne.

Conclusions. No conclusions were made. The news release was strictly descriptive.

Public Education. There was no pertinent information regarding public education in this news release other than the cost information.

California Integrated Waste Management Board. 1993. Statewide waste prevention plan, report to the legislature. Sacramento, CA.

Objectives. The California Integrated Waste Management Board (CIWMB) is responsible for developing strategies to promote waste prevention efforts within the public and private sectors and is required to make recommendations for: 1) legislative actions to promote prevention; 2) actions to improve packaging and product design; 3) actions to develop and implement product durability standards; and 4) actions to reduce toxicity of packaging and products. This plan was prepared in response to the Statewide Waste Pollution Prevention mandate. This plan provides a summary of prioritized activities to advance waste prevention throughout California.

Conclusion. This waste prevention plan is intended to provide the framework and guidelines in order to implement waste prevention programs and policies. The CIWMB recognizes that implementation of activities and future analysis of new issues may lead to changes. The CIWMB realizes that such changes may warrant subsequent revisions.

Public Education. The primary goal of this plan is to create awareness and encourage individuals to incorporate waste prevention practices into their daily activities. As a part of this outreach campaign CIWMB developed two media kits, one for residential customers, the other for local governments.

As a part of the statewide campaign, the CIWMB is also pilot-testing television commercials, radio announcements, and billboards encouraging consumers to purchase products and packaging that have minimal packaging and are recyclable, or are made with recyclable materials.

In an effort to create an awareness of the solid waste problem and highlight individual actions that can be taken to eliminate or reduce waste generation, the CIWMB is considering expanding the public awareness campaign statewide. The strategy for this effort would entail informing the public through a step-by-step process. It is anticipated that this statewide campaign would be monitored for effectiveness and revised if necessary as the CIWMB moves into the next level of educating the public on waste prevention.

Gainer & Associates and Tellus Institute. State initiatives in waste prevention. A working paper prepared for the California Integrated Waste Management Board. October 1992. Sacramento, CA.

Objectives. This report provides a comprehensive summary of waste prevention (source reduction) programs that the California Integrated Waste Management Board (CIWMB) could consider for its Statewide Waste Prevention Plan. The information presented is based on literature reviews and program surveys of existing policies being implemented by other states, local governments, and businesses. The information may also be helpful to local jurisdictions and others interested in learning more about waste prevention activities and programs.

Conclusions. The report does not provide any specific conclusions nor does it provide any specific recommendations to the CIWMB, but provides examples of other public education programs.

Public Education. The public education discussions within this report are targeted towards source reduction. Approximately fourteen examples of public education campaigns are detailed in this report. This information can assist in the development of other litter public education campaigns.

9.0 FEDERAL AGENCIES

United States Department of Agriculture (USDA), Forest Service. n.d. Welcome to Woodsy's wonderful world! <http://www.fs.fed.us/spf/woodsy/> (6 April 2001).

Objectives. The objective of this web site is to introduce the reader to Woodsy Owl the Forest Service's environmental champion and how to arrange for him to visit their school or after-school program.

Conclusions. No conclusions were made.

Public Education. The Woodsy Owl program is geared toward children and teaching them a simple, hands-on land stewardship.

USDA, Forest Service. n.d. Office of communications personnel contact registry. <http://www.fs.fed.us/intro.directory/pao/index.html> (7 July 2001).

Objectives. The objective of this web site is to inform the reader of the Forest Service's Office of Communication contact registry as well as indicate their research stations across the United States.

Conclusions. No conclusions were made. The document was strictly descriptive.

Public Education. There was no pertinent information regarding public education on this web site other than to inform the reader of the Forest Service's personnel contact registry.

Environmental Protection Agency. 1997. Proper disposal of trash, July 7, 1997. <http://www.epa.gov/OWOW/NPS/kids/ltrrite.htm> (22 June 2001).

Objectives. The objective of this web site is to teach children the proper disposal of trash and the consequences of not disposing of it properly.

Conclusions. No conclusions were made. The document was strictly descriptive.

Public Education. The web site itself was geared toward teaching children.

10.0 PUBLIC RELATIONS SOCIETY OF AMERICA (PRSA) SILVER ANVIL AWARDS

Silver Anvil Resource Center. 1983. A program to keep Jacksonville beautiful. <:http://www.silveranvil.org/1983data/6BW8304D.html> (28 June 2001).

Objectives. The objective of this web site is to focus attention on one Silver Anvil winner. The Silver Anvil is annually awarded to public relations practitioners who have successfully addressed a contemporary issue with exemplary professional skill, creativity and resourcefulness.

Conclusions. The use of training workshops; news releases; public service announcements; internal features; photo releases; booklets and brochures; letters; bill stuffers; film; posters; billboards; television programs; and special events produced the following results: 1) more than 14,810 people have been reached and trained in anti-litter programs. These individuals then went on to train 35 civic organizations, 13 government groups and 19 businesses or professional organizations; 2) more than 355,000 were reached through film; and 3) more than 99,000 school children were reached through workshops, poster presentations and clean campus projects.

Public Education. Keep Jacksonville Beautiful (KJB) was initiated in October 1981 to educate residents of Jacksonville, Florida, on the problems of littering. An agency composed of senior public relations students at the University of North Florida was created to plan and carry out a comprehensive public relations program for KJB and twelve of its major cooperators. The objectives of the program were to: 1) change the attitude and behaviors of citizens concerning litter by educating them in the proper handling of solid waste materials; 2) teach proper containerization of each of the seven major sources of litter; and 3) plan and carry out individually designed anti-litter programs for each of twelve major cooperators.

Silver Anvil Resource Center. 1973. Owens-Illinois anti-litter program. <http://www.silveranvil.org/alldata/6BW7302A.html> (28 June 2001).

Objectives. The objective of this web site is to focus attention on a Silver Anvil winner that designed and executed a program in 1972 with the purpose of educating the youth on the environment as well as reemphasizing its efforts to help solve environmental problems.

Conclusions. Monetary awards were given to Boy Scout and Girl Scout Troops when industrial facilities, located within their Troops, had outstanding anti-litter, beautification and recycling projects. Nearly 1,290 Boy Scout and Girl Scout Troops representing 40,000 scouts participated. Thousands of boys and girls throughout the country were encouraged to participate in worthwhile projects designed to help the environment in their communities. Due to this effort, adults received a better understanding of environmental problems and their possible solutions.

Public Education. The company that sponsored the event became concerned that an increased emphasis on solid waste and air and water pollution might cause a corresponding decrease in long-time educational efforts to stop the littering of the nation's streets, highways and other public places. As a result of this

concern, the company developed a nationwide anti-litter and beautification program in cooperation with the Boy and Girl Scouts.

Silver Anvil Resource Center. n.d. GCMI bottle reclamation program. <http://www.silveranvil.org/alldata/6BW7102A15.html> (28 June 2001).

Objectives. The objective of this web site is to focus attention on a Silver Anvil winner that designed and executed a glass recycling program in 1970 with the purpose of: 1) showing that it is better both ecologically and economically to recycle no-deposit glass bottles than to ban or tax them; 2) demonstrating the recyclability of glass bottles and jars into new glass containers and also into secondary products such has highway-paving and home-building materials; and 3) lessening the volume of glass containers in litter and solid waste.

Conclusions. The program was a huge success. One hundred and two (102) million bottles and jars were redeemed and recycled during the first six months of the industry-wide program. No anti-bottle bills were passed at the state or national level. It was estimated that one million individuals and thousands of organizations including Boy Scouts and Girl Scouts, conservation and ecology clubs, PTA's, Garden Clubs, and many other groups participated in the bottle reclamation program.

Public Education. In order for the reclamation program to have worked, the public needed to be informed, educated and motivated about bottle reclamation. The sponsoring institute also developed press conferences, TV film clips, radio and TV interviews, brochures, booklets, speeches, print and broadcast advertising, and instruction manuals for reclamation center personnel in order to get the pollution prevention message to the public. Furthermore, the sponsoring institute had to work in close cooperation with state, county, and municipal officials; Boy Scout and Girl Scout groups; ecology clubs; Garden Clubs; Chambers of Commerce; and other organizations.

Silver Anvil Resource Center. 1970. Glad disposer trash bags campaign – stash the trash. <http://www.silveranvil.org/alldata/6BW7005A07.html> (28 June 2001).

Objectives. The objective of this web site is to focus attention on a Silver Anvil winner that designed and executed a plastic trash bag campaign in 1969 with the purpose of: 1) creating widespread trade and consumer awareness of their brand of plastic disposer trash bags through an effective new product introduction; 2) fostering trial purchase and use of the product by consumers through convincing consumer publicity programs; 3) establishing acceptance of the product in regular refuse collection programs through educational projects directed at sanitation directors and municipal officials; and 4) since success largely depended on acceptance of the product by municipal authorities, and because these individuals normally shun programs which seem overtly commercial, each program was built around community involvement and public service activities.

Conclusions. Based on report figures, the campaign was extremely successful. During the three months following the program, sales increased. Publicity activities in cities facing sanitation emergencies resulted in direct sales gains. Plastic bags and wraps during the year following the program showed the greatest growth among all supermarket product categories. Within this category, plastic trash bags exhibited the greatest growth and the sponsor company's brand held the greatest market share.

Public Education. Programs were designed to clean up the landscape. A "Community Cleanup Kit" containing all materials for a one-hour program was offered to women's clubs. A film "Cleanliness is Next" showing how a Massachusetts town banded together to beautify their community was distributed to groups around the country. A "Stash the Trash" television contest ran in ten major cities and was sponsored by the plastic bag manufacturer and local civic groups and television stations. Prize money was awarded to groups who planned and executed superior community cleanup projects. A booklet, "This Land is Your Land, Keep It Clean" describing how to enjoy national parks and wilderness areas without turning them into refuse dumps, was created and donated to the Department of the Interior's "Johnny Horizon" program. A "Stash the Trash" tele-lecture was aired telling how to avoid health hazards in emergencies. A "Stash the Trash" folder was created telling how to avoid hazards during periods of garbage accumulation.

11.0 OTHER STATES

Texas Department of Transportation. n.d. Don't mess with Texas, litter survey, August 1995.

Objectives. The objectives of this study were to determine the rate of litter accumulation; to identify brand names of litter items and/or the source or distributor; to characterize litter by composition and use; and to characterize the relationship between litter accumulation and certain environmental characteristics such as temperature, average daily traffic volume, and rainfall events.

Conclusions. This was the first litter survey in Texas which measured total rather than visible litter and was the first survey in Texas to use statistical methods to estimate the number of samples required to achieve a target precision goal. The precision goal was met. The environmental factor that is most strongly correlated with litter accumulation rates is the traffic volume on the roadway. There was no significant correlation between the number of convenience stores and fast food businesses with litter accumulation rates. Cigarette butts were the most prevalent of all the litter items and constituted 48% of the litter. The next most common item was paper (17%) followed by plastic (11%). The largest number of items associated with brand names is Marlboro (36%).

Public Education. There was no pertinent information regarding public education in this study.

Comments. 75,327 individual litter items were surveyed in this study. On Texas roadways, the average litter accumulation rates is estimated to be approximately 3,500 items per month per mile. This is based on a count of all litter items, including cigarette butts. When cigarette butts are excluded from the litter count, the average accumulation rate is estimated to be approximately 1,200 items per month per mile.

Texas Department of Transportation. 1998. Don't mess with Texas litter attitudes and behaviors study, executive summary. <http://www.dontmesswithtexas.org/res1998.htm> (27 June 2001).

Texas Department of Transportation. 1998. Don't mess with Texas litter attitudes and behaviors study; for the Texas department of transportation; final results fact sheet. <http://www.dontmesswithtexas.org/rfs1998.htm> (27 June 2001).

Objectives. The objectives of these studies were to determine litter attitudes and behavior in Texas.

Conclusions. The studies revealed that 52% of Texans either participated in or condoned littering behavior in the past 3 years and 38% admitted to actual littering. Texans can be classified into one of five categories: Gross Litterers (they have personally discarded significant litter in the past three months) representing 7% of adult Texans; Micro Litterers (they have personally discarded cigarette butts, food, candy wrapper and other minor litter in the past three months) representing 15% of adult Texans; Reformed Litterers (they have personally discarded major or minor litter in the past 36 months) representing 16% of adult Texans; Tolerant Litterers (they have not personally discarded litter, but have been with people that have, but did not condemn the behavior) representing 14% of adult Texans; and Non Litterers (they never litter) representing 48% of adult Texans. The top six predictors of littering behavior are young individuals that: have never been married; smoke; eat fast food at least twice a week; drive more than 50 miles per day; and frequent bars or other forms of nighttime entertainment at least one

a week. An overwhelming majority of litterers are teenagers or young adults under 24. Of those under 21, almost 20% are Gross Litterers and 30% are Micro Litterers. Regarding adults between the ages of 25 to 29, only 10% are Gross Litterers and 23% are Micro Litterers. Young males are more likely to be Gross Litterers and young females are equally as likely as young males to be Micro Litterers. Of those Texans who smoke, more than half admit to littering. Forty-five percent of all litterers in Texas drive a pickup truck.

Texans perceive that people who are drinking alcohol and then throw trash on the roads are a major source of litter. They also perceive teenagers and individuals that abandon construction materials as nearly equal sources of litter. Texans perceive smaller litter as less of a problem than larger litter. They feel that reminding people of the imposed fine for littering is more successful than a more altruistic approach. They feel that letting fast food, beer and cigarette companies use the Don't Mess With Texas slogan on their packaging and advertising is effective. About 62% of all Texans are very aware of the Don't Mess With Texas Slogan and 90% want to see the campaign continued. Texans incorrectly believe prisoners, more than any other group, are responsible for picking up litter from roadsides in Texas. Eighty two percent are aware of the Adopt-A-Highway Program. One in five Texans do not know the litter prevention meaning of the "Don't Mess With Texas" slogan.

The Don't Mess With Texas advertising campaign has a long history of success due to its use of well known spokespersons and it tough stance on litter.

Public Education. The only public education aspect of the study is its recommendation that the Don't Mess With Texas campaign should continue.

Texas Department of Transportation. n.d. The history of don't mess with Texas. <http://www.dontmesswithtexas.org/DMWT_History.htm> (27 June 2001).

Objectives. The objective of this report is to introduce the reader to the history of the Don't Mess With Texas campaign and additional research that has been done since its formation in 1985.

Conclusions. Part of the campaign's success is the use of athletes and musicians who are admired by the target audience (white males ages 18 to 34). By 1991, the amount of visible litter on Texas roadways had decreased, since 1985, by 72%. The 1998 littering attitudes and behaviors study indicated a shift in the littering population from white males ages 18 to 34 to men and women between the ages of 16 and 24.

Texas Department of Transportation. n.d. Partners: working together for a litter-free Texas. < http://www.dontmesswithtexas.org/partner_main.htm> (27 June 2001).

Objectives. The objectives of this web site are to educate the reader to the fact that even though the "Don't Mess With Texas" campaign has been hugely successful more involvement is needed and that the Partner Program is a way to help stop Texans from littering the roadsides.

Conclusions. No conclusions were made.

Public Education. This web site is geared toward educating the public in Texas about the need for the continued and increased support of the "Don't Mess With Texas" campaign in general and the Partner Program in particular.

Texas Department of Transportation. n.d. Don't mess with Texas trash-off; April 7, 2001. <:http://www.dontmesswithtexas.org/trashoff_main.htm> (27 June 2001).

Objectives. The objectives of this web site is to introduce the origin of the Trash-Off and highlight its progress over the years as well as to include comments from the public about the campaign.

Conclusions. The Don't Mess With Texas Trash-Off has been and continues to be a huge success.

Public Education. The Don't Mess With Texas Trash-Off has made many people around the world aware of the problem of roadside litter and has motivated them to get involved as part of the solution.

Texas Department of Transportation (www.dontmesswithtexas.org).

Here are quotes from the website:

Don't Mess with Texas is the public education arm of the Texas Department Of Transportation's (TxDOT) litter prevention programs. Created in 1986, the campaign strives to educate the public about the litter problem in Texas. Based on research of litter behavior and attitudes, the program uses multiple forms of media such as radio, television, billboards, and special events like the Trash-Off to reach the public. Joining the Don't Mess with Texas campaign are the Adopt-A-Highway program and a grassroots partnership with Keep Texas Beautiful. Together these programs form a comprehensive litter prevention strategy.

Surveys

The first study was conducted in September, 1985. The primary objective of this research was to investigate attitudes and perceptions about littering among Texas residents. Through one-on-one, in-depth interviews, individuals were asked a series of questions to determine their attitudes about littering. Among the questions asked were: Do you litter? If so, how frequently? What is litter? Do you know that littering is a crime? This research revealed that the most likely frequent litterers are white males, ages 18 to 34. With that information, GSD&M tailored the litter prevention message to this target audience. Softer messages like "Pitch In" were not found to be effective with this group, and so the Don't Mess with Texas public service announcements were designed to send a more hard-hitting message. ....

In 1998, TxDOT initiated another study of littering attitudes and behavior. This coincided with a new advertising agency taking the helm of the Don't Mess with Texas campaign. This research, undertaken by NuStats, Inc. in conjunction with Tuerff-Davis EnviroMedia, revealed a shift in the demographics of litterers. The new target was shown to be men and women between the ages of 16-24 who smoke, eat lots of fast food, drive 50 or more miles a day, frequent bars, and are single. Gone are the days of the single male being the only usual suspect in littering.

Oklahoma Department of Transportation. n.d. Highways beautification, litter hotline. <http://www.okladot.state.ok.us/hwyinfo/beauty/hotline.htm> (21 June 2001).

Objectives. The objective of this web site is to educate the reader about the Oklahoma Litter Hotline and encourage citizens to report highway littering incidents. The ODOT can then send the owner of the car a postcard explaining that someone was seen littering from their car and ask them to join the effort to keep the roadsides attractive.

Conclusions. No conclusions were made.

Public Education. The goal of the program is to involve the public in roadside litter prevention.

Virginia Department of Environmental Quality. n.d. Litter prevention and recycling. <http://www.deq.state.va.us/recycle/lprevention.html> (25 April 2001).

Objectives. The objective of this web site is to define litter for the reader and to provide litter prevention resources so the reader will become more involved.

Conclusions. No conclusions were made.

Public Education. The goal of the web site is to educate the public about litter and encourage involvement in litter prevention.

Georgia Department of Community Affairs. n.d. Litter prevention in Georgia. <http://www.dca.state.ga.us/solidwaste/kgb/litter.html> (21 June 2001).

Objectives. The objectives of this web site are to educate the reader about litter prevention techniques in general and litter prevention in Georgia in particular.

Conclusions. The most successful way to prevent littering in a community is to have an ongoing, organized program that involves local government; businesses; civic groups; the media; schools; and private citizens.

Public Education. The web site is geared toward the education of the public in litter and litter prevention.

Georgia Department of Community Affairs. n.d. Litter & illegal dumping in Georgia. <http://www.dca.state.ga.us/solidwaste/kgb/litterflyer.html> (21 June 2001).

Objectives. The objectives of this web site are to inform the reader about Georgia litter and illegal dumping laws; what is considered illegal; what common violations and their associated penalties are; as well as what an individual can do to help with the problem.

Conclusions. No conclusions were made.

Public Education. The web site itself was a public education tool that also gave sources of additional information and involvement.

Arizona Clean & Beautiful Programs. n.d. Arizona Clean & Beautiful Programs. <:http://aspin.asu.edu/acb/programs.html> (21 June 2001).

Objectives. This web site introduces the reader to the Arizona Clean & Beautiful (ACB) program. The program's goal is to develop successful partnerships designed to prevent litter and educate the public on integrated solid waste and provide sound environmental information in collaboration with a variety of businesses; industry groups; governmental agencies; and other organizations.

Conclusions. ACB research has found that people are more likely to throw litter on top of litter than drop litter in neat surroundings. Most people will not pick up after those who leave trash behind. People who feel the greatest personal obligation to not litter are those who feel a strong sense of identity with their communities; frequent recreational areas; and place a special value on a sense of belonging. Littering seems to be not as prevalent in areas that have community recycling programs.

Data collected by volunteers participating in cleanups indicate that the predominating types of litter items collected include (from highest to lowest): cigarette butts; plastic pieces; foamed plastic pieces; food bags and wrappers; paper pieces; plastic caps and lids; glass pieces; glass beverage bottles; metal beverage cans; plastic beverage bottles; metal bottle caps; and pieces of clothing. Most of the items are food related.

Public Education. The web site was designed to educate the public about the Arizona Clean & Beautiful (ACB) Programs. ACB programs are geared toward providing information about litter and litter prevention to the public and providing avenues for public involvement.

Pennsylvania Resources Council. Don't be a litterbug. n.d. http://prc.org and http://www.litterbug.org (9 August 2001).

Objectives. The Pennsylvania Resources Council (PRC) is a nationally recognized nonprofit citizens' group founded in 1939. Their objectives are to work with industry, government, and grass-roots organizations to seek environmental solutions for issues such as waste reduction, recycling, litter, and visual pollution.

Conclusions. Litter is a serious problem in Pennsylvania. These two web sites contain information about PRC, their activities, and information on their anti-litter program.

Public Education. The litterbug.org web site contains numerous public education programs in the state. It also describes the history of the "litterbug" character. It is a registered trademark of the PRC and was first introduced in 1952. It has had several different updates over the years. PRC used the character continuously for the next fifty years in many anti-litter campaigns.

PRC first allowed the National Council of State Garden Clubs to use the Litterbug in its anti-litter campaign during the mid-fifties in conjunction with the "Don't Be A Litterbug" slogan. A few years later PRC gave permission to Keep America Beautiful. This organization used the bug for over ten years and put the Don't Be A Litterbug slogan to music.

In 1997 the Pennsylvania Department of Environmental Protection received permission to use the Litterbug in its forthcoming statewide anti-litter campaign. A mascot was created by PRC and the Litterbug traveled to schools, community events and meetings preaching litter and being warned "Don't Be A Litterbug". In 1999 the Pennsylvania Department of Transportation (PennDOT) received permission from PRC to use the Litterbug in its anti-litter program and had six more Litterbug mascots designed for loan through its regional offices.

Other items described on the web site include:

- Litter hotline: 1-888-LITTERBUG
- Lens on Litter Photo Contest
- Take the pledge not to Litter
- Let's Tackle Litter program (in conjunction with high school football)
- Information on other anti-litter efforts, such as Coca-Cola's
- Links, including one from an Alabama nonprofit organization's site: http://www.AuntiLitter.org. "Auntie Litter is Anti-Litter."

12.0 AUSTRALIA

Allison, R. A., T.A. Walker, F.H.S. Chiew, I.C. O'Neill, and T.A. McMahon. 1998. From roads to rivers, gross pollutant removal from urban waterways. Report 98/6: Cooperative Research Centre for Catchment Hydrology.

Objectives. The study was conducted to determine effective approaches for reducing water degradation caused by gross pollutants carried in urban storm water. Two litter monitoring programs were conducted and pollutant reduction strategies were analyzed.

Conclusions. The report concluded that gross pollutants are a major problem to urban waterway managers. Technologies to capture pollutants from within the drainage area are available but expensive. Two pollutant trap systems were identified as promising. They are the continuous deflective separation device and the side entry pit trap.

Public Education. Higher amounts of litter are transported from commercial and light-industrial areas than from residential areas. Therefore, the report suggested that commercial and light industrial land uses should be targeted for reduction strategies.

The report also briefly discussed education programs, citing media advertising and drain labeling as increasing awareness of stormwater systems. It cited another report that said community involvement and education can potentially reduce the impacts of storm water pollutants on receiving waters, but the impacts take place over a long time and are difficult to quantify.

The report stated that manufacturers play a part in the litter problem through packaging and advertising. Manufacturers want to reduce the number of items becoming litter to avoid gaining a reputation as an environmentally unfriendly company.

Community cleanup days were cited as successful in cleaning waterways in the short term. They do not address the source of contamination, but promote awareness through education and media attention.

Comments. The report cited a study that concluded that the public perceives gross pollutants as the greatest threat to waterway health.

Cooperative Research Centre for Catchment Hydrology. n.d. Program 7: communication and adoption. <http://www.catchment.crc.org.au/programs/the_programs/cap.htm> (28 May 2001).

Objectives. The core business of the Cooperative Research Centre (CRC) is world class research. They are also committed to the communication and adoption of their research outcomes by the end user.

Conclusions. The organization feels that, through the incorporation of certain strategies, the CRC for Catchment Hydrology will be recognized as delivering a continually improving best practice communication and adoption program, they will create synergies for extending research outcomes to end-users through a two-way interactive process; their outcomes will be adopted by the key end-users; and they will improve the understanding and management of Australia's land and water resources.

Public Education. The CRC for Catchment Hydrology has two key functions: 1) performing world class research on Australia's land and water resources and 2) communicating the results to the end-user so that it can be adopted. This communication with the public takes the form of end-user involvement with planning and research; providing a monthly newsletter; maintaining a leading-edge web site; providing a seminar series; publishing a technical report; publishing a video series and practical reference materials; providing field tours and demonstrations; providing professional education from targeted short courses through to postgraduate scholarships; and contributing feature articles to key trade journals.

Cooperative Research Centre for Catchment Hydrology. n.d. Program 4: urban stormwater quality. <http://www.catchment.crc.org.au/programs/the_programs/urban.htm> (28 May 2001).

Objectives. The objective is to develop storm water management for the protection of environmental and community values.

Conclusions. Urban storm water is a major contributor to the pollution of rivers and bays. Runoff quality and quantity has been responsible for the degradation of most urban streams.

Public Education. No reference to public education was mentioned.

Cooperative Research Centre for Catchment Hydrology. n.d. Program 4.1: stormwater pollutant sources, pathways and impacts. <http://www.catchment.crc.org.au/programs/projects/p4_1.htm> (28 May 2001).

Objectives. The CRC for Catchment Hydrology aims to develop a suite of models for estimating storm water pollutant loads from different source areas; defining their impacts on aquatic ecosystems; and predicting the performance of storm water management practices. They also aim to formulate a Decision Support System for the development of cost-effective strategies and then communicate the cost/benefits of these strategies to the non-technical decision maker.

Conclusions. Since the hydrology and ecology of urban aquatic systems are highly dynamic in their response to the stochastic nature of urban storm water quantity and quality, many urban catchment management authorities and local municipalities are developing storm water management strategies that address multiple objectives beyond flood mitigation and storm water drainage. However, there are a number of inadequacies in the manner that these strategies are formulated and implemented.

Public Education. The public education aspect of this project has been the development of the Decision-Support-System which will have a highly developed user interface to graphically present system output to non-technical decision makers.

Cooperative Research Centre for Catchment Hydrology. n.d. Program 4.2: stormwater best management practices. <http://www.catchment.crc.org.au/programs/projects/p4_2.htm> (28 May 2001).

Objectives. Since there is an insufficient understanding of the efficacy and efficiency of many structural storm water management practices in Australian conditions, the CRC aims to monitor their performance and to review current non-structural measures.

Conclusions. Economic analysis of the performance of storm water management practices is currently poor. Therefore, urban storm water quality management cannot be fully integrated into a holistic approach to catchment management.

Public Education. There is no public education aspect to this report.

Cooperative Research Centre for Catchment Hydrology. n.d. CRC publications. <http://www.catchment.crc.org.au/publications> (28 May 2001).

Objectives. The objective of this web site is to provide the opportunity to purchase CRC publications and videos.

Conclusions. No conclusions are made.

Public Education. The public education aspect of this web site is the availability of information on CRC research.

Vertessy, R. 2001. Catchword, No. 95,: program 1, predicting catchment behavior. Cooperative Research Centre for Catchment Hydrology.

Objectives. This CRC group is building an Environmental Management Support System to help manage water quality in the waterways and catchments of the southeast Queensland region.

Conclusions. No conclusions were made. The article was a description of the status of the project.

Public Education. There was no public education aspect to this article.

Hairsine, P. 2001. Catchword, No. 95,: program 2, land-use impacts on rivers. Cooperative Research Centre for Catchment Hydrology.

Objectives. This CRC group is studying: 1) changes to water yield (or stream flows) as a result of land-use change, 2) movements of sediment in stream networks as affecting in-stream physical habitat, 3) movement of sediment and nutrients in catchments as affecting water quality and 4) movement of salt in catchments as affecting water quality.

Conclusions. No conclusions were made. The article was a description of the status of the project.

Public Education. There was no public education aspect to this article.

Weinmann, E. 2001. Catchword No. 95: program 3.1, sustainable water allocation: integration of water balance, climatic and economic models. Cooperative Research Centre for Catchment Hydrology.

Objectives. The goal of this CRC group is to develop more comprehensive system simulation capabilities as a basis for sustainable water allocation.

Conclusions. No conclusions were made. The article was a description of the status of the project.

Public Education. There was no public education aspect to this article.

Jenkins, G. 2001. Catchword No. 95: program 4, urban stormwater quality: the effect of vegetation on hydraulic efficiency in artificial wetlands. Cooperative Research Centre for Catchment Hydrology.

Objectives. This CRC group aims to undertake a numerical model study to investigate the effects of emergent vegetation on the hydraulic characteristics of artificial wetlands.

Conclusions. They have found that poor arrangement of wetland vegetation can result in a significant reduction in the hydraulic efficiency of the wetland system.

Public Education. There was no public education aspect to this article.

McMahon, T. 2001. Catchword No. 95: program 5, climate variability: stochastic downscaling of climate variables. Cooperative Research Centre for Catchment Hydrology.

Objectives. This CRC group aims to assess the reliability and resilience of the Murrumbidgee Basin's water supply system under climate variability.

Conclusions. No conclusions were made. The article was a description of the status of the project.

Public Education. There was no public education aspect to this article.

Ladson, T. 2001. Catchword, No. 95,: program 6, river restoration: an Australian handbook of stream roughness coefficients. Cooperative Research Centre for Catchment Hydrology.

Objectives. This CRC group along with the National Rivers Consortium, and Land and Water Australia are producing an Australian Handbook of Stream Roughness Coefficients which is intended to become part of a toolkit for waterway managers, catchment groups and consultants when planning and designing river restoration works.

Conclusions. No conclusions were made. The article was a description of the status of the project.

Public Education. There was no public education aspect to this article.

Allison, Robin, F. Chiew, and T. McMahon. 1997. Stormwater gross pollutants industry report, Report No. 97/11. Cooperative Research Centre for Catchment Hydrology.

Objectives. This report summarizes the CRC for Catchment Hydrology's research on gross pollutants in urban storm water. The following topics are covered in the report:

- CRC's gross pollutant monitoring programs
- Stormwater gross pollutant characteristics (loads and types)
- Gross pollutant trapping systems
- Field monitoring of two gross pollutant traps

- Estimating gross pollutant loads and comparing different trapping strategies

Conclusions. The CRC's findings demonstrate that although large amounts of gross pollutants are carried from urban catchments via storm water, technologies are available to trap these pollutants. The results of this study have been incorporated into a decision-support-system (DSS) for managers to use in choosing from a range of gross pollutant traps described in this report.

Public Education. There was no information regarding public education in this study.

Elzufon, Betsy. 2000. Tools to measure source control effectiveness. Project 98-WSM-2. Water Environment Federation.

Objectives. The objective of this report is to develop evaluation tools that are applicable to a range of commercial and residential source control programs with varying target pollutants, environmental conditions, and available program resources. The report details a project that was conducted in two phases. In the first phase, a model framework was developed for incorporating effectiveness measurement into a source control program, and tools were evaluated by assessing existing efforts to measure program effectiveness. During the second phase of the project, the framework and tools were tested through demonstration projects conducted by storm water and wastewater agencies as part of their pollution prevention programs.

Conclusion. In Section 5.3 entitled Findings and Recommendations, the report discusses final results with respect to barriers in conducting evaluations, benefits realized from program evaluations, and lessons learned from other fields. In addition the report provides recommendations for conducting demonstration projects to test the framework and tools presented within the report.

Public Education. There are a number of case studies within this report that have a public education component to their source control program. For programs targeting residential audiences, most of the control strategies used for this audience are based on educational outreach materials and the methods of advertising this information to the public. Effectiveness measurement tools commonly used include quantitative and targeted surveys, tracking responses, and focus groups. Other tools that have been used successfully when adequate data are available include estimated load reductions, tracking sales, effluent toxicity, and modeling.

The report also stated that public education and outreach programs can be expected to have a percentage of effectiveness between 5% and 20%. Outreach efforts in Seattle, Washington resulted in behavior changes in 6% to 13% of the people surveyed. In Palo Alto, the average return rate for car wash coupons mailed to residents, as an outreach measure was 10% in 1995 and 9% in 1996. Previous outreach efforts in Palo Alto resulted in an approximately 10% participation rate, therefore, this percentage is used as the participation factor for most public education programs. In cases where the program involves a more complicated message and/or clear alternative behaviors or products are not available, then a 5% participation factor is used.

13.0 IRELAND

Tobin Environmental Services Ltd. 2000., An assessment of local authority litter management plans, May 2000. Ireland, The Litter Monitoring Body.

Objectives. The objective of this report is to provide results from the Monitoring Body's assessment of seventy-four Litter Management Plans (LMPs) which were prepared by local authorities in Ireland. An assessment protocol was utilized for plan review. The Assessment Protocol combined relevant element of the Litter Pollution Act, 1997 with key aspects of international and Irish litter management best practice.

Conclusions. Of the seventy-four LMPs review, results indicated that overall the LMPs were compliant with the statutory requirements of their plans and were only partially compliant with the best practice component of the LMPs. Compliance with the statutory requirements of the LMPs was due to the fact that the local authorities developed this part of their LMP on the requirements stated within the Litter Pollution Act, 1997. The low level of compliance with the best practice component of the LMPs was due to the fact that best practice is associated with litter management planning and communicating with the public.

Recommendations are provided for the preparation of future LMPs. The recommendations fall into three main categories: Statutory; Best Practice; and Communication Aspects.

Public Education. The best practice component of the LMPs, which includes public education, had a high degree of noncompliance. The best practice component includes sections on Structures and Responsibilities; Training and Awareness; Communication and Documentation; and Emergency Preparedness and Response. Regarding the Structures and Responsibilities Section, information on the number of Litter Wardens and cleansing staff was inadequate. Information regarding Training and Awareness was lacking in most of the LMPs submitted. A slight improvement was observed in the Communication and Documentation Section. Although only thirty-seven plans had a system for identifying when major events would be taking place, the LMPs indicated that large numbers of local authorities have a system in place for giving talks in schools. Regarding the Emergency Preparedness and Response section, documentation regarding identification of emergency situations was not provided. For example, there were no emergency situations identified and most of the Plans showed no evidence that provision had been made for extreme weather conditions. It was noted that provisions should be made for dealing with bad weather as rain and wind will always spread litter and make a bad situation worse.

Tobin Environmental Services, Ltd. n.d. National litter pollution monitoring system – monitoring manual. Litter survey guidelines for local authorities. Ireland: The Litter Monitoring Body.

Objectives. The report defines commonly observed Potential Litter Generators found in Ireland. The report designates the potential litter generators into three specific severity classes. They are:

1. Potentially highly polluting;
2. Potentially moderately polluting;
3. Temporary, seasonal or sporadic generators.

Potential Litter Generators are classified into these severity classes depending on the likelihood of their ability to cause litter pollution. After a generator has been assigned to a particular class, a severity weighting is then applied.

The locations and distribution of Potential Litter Generators across a given local authority functional area will then be incorporated into a Litter Monitoring GIS system. Upon completion, it is anticipated that the GIS maps (termed Litter Generation Potential Maps) will identify where significant clusters of pollution risk occur in an authority's functional area.

Conclusions. Research indicates that chronically littered locations usually had the following attributes in common:

1. High population density;
2. Large number of visitors;
3. Low levels of local civic pride;
4. Low levels of litter related awareness;
5. Poor background environmental conditions.

Public Education. There was no mention of a specific public education component in this report. However, it is interesting to note that chronically littered locations usually occurred in areas associated with low levels of litter related awareness.

Comments. Chapter One and Appendices 4.1 through 4.3.4 were summarized for this review.

Tobin Environmental Services Ltd. 2000. Litter monitoring body annual report for 1999/2000, May 2000. Ireland: The Litter Monitoring Body.

Objectives. The objectives of this report are to summarize the key activities which have been undertaken by the Litter Monitoring Body over the course of one year to facilitate the development of an efficient and effective national monitoring mechanism in Ireland. Some of the activities described include stakeholder consultation; the development of a customized litter survey methodology; and the assessment of current Litter Management Plans. In addition, the report also outlines priorities for action over the following year – as regards to each of the key players of the Litter Monitoring System (namely, the Litter Monitoring Body, the local authorities and the Department of the Environment and Local Government).

Conclusions. The report concluded that in terms of solutions, it is likely to be simpler to improve coordination between and within local authorities in litter abatement and collection. Better coordination between local authorities and state and semi-state agencies was also recommended. A clear focus on keeping public buildings litter free forms a key part of this strategy.

Enforcement, awareness and education were viewed as interlinked components in reducing Ireland's litter problem. The need for situation-specific balancing of these different elements was indicated. It was also recommended that consideration be given to the introduction of a sliding scale for litter fines. In addition,

the need for consideration of additional services such as bulky waste collections was discussed, as was the importance of consistent and ongoing national advertising and education media campaigns.

Public Education. The report stated that a combination of awareness, educational and enforcement measures is required in any given functional area in order to deal with the various types of litter offenses and problems which may occur. Two specific types of functional areas were identified. The first type incorporates the majority of the country while the second type comprises the major urban areas during the tourist season and Dublin throughout the entire year.

In the first type of functional area litter offenders are likely to be local residents or frequent visitors. In this type of situation, an approach based on verbal warnings and education is most appropriate, with fines being used as a last resort or in the more severe cases. In the second type of functional area litter offenders are most likely tourists or individuals that the Litter Wardens are not familiar with. Therefore, education regarding remediation measures is not likely to occur. In such situations, heavy reliance on litter fines is likely to be the more appropriate approach.

Litter Monitoring Body. n.d. National Pollution Monitoring System. Wallace Launches Web Site. <http://www.environ.ie/press/teswebsite.html> (20 June 2001).

Objectives. This file from the Internet provides information regarding the different activities taking place in Ireland in order to prevent and control litter.

Conclusions. Some of the information provided at this web site includes anti-litter activities; anti-litter campaigns; cleansing machinery; litter receptacles; local authority services; recycling and the name and shame activity. It is anticipated that this web site will allow local authorities to share information with each other, especially in relation to good litter control practice at the local, regional and national level.

Public Education. A number of public education campaigns are provided on this web site. Details from a few of them are provided below.

1. A federation comprising county and local town officials was established in order to increase dialogue and debate in relation to the reduction of litter across the county.
2. An Anti Litter Working Group has been established. Here, people from different sectors of the community meet regularly to discuss how to improve the litter situation in County Waterford.
3. An Anti Litter Campaign using car stickers and billboard advertising was established in County Galway.

The Report of the National Anti-Litter Forum. n.d. Taking pride in our environment, a national anti-litter strategy.

Objectives. Ireland's tourism industry considers litter to be the single biggest issue which negatively impacts the Irish economy. The overall objective of this report was to identify actions that are required in order to tackle the litter problem. Their primary approach to resolving the litter problem requires the involvement of all sectors of the community. The report reviews current actions targeting litter pollution

and develops initiatives to enhance and extend these actions with the objective of solving the litter problem.

Conclusions. The findings indicate that rigorous enforcement of the legislation is the key to success. Parallel measures such as education should then follow. The Litter Pollution Act was instituted in July 1997. Although the act is comprehensive and a significant improvement has been realized, some elements of the act may need further amendment in order to provide better support local authority enforcement action. National statistics indicate that six months (January – June, 1997) prior to the Litter Pollution Act there were 100 convictions and 981 on-the-spot fines were issued to individuals for littering. For the period from January – June 1999, national statistics indicate that there were 354 convictions and 8,277 on-the-spot fines were issued. This demonstrates a significant improvement in local authority enforcement after the Litter Pollution Act was mandated.

Economic and fiscal factors will have to constitute an increasingly important part of any market based incentive for environmentally friendly economic behavior. Key actions for economic and fiscal instruments will require the resources of government, local authorities and business.

Public Education. The report states that litter awareness and education should be treated as equal and inseparable. Any public education litter program should focus the attention of individuals and of the various sectors in society on their personal and collective obligations. The report further states that a public education program should engage the interest and commitment of individual's and the various sectors to contribute to the eradication of the litter problem in Ireland.

Public education litter programs have had some success in Ireland, but still the desired effect in terms of a litter free environment has not been realized. New strategies involve supporting new public education and awareness programs which generate enthusiasm and cooperation for positive action. Public education programs should seek the cooperation of schools in the promotion of litter education, awareness, and prevention among the school-going population through opportunities within the school curriculum. Also litter prevention should be the core element of central and local government policies.

Key actions include the undertaking of a major anti-litter campaign. This campaign should have the impact equivalent to drinking and driving and safety belt usage campaigns. The campaign should draw attention to the significant penalties associated with litter offenses in Ireland. The campaign should employ the use of high profile celebrities; the media; and key-influencing groups. An example would be to request that Ireland's National Lottery include an anti-litter message in its television programs and advertising.

Comments. The authors of the report state that those who cause litter should be prosecuted and that a zero tolerance approach to littering should be rigorously followed, whether the littering is by an individual, a business, or a public authority.

Environment Department. 2000. Cork litter management plan, report to council, 20 March 2000.

Objectives. The objective of this report is to summarize the activities that took during 1999. The plan identified a number of key elements. These were summarized as initiatives on enforcement; capital investment; cleansing; public education and community/business partnership.

Conclusions. Cork City has a huge litter problem which is unsightly, unhygienic, and detrimental to the city's image and development. The litter problem is affecting all areas of the city. A committee carried out an audit in order to help the city develop a highly effective anti-litter strategy. The audit identified the main sources of litter and identified the generators of those sources. A list of generators is provided in this Litter Management Plan.

Public Education. The public education activities that took place during 1999 included:

A number of school visits were carried out during 1999. Presentations on litter and the problems associated with it were provided to pupils.

The Mayor made a number of public appearances and highlighted the urgent need to tackle the litter problem by everybody – general public; schools; businesses; community groups; etc.

A litter blitz was organized in cooperation with Cork Chamber of Commerce; Cork Business Association; Cork City Challenge; The Gardai; and Community Groups. The blitz received considerable publicity from the local media. Feedback from traders and the general public was positive.

A total of 40 schools participated in the Tidy Schools Competition.

Advertising with the local media has been utilized in order to get the message across that litter is not acceptable. Also, a number of radio and press interviews have been given to local media to highlight Cork's commitment to the eradication of the litter problem.

Funding was received from the Department of the Environment towards the production of a video on litter.

Litter Monitoring Body. 2001. Litter action plan.

Objectives. The Litter Action Plan provides Ireland's national strategy to eradicate litter pollution. It is the first national anti-litter strategy based on extensive consultation with the public and private sectors, as represented by the membership of the National Anti-Litter Forum. This document endorses multi-sectoral action as the key to combating litter, through a more focused and intensive program.

Conclusions. Through implementation of this plan, local authorities will have an enhanced role. For example, local authorities will be able to make general anti-litter by-laws for their areas. Also, local authorities will be able to intensify their anti-litter operations, including in the area of enforcement. Local authorities will also be able to learn from best practice to combat litter. Also, one of the key measures of the plan will be an increase in financial penalties for litter offenses.

Public Education. The anti-litter message will form an important part of the National Environmental Awareness Campaign. The Departments of Education and Science, and Environment and Local Government will support an effort by schools, colleges and training centers to promote litter awareness and education. Local authority litter education/awareness activities will have a particular focus on involving schools in anti-litter action. An inventory of successful litter education and awareness activities will be developed and made available through a web site.

Comments. The report acknowledges that the litter problem is far from solved and that, in many ways, Ireland's economic success of recent years has exacerbated the problem.

14.0 WEB SITES

Natural Resources Defense Council. Jolly Giant Creek daylighting and outdoor classroom, Arcata, California, June 20, 2001. <http://www.nrdc.org/water/pollution/storm/chap9.asp>

Objectives. The objective of the report is to inform the reader about the success of the seven year environmental education project in Arcata, California.

Conclusions. This environmental education project ultimately inspired Arcata, CA to develop a new drainage master plan.

Public Education. A seven year environmental education project developed into a state-funded effort that included a pedestrian thoroughfare and passive recreation area.

Natural Resources Defense Council. Promoting public education and participation, June 20, 2001. <http://www.nrdc.org/water/pollution/storm/chap9.asp>

Objectives. The objective of this study was to determine the effectiveness of 1) municipalities banding together to create a consistent area-wide runoff pollution public education program, and 2) advertising in increasing public awareness of runoff pollution.

Conclusions. Three surveys demonstrated that the advertising campaign brought about an impressive improvement in public attitudes and behavior. There was a 9% increase in respondents thinking pollutants enter the watershed through runoff; a 36% increase in respondents thinking pollutants enter the watershed through illegal dumping; a 46% increase in respondents aware of programs to educate the public about dumping in storm drains; and a 70% increase in respondents who changed their behavior. Recognition of billboards as a source of information increased from 8% to 22% among those aware of the educational campaign.

The banding together of municipalities provides a consistent and cost effective way to prepare and transmit educational materials. The joint effort ensures a common approach and method across the county, and increases the number of times that a resident might hear the same message while traveling.

Public Education. Seventeen municipal agencies and districts within Alameda county joined together to increase public awareness of runoff pollution problems and to inform individuals about what they can do to reduce the problem. Municipalities have stenciled storm drains with messages regarding drains leading directly to the San Francisco Bay; radio announcements; banners on the sides of buses; inserts in utility bills; handouts and flyers; and public appearances by municipal agency staff at local fairs and festivals are among the many techniques used to educate the public. The municipalities also monitored the public's response to their efforts with the use of surveys.

Comments. The coordination effort has been so successful that it has been duplicated on a regional level. Six other county-wide stormwater programs abutting the San Francisco Bay have formed the Bay Area Stormwater Management Agencies Association to encourage consistency between the programs and to take advantage of efficiencies in program development across jurisdictional boundaries.

Californians Against Waste. <http://www.cawrecycles.org/> (9 July 2001).

Objectives. The objective of this web site is to introduce the reader to Californians Against Waste, offer information about recycling and other environmental issues and programs and to provide web site links to other environmental related web sites.

Conclusions. No conclusions were made. The document was strictly informative.

Public Education. The purpose of the web site is to provide information to the public.

City of Chicago. n.d. Every Litter Bit Hurts!, 6/21/01.
<http://www.ci.chi.il.us/Environment/Litter/>
<http://www.ci.chi.il.us/Environment/Litter/whylitter.html>
<http://www.ci.chi.il.us/Environment.html/Contacts.html>

Objectives. The objectives of this web site is to educate the reader about the problem of litter in Chicago, the sources of litter in the city, why people litter and the fact that an individual's behavior does make a difference.

Conclusions. Littering is a serious problem in Chicago. Citizens litter because they do not feel responsible for public areas and they feel that someone else is there to pick it up. Once litter starts to pile up, people feel even less responsible for adding to it. Citizens of Chicago usually litter outside of their own neighborhood.

Public Education. The web site is geared toward educating the reader about the litter problem in Chicago. It also includes a list of contacts for the Chicago Department of the Environment.

Slayer, Jeff, program coordinator, City of Chicago. 2001. E-Mail correspondence with Tim Whyte, n.d. Santa Ana, CA.

The City of Chicago's program, "Every litter bit hurts" involves partnerships with other agencies and non-profit organizations. The program sponsors cleanups in neighborhoods and along the Chicago River. The web site, www.ci.chi.il.uc/Environment/Litter/, acts as an education tool for teachers and residents. The city has not yet developed print materials.

Natural Resources Defense Council. n.d. http://www.nrdc.org/water/pollution/storm/chap9.asp#

Alameda County, CA Stormwater Education Project.

Municipalities banded together to create a consistent area-wide advertising program would educate people about stormwater problems more effectively and at a lower cost.

The municipalities conducted three telephone surveys.

The third survey followed a four-month ad campaign on buses, billboards and in newspapers. The survey revealed that a much greater number of respondents were aware of the education programs: seventy percent, rather than forty six percent. Nearly seventy percent of those aware of the campaign changed

their behavior. This represents forty eight percent of the total surveyed sample. Recognition of billboards as a source of information increased from 8 to 22 percent among those aware of the educational campaign. This indicated a particular effectiveness of this media technique. While the respondents in these surveys may in some cases overstate their new convictions and changes in behavior, the significant increases indicate that at least on some level the message got through.

Survey Results For Alameda County Advertising Campaign	Percent Increase
Increase in respondents thinking pollutants enter watershed through runoff	9%
Increase in respondents thinking pollutants enter watershed through illegal dumping	36%
Respondents aware of programs to educate public about dumping in storm drains	46%
Respondents who changed behavior	70% (of those aware of campaign)

15.0 OTHER

Environmental Health Perspectives. 1999. The price of cigarettes. December, 107. <http://ehpnet1.niehs.nih.gov/docs/1999/107-12/forum.html>

Objectives. The objective of the article is to point out the indirect effects smoking has on the environment, in particular, the production of waste from consumption including paper and plastic packaging and cigarette butts and the deforestation associated with tobacco farming.

Conclusions. The research of Novotny and Zhao published in the August 1999 issue of *Tobacco Control* indicates that approximately 5.5 trillion commercially produced cigarettes were consumed in 1995 worldwide, 83% of which were filter-tipped. The cigarette tips contain cellulose and thus remain in the environment for 18 months or more. These butts pose a health hazard to animals and children if eaten. They also indicate that worldwide tobacco manufacturing produced 2.26 billion kilograms of solid waste and 209 million kilograms of chemical waste worldwide in 1995. One waste product from the production of low-nicotine cigarettes is nicotine which is considered by the EPA to be a hazardous chemical requiring special disposal.

Novotny and Zhao recommend enforcing laws against cigarette butt littering, levying taxes on cigarettes to offset cleanup, forcing the tobacco industry to improve the biodegradability of filters and packaging, and increasing public awareness of the magnitude of the waste problem.

According to the Center for Marine Conservation, cigarette butts were the leading item collected across 90 countries in 1998 which accounted for almost 24% of all items found.

According to the research of Geist published in the August 1999 issue of *Tobacco Control,* between 1991 and 1995 approximately 200,000 hectares of forests worldwide were removed for tobacco farming each year, primarily in Africa, Asia, and Latin America. In addition, tobacco curing requires 11.4 million tons of solid wood annually. Geist also suspects that soil erosion, nutrient depletion, changes in microclimates, and land degradation also occur.

Public Education. Novotny and Zhao do advocate, among other things, increasing public awareness of the magnitude of the waste problem associated with cigarette manufacturing and the improper disposal of cigarette butts.

Water Environment Research Foundation. 1998. Public education programs. In Residential and commercial source control programs to meet water quality goals.

Objectives. This chapter provides nationwide information regarding messages used in pollution prevention and stormwater education, audiences addressed; outreach approaches used; the watershed management approach; and use of behavior change principles.

Conclusions. The following are highlights of the information/suggestions offered in Chapter 5.0 which was gleaned from public education programs throughout the United States:

- The best materials use layman's language; are highly visual; relatively brief; and focus on the tools for behavioral modification. These materials were designed to be succinct, deliver the key messages quickly and clearly, and provide the tools to go out and do the job right.
- Successful programs used for businesses included: point-of purchase displays, business recognition programs, educational materials and ethnic employee training.
- Most school programs are targeted toward younger students. Environmental educators hope to teach the young generation about pollution prevention and that the students will then nag their parents and guardians to improve their own actions.
- The Los Angeles County Public Works Department asked people where they obtained information on the storm drain system. Their responses were, in order, as follows: broadcast television, newspaper, radio, cable television, magazine, billboard, stenciling drains, brochure, school child.
- There are many barriers to achieving change besides lack of information. The recommended approach is to start a project by clearly defining the final objective, clearly identifying and understanding the audience, and addressing this audience's barriers to changing behavior. Certain strategies effectively change behavior:
- Getting involved is the first step toward making a commitment.
- Feedback and follow-up are important. It gives people cues about the impacts of their behavior change.
- People will first listen to their friends or relatives, or others they see as credible.
- A few people in a group will typically adopt the change and then spread them through the group.
- Changing attitudes may not change behavior.
- Incentives usually change short term but not long term behavior.
- If you need to provide information, present it effectively. People are more likely to pay attention to information when it is vivid, personal, specific and concrete, stated in terms of loss rather than gain, told as a story, and emotional.

Public Education. This portion of the document holds that the education of a community's residents and businesses concerning wastewater and stormwater issues is an essential part of a nonindustrial pollution prevention and stormwater program. To that end, the chapter provided information regarding messages used in pollution prevention and stormwater education, audiences addressed, outreach approaches used, the watershed management approach, and use of behavior changing principles.

16.0 LITTER LAWS

A number of litter laws, ordinances and acts were evaluated as a part of this literature review. These laws were put into place in order to combat the problems of litter pollution more effectively. The following is intended as a guide to the current litter laws in the United States as well as elsewhere.

California

State Bill 650: Litter Control, Recycling and Resource Conservation Act. This bill enacted a comprehensive Statewide Litter Control, Recycling, and Resource Conservation Plan and established a related Fund.

State Bill 651: Litter Control. Appropriated $2 million in funds to the State Litter Control, Recycling, and Resource Fund.

State Bill 261: Solid Waste Management Act of 1980. This bill changed the name of the "Litter Control, Recycling, and Resource Recovery Act of 1977" to the "Solid Waste Management Act of 1980." This bill also redesignated the "State Litter Control, Recycling, and Resource Recovery Fund" as the "State Solid Waste Management Fund" (SWMF). This bill changed the authorized expenditure of 30 percent of the SWMF for cleanup of recreational lands and public thoroughfares by cities and counties to 32 and ½ percent to be available to cities and counties and designated public agencies and private entities for specified purposes related to litter for the purpose of promoting sound solid waste management. This bill also provided for 7 and ½ percent of the SWMF to be used for litter law awareness and compliance.

City of Clovis: Waste Disposal Prohibitions. The City of Clovis has enacted a waste disposal ordinance in order to control litter pollution.

Guam

Article 2. Litter Control. The purpose of this article is to define and describe procedures pertaining to littering, and to provide authority for the regulation of littering in order to enhance the environment for the people of Guam. In Guam, littering is punishable by a fine not less than $500 nor more than $1,000. Additionally, any person convicted for a second or subsequent litter offense will be required by the Court to pick up and remove litter from a public place.

Ireland

Litter Pollution Act, 1997. This act was formulated as a response to the problems of litter pollution in Ireland. In this act, the definition of litter is quite wide and extends beyond casual pieces of paper or cigarette ends to anything large or small which is, or is likely to become unsightly. A person convicted of a litter offense may also be required by the court to pay the local authority's costs and expenses in investigating the offense and bringing the prosecution.

Local authorities are responsible for implementing litter laws in their own areas. This means they are responsible for the prevention and control of litter and they have the power to take enforcement action against individuals who break or ignore the law.

Regarding fines, leaving or throwing litter in a public place is an offense which can be subject to an on-the-spot fine of twenty five Irish pounds or a maximum fine of 1,500 Irish pounds in court.