AMAFCA/ALBUQUERQUE MS4 FLOATABLE & GROSS POLLUTANT STUDY

Prepared
for:

AMAFCA

CITY OF ALBUQUERQUE TRICENTENNIAL 1706-2006 NEW MEXICO

Prepared
by

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OCTOBER 2005

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AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

SEPTEMBER 2005

I, Clinton Dodge, Registered Professional Engineer No. 6410, hereby certify that these documents were prepared by me or directly under my supervision, and are true and correct to the best of my knowledge and belief.

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This is a planning document. Although it is the intent of the City and AMAFCA to address the goals and recommendations of this Plan, this study does not obligate the City of Albuquerque or AMAFCA in any way. Proposed facility locations, treatments and cost estimates are conceptual only, and may be altered or revised based upon future regulatory requirements, project analysis, changed circumstances or otherwise. Land uses included in this document were assumed for the basis of analysis only.

AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

I. PREFACE

ACKNOWLEDGEMENTS

The development of this Study and the accompanying Gross Pollutant Reduction Program incorporates the input and contribution of many organizations and individuals. The list is too numerous to acknowledge everyone individually. The project team listed here performed the bulk of the editing and review efforts assisted by numerous other local agencies and individuals. This study was funded jointly by Albuquerque Metropolitan Arroyo Flood Control Authority and the City of Albuquerque.

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ABBREVIATIONS, ACRONYMS, DEFINITIONS & GLOSSARY

Albuquerque MS4   The area, except agricultural lands, within the corporate boundaries of the City of Albuquerque served by or contributing to discharges from MS4s owned or operated by the permitted agencies (AMAFCA, Albuquerque, NMDOT & UNM) (See SWQRD#01 - NPDES Permit No. NMS000101).

AMAFCA - Albuquerque Metropolitan Arroyo Flood Control Authority

AMAFCA/Albuquerque Drainage System The drainage systems discharging to the Rio Grande from the North Diversion Channel outfall on the north to the Isleta Pueblo boundary on the south. This encompasses all of the City of Albuquerque and the portion of the AMAFCA jurisdiction that drains to the Rio Grande.

BAT– Best Available Treatment   A level of technology based on the best (state of the art) control and treatment measures that have been developed or are capable of being developed and that are economically achievable within the appropriate industrial category.

BCT – Best Control Technology See BAT.

BERNCO – Bernalillo County.

BMPs - Best Management Practices.   Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs include devices, practices or methods for removing reducing, retarding, or preventing targeted stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters. BMPs also include treatment requirements, operating procedures, and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

BMPRD#xx – Reference documents relating to best management practices (See Appendix B).

BMP System. A BMP System includes the BMP and any related bypass or overflow. For example, the efficiency can be determined for the BMP by itself, or for the BMP system including bypass or overflow.

BOD - Biological Oxygen Demand

BWS - Baffled Weir Structure

Coarse Sediments. Inorganic breakdown products from soils, minerals, pavement, building materials, etc. with a sediment particle size sufficiently large to settle out in stormwater facilities. Although this study is not focused on removal of coarse sediment, structural BMPs must deal with and account for sediment transport and deposition.

COA – City of Albuquerque

COD – Chemical Oxygen Demand

Corps – U.S. Army Corps of Engineers.

CSO – Combined Sewer Overflow

CWA - Clean Water Act (Water Quality Act)(Federal Water Pollution Control Act) Public law 92-500; 33 U.S.C. 1251 et seq.

CWB - Constructed Wetlands Basin Facility

DBS – Detention Basin/Sedimentation Facility.

DPM – Development Process Manual. City of Albuquerque administrative and design manual.

DSN - Debris Screen, Non-mechanical

DFPR – Drainage Facility Planning Review. A GIS database of existing and proposed major drainage facilities.

Effectiveness. Measure of how well a BMP System meets its goals in relation to all stormwater flows.

Efficiency. Measure of how well a BMP or BMP System removes pollutants.

EMC - Event Mean Concentration. Flow-proportional average concentration of a given parameter during a storm event. The total constituent (mass, volume) divided by the total runoff (mass, volume).

EPA – Environmental Protection Agency

ER - Efficiency Ratio. A method of computing efficiency. The ratio of the difference between the average inlet EMC and the average outlet EMC divided by the average inlet EMC.

Floatables, Floatable Debris. Litter and Vegetative Debris in stormwater runoff. Litter and other man-made pollutants such as plastic, paper, aluminium cans and construction trash and vegetative debris such as leaves, tumbleweeds, twigs, grass clippings, etc. that float or remain suspended.

Floatable Material (CWA Definition)

(A) In General - The term “floatable material” means any foreign matter that may float or remain suspended in the water column.

(B) Inclusions – The term “floatable material” includes –

a. Plastic;
b. Aluminum cans;
c. Wood products;
d. Bottles; and
e. Paper products

GENRD#xx Reference documents related to general stormwater management (See Appendix B).

GFS - Grass Filter/Sedimentation Facility

GIS – Geographic Information System

GPRD – Gross Pollutant Removal Device

GPRP – Gross Pollutant Reduction Plan

Gross Pollutants. Litter, Vegetative Debris, Floatable Material and Coarse Sediments of relatively large size (as used in this study – 1.75” nominal or larger)

Gross Solids (Caltrans definition). Litter, vegetation and other particles of relatively large size (5mm (0.2 in. nominal) or larger)

GSRD – Gross Solids Removal Device

HDM - Hydrodynamic & Debris Manhole Facility

ISS - Infiltration System Facility

ISL – Individual Storm Loads. A method of computing efficiency. Unity minus the ratio of load out to load in for each storm. Overall efficiency is the average over all storms.

Leachate Water that collects contaminants as it trickles or flows through waste, litter, debris, soil, etc.

LID – Low Impact Development

Litter. Human derived trash, such as, paper, plastic, polystyrene, metal, glass, construction trash, etc.

LSE – Lognormal Statistical Efficiency. A method of computing efficiency.

Mean Concentration. A method of computing efficiency. Unity minus the ratio of the average outlet to average inlet concentrations.

MBS - Mechanical Bar Screen Facility

MEP – Maximum Extent Practicable A standard for water quality that applies to MS4 operators regulated under the NPDES Storm Water Program. Narrative discharge limitations requiring BMPs designed to satisfy the technology requirement of CWA and protect water quality. BMPs are determined by permittee and permit authority and assembled into a Stormwater Management Program (SWMP). Implementation of BMPs consistent with SWMP constitutes MEP compliance.
An excerpt from CWA Section 402(p)(3)(B)(iii) identifies MEP as the statutory standard that establishes the level of pollutant reductions that operators of regulated MS4s must achieve. The CWA requires that NPDES permits for discharges from MS4s "shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods".

MFS - Media Filter/Sedimentation Facility

MS4 – Municipal Separate Storm Sewer System A publicly-owned conveyance or system of conveyances that discharges to water of the U.S. and is designed or used for collecting or conveying storm water, is not a combined sewer, and is not part of a publicly owned treatment works.

NMDOT (NMSHTD) – New Mexico Department of Transportation (Formerly New Mexico State Highway & Transportation Department)

NPDES – National Pollutant Discharge Elimination System Surface water quality program authorized as part of the Clean Water Act (40 CFR 122.2)

NPS – Non-Point Source Pollutants Pollutants from many diffuse sources. NPS is caused by rainfall/snowmelt moving over and through the ground.

Organics or Organic Debris. Organic material including leaves, branches, seeds, twigs, grass clippings, etc.

O&M – Operation and Maintenance

OWS - Oil/Water Separator Facility

Performance. Measure of how well a BMP meets its goals for stormwater that the BMP is designed to treat.

Permittee – The agencies permitted to discharge under NPDES Permit NMS000101 (AMAFCA, City of Albuquerque, NMDOT and UNM).

PPS - Porous Pavement Systems

RPS - Retention Pond Sedimentation Facility

Sediment(s). Soil, sand and minerals conveyed in or deposited from stormwater runoff.

SPO - Submerged Port Outlet An outlet structure with ports that are submerged during flow operation (i.e. hooded outlets, reversed slope ports, etc.)

Stormwater Quality Constituents. Suspended and dissolved pollutants (non-gross pollutants) such as metals, nutrients, ions, minerals, microbiological, volatile and semi-volatile organic compounds, pesticides, PCBs, hydrocarbons, BOD, COD, TSS, etc.

Summation of Loads. A method of computing efficiency. The ratio of the summation of all incoming loads to the summation of all outlet loads.

SWMP – Storm Water Management Program. A comprehensive program comprised of various elements and activities designed to reduce storm water pollution to the maximum extent practicable.

SWPPP – Storm Water Pollution Prevention Plan A plan to describe a process whereby a facility evaluates potential pollutant sources and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in storm water runoff.

SWQ – Storm Water Quality Facility.

SWQRD#XX Reference documents related to stormwater quality facilities (See Appendix B)

TMDL – Total Maximum Daily Load The maximum amount of pollutants which can be released into a water body without adversely affecting the water quality.

TSS – Total Suspended Solids

UDFCD – Urban Drainage and Flood Control District, Denver CO.

UNM – University of New Mexico

Vector An organism, often and insect or rodent, that carries disease.

Vegetation Debris Organic debris from vegetation including leaves, branches, seeds, twigs, grass clippings, etc.

Watershed The geographical area which drains to a specified point on a water course.

Waters of the United States (See 33 CFR Part 328).

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.
2. All interstate waters including interstate wetlands.
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
   a. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
   b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
   c. Which are used or could be used for industrial purpose by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under the definition;
5. Tributaries of waters identified above in 1-4;
6. The territorial seas;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in 1-6 above.

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA, are not waters of the United States.

Wetlands Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (See 33 CFR Part 328).

WQC - Water Quality Channel Facility

WQCV – Water Quality Capture Volume

EXECUTIVE SUMMARY

AMAFCA/ALBUQUERQUE MS4

FLOATABLE & GROSS POLLUTANT STUDY

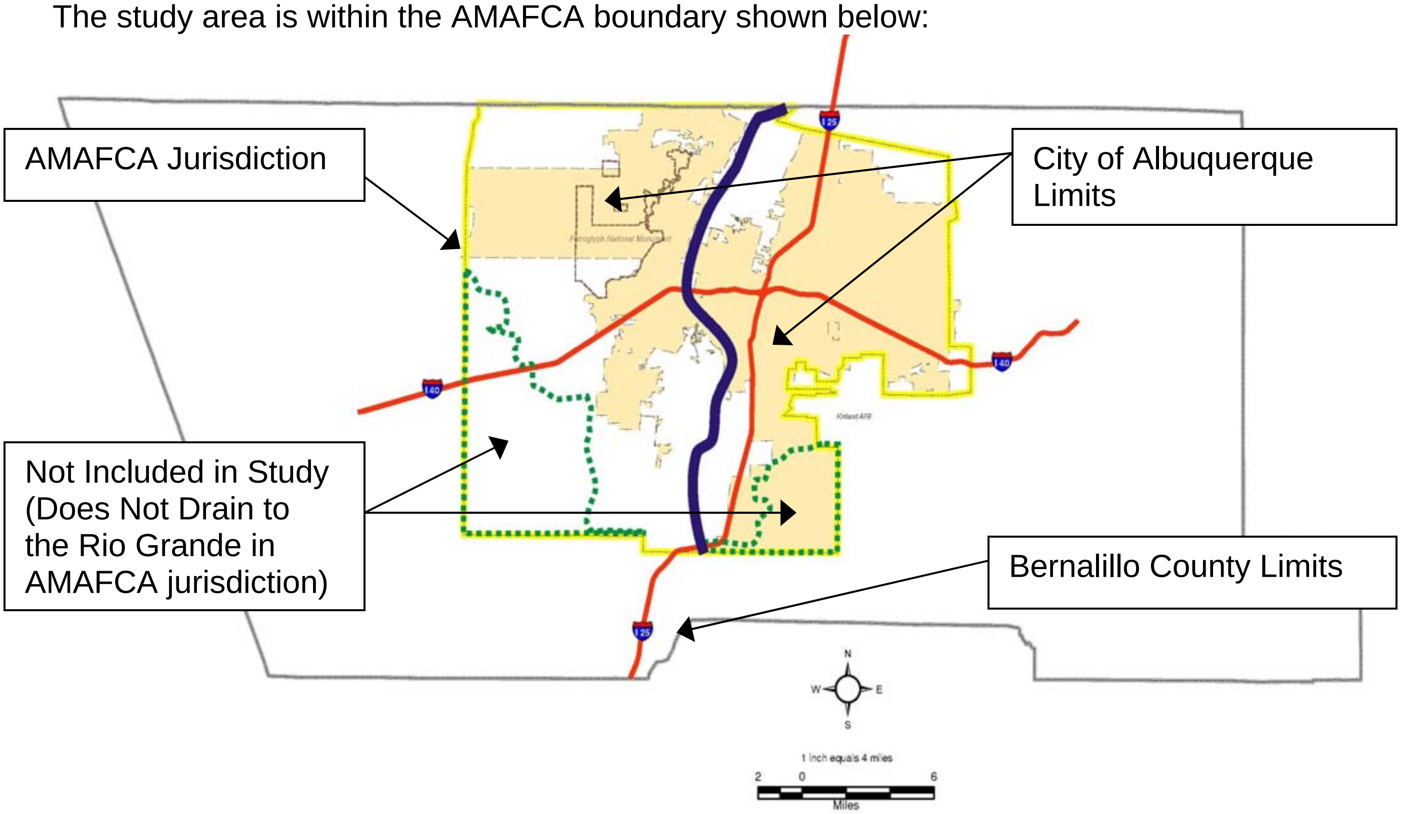
EXECUTIVE SUMMARY

I. INTRODUCTION

This study investigates the floatable debris, litter and other gross pollutants in the AMAFCA/Albuquerque Municipal Separate Storm Sewer System (MS4) (i.e. the drainage system). Methods are evaluated and identified to reduce the discharge of these materials through the MS4 and into the Rio Grande.
This study includes the following components:

- Gross Pollutant Reduction Plan
- Identification of potential source controls and structural BMPs from the literature.
- Characterization of the gross pollutants and floatables in the system.
- Source control BMPs.
- Structural BMPs.
- Monitoring and on-going data collection

The study area is within the AMAFCA boundary shown below:



A. OBJECTIVE AND DESCRIPTION

- The objective of this study is to identify and evaluate source controls and structural Best Management Practices (BMPs) to reduce gross pollutants (floatables, litter, debris) discharged through the AMAFCA/Albuquerque drainage system.
- The AMAFCA/Albuquerque drainage system encompasses all drainage basins and facilities within the AMAFCA jurisdiction and the City of Albuquerque that drain to the Rio Grande within AMAFCA's boundary.
- AMAFCA and Albuquerque have built over 50 water quality facilities to obtain functional and O&M experience. High maintenance costs, plugging of facilities and by-pass of submerged debris are identified as critical areas for future facilities.
- Flood control is the primary purpose of the AMAFCA/Albuquerque drainage system. Gross pollutant BMPs are not intended to reduce or limit the flood control function of the system.

B. GROSS POLLUTANT DEFINITION

- National and international reference data regarding sources, amounts and types of litter and debris in stormwater is limited. Also, a uniform standard for measuring and evaluating gross pollutants has not been established.
- Gross Pollutants are the larger particles (defined as 1-3/4" or larger in the study) of litter, vegetative debris, floatable debris and coarse sediments in stormwater runoff.
- One common term used for gross pollutants is "Floatables" or "Floatable Debris". This can be misleading. Up to 80% of stormwater gross pollutants (i.e. floatables) do not float on the surface, but are submerged in the storm flow. As a result, facilities to remove gross pollutants must address both surface floating and submerged litter and debris.
- Long-term local monitoring and data collection is recommended to:
  - Satisfy NPDES Permit requirements
  - Develop a better understanding of gross pollutant sources
  - Evaluate BMPs specific to the AMAFCA/Albuquerque drainage system.

La Orilla Debris Baffle (4/3/04)

C. NPDES PERMIT

- AMAFCA, Albuquerque, NMDOT and UNM are authorized to discharge stormwater from the Albuquerque Municipal Separate Storm Sewer System (MS4) by NPDES Permit No. NMS000101.
- The Permit includes requirements to evaluate, monitor and control floatables (defined in this study as gross pollutants). This study is one component of the MS4 Permit requirements for floatable control.
- The Permit requires the permittees establish a total of four locations for compliance monitoring. Locations are recommended in this study.

II. GROSS POLLUTANT REDUCTION PLAN (GPRP)

This study proposes a Gross Pollutant Reduction Plan (GPRP) to address the reduction of gross pollutants in the MS4 and discharged from the system. The Plan includes recommendations and suggestions for incorporation in the Storm Water Management Program. The proposed GPRP addresses the "floatable" requirements in the NPDES Permit. Table VI-1 in the report identifies the relationship between the GPRP elements and the Permit.

Menaul Basin Screen & Baffled Pipe Outlet

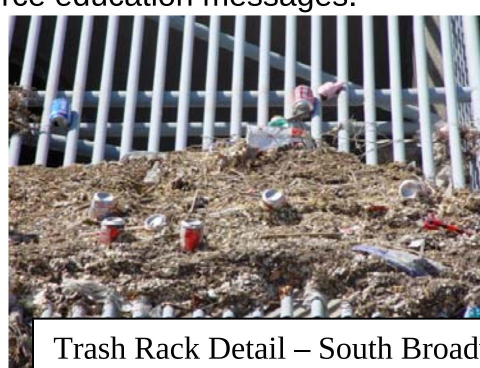
A. ADMINISTRATIVE CONTROLS

- Update the Development Process Manual (DPM) to include:
  - Gross pollutant criteria for new projects and projects requiring drainage plan submittals.
  - Low Impact Development (LID)
- Identify and focus on gross pollutants from "Priority Projects" identified as:
  - Multi-family residential with more than 10 units.
  - Auto repair.
  - Fueling facilities and gas stations.
  - Restaurants and food facilities.
  - Retail and office sites larger than 0.5 acres.
  - Dumpster and compactor pads.
- Develop BMP facility design standards for "Priority Projects" addressing:
  - Flood control.
  - Design storm definition – average annual event, approximately a 0.6" rainfall resulting in approximately ¼" runoff.

- Floating and submerged debris.
  - Leaching and re-suspension of pollutants.
  - Bypass and overflows.
  - Inspection and O&M.
  - Vector control.
- Establish and maintain a monitoring program:
  - Establish a total of four monitoring locations to comply with NPDES Permit monitoring requirements.
  - Establish a long-term monitoring, data collection and review system to develop a better understanding of gross pollutant sources and BMP performance specific to the AMAFCA/Albuquerque drainage system.
- Develop and implement a Watershed Protection Ordinance emphasizing gross pollutant production “hot spots”, such as industrial, commercial and retail.
- Partner with upstream dischargers to reduce gross pollutant discharge to the AMAFCA/Albuquerque system.

B. SOURCE CONTROLS

- Control of pollutants at the source is a high priority to reduce facility and O&M costs. Development of an on-going funding program for source control to be shared by all stakeholders is suggested.
- Education Program
  - Update and certify the existing educational program to conform to Permit requirements.
  - Promote a “litter free” culture.
  - Target select audiences and age groups.
  - Develop and deliver a consistent dynamic region-wide message.
  - Address intentional roadway trash and litter generation.
  - Address multi-lingual and multi-cultural aspects.
  - Build local and regional partnerships to reinforce education messages.
  - Promote, publicize and facilitate public reporting of illicit discharges.
- Anti-Litter Campaigns
  - Partner with local governments to coordinate anti-litter activities.
  - Advertise and enforce anti-litter regulations.
  - Utilize anti-litter volunteers to pick-up litter before it can enter the drainage system.
  - Establish “Litter Free Park”, “Litter Free Construction”, etc. areas.
  - Enforce construction litter control through the Storm Water Pollution Prevention Plan (SWPPP).
  - Promote environmentally responsive recycling.

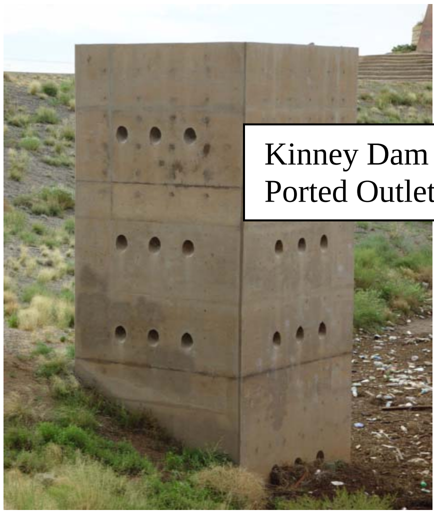


Trash Rack Detail – South Broadway Pond (4/23/04)

- Operations and Maintenance (O&M)
  - Implement procedures for locating (GPS surveys), monitoring, inspection, maintenance and recordkeeping of stormwater quality facilities.
  - Develop a gross pollutant O&M "Good Housekeeping" program for public facilities (i.e., roads, parks, channels, equipment yards, etc.).
  - Update street sweeping and inlet cleaning program to conform to Permit.

Tierra Oeste Debris Manhole

- Containers
  - Require dumpster and waste compacter pads and sites to be self-contained and to discharge runoff to the sanitary sewer system.
  - Initiate a program to bag all trash before placing in containers.
  - Establish minimum requirements and provide or require appropriate trash containers in all parks, retail and commercial areas, fast food sites, construction sites, etc.
- Industrial & Commercial Source Control
  - Partner with Priority Project operators to reduce gross pollutants.



Kinney Dam Reverse Slope Ported Outlet

C. STRUCTURAL BMP CONTROLS

- Structural gross pollutant BMP opportunities were identified from local experience and extracted from the literature.
  - Screens and trash racks – good gross pollutant collection, maintenance issues.
  - Catch basin inserts and modified catch basin designs – difficult to maintain.
  - In-line hydrodynamic separators and debris manholes - work well, periodic cleaning required.
  - Netting systems and booms in open channels – limited local data.
  - Debris baffles and weirs – Good success with baffle system gross pollutant removal, but submerged debris bypasses under the baffle.
  - Litter baskets, cages and traps at outfalls – good collection, maintenance issues.
  - Reverse slope ported outfalls – Good for

Bear Canyon Debris Removal Retrofit

surface floating debris. Submerged debris passes through port or plugs smaller ports.
    - Mechanized removal of collected debris. Experimentation with modified debris collection equipment to allow solid waste pick-up is underway to minimize O&M costs.
- Watershed Water Quality Plans - Prepare simple overall water quality plans to establish the best combination of source control and structural BMPs for each watershed.
- Existing and identified proposed water quality facilities are listed at the end of the GPRP.

- Twenty watersheds are upstream of the MS4 and discharge runoff into the AMAFCA/Albuquerque system (Table GPRP-1). New or upgraded BMPs are proposed for 16 of these.
- Twelve watersheds discharge to the North and South Diversion Channels (Table GPRP-2). Thirteen water quality facilities are operational in these watersheds with an additional 13 identified or proposed.

Bear Canyon Debris Fence and modified dumpsters

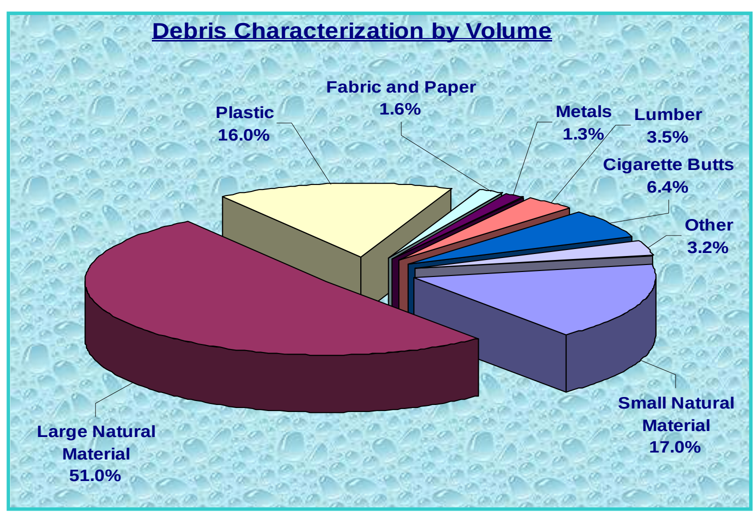
- Eighteen watersheds discharge directly to the Rio Grande (Table GPRP-3). Twenty three water quality facilities are operational. An additional 15 are proposed.

III. GPRP DEVELOPMENT

A. GROSS POLLUTANT CHARACTERISTICS

The nature of gross pollutants is important for design of structural and non-structural controls. Gross pollutant characterization was determined from the literature and from testing of local gross pollutants.

- Physical
    - Samples were collected from nine different sites, segregated into categories, weighed and the volume of each estimated.



- The Debris Characterization graph summarizes these results.
- The quantity of gross pollutants is large, estimated to be between 8 and 15 cubic feet per acre per year.
- The gross pollutants are heavy, with a wet weight of 35 #/cf proposed for design.

N. Pino Debris Baffle Inlet

- Wet Debris Sampling –
  - It was observed that the debris frequently looked oily, had an odor, etc. leading to speculation that there may be a significant amount of "water quality constituents" (metals, nutrients, bacteria, volatile organic compounds, etc.) attached to the gross pollutants.
  - A limited sample survey experiment was conducted on leachate from collected gross pollutants at three sites to estimate this effect.
  - These samples indicate that suspended and dissolved storm water quality constituents are attached to the gross pollutants, can be stripped off by subsequent storms and the pollutant concentrations in the leachate are approximately 2 to 4 times higher than those in stormwater runoff.
  - However, the leachate will be diluted by the stormwater runoff volume, reducing the overall concentration level in the total runoff to significantly below the stormwater pollution concentrations.
  - The reduction of storm water quality constituents is a secondary benefit of the removal of gross pollutants.

San Antonio submerged inlet ported outlet

B. SUPPLEMENTAL DATA

- Seven regional and four local agencies were interviewed to evaluate the floatable elements of their stormwater quality program. Los Angeles is the only location interviewed with floatable reduction permit requirement. This data is integrated into the GPRP.

- Due to the large quantity/volume of gross pollutants in the system, capital costs for structural removal facilities and the on-going costs of O&M to remove
collected litter and debris are expected to be significant.

- Currently, stormwater quality facilities and O&M are funded from general funds. Due to the long-term potential for increased costs to construct, operate and maintain facilities, alternate or additional funding methods, such as a stormwater utility, may be required.

Pino Arroyo Debris Basin reverse slope ported outlet.

GROSS POLLUTANT REDUCTION PLAN (GPRP)

AMAFCA/ALBUQUERQUE
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
GROSS POLLUTANT REDUCTION PLAN (GPRP)

SEPTEMBER 2005
ASCG 20482

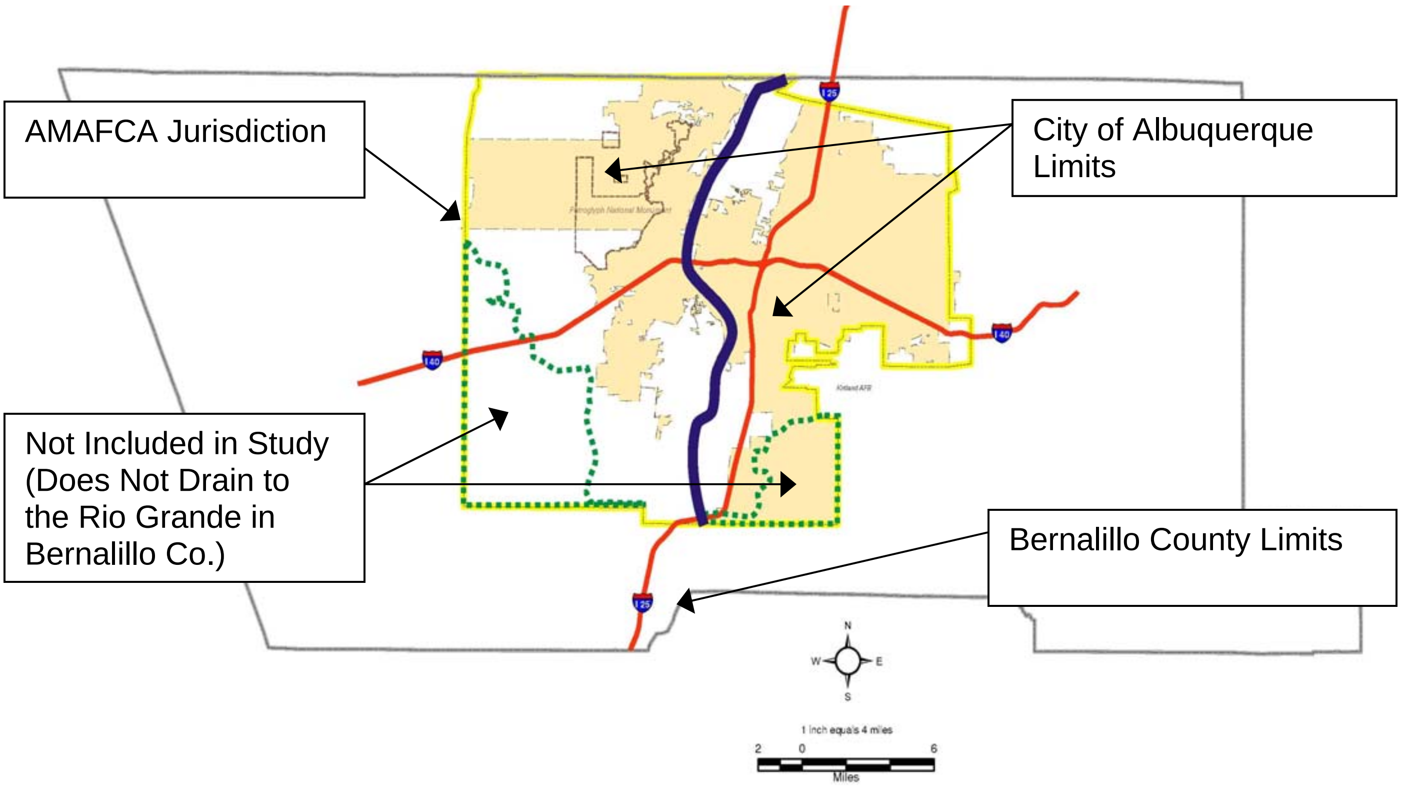
I. INTRODUCTION

The Gross Pollutant Reduction Plan (GPRP), identifies control and treatment practices to reduce the discharge of litter, debris, trash, floatable material and other gross pollutants into and through the AMAFCA/Albuquerque drainage system and into the Rio Grande. This report includes development rationale of the study and additional detail for the GPRP. Implementation of the GPRP will be through the Storm Water Management Program (SWMP) as funding and staffing allow. The GPRP is intended to be a “living document” and as additional data becomes available, the GPRP will require updating.

A. OBJECTIVE AND DESCRIPTION

The objective of the GPRP is to identify source and structural controls to reduce the amount of Gross Pollutants discharged into and through the AMAFCA/Albuquerque drainage system, including reduction of the discharge of gross pollutants from the North and South Diversion Channels.

The AMAFCA/Albuquerque Drainage System encompasses all drainage basins and facilities within the AMAFCA jurisdiction and the City of Albuquerque that drain to the Rio Grande within Bernalillo County. This includes all discharges to the Rio Grande, from the North Diversion Channel outfall on the north to the Bernalillo County/Isleta Pueblo boundary on the south. Note that the Albuquerque MS4, as defined in the NPDES Permit, is the area inside the City limits. The study boundary includes the AMAFCA jurisdiction and extends outside the City limits
The AMAFCA/Albuquerque drainage system boundary and watershed identification are shown on Figure 1 in Appendix ‘A’. The study area is shown on the following page.



B. DEFINITIONS

Definitions and acronyms are identified at the beginning of the report. The following definitions are particularly useful in understanding the GPRP.

<u>BMP - Best Management Practice</u>. A device, practice or method for removing reducing, retarding, or preventing targeted stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters.

<u>Coarse Sediments</u>. Inorganic breakdown products from soils, minerals, pavement, building materials, etc., with a sediment particle size sufficiently large to settle out in stormwater facilities.

<u>Floatable Material.</u> In general, the term “floatable material” means any foreign matter that may float or remain suspended in the water column. This includes plastic, aluminum cans, wood products, bottles, paper products, etc.

<u>Gross Pollutants</u>. Litter, Vegetation Debris floatable material, and Coarse Sediments defined as material larger than 1-3/4”.

<u>Litter</u>. Human derived trash, such as, paper, plastic, polystyrene, metal, glass, construction debris, etc.

<u>Stormwater Quality Constituents.</u> Suspended and dissolved pollutants (non-gross pollutants) such as metals, nutrients, minerals, microbiological, volatile organic compounds, pesticides, PCBs, hydrocarbons, BOD, COD, TSS, etc.

<u>SWQ</u>. Storm water quality facility.

<u>Storm Water Quality Treatment Rate.</u> The peak rate of flow from the water quality storm event.

Storm Water Quality Treatment Volume (SWQV). The runoff volume from the storm water quality storm event.
Water Quality Storm Event. The storm event precipitation of 0.6” in 6 hours. This is approximately equivalent to the average annual precipitation event and the 80th percentile rainfall event.

C. NPDES PERMIT REQUIREMENTS

The GPRP is structured to address floatable (gross pollutants, litter, debris and floatable material) requirements of NPDES Permit No. NMS000101. The NPDES permit authorizes discharge of stormwater to Waters of the United States by AMAFCA, City of Albuquerque, UNM and NMDOT (the co-permittees) from all portions of the Albuquerque Municipal Separate Storm Sewer System (MS4) in accordance with permit conditions.

II. ADMINISTRATIVE CONTROLS

A, ALBUQUERQUE DEVELOPMENT PROCESS MANUAL UPDATE

Develop and implement a stormwater quality update for the Development Process Manual (DPM) to include:

1. Gross pollutant reduction requirements for new development and developments requiring drainage plan approval. Address both planning level BMP’s and structural BMP’s. Integrate gross pollutant reduction requirements with storm water quality constituent reduction requirements.
2. Structural BMP Design Criteria and Standards.
3. Low Impact Development (LID) site design recommendations for reduction of impervious surfaces and total site runoff.
4. Commercial and industrial pollution prevention and source control guidelines.
5. Develop and implement a policy requiring structural BMP gross pollutant controls to be installed and maintained by the owner in “Priority Project” developments. “Priority Projects” are defined as:
   a. Retail, warehouse and office developments in excess of 0.5 acres site size,
   b. Automotive repair shops,
   c. Restaurants,
   d. Gas stations/fueling facilities,
   e. Dumpster, compactor and waste collection and storage pads on all commercial and industrial sites,
   f. Residential developments with more than 10 residential units, excluding single family housing subdivisions.

B. STRUCTURAL BMP DESIGN CRITERIA FOR GROSS POLLUTANT CONTROL:

1. Design the facility to pass the flood protection storm event with the design volume gross pollutant load collected/stored (i.e., prior to clean-out).
2. Maintain flood prevention capability and capacity.
3. Design storm - Treat the runoff from the water quality storm event as defined in the DPM update (0.6” precipitation within a six hour period)
4. Design the facility to capture gross pollutants as both surface floating debris and/or submerged debris.
5. To the extent practical, design the facility to minimize re-suspension of the collected gross pollutants in subsequent runoff events, regardless of the flow rate or volume.
6. To the extent practical, provide storage of captured debris out of low flows to minimize leaching of stormwater quality constituents from captured gross pollutants by subsequent storm events.
7. Design publicly maintained facilities to pass the flood protection design storm event with the design volume gross pollutant load collected/stored (i.e., prior to clean-out).
8. Design privately maintained facilities, such as commercial sites, to contain/retain the gross pollutant design storm runoff volume on-site if the facility is plugged.
9. Design the facility for ease of maintenance and to require only occasional inspection between clean outs.
10. To the extent practical, design the facility to typically require maintenance or clean-out not more than once per year. Provide passive storage capacity for the anticipated average annual gross pollutant load within the facility based on the following initial guidelines.

Land Use	Load (cf/ac/yr)
Commercial	15
Single Family Residential	8
Multiple Unit Residential	10
Industrial	4.2
Parks/Playgrounds/Schools	10
Collector & Arterial Streets	10

In lieu of providing storage, O&M programs or enforced maintenance schedules for BMPs to ensure operational facilities could meet the requirement of this section.

11. Provide adequate access for mechanical equipment maintenance and clean-out. If feasible, provide an on-site temporary storage area for debris, protected from wind or rainfall erosion.
12. Provide adequate drainage within the structure or device and/or other measures for disease vector control

C. MONITORING

1. PERMIT AND SYSTEM MONITORING

System monitoring will provide data to satisfy the requirements of the NPDES NMS000101 Permit; identify the quantity and characterization of gross pollutants within the system; identify system characteristics, hot spots and priorities; provide data for BMP design; allow improved O&M priorities, procedures and cost control; and gauge the effectiveness over time of gross pollutant reduction activities.

a. Identify existing SWQ facilities with effective gross pollutant collection as potential monitoring sites.

b. Develop a monitoring protocol for collection, measurement and characterization of gross pollutants along with associated storm, drainage area and land use information.

c. Collect and evaluate gross pollutant samples, in accordance with the protocol, after each storm event with a projected runoff greater than 0.1" at each identified facility.

d. Take gross pollutant characterization samples for approximately 10% of the total samples.

e. Build a database of this data and analyze for a better understanding of gross pollutant production, collection, etc. Modify protocol, sites, etc., as needed.

f. Proposed existing SWQ facilities to consider are listed below (with notes). Two facilities, the North Pino Arroyo NDC Inlet and the Barelas Lift Station are currently being used as monitoring locations to satisfy the AMAFCA/City Permit "floatable material monitoring" requirement.
   i. <u>S. Pino Debris Removal Basin</u>. Install a vertical grate debris fence on the debris basin overflow spillway to prevent discharge of gross pollutants if the ported tower is overwhelmed. Install a safety grate on the channel diversion sump.
   ii. <u>N. Pino Debris Facility</u>. Install a vertical grate debris fence on the wetland overflow to prevent floatables from leaving the wetland. Install intermediate vertical fence/gates in the secondary side of the baffle structure to minimize plugging the outlet grate. Install flow measurement gages on the channel upstream and downstream of the diversion.
   iii. <u>Alameda SD Debris Screen.</u> Modify the mounting structure to allow mechanical cleaning.
   iv. <u>S. Broadway Pond</u>. Install a debris fence between the inlet and outlet to minimize extent of debris within the pond.

v. <u>Menaul/Claremont Pond System</u>.
vi. San Antonio Arroyo Sediment and Debris Basin. Install a vertical grate debris fence on the overflow spillway weir to prevent discharge of floatables when the basin overflows.
vii. Barelas Lift Station Bar Screen (COA Station #32)
viii. Pump Station Bar Screen #2 – Alcalde?
ix. Dam Ported Outlet #1 – Westgate Dam?
x. Dam Ported Outlet #2 – Lower N. Domingo Baca Dam?
xi. Dam Ported Outlet #3 – North Domingo Baca Dam?
xii. Dam Ported Outlet #4 – South Domingo Baca Dam?
xiii. Debris Manhole #1
xiv. Debris Manhole #2
xv. Debris Manhole #3

2. BMP EFFECTIVENESS MONITORING

The purpose of this monitoring is to evaluate BMP function and efficiency, provide design guidance and assess the water quality impact of the BMP.

a. Select at least one of each type of BMP and implement a monitoring program to determine BMP effectiveness.

b. In general, follow the BMP Performance Monitoring Guidelines from the National BMP Database. Develop a monitoring protocol by expanding on the system monitoring protocol.

3. BMP TEST FACILITY

The purpose of this effort is to provide a location within the system to do trials and tests of proposed litter and debris collection methods, better identify the gross pollutant character, etc.

a. Establish an area, such as one of the NDC inlet basins, as a test location.

b. Develop a collection and monitoring protocol based on protocols developed for other monitoring.

c. Use temporary traffic barriers or similar movable devices to segregate and direct runoff and debris into specific test locations and to use as anchors for fences, screens, baffles, etc.

d. Provide a stable accessible area for installation of different types of BMPs and for collection and clean-out of debris.

III. GROSS POLLUTANT SOURCE CONTROLS

A. EDUCATION AND OUTREACH PROGRAM

The primary education and outreach program is intended to reduce the generation of gross pollutants by increasing public awareness and increased “buy-in” of water quality issues.

1. Update the Education Program and certify that the update is implemented to satisfy NPDES Permit requirements
2. Develop one dynamic, positive message and target how it is delivered.
3. Implement a combination of public information and multi-media campaigns to emphasize litter control and increase awareness of the connection between litter and water quality.
4. Coordinate with all local government agencies in the middle Rio Grande (i.e., AMAFCA, Albuquerque, UNM, NMDOT, Los Ranchos, Corrales, Rio Rancho, SSCAFCA, Bernalillo, Bernalillo County, Sandoval County, Sandia Pueblo, Isleta Pueblo, etc.) to develop a consistent delivery slogan/mascot.
5. Utilize multi-lingual materials.
6. Develop educational materials for use in schools.
7. Establish and promote a “hot line” reporting system for litterbugs, trash dumpers, illicit dischargers, landscape debris dischargers, untarped loads, etc.
8. Develop and implement signage for City trash pick-up trucks.
9. Encourage residential low impact development and natural drainage controls.
10. Educate elected officials and administrators that this is a long-term program with cumulative pay-off.
11. Educate municipal employees (AMAFCA, COA, UNM, NMDOT, County, etc.) regarding good housekeeping for municipal operations.
12. Educate the construction industry.
13. Educate the consultant and design industry.
14. Implement a science program in high schools and/or middle schools to teach students the effects of water pollution on their environment (this will reach a portion of the rebel market).
15. Funding:
    a. Establish and gain concurrence for a target annual budget keeping in mind the long-term requirement for a successful program.
    b. Develop funding sources for the program that will not take away from on-going O&M and capital programs.
    c. Investigate fund raising opportunities that will be beneficial to the environment.
    d. Research and apply for grants that benefit environmental programs.

B. ANTI-LITTER PROGRAM

The anti-litter program is envisioned as an extension of the on-going City and State anti-litter campaigns.

1. Partner and coordinate with local agencies to maximize the litter problem awareness. Work towards changing the culture so that it is not OK to litter.
2. Develop the anti-litter program recognizing that a significant portion of litter is intentional.
3. Encourage the use of litter volunteers and public service to remove litter (i.e. trash breeds trash).
4. Establish and promote “Litter Free” areas to increase awareness.
5. Promote recycling to reduce litter production.

C. REGULATIONS, ORDINANCES AND LEGISLATIVE INITIATIVES

1. Watershed Protection Ordinance - Develop a watershed protection ordinance with one element focused on the reduction of gross pollutant sources. This is a permit requirement. Consider the following elements for gross pollutant reduction:
   a. Encourage or require “Low Impact Development.”
   b. Permit fee on Special Events and on Construction Yards and Sites earmarked for anti-litter education and prevention.
   c. Penalty assessment on special events or construction sites contributing to gross pollutants. Consider linkage to the Storm Water Pollution Prevention Plan (SWPPP).
   d. Penalty assessment on individual or business that deposits leaves or debris into public streets or rights-of-way (i.e., leaf-blowers, etc.).
   e. An incentive for businesses that promote anti-litter with messages on bags and containers, recycling bins, trash receptacles, etc.
2. Local Government Coordination:
   a. Runoff Entering AMAFCA/Albuquerque System – Initiate Joint Power Agreements, Joint Resolutions or Memoranda of Understanding with local governments upstream of and discharging to the AMAFCA/Albuquerque drainage system to institute gross pollutant reduction programs and facilities on watersheds discharging from developing or urban areas. This could include Rio Rancho, SSCAFCA, Sandoval County, Corrales, Sandia Pueblo, US Forest Service, Los Ranchos de Albuquerque, Bernalillo County, etc.
   b. Plastic and Polystyrene Reduction - Initiate Joint Power Agreements, Joint Resolutions or Memoranda of Understanding with other local governments (i.e., Rio Rancho, SSCAFCA, Sandoval Co., Bernalillo Co. etc) aimed at reducing the use of non-biodegradable pollutants such as polystyrene, styrofoam, plastics and other floatable pollutants. The objective is to use bio-degradable containers in businesses, offices, cafeterias and other consumer uses.

c. Recycling – Support local recycling programs, particularly the education and outreach components.
d. Enforcement – In conjunction with local enforcement and judicial administrations, establish and implement anti-litter enforcement procedures.

3. Legislative Initiatives:
   a. Bottle Bill – Coordinate and support potential bottle bill legislation with the City Anti-litter campaign and other local efforts to enact a bottle bill. In the event these programs do not elect to pursue a bottle bill, re-evaluate bottle bill potential in 2008.
   b. Environmentally Responsive Recycling Business - Promote incentives at the state level for environmentally responsive recycling businesses.

D. OPERATIONS & MAINTENANCE

1. Operations and Maintenance (O&M) Practices
   O&M is a major focus area both for source control and to ensure the water quality facilities are functioning as intended. Facilities that receive a large volume of trash and debris should be identified and addressed at frequent intervals.

2. SWQ Inspection Procedures
   Establish a procedure and recordkeeping system for inspections of all SWQ facilities, both public and private. Locate facilities using GPS technology. Identify frequency, time of year, how inspection is performed, safety issues and any unique concerns for each facility by type of BMP, location and experienced problems. Utilize recordkeeping consistent with the DFPR database facility IDs.

3. Municipal Operations O&M
   Develop a municipal operation O&M program (each co-permittee agency) addressing maintenance activities, procedures and controls to reduce gross pollutants in the MS4. Address all aspects of municipal facilities (i.e., streets, parking facilities, solid waste collection, equipment and material yards, parks, schools, channels, ROW areas, flood control facilities, etc.). Include an education component (permit requirement).

4. Street Sweeping Program Update
   Update the street sweeping program and submit certification to EPA.

5. Inlet Cleaning
   Implement procedures to identify hot spot and critical areas and clean storm drain catch basins, street inlets, channels and other locations within these areas annually. Conduct this cleaning in conjunction with the street sweeping program to optimize the collection of vegetation debris.

E. CONTAINERS

1. Dumpster and Compactor Pads/Sites
   Develop standards and require all dumpster and compactor sites to be self-contained and to discharge runoff to the sanitary sewer system.

2. Residential Roll-Out Containers
   Emphasize bagging all trash before placing in container to minimize blowing litter.
   a. Advisory/educational material mailed with statement(s)
   b. Notice on front of new containers
   c. Stick on notice (i.e. bumper sticker) for front of container as part of advisory/education program

3. Park & Special Event Containers
   a. Establish and enforce a minimum number of trash containers for parks and special events.
   b. Switch to small top-opening enclosures for park trash receptacles. Replace open barrels/containers in parks.
   c. Place adequate trash receptacles to prevent overflow.
   d. Place trash receptacles in all parks.
   e. Promote “LITTER FREE PARK ZONES” with signs, etc.

4. Construction Debris Roll-off Dumpsters
   a. Provide residential trash containers for litter disposal by workers in conjunction with each dumpster.
   b. Provide signage for “LITTER FREE CONSTRUCTION SITE.”

5. Dumpsters and Compactors
   a. Require all new development and re-development dumpster and compactor sites, commercial and industrial waste collection areas and dumpster pads to be self contained and drain to the sanitary sewer system through grease traps.
   b. Require operable covers or lids on all commercial dumpsters.
   c. Emphasize bagging all trash before placing in dumpster.
      i. Advisory/educational material mailed with statement(s).
      ii. Notice on front of new dumpsters.
      iii. Stick-on notice (i.e. bumper sticker) for front of dumpster as part of advisory/education program or place on dumpster during pick-up.

F. INDUSTRIAL & COMMERCIAL SOURCE CONTROL

1. Partner with “Priority Project” developments to emphasize and optimize gross pollutant controls. Priority Projects are:
   a. Retail, warehouse and office developments in excess of 0.5 acres site size,

b. Automotive repair shops,
c. Restaurants,
d. Gas stations/fueling facilities,
e. Dumpster, compactor and waste collection and storage pads on all commercial and industrial sites,
f. Residential developments with more than 10 residential units, excluding single family housing subdivisions.

2. Watershed SWQ Facility Plans as one component of industrial and commercial source control - identify and develop plans to address specific industrial and commercial gross pollutant issues in each watershed.

IV. WATERSHED WATER QUALITY PLANS

A. NORTH AND SOUTH DIVERSION CHANNEL SWQ PLANS.

Prepare a SWQ facility plan for each NDC and SDC outfall or watershed to determine the best combination of local and regional BMPs and location of BMPs for that system. Include plans to address industrial and commercial gross pollutant issues specific to that watershed. Where appropriate, consider a structural gross pollutant reduction BMP at the outfall to the NDC or SDC. Evaluate the feasibility and practicality of a gross pollutant SWQ facility at the outfall of the NDC to the Rio Grande and the SDC to the Rio Grande.

B. RIO GRANDE OUTFALL SWQ PLANS.

Prepare a SWQ Facility Plan for each outfall or watershed to the Rio Grande to determine the best combination of BMP(s) for that system. Include plans to address industrial and commercial gross pollutant issues specific to that watershed. Where appropriate, incorporate a gross pollutant reduction BMP at the outfall to the Rio Grande.

V. POLLUTANT CONTROL FROM UPSTREAM WATERSHEDS

Reduce Gross Pollutants entering the AMAFCA/Albuquerque system from tributary areas upstream of the AMAFCA/Albuquerque drainage system boundary (See Figure 1 in Appendix ‘A’). Watersheds that enter the system and upstream agencies are:

Calabacillas – SSCAFCA and City of Rio Rancho
Cabezon – SSCAFCA and Village of Corrales
North Camino – Sandia Pueblo and Forest Service
La Cueva – Sandia Pueblo and Forest Service
Domingo Baca, North Pino, Pino Arroyo, Bear Canyon Arroyo, Embudo Arroyo – Forest Service
Tijeras Arroyo – Kirtland AFB, Forest Service, Village of Tijeras, Bernalillo, Torrance, Sandoval and Santa Fe Counties.

A. AGENCY AGREEMENTS

Consider MOUs and partnerships to reduce floatables entering the AMAFCA / Albuquerque system from upstream areas.

B. STRUCTURAL BMPS

1. Retrofit existing detention facilities without gross pollutant reduction outlets on the upstream arroyos with gross pollutant control outlets.

2. Provide gross pollutant reduction facilities on those arroyos that do not have upstream detention facilities.

3. Table GPRP-1 lists the off-site arroyos and watersheds and the structural system upgrades proposed to reduce gross pollutants entering the system from upstream areas.

VI. POLLUTANT CONTROL - NORTH AND SOUTH DIVERSION CHANNEL

Reduce gross pollutants entering the North Diversion Channel (NDC) and South Diversion Channel (SDC) from the contributing watersheds by implementing structural controls within the watershed.

Table GPRP-2 summarizes the existing major outfalls from the AMAFCA/COA system to the NDC and SDC and lists the existing and proposed major SWQ facilities within that watershed.

VII. POLLUTANT CONTROL - RIO GRANDE OUTFALL WATERSHEDS

Reduce gross pollutants entering the Rio Grande from the contributing watersheds by implementing structural controls within the watershed.

Table GPRP-3 summarizes the existing watersheds and major outfalls from the AMAFCA/COA system to the Rio Grande and proposed SWQ facilities.

TABLE GPRP - 1
AMAFCA/ALBUQUERQUE GROSS POLLUTANT REDUCTION PLAN
CONTROL OF UPSTREAM RUNOFF
EXISTING & PROPOSED BMPs
March, 2005

OBJECTIVE: Reduce the gross pollutants entering the AMAFCA/ALBUQUERQUE drainage system from runoff originating upstream of the AMAFCA boundary by use of structural BMPs.

REF NO.	TABLE GPRP-1 CONTROL OF UPSTREAM RUNOFF	EXISTING DAM(S) IN UPPER REACHES		ARROYO ENTERING MS4 AREA	PROPOSED BMP IMPROVEMENT
	WATERSHEDS	FAC ID	NAME		
1	Bear Canyon Arroyo	BEABC 274D	John Robert Dam	Bear Canyon Arroyo	Add Gross Pollutant Debris Forebay or Outlet
2	Calabacillas	CBSCA 192D	Swinburne Dam	Calabacillas Arroyo	Add Gross Pollutant Debris Forebay or Outlet
3	Calabacillas	CBSBD 000D	Black Arroyo Dam	Black Arroyo	Add Gross Pollutant Debris Forebay
4	Calabacillas			7 Bar Channel	NA - Existing Upstream NM 528 Channel and Roskos Field Wetland limit gross pollutant
5	Campus Wash				Construct Debris Diversion and Removal Facility at Campus Wash outfall to NDC
6	Domingo Baca	DOBSD 262Q	S. Domingo Baca Dam	S. Domingo Baca A.	NA - Utilize existing debris facility at dam for South
7	Domingo Baca	DOBND 207Q	N. Domingo Baca Dam	N. Domingo Baca A.	NA - Utilize existing debris facility at dam for North
8	Embudo	EMBPL 126D	Piedra Lisa Dam	Piedra Lisa Arroyo	Add Gross Pollutant Debris Forebay or Outlet
9	Embudo	EMBSG 060D	Glenwood Basin	S. Glenwood Hills A.	Add Gross Pollutant Debris Forebay or Outlet
10	Embudo	EMBGL 098D	Hidden Valley Basin	N. Glenwood Hills A. Trib	Add Gross Pollutant Debris Forebay or Outlet
11	Embudo	EMBEA 437D	Embudo Dam	Embudo Arroyo	Add Gross Pollutant Debris Forebay or Outlet
12	Embudo			N. Glenwood Hills A.	Construct Debris Diversion and Removal Facility at Arroyo
13	La Cueva	LACHD 000D	Camino Dam (Proposed)	El Camino Arroyo	Incorporate Gross Pollutant Debris Forebay at dam
14	La Cueva			La Cueva Arroyo	Construct Debris Diversion and Removal Facility at upper end

REF NO.	TABLE GPRP-1 CONTROL OF UPSTREAM RUNOFF	EXISTING DAM(S) IN UPPER REACHES		ARROYO ENTERING MS4 AREA	PROPOSED BMP IMPROVEMENT
	WATERSHEDS	FAC ID	NAME		
15	North Camino			N. Camino Arroyo	Construct Debris Diversion and Removal Facility at entry to concrete channel
16	Pino	PINPA 315D	Pino Dam	Pino Arroyo	Add Gross Pollutant Debris Forebay or Outlet
17	Tijeras Arroyo			Tijeras Arroyo	Construct Debris Diversion and Removal Facility on Tijeras Arroyo at upper end
18	Tijeras Arroyo	TIJLO 025D	Lomas Det. Basin	Lomas Channel	Add Gross Pollutant Debris Forebay or Outlet
19	Tijeras Arroyo			Copper Channel	Construct Debris Removal Facility at start of Channel
20	Tijeras Arroyo			Four Hills Arroyo	NA - Does not extend to undeveloped runoff area.

TABLE GPRP-2
AMAFCA/ALBUQUERQUE GROSS POLLUTANT REDUCTION PLAN
NORTH & SOUTH DIVERSION CHANNEL WATERSHEDS
EXISTING & PROPOSED BMPs

OBJECTIVE: Reduce gross pollutants in runoff entering the North and South Diversion Channels with structural BMPs.

REF NO.	TABLE GPRP-2 N. & S. DIVERSION CHANNEL WATERSHEDS	EXISTING AND CURRENTLY PROPOSED SWQ FACILITIES	E - EXISTING P-PROPOSED	DESIGN FLOW (cfs) @ OUTFALL	FACILITY OUTFALL TO	FACILITY ID	POLLUTANT CONTROL IMPROVEMENT
1	North Diversion Ch.	Debris Screen @ Alameda SD Outfall	E			NDCP2 096Q	Upgrade for easier maintenance
2	North Diversion Ch.	Debris Screen @ Girard SD Outfall	E			NDCP3 437Q	Upgrade for easier maintenance
3	North Diversion Ch.	Vineyard Arroyo SWQ	P			NDCVI 000Q	GPRD @ inlet to NDC
4	North Diversion Ch.	SWQ Facility Plan	P				Identify locations and types of BMPs
5	Bear Canyon Arroyo	SWQ Facility Plan	P	1,800	North Diversion Channel		Identify locations and types of BMPs
6	Bear Canyon Arroyo	Water Quality Channel @ inlet	P	1,800	North Diversion Channel	BEABC 000Q	
7	Bear Canyon Arroyo	Debris Screen @ Inlet	P			BEABC 007Q	
8	Bear Canyon Arroyo	Baffle Bypass w/ Submerged Port Outlet	P			BEABC 017Q	
9	Campus Wash	SWQ Facility Plan	P	5,100	North Diversion Channel		Identify locations and types of BMPs
10	Campus Wash		P	5,100	North Diversion Channel		Debris BMP at entrance to NDC
11	Domingo Baca	SWQ Facility Plan	P	7,800	North Diversion Channel		Identify locations and types of BMPs
12	Domingo Baca	SWQ @ NDC Inlet	E	7,800	North Diversion Channel	DOBND 000Q	
13	Domingo Baca		E			DOBND 001Q	
14	Domingo Baca	Lower N. DOB Dam Outlet	E			DOBND 067Q	
15	Domingo Baca	North DOB Dam Outlet	E			DOBND 207Q	
16	Domingo Baca	South DOB Dam Outlet	E			DOBSD 262Q	

REF NO.	TABLE GPRP-2 N. & S. DIVERSION CHANNEL WATERSHEDS	EXISTING AND CURRENTLY PROPOSED SWQ FACILITIES	E - EXISTING P-PROPOSED	DESIGN FLOW (cfs) @ OUTFALL	FACILITY OUTFALL TO	FACILITY ID	POLLUTANT CONTROL IMPROVEMENT
17	Embudo	SWQ Facility Plan	P	5,100	North Diversion Channel		Identify locations and types of BMPs
18	Embudo	State Fair Infield Debris Screen	E	5,100	North Diversion Channel	EMBSF 021Q	
19	Embudo	State Fair NW Pond Debris Screen	E			EMBSF 000Q	
20	Grantline	SWQ Facility Plan	P	3,910	North Diversion Channel		Identify locations and types of BMPs
21	Grantline	Grantline SWQ @ NDC Inlet	P	3,910	North Diversion Channel	GRAGL 000Q	
22	Hahn	SWQ Facility Plan	P	5,470	North Diversion Channel		Identify locations and types of BMPs
23	Hahn	Hahn SWQ @ NDC Inlet	P	5,470	North Diversion Channel	HAAHA 000Q	
24	La Cueva	SWQ Facility Plan	P	5,500	North Diversion Channel		Identify locations and types of BMPs
25	La Cueva	SWQ @ NDCInlet	P	5,500	North Diversion Channel	LACLC 000Q	
26	North Camino	SWQ Facility Plan	P	4,500	North Diversion Channel		Identify locations and types of BMPs
27	North Camino	SWQ @ NDC Inlet	P	4,500	North Diversion Channel		
28	North Pino	SWQ Facility Plan	p	2,600	North Diversion Channel		Identify locations and types of BMPs
29	North Pino	Low Flow Diversion & Baffled Weir Structure @ Inlet	E	2,600	North Diversion Channel	NOPPA 001Q	
30	North Pino	Constructed Wetland @ NDC Inlet	E			NOPPA 000Q	
31	Pino	SWQ Facility Plan	P	6,900	North Diversion Channel		
32	Pino	Constructed Wetland @ NDC Inlet	E	6,900	North Diversion Channel	PINPA 009Q	

REF NO.	TABLE GPRP-2 N. & S. DIVERSION CHANNEL WATERSHEDS	EXISTING AND CURRENTLY PROPOSED SWQ FACILITIES	E - EXISTING P-PROPOSED	DESIGN FLOW (cfs) @ OUTFALL	FACILITY OUTFALL TO	FACILITY ID	POLLUTANT CONTROL IMPROVEMENT
33	Pino	Low Flow Diversion & Basin w/ Submerged Port Outlet @ NDC Inlet	E	6,900	North Diversion Channel	PINPA 010Q	
34	Pino	Osuna SD Outfall SWQ	P		North Diversion Channel	PINBO 000S	
35	Tijeras Arroyo	SWQ Facility Plan		22,700	South Diversion Channel		Identify locations and types of BMPs
36	Tijeras Arroyo	SWQ @ South Diversion Channel		22,700	South Diversion Channel		

TABLE GPRP-3
AMAFCA/ALBUQUERQUE GROSS POLLUTANT REDUCTION PLAN
RIO GRANDE WATERSHEDS
EXISTING & PROPOSED BMPs

March, 2005

OBJECTIVE: Control Gross Pollutants entering the Rio Grande with use of structural BMPs.

REF NO.	TABLE GPRP-3 RIO GRANDE WATERSHEDS	WS ID	EXISTING AND CURRENTLY PROPOSED SWQ FACILITIES	E - EXISTING P-PROPOSED	FACILITY OUTFALL TO	DESIGN FLOW (cfs) @OUTFALL	FACILITY ID	PROPOSED SWQ BMP IMPROVE-MENT
1	Alameda/ Riverside Drain	ARD	SWQ Facility Plan		Rio Grande	290		Identify locations and types of BMPs
2	Alameda/ Riverside Drain	ARD	Claremont PS Bar Screen	E			ARDCL 000Q	
3	Alameda/ Riverside Drain	ARD	Menaul Pond Sand Filter	E			ARDMP 001Q	
4	Alameda/ Riverside Drain	ARD		P				SWQ Facility at I-25 prior to outfall to Isleta Pueblo,
5	Amole-Hubbell	AMH	SWQ Facility Plan		Arenal Canal			Identify locations and types of BMPs
6	Amole-Hubbell	AMH	Amole Dam Ported Outlet	E	Arenal Canal		AMHAH 070Q	
7	Amole-Hubbell	AMH	Borrega Dam Ported Outlet	E			AMHBR 025Q	
8	Amole-Hubbell	AMH	Westgate Dam Ported Outlet	E			AMHWG 000Q	
9	Amole-Hubbell	AMH	Snow Vista Pond Ported Outlet	E			AMHSV 094Q	
10	Cabezon	CBZ	SWQ Facility Plan		Corrales Riverside Lateral	483		Identify locations and types of BMPs
11	Cabezon	CBZ	Skyview Acres Pond Ported Outlet	E	Corrales Riverside Lateral	483	CBZSA 000Q	
12	Cabezon	CBZ	Cabezon SWQ	P	Corrales Riverside Lateral	483	CBZCZ 000Q	SWQ Facility @ Outfall
13	Calabacillas	CBS	SWQ Facility Plan		Rio Grande	15,300		Identify locations and types of BMPs
14	Calabacillas	CBS	Swinburne Dam SWQ	P	Rio Grande	15,300	CBSCA 191Q	
15	Calabacillas	CBS	Black Dam SWQ	P	Rio Grande	15,300	CBSBD 000Q	

REF NO.	TABLE GPRP-3 RIO GRANDE WATERSHEDS	WS ID	EXISTING AND CURRENTLY PROPOSED SWQ FACILITIES	E - EXISTING P-PROPOSED	FACILITY OUTFALL TO	DESIGN FLOW (cfs) @OUTFALL	FACILITY ID	PROPOSED SWQ BMP IMPROVE-MENT
16	Calabacillas	CBS	Lyon Blvd. SWQ	P	Rio Grande	15,300	CBSCA 186Q	SWQ on all local drainage below dams
17	Calabacillas Outlet	CBO	SWQ Facility Plan		Rio Grande	100		Identify locations and types of BMPs
18	Calabacillas Outlet	CBO		P	Rio Grande	100		
19	Calabacillas Outlet	CBO		P	Rio Grande	100		SWQ @ Outfall
20	Far Southeast	FSE	SWQ Facility Plan		Rio Grande			Identify locations and types of BMPs
21	Far Southeast	FSE	Detention Basin	P	Rio Grande		FSEBM 023D	
22	North Valley East	NVE	SWQ Facility Plan		Rio Grande			Identify locations and types of BMPs
23	North Valley East	NVE	Paseo del Norte PS Bar Screen	E	Rio Grande		NVEPN 000Q	
24	North Valley East	NVE	Montano PS Bar Screen	E	Rio Grande		NVEMO 000Q	
25	North Valley East	NVE	Nature Center PS Bar Screen	E	Rio Grande		NVENC 000Q	
26	North Valley East	NVE	Trellis-Campbell PS Bar Screen	E	Rio Grande		NVETC 000Q	
27	North Valley East	NVE	Duranes PS Bar Screen	E	Rio Grande		NVEDU 000Q	
28	Piedras Marcadas	PMC	SWQ Facility Plan		Rio Grande	389		Identify locations and types of BMPs
29	Piedras Marcadas	PMC	La Orilla Outlet Baffled Weir @ Outfall	E	Rio Grande	389	PMCCC 000Q	
30	Piedras Marcadas	PMC	Piedra Marcadas Dam Ported Outlet	E	Rio Grande	389	PMCPM 000Q	
31	Piedras Marcadas	PMC	Coors/PdN SWQ	P	Rio Grande	389	PMCCC 088Q	
32	San Antonio	SAN	SWQ Facility Plan		Rio Grande	3,900		Identify locations and types of BMPs

REF NO.	TABLE GPRP-3 RIO GRANDE WATERSHEDS	WS ID	EXISTING AND CURRENTLY PROPOSED SWQ FACILITIES	E - EXISTING P-PROPOSED	FACILITY OUTFALL TO	DESIGN FLOW (cfs) @OUTFALL	FACILITY ID	PROPOSED SWQ BMP IMPROVE-MENT
33	San Antonio	SAN	Sediment and Debris Basin @ Outfall	E	Rio Grande	3,900	SANSA 000Q	
34	San Jose Drain	SJD	SWQ Facility Plan		Rio Grande	700		Identify locations and types of BMPs
35	San Jose Drain	SJD		P	Rio Grande	700		SWQ @ Outfall
36	Sequoia	TCS	SWQ Facility Plan		Rio Grande			Identify locations and types of BMPs
37	Sequoia	TCS		P	Rio Grande			SWQ Debris Screen at Outfall
38	South Diversion Ch.	SDC	SWQ Facility Plan		Rio Grande	37,000		Identify locations and types of BMPs
39	South Diversion Ch.	SDC	Baffle bypass SWQ	P	Rio Grande	37,000	SDCSO 070Q	
40	South Diversion Ch.	SDC	SWQ @ Outfall	P	Rio Grande	37,000	SDCSO 000Q	
41	South Valley East	SVE	SWQ Facility Plan		Rio Grande			Identify locations and types of BMPs
42	South Valley East	SVE	Urban PS Bar Screen	E	Rio Grande		SVEUR 000Q	
43	South Valley East	SVE	Alcalde PS Bar Screen	E	Rio Grande		SVEAL 000Q	
44	South Valley East	SVE	Barelas PS Bar Screen	E	Rio Grande		SVEBO 000Q	
45	South Valley East	SVE	Bell & Commercial PS Bar Screen	E	Rio Grande		SVEBC 000Q	
46	South Valley East	SVE			Rio Grande			SWQ @ Far SE outfall
47	Southwest Mesa	SWM	SWQ Facility Plan		Interior Valley Drains			Identify locations and types of BMPs
48	Southwest Mesa	SWM	Pajarito Diversion Sediment Basin	E	Interior Valley Drains		SWMPD 010Q	
49	Southwest Mesa	SWM	Raymac Dam Ported Outlet	E	Interior Valley Drains		SWMRD 000Q	
50	Southwest Mesa	SWM	McCoy Dam Ported Outlet	E	Interior Valley Drains		SWMMC 000Q	

REF NO.	TABLE GPRP-3 RIO GRANDE WATERSHEDS	WS ID	EXISTING AND CURRENTLY PROPOSED SWQ FACILITIES	E - EXISTING P-PROPOSED	FACILITY OUTFALL TO	DESIGN FLOW (cfs) @OUTFALL	FACILITY ID	PROPOSED SWQ BMP IMPROVE-MENT
51	Southwest Valley	SWV	SWQ Facility Plan					Identify locations and types of BMPs
52	Southwest Valley	SWV	Black Mesa SWQ	P	Isleta, Riverside, Padillas, Armijo Drains		SWVID 001Q	
53	Vista Grande	VSG	SWQ Facility Plan		Rio Grande			Identify locations and types of BMPs
54	Vista Magnifica	VMG	SWQ Facility Plan		Rio Grande			Identify locations and types of BMPs
55	West Bluff Outfall	WBO	SWQ Facility Plan		Rio Grande	2,150		Identify locations and types of BMPs
56	West Bluff Outfall	WBO	West Bluff Channel Baffled Weir @ Outfall	E	Rio Grande	2,150	WBO40 075Q	
57	West Bluff Outfall	WBO	Phase III SWQ	P	Rio Grande			

STUDY

AMAFCA/ALBUQUERQUE MS4
FLOATABLE GROSS POLLUTANT STUDY

I. INTRODUCTION

A. STUDY SCOPE & REPORT FORMAT

This study evaluates source controls and structural Best Management Practices (BMPs) to control and reduce gross pollutants (litter, debris, trash, floatables and other gross pollutants) entering and discharging through the AMAFCA/Albuquerque drainage system into the Rio Grande, including into the North and South diversion Channels. The study proposes a gross pollutant reduction plan, the "Litter In The River-NO" (LITRNO) Plan. The proposed activities identified in the LITRNO Plan are based on the best data available from this Study. Implementation of the Plan will be through the Storm Water Management Program (SWMP) as funding and staffing allow. The Plan is intended to be a "living document" and will require updating as additional data becomes available.
Supporting data are contained in the Technical Appendix, published separately.

B. AREA OF STUDY

The geographic areas of interest for this study are the watersheds draining to the Rio Grande from the North Diversion Channel outfall south to the County line. This is essentially all of the areas within the AMAFCA boundary that drain to the Rio Grande. This includes areas and watersheds outside the City limits and thus outside the "Albuquerque MS4" defined in the NPDES Permit NMS000101 (See Technical Appendix No. I).

This drainage area is identified as the "AMAFCA/Albuquerque Drainage System" and is shown on Figure 1 in Appendix A.

C. GROSS POLLUTANTS

The stormwater pollutants investigated in this study are "gross pollutants". These consist of man-made litter, vegetative debris and coarse sediment larger than 1-3/4 inches. These are also refered to as "Floatables" or "Floatable Debris".

A large percentage of gross pollutants are submerged or semi-submerged and do not float on the surface. Under some conditions, it has been reported that as much as 80% of litter and 90% of vegetation debris does not float on the surface. A wide range of submergence has been observed in local drainage and debris removal facilities. For example, saturated tumbleweeds are frequently observed locally floating submerged with embedded leaves and litter. As a consequence, structural treatment controls must address submerged as well as surface floating debris for maximum effectiveness.

D. DEFINITIONS

Definintions and abbreviations are included in the Glossary at the front of the report. The following definitions are particularly useful in understanding the report:
AMAFCA/Albuquerque Drainage System discharges to the Rio Grande, from the North Diversion Channel outfall on the north to the Isleta Pueblo boundary on the south. This encompasses all of the City of Albuquerque and the portion of the AMAFCA jurisdiction that drains to the Rio Grande.
Best Management Practices (BMPs) are devices, practices or methods for removing reducing, retarding, or preventing targeted stormwater runoff pollutants and contaminants from reaching receiving waters.
Floatable Debris is any foreign matter that may float or remain suspended in the water column. This includes plastic, aluminum cans, wood products, bottles, paper products, etc.
Gross Pollutants Man made litter, vegetation debris and coarse sediment larger than 1-3/4”.
Stormwater Quality Constituents are suspended and dissolved pollutants (non-gross pollutants) such as metals, nutrients, minerals, microbiological, volatile organic compounds, pesticides, PCBs, hydrocarbons, BOD, COD, TSS, etc

E. CRITERIA

1. Albuquerque Municipal Storm Sewer System Permit NMS000101

The Albuquerque Municipal Storm Sewer System (MS4) Permit authorizes AMAFCA, the City of Albuquerque, the New Mexico Department of Transportation and the University of New Mexico to discharge from all portions of the Albuquerque MS4 to waters of the U.S. The permit covers all areas, except agricultural lands, within the corporate boundary of the City of Albuquerque served by or contributing to discharges from MS4s owned or operated by the permitted agencies. Within this report, this permit is referred to as the MS4 Permit and the permitted agencies as the permittees. A copy of the MS4 Permit is included in Technical Appendix I.

2. MS4 Permit Floatable and Related Requirements

The MS4 Permit includes AMAFCA, Albuquerque, NMDOT and UNM requirements related to Gross Pollutants and Floatable debris. These are paraphrased on Table I-1. See the MS4 Permit in Technical Appendix I for specific language. Also Table VI-1 summarizes the floatable permit requirements along with the proposed Plan elements to address the requirement.

TABLE I-1
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY
NPDES PERMIT REQUIREMENTS SUMMARY MATRIX

Permit Ref. Sec.	Description	RESPONSIBLE AGENCY
II.A.6.c	Implement a program to reduce the discharge of floatables w/ source controls and where necessary, structural BMPs	Permitees
II.A.10.a	Implement public education program to promote, publicize and facilitate public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4.	Permitees
Part III. SWMP #3a	List all SWQ facilities by basin in SWMP w/ record of maintenance and inspections.	Permitees
Part III. SWMP #3b	Include target number of structures per quarter in inspection and maintenance program.	Permitees
Part III. SWMP #5c	Revise street sweeping program w/ increased frequencies, account for leaf litter, de-icing operations & proximity to water bodies and	AMAFCA/ COA
Part III. SWMP #5d	Certification of the implementation of revised street sweeping program.	AMAFCA/ COA
Part III. SWMP #16a	Public education program revisions for public reporting of illicit discharges or improper disposal of materials.	AMAFCA/ COA
Part III. SWMP #16b	Certification of the implementation of the revised public education program.	AMAFCA/ COA
Part III. SWMP #17a	Develop a program to reduce the discharge of floatables and trash from the North Diversion Channel (NDC). Submit results of a study to determine the most effective structural or	AMAFCA/ COA
Part III. SWMP #17b	Begin installation of permanent BMPs to control the discharge of floatables and debris to the NDC to the MEP	AMAFCA/ COA

TABLE I-1
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY
NPDES PERMIT REQUIREMENTS SUMMARY MATRIX

Permit Ref. Sec.	Description	RESPONSIBLE AGENCY
Part III. SWMP #17c	Conduct evaluations of trash reduction needs from entire MS4 and determine the most effective structural or treatment control BMPs to reduce floatables discharged through the MS4	Permitees
1	all conveyances discharging directly to the Rio Grande	
2	upstream contributing systems	
3	possible retrofits of detention basins	
4	source control for floatables in commercial and industrial areas.	
5	Evaluation results in Report format with recommendations and milestones for implementation	
Part III. SWMP #17d	Complete installation and implementation of BMPs and retrofit structures to control floatables and trash based on Item 17.c above	Permitees
Part III. SWMP #17e	Begin implementation of source control of floatables in industrial and commercial areas	AMAFCA/ COA
Part III. SWMP #17f	Develop a floatable monitoring program, install a floatable monitoring location and commence monitoring (1 each).	NMDOT/ UNM
Part III. SWMP #17g	Develop a floatables monitoring program, install two floatable monitoring locations and commence monitoring	AMAFCA/ COA
Part III. SWMP #21.a.1.a	Good Housekeeping for Municipal Operations - Develop and implement an O & M program w/ a training component addressing maintenance activities, procedures, controls to reduce	Permitees
Part V.B	Floatables Monitoring. Locations for monitoring floatable material in discharges to or from their MS4 at least twice per year (measured in cubic	
	AMAFCA/Albuquerque – two monitoring stations	AMAFCA/ COA
	NMDOT & UNM – one monitoring station each	NMDOT/ UNM
Reference: NPDES Permit No. NMS000101 issued Oct. 31, 2003, effective Dec. 1, 2003		

II. EXISTING DRAINAGE SYSTEM OVERVIEW

A. AMAFCA/ALBUQUERQUE DRAINAGE SYSTEM

The AMAFCA/Albuquerque drainage system has developed over time in conjunction with urbanization with an emphasis on flood control. The system is designed to flush sediments, trash and floatable debris downstream to minimize conveyance system blockage. The major drainage facilities are shown on Figures 1 and 2 in Appendix A.

Two large facilities were constructed in the early 1960's to protect the valley area from flooding, the North Diversion Channel (NDC) and the South Diversion Channel (SDC). These channels were built by the Army Corps of Engineers and are owned and operated by AMAFCA. The NDC is a high velocity concrete channel diverting runoff from Northeast Albuquerque northward to the Rio Grande and is designed for a flow of 44,000 cubic feet per second (cfs) at the outfall. The SDC is an earthen channel with drop structures protecting the Southeast Valley by intercepting flows from Southeast Albuquerque and the Tijeras Arroyo and is designed for a flow of 37,000 cfs at the outfall to the Rio Grande.

Alameda Debris Screen and North Diversion Channel (4/3/04)

B. HYDROLOGY

Albuquerque is a high-desert city with elevations ranging from 4,900 to 6,500 feet above sea level. The climate consists of low humidity and abundant sunshine. Annual rainfall averages between 8" and 9". The 100-year 24-hour event precipitation varies with elevation, ranging from 3.6 inches in the foothills to 2.6 inches west of the Rio Grande. Storms are typically infrequent thunderstorms with peak intensities ranging between 4.7 and 5.6 in/hr for the 100-year event. This creates a high potential for erosion and a large capacity for debris, sediment and litter transport within the system.

The typical annual hydrologic and associated floatable cycle consists of the following:

Haynes Park Debris Forebay (Bank full – 4/3/04)

WINTER - Average precipitation of 1.4", either as snow or low intensity rain. Organic debris from deciduous tree leaf fall and litter builds up in inlets and other areas of the drainage system.

SPRING - Average precipitation of 1.6”, typically low intensity rainfall. Organic debris and litter may or may not be flushed through the system due to low runoff rates and volumes.

SUMMER - “Monsoon season” weather patterns with short intense afternoon thunderstorms. Average precipitation of 3.9”. Due to the larger runoff rates and volumes, the accumulation of debris and litter are forced downstream.

FALL - Average precipitation of 1.9”, usually as low intensity rainfall. Leaf fall accumulates in the system.

The AMAFCA/Albuquerque drainage system is designed to provide flood protection. Facility designs conform to the Development Process Manual (DPM) criteria for infrequent flood events, typically with a return periods of 100 years.

To remove a significant percentage of gross pollutants and keep reasonable facility sizes, stormwater quality facilities (SWQ) are typically designed for frequent smaller storms. For example, the 80th percentile rainfall event is frequently referenced as a cost effective treatment level (i.e., 80% of the total rainfall depth is treated) (SWQRD#17, SWQRD#18). Table II-1 summarizes rainfall and runoff events, based on precipitation data for the Albuquerque area. The 80th percentile precipitation is approximately 0.6 inches. This also corresponds to the average annual rainfall event.

C. DRAINAGE SYSTEM DESCRIPTION

1. Watersheds

Watershed boundaries have been identified in the Drainage Facility Planning Review (DFPR – GENRD#11) for areas that drain directly to the Rio Grande or that drain to a regional diversion facility. Thirty two watersheds are identified as shown on Figure 1 in Appendix A. Table II-2 lists the watersheds, the receiving water and the design flow rate at the outfall for the watersheds. Thirteen of these watersheds extend upstream (outside) of the AMAFCA and Albuquerque City limits.

2. East Mesa

The East Mesa includes 106 square miles of upland watersheds between North Diversion Channel and South Diversion Channel and the base of the Sandia Mountains. See Figures 1 and 2. Most of this area is developed with a mix of urban residential, commercial and industrial use. The Mesa is formed from alluvial deposits with typical slopes from 2% to 4%. The drainage systems consist of paved street and storm drain runoff collection with open channel conveyance along historic drainage paths. Due to the slopes, conveyance velocities are typically in excess of 10 fps requiring concrete lined or other types of stabilized channels to prevent catastrophic erosion. Overall, the system is designed to pass floatables through the facilities to prevent plugging or clogging. All of the channels and drainage facilities drain into the NDC or the SDC that outfall directly to the Rio Grande.

Runoff enters the East Mesa drainage system from the Sandia Mountains on the east conveying floatables, sediments and other pollutants. Approximately 16 major arroyo systems flow into the MS4 from the east. Nine of these systems have detention dams located in the upper portion to regulate flood flow. They also provide for some floatable collection and offer the potential for retrofitting to essentially cut-off upstream floatable sources. To date, two systems have been retrofitted with submerged port outlets to capture floatables.

Highland Detention Basin Trash Rack (4/3/04)

3. West Mesa

The West Mesa includes 130 square miles of watersheds west of the Rio Grande Valley. The west mesa area is approximately one-third developed. Typical slopes are 2% to 4%. Similar to the East Mesa, storm drain and channel facilities on these slopes have high velocities and the capacity to convey debris downstream.

4. Valley Floor

The North and South Valley areas are relatively flat with slopes typically less than 0.5%. This area is transitioning from irrigated agricultural to mixed urban land uses. The valley is laced with raised irrigation canals and groundwater drains. Due to the patchwork of drainage facilities and the flat slopes, the debris conveyance capacity of the existing systems in the valley is low. Additionally, portions of the MS4 are pumped from the valley to the Rio Grande. These pump stations incorporate mechanical bar screens to protect the pumps which also provide debris removal.

La Orilla Debris Baffle (4/3/04)

D. EXISTING FACILITIES

The AMAFCA/Albuquerque drainage system is extensive, consisting of:

- Approximately 16, 000 storm drain catch basins, typically combination gutter grates with curb opening inlets;

- Approximately 480 miles of underground storm drain piping, ranging in size from 18” to 108” diameter;
- 51 major flood control dams,
- Approximately 6 miles of dikes and diversion structures;
- Approximately 175 miles of constructed channels; and,
- Approximately 55 stormwater quality facilities.

The operational stormwater quality facilities (SWQ) range in type from small debris manholes, ported towers, submerged ported outlets and debris screens to mechanical bar screens on pump stations, constructed wetlands and baffled weir outlets. The existing stormwater quality facilities are shown on Figure 2 and listed on Table II-3. Details are presented in Technical Appendix II – Existing Facility Review Data.

In evaluating the different types of existing facilities, several items were identified to be considered when designing future facilities for stormwater quality:

- High velocity channels throughout the AMAFCA/Albuquerque system make capture of gross pollutants difficult.

- The existing facilities trap a significant quantity of gross pollutants and frequent maintenance is necessary. Cleaning can be difficult if the pollutants have been jammed into smaller spaces by water pressure.

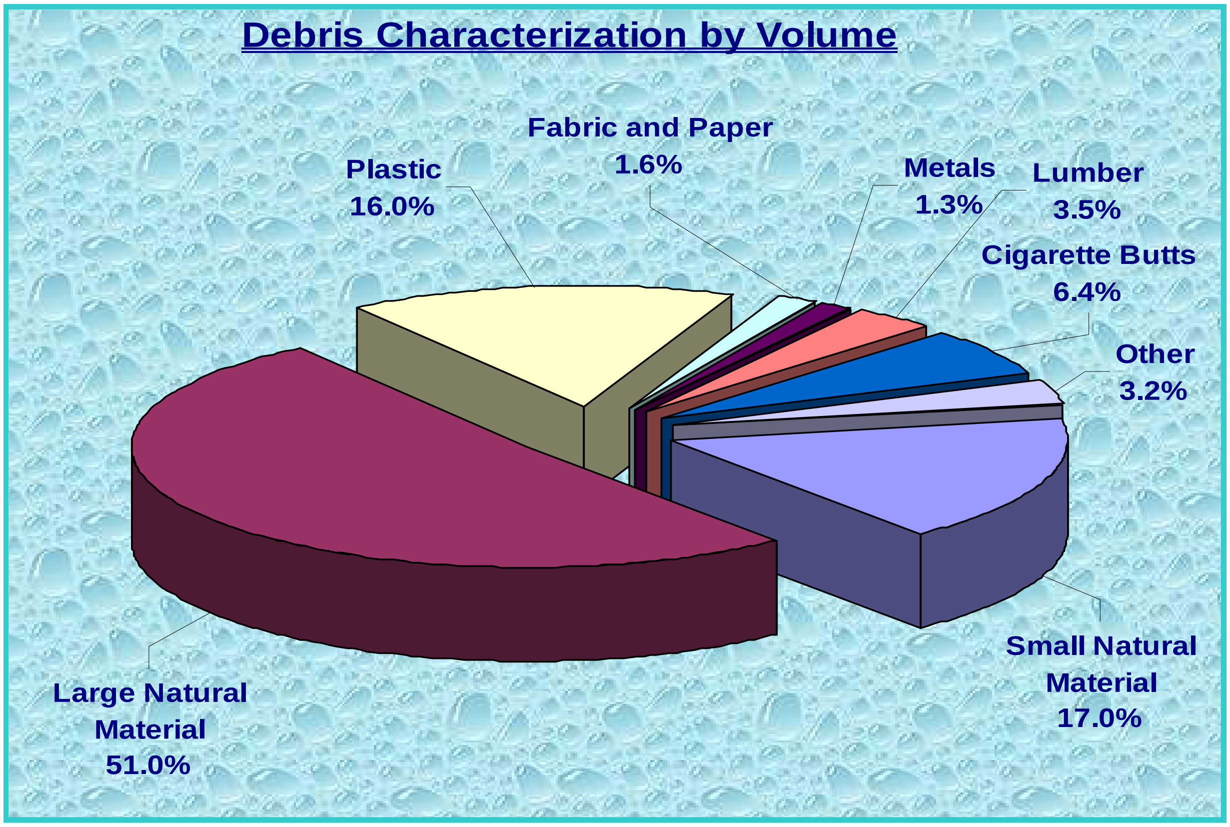
- Submerged port outlets in detention ponds pass submerged debris and also plug with gross pollutants, resulting in by-pass flow. Also, mechanical cleaning of detention pond facilities requires a paved area for vehicular access.

- Bar Screens trap organic debris, such as tumble weeds, which in turn trap smaller gross pollutants. The resultant volume can plug the bar screen resulting in by-pass flows.

Maintenance on future facilities is a major concern. Storage volume for collected debris and avoidance of leaching and re-suspension should be considered in design standards.

E. DEBRIS CHARACTERIZATION

In order to evaluate the types of water quality facilities that will best suit the needs of the MS4, a characterization of waste in the existing system was conducted. This characterization task consisted of sorting the debris into categories by visual examination and stormwater quality constituent testing of debris leachate. (See additional detail in Technical Appendix II & VII)



1. Debris Categories

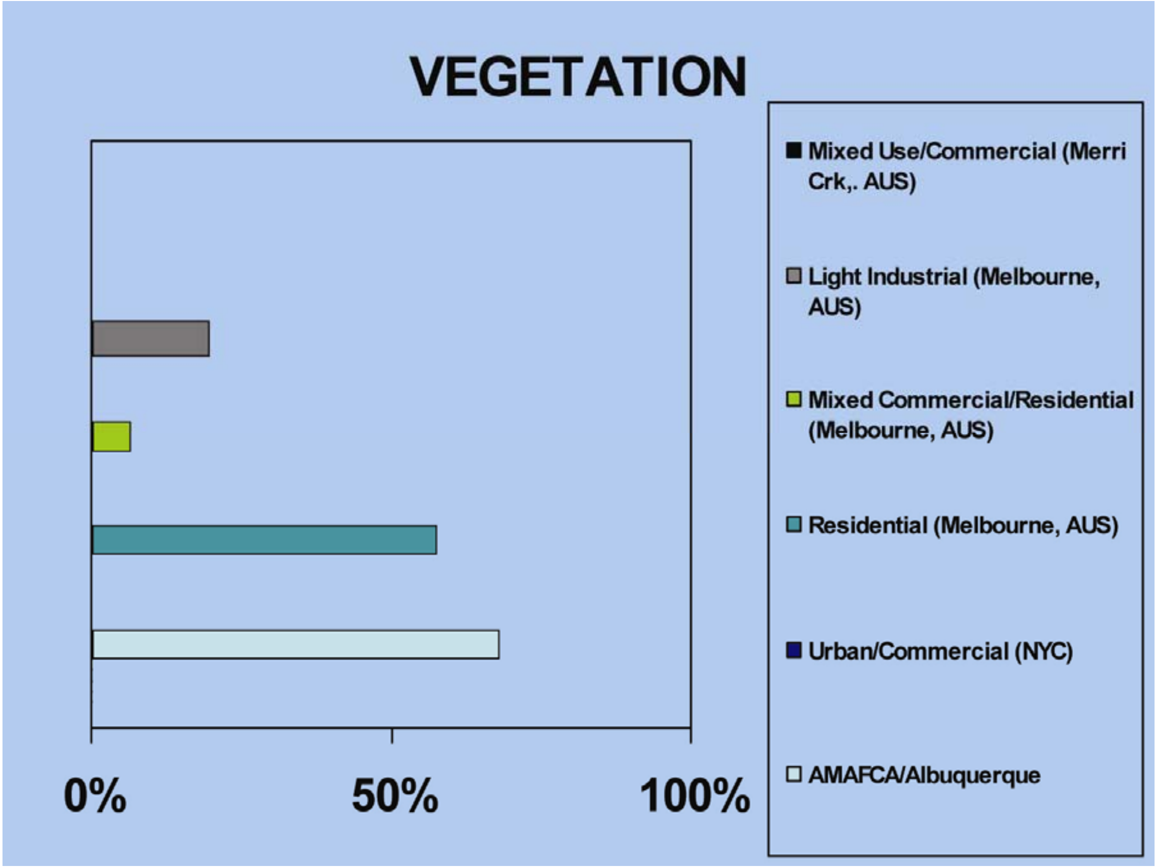
Sorted debris for characterization (6/30/04)

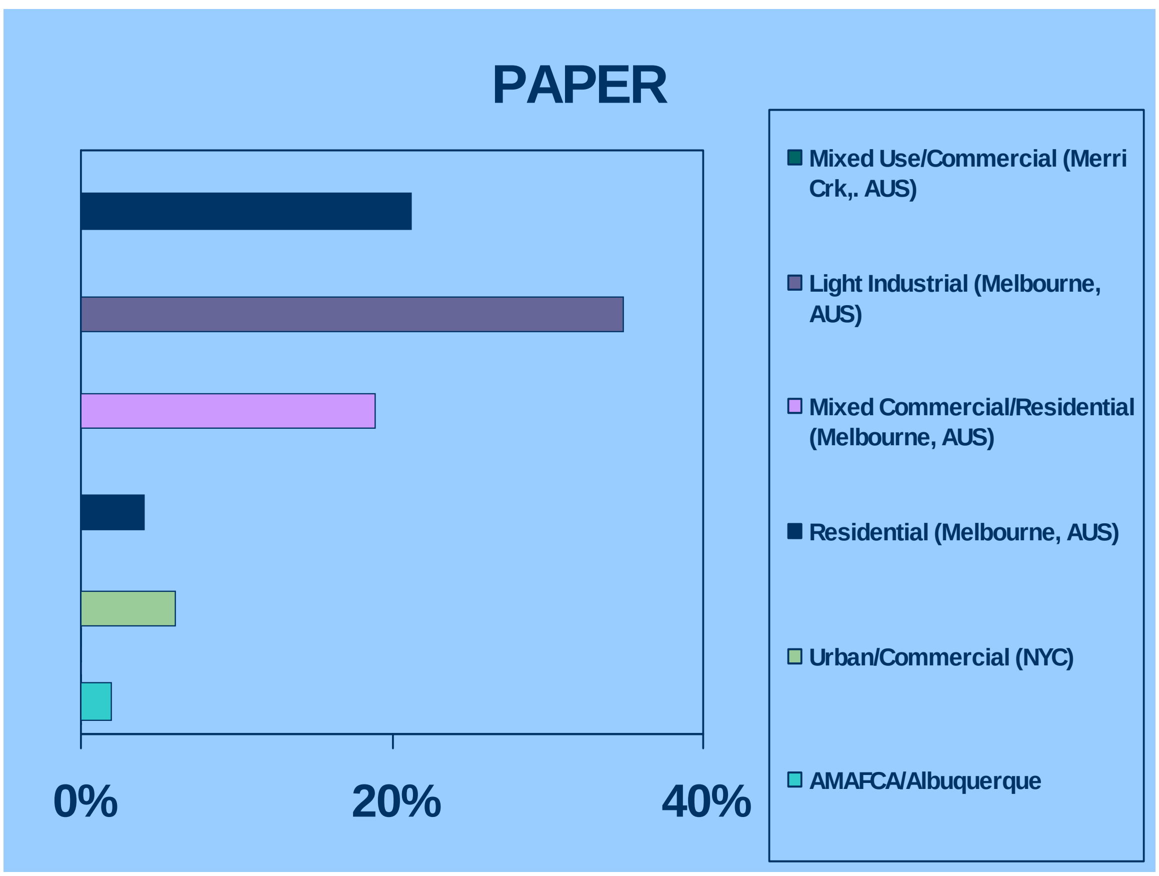
Debris categories were determined using used visual segregation of debris into categories, estimate of volume using graduated bucket and percent by volume for each category. Categories are; Natural Materials (including organics with leaf litter, tumbleweed and grasses) and man-made materials (including paper, fabric, cigarettes, lumber, cans, glass and expanded foam, bottles, bags and sheet plastic).

In March and April of 2004, there were several significant storms in the Albuquerque area. Preliminary debris characterization was conducted at the North Pino Debris Facility as well as other locations in the system. Table II-4 includes a summary of the debris characterization. Technical Appendix II contains the detailed data sheets.

Trash Rack – South Broadway Pond (4/23/04)

The following graphs compare the types of gross pollutants in the AMAFCA/Albuquerque MS4 to other locations.


VEGETATION
0%
50%
100%
Mixed Use/Commercial (Merri Crk,. AUS)
Light Industrial (Melbourne, AUS)
Mixed Commercial/Residential (Melbourne, AUS)
Residential (Melbourne, AUS)
Urban/Commercial (NYC)
AMAFCA/Albuquerque


PAPER
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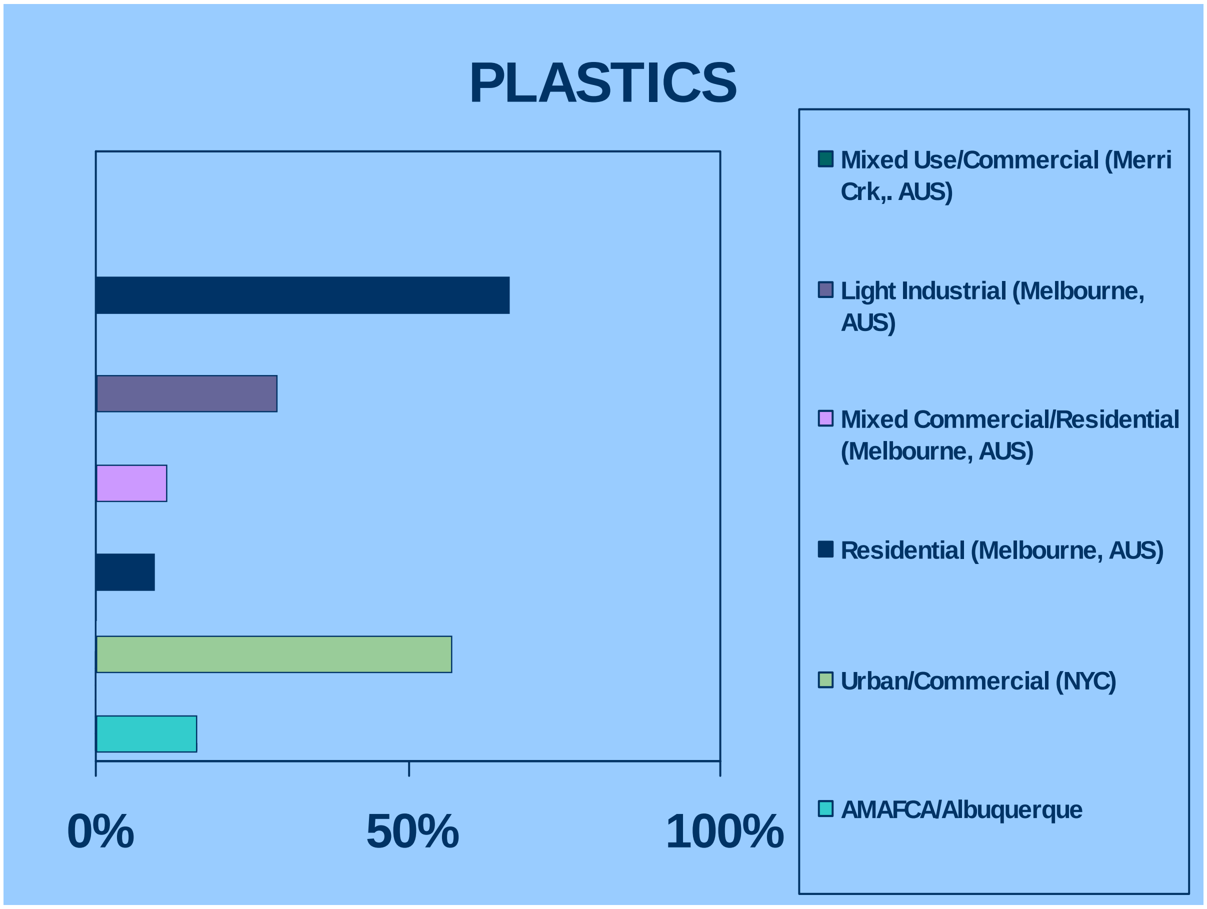
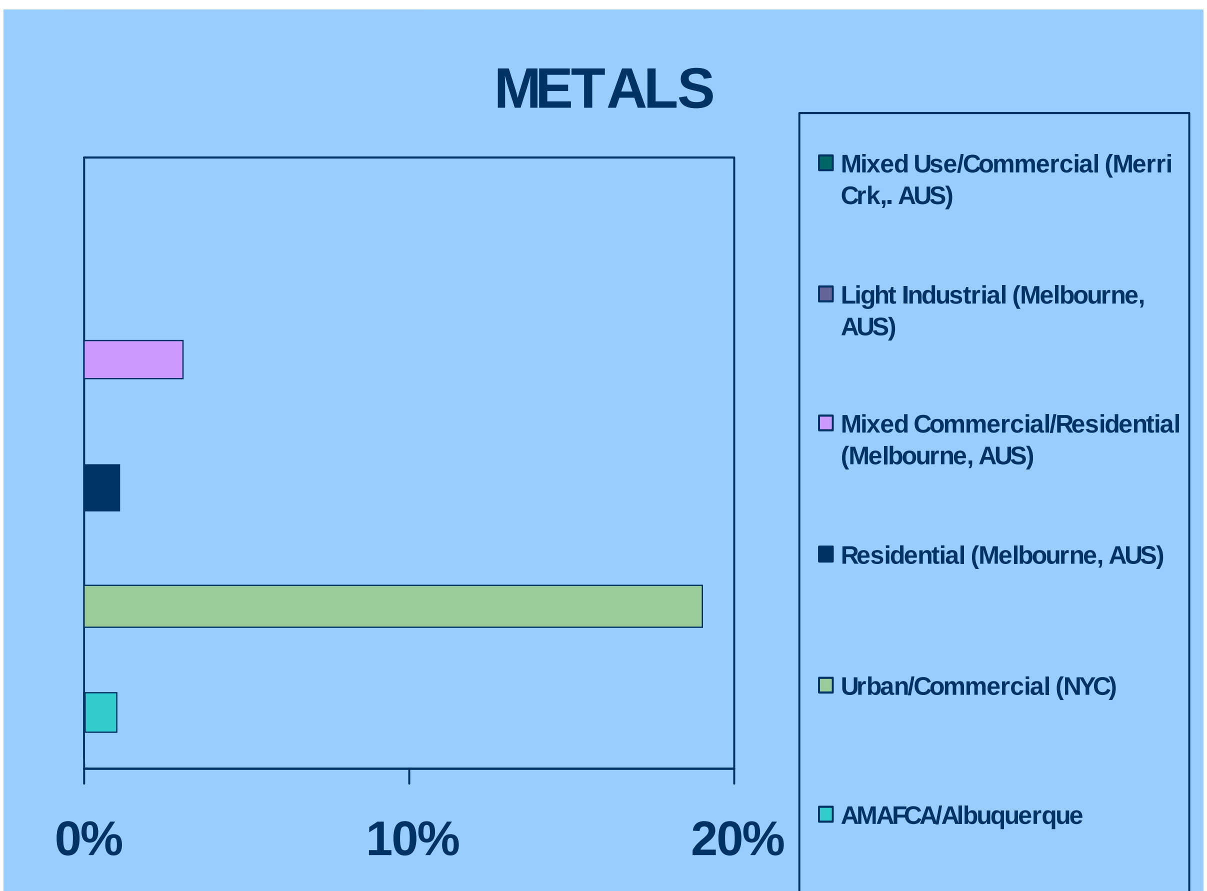
20%
40%
Mixed Use/Commercial (Merri Crk,. AUS)
Light Industrial (Melbourne, AUS)
Mixed Commercial/Residential (Melbourne, AUS)
Residential (Melbourne, AUS)
Urban/Commercial (NYC)
AMAFCA/Albuquerque


PLASTICS
Mixed Use/Commercial (Merri Crk,. AUS)
Light Industrial (Melbourne, AUS)
Mixed Commercial/Residential (Melbourne, AUS)
Residential (Melbourne, AUS)
Urban/Commercial (NYC)
AMAFCA/Albuquerque
0%
50%
100%


METALS
Mixed Use/Commercial (Merri Crk,. AUS)
Light Industrial (Melbourne, AUS)
Mixed Commercial/Residential (Melbourne, AUS)
Residential (Melbourne, AUS)
Urban/Commercial (NYC)
AMAFCA/Albuquerque
0%
10%
20%

2. Debris Leachate Testing

Debris in Dumpster – Barelas Pump Station

Leachate from debris was used to determine the amount of water quality constituents that would leach or wash off of the gross pollutants. This effort was intended to determine if there might be secondary benefits of removing the gross pollutants if stormwater quality constituents (i.e. dissolved and suspended pollutants) were associated with them. Details of these tests are included in Technical Appendix VII. The following procedure was used to assess the leachate.

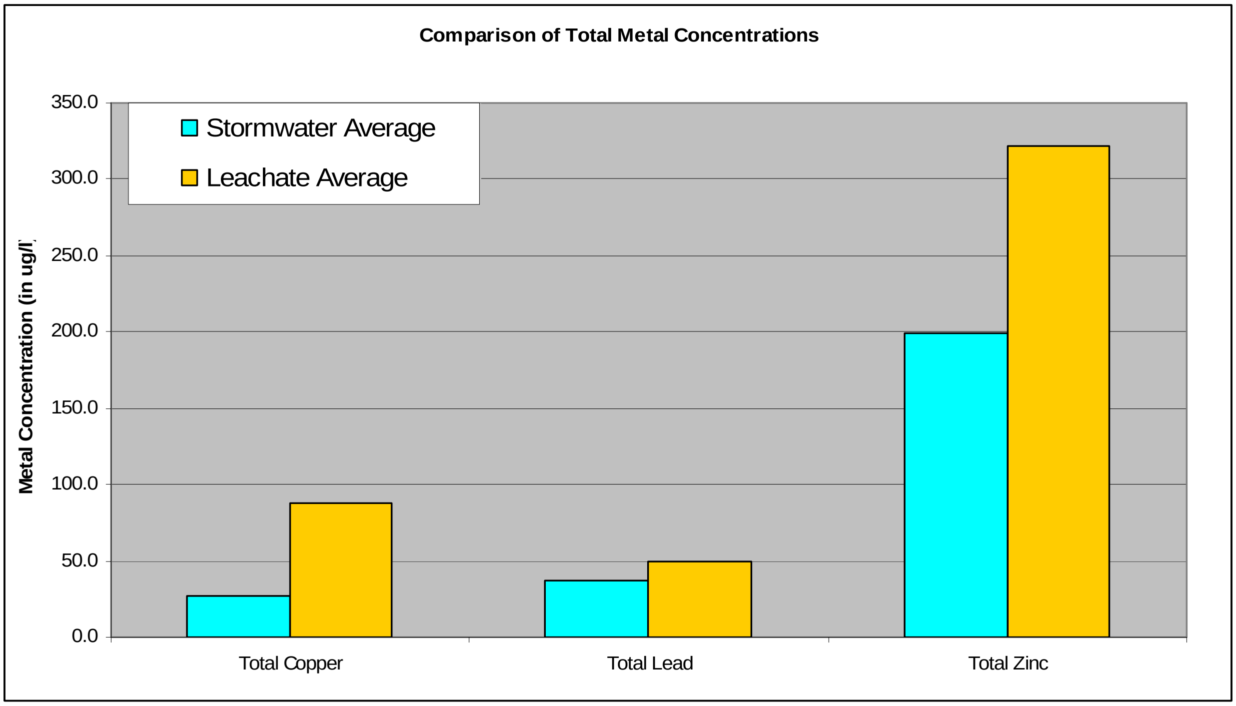
Leachate sampling

One cubic yard sample was collected from three separate locations within 24 hours of a storm event. Each CY sample was immersed in distilled water for 15 minutes, the leachate sampled and delivered to the laboratory for analysis. The leachate was tested using the same protocol and standards as the water quality constituent testing performed on runoff samples by USGS for AMAFCA and the City.

The experiment supported the general assumption that the debris in the stormwater system can impact water quality if permitted to develop a leachate in an area with significant accumulation, such as a detention pond. The leachate samples obtained from the accumulated debris sampled by the method used in this survey contained a wide variety of constituents above detectable levels. The results are compared with stormwater concentrations on the following graphs. Of these constituents, the most significant observations are as follows:

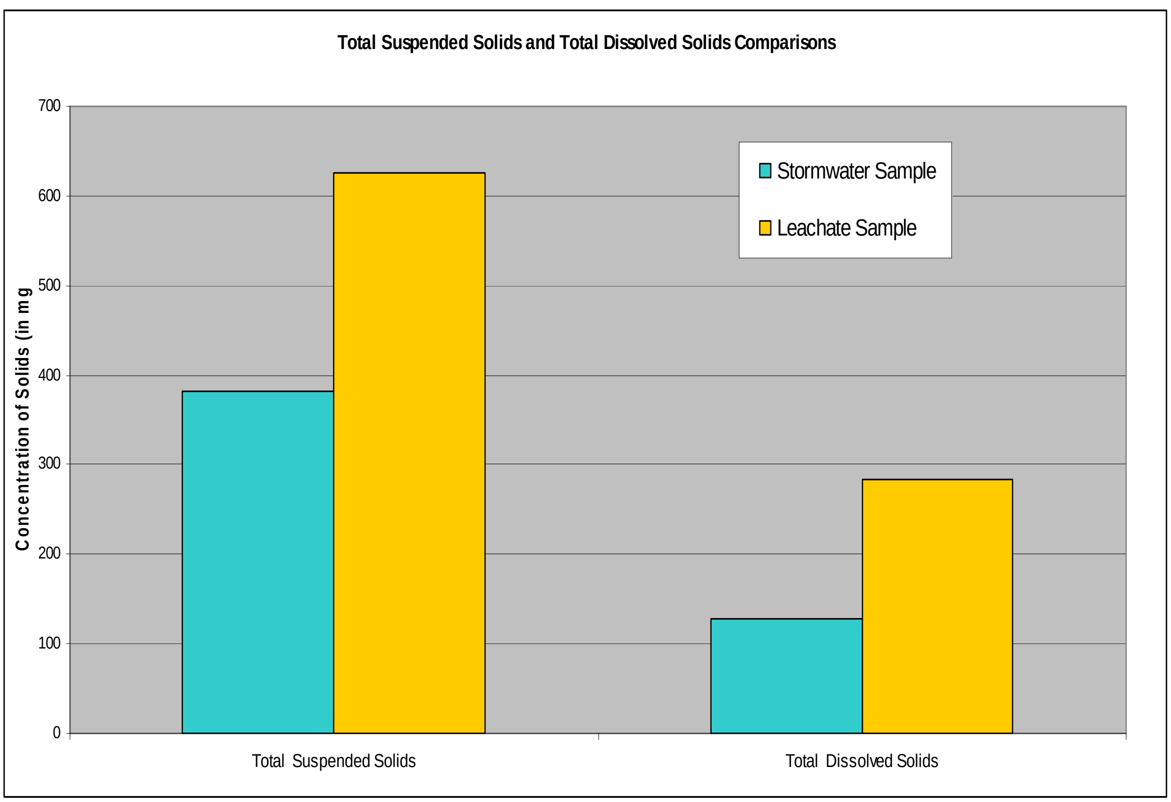
a. Metal Constituents: total copper, total lead, and total zinc of the leachate solutions showed increased concentrations when compared to the stormwater average. Other total metals such as arsenic, cadmium, chromium, nickel, and silver showed detectable concentrations. Beryllium, mercury, and selenium were not found in detectable concentrations for any of the leachate samples.

b. Petroleum Hydrocarbons and Solvents: the significant occurrences in this group were limited to hydrocarbon constituents such as ethylbenzene, toluene, total xylenes, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, chrysene, fluoranthene, and pyrene. A common source for these constituents would include fuels spills on road or parking locations that are within the discharge area. Methyl ethyl ketone (or 2-Butanone) in association with acetone was detected in elevated quantity for the two sample locations with analyses for volatile and semi-volatile constituents. The high concentrations of



these two compounds for Barelas Pump Station sample were inferred to be associated with the method of debris accumulation (an active debris screen versus detention pond). Other compounds such as styrene and phthalates were assessed to be associated with the type of debris, namely Styrofoam and plastic containers.

c. Pesticide and Herbicide: there were no detectable occurrences of analytes from either of these general classifications. The sampling events occurred during periods of potential applications of current pesticides and herbicides for use at industrial and residential sites.



d. Anions, Solids, and Other Organic Compounds: there were no significant correlations identified from the remaining group of constituents. Fecal coliform, ecoli concentrations, anions such as nitrate, sulfate, and chlorine were consistent with the observed ranges of the stormwater analyses. Total suspended solids and total dissolved solids concentrations supported the basic assumption that the concentrations of the leachate sample were greater than the stormwater samples. Other organic compounds detected consistently included eucalyptol (eucalyptus oil) and oleic acid. Both are found in personal care products.

Although the concentrations of pollutants in the leachate is significant, this will be diluted within the overall runoff volume. For example, if we assume that the leachate is mixed uniformly throughout the runoff volume, the following concentration levels for zinc at the N. Pino outfall are:

Leachate – 330 μg/l
Diluted Leachate – 1 μg/l
Stormwater average – 200 μg/l

Obviously if the leachate is concentrated at the beginning of the storm, the contribution will be higher.

Based on this limited data, it appears that a significant amount of water quality constituent pollutant washes off of debris. Although this limited testing is not a statistically valid sample, these preliminary results indicate that removal of gross pollutants contributes to water quality and further testing is warranted if removal of water quality constituents associated with gross pollutant removal is to be considered an element of the overall stormwater quality program.

F. GROSS POLLUTANT QUANTITY & TYPE

Understanding the quantity and makeup of gross pollutants generated within the AMAFCA/Albuquerque system is a critical component of the overall plan. For the initial LITRNO Plan, estimates of the types and quantities of gross pollutants have been derived from studies in other locales supplemented with available data from the local system. Due to the variability in the data, continued measurement of the quantity and types of gross pollutants generated within the AMAFCA/Albuquerque system is proposed to refine the estimates included in this study.

Trash Rack Detail – South Broadway Pond (4/23/04)

South Broadway Pond SW Slope (4/23/04)

Local system debris data has been extracted from AMAFCA records. AMAFCA has a program to remove litter from the AMAFCA facilities using a manual pick-up crew. Data is available for the period of September 2003 to March 2004 and is contained in Technical Appendix II.

The volume of litter removed ranges from 28 to 1,500 cubic feet per square mile of upstream drainage area (cf/sm). The average gross pollutant removed from all facilities is 64 cf/sm (0.1 cf/ac).

This is significantly lower than the typical range quoted from other sources in the range of 5 cf/ac/yr to 15 cf/ac/yr. This may be due in part to the nature of the manual cleaning as not all of the gross pollutant is trapped and only litter is removed from the system.

TABLE II-1
AMAFCA/ALBUQUERQUE MS4 GROSS POLLUTANT STUDY
RAINFALL & RUNOFF FREQUENCY DATA

RETURN FREQUENCY SUMMARY

Projected No. of Storms Per Year	Rainfall Depth (in.)
0.01	2.60” (6-hr)
0.1	1.73” (6-hr)
1.0	0.59”
5	0.25”
17	0.10” *

* Precipitation 0.05” or greater, less than 0.15”.

VOLUME SUMMARY

Percent of Total Volume	Rainfall Depth (in.)	Runoff (a) Depth (in.)	Runoff (b) Depth (in.)	Runoff (c) Depth (in.)
80% of total rainfall	0.65”	0.11”	0.22”	0.40”
90% of total rainfall	0.94”	0.20”	0.37”	0.65”
80% of total runoff (a)	1.0”	0.23”	0.40”	0.70”
90% of total runoff (a)	1.34”	0.43”	0.66”	1.00”
80% of total runoff (b)	0.9”	0.18”	0.35”	0.61”
90% of total runoff (b)	1.2”	0.34”	0.55”	0.88”
80% of total runoff (c)	0.9”	0.18”	0.35”	0.61”
90% of total runoff (c)	1.2”	0.34”	0.55”	0.88”

(a) Urban residential drainage basin, 22% impervious.
(b) Urban residential drainage basin, 50% impervious
(c) Commercial basin, 85% impervious

AVERAGE MONTHLY SUMMARY (1)

January	0.40” precipitation	3.9 storm events
February	0.43” precipitation	4.1 storm events
March	0.55” precipitation	4.8 storm events
April	0.46” precipitation	3.3 storm events
May	0.53” precipitation	4.5 storm events
June	0.59” precipitation	4.3 storm events
July	1.36” precipitation	9.2 storm events
August	1.55” precipitation	9.6 storm events
September	0.94” precipitation	5.9 storm events
October	0.90” precipitation	4.6 storm events
November	0.49” precipitation	3.5 storm events
December	0.49” precipitation	4.0 storm events
Annual	8.68” precipitation	61.6 storm events

(1) All storms larger than 0.01”

TABLE II-1 Continued
AMAFCA/ALBUQUERQUE MS4 GROSS POLLUTANT STUDY

RAINFALL & RUNOFF FREQUENCY DATA
Albuquerque International Airport Station, 1948 - 2001
Source: GENRD#12, Characterizing Higher Frequency Storm Events in the Albuquerque Area, Pierce Runnels.

			RAINFALL			RUNOFF (1)			RUNOFF (2)			RUNOFF (3)		
Total # Storms	Percent of Storms	Cum. % of storms	Precip Depth (in.)	Percent of total precip	Cumulative % of total	Runoff Depth (in.)(1)	Percent of total runoff	Cumulative % of total	Runoff Depth (in) (2)	Percent of total runoff	Cumulative % of total	Runoff Depth (in) (2)	Percent of total runoff	Cumulative % of total
0	0	0	0.0	0.0	0									
924	49.1	49	0.1	20.4	20	0.00	0.0	0	0.00	0	0	0.00	0.0%	0
391	20.8	70	0.2	17.3	38	0.01	9.8	10	0.05	17.2%	17%	0.06	13.3%	13%
211	11.2	81	0.3	14.0	52	0.04	13.6	23	0.08	14.8%	32%	0.10	12.0%	25%
121	6.4	87	0.4	10.7	62	0.06	12.6	36	0.11	11.7%	44%	0.18	12.4%	38%
79	4.2	92	0.5	8.7	71	0.08	11.3	47	0.15	10.4%	54%	0.27	12.1%	50%
48	2.6	94	0.6	6.4	77	0.10	8.8	56	0.20	8.4%	62%	0.36	9.8%	60%
33	1.8	96	0.7	5.1	83	0.13	7.4	64	0.25	7.2%	70%	0.44	8.3%	68%
20	1.1	97	0.8	3.5	86	0.15	5.3	69	0.29	5.1%	75%	0.53	6.0%	74%
17	0.9	98	0.9	3.4	89	0.18	5.5	74	0.35	5.2%	80%	0.61	5.9%	80%
12	0.6	99	1.0	2.6	92	0.23	4.9	79	0.40	4.2%	84%	0.70	4.8%	85%
8	0.4	99	1.1	1.9	94	0.28	4.0	83	0.50	3.5%	88%	0.80	3.6%	88%
6	0.3	99	1.2	1.6	96	0.34	3.6	87	0.55	2.9%	91%	0.88	3.0%	91%
3	0.2	99	1.3	0.9	96	0.40	2.2	89	0.64	1.7%	92%	0.96	1.6%	93%
4	0.2	100	1.4	1.2	98	0.47	3.3	92	0.70	2.5%	95%	1.05	2.4%	95%
1	0.1	100	1.5	0.3	98	0.54	1.0	93	0.78	0.7%	95%	1.14	0.6%	96%
1	0.1	100	1.6	0.4	98	0.59	1.1	94	0.86	0.8%	96%	1.23	0.7%	97%
2	0.1	100	1.7	0.8	99	0.68	2.4	97	0.96	1.7%	98%	1.37	1.6%	98%
0	0	100	1.8	0.0	99	0.75	0.0	97	1.02	0.0%	98%	1.40	0.0%	98%
1	0.1	100	1.9	0.4	100	0.83	1.5	98	1.10	1.0%	99%	1.50	0.9%	99%
0	0	100	2.0	0.0	100	0.91	0.0	98	1.18	0.0%	99%	1.57	0.0%	99%
1	0.1	100	2.1	0.5	100	0.99	1.8	100	1.27	1.1%	100%	1.67	0.9%	100%

(1) Runoff computed for urban residential drainage basin, 22% impervious.
(2) Runoff estimated for residential basin w/ 50% impervious.
(3) Runoff estimated for commercial basin w/ 90% impervious

TABLE II-2
AMAFCA/ALBUQUERQUE MS4
GROSS POLLUTANT STUDY

WATERSHED SUMMARY

WATERSHED	ID	DRAINS TO	APPROXIMATE AREA (sq. mi.)*	FLOW (cfs) @OUTFALL
Alameda/Riverside Drain	ARD	Rio Grande	4.8	290
Amole-Hubbell	AMH	Arenal Canal	35.9	Gated Dams
Barr Drain	BAR	Rio Grande	0.6	
Bear Canyon Arroyo	BEA	North Diversion Ch.	7.0	1,800
Cabezon	CBZ	Corrales Riverside Lateral	1.9	483
Calabacillas	CBS	Rio Grande	19.6	15,300
Calabacillas Outlet	CBO	Rio Grande	0.7	100
Campus Wash	CAW	North Diversion Ch.	6.0	5,100
Domingo Baca	DOB	North Diversion Ch.	8.2	7,800
Embudo	EMB	North Diversion Ch.	20.2	5,100
Grantline	GRA	North Diversion Ch.	0.8	3,910
Hahn	HAA	North Diversion Ch.	6.8	5,470
La Cueva	LAC	North Diversion Ch.	5.8	5,500
North Camino	NCA	North Diversion Ch.	3.3	4,500
North Diversion Ch.	NDC	Rio Grande	4.1	44,000
North Pino	NPO	North Diversion Ch.	2.8	2,600
North Valley East	NVE	Rio Grande	13.4	Various Pump Sta.
Piedra Marcadas	PMC	Rio Grande	7.2	389
Pino	PIN	North Diversion Ch.	5.4	6,900
San Antonio	SAN	Rio Grande	52.0	3,900
San Jose Drain	SJD	Rio Grande	2.4	700
Sequoia	TCS	Rio Grande	0.3	
South Diversion Ch.	SDC	Rio Grande	7.3	37,000
South Valley East	SVE	Rio Grande	19.3	
Southwest Mesa	SWM	Interior Valley Drains	9.5	
Southwest Valley	SWV	Isleta Drain, Riverside Drain	27.3	
Tijeras Arroyo	TIJ	S. Diversion Ch.	28.5	22,700
Vista Grande	VSG	Rio Grande	0.3	
Vista Magnifica	VMG	Rio Grande	1.0	
West Bluff Outfall	WBO	Rio Grande	4.6	2,150
		East Mesa	106.2	
* Area within AMAFCA Boundary		(NDC total area = 70.4 SM)		
		West Mesa	130.4	
		Valley	70.4	
		TOTAL	307.0	

TABLE II-3
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

EXISTING & CURRENTLY PLANNED STORMWATER QUALITY FACILITIES

Last Printed 9/16/2005

FACILITY NAME	FACILITY ID *(1)	STATUS *(2)	BMP TYPE	BMP ID
EXISTING SWQ FACILITIES				
	AMOLE-HUBBELL WATERSHED (AMH)			
Snow Vista Pond SWQ	AMHSV 094Q	E	Submerged Port Outlet	SPO
Westgate Dam	AMHWG 000Q	E	Submerged Port Outlet	SPO
Amole Dam	AMHAH 070Q	E	Submerged Port Outlet	SPO
Borrega Dam	AMHBR 025Q	E	Submerged Port Outlet	SPO
	ALAMEDA RIVERSIDE DRAIN WATERSHED (ARD)			
Menaul Detention Basin	ARDMP 001Q	E	Media (Sand) Filter Sed Fac.	MFS
Claremont Pump Station	ARDCL 000Q	E	Mechanical Bar Screen	MBS
	ARD?? ???Q	E	Hydrodynamic/Debris MH	HDM
	ARD?? ???Q	E	Hydrodynamic/Debris MH	HDM
	ARD?? ???Q	E	Hydrodynamic/Debris MH	HDM
	ARD?? ???Q	E	Hydrodynamic/Debris MH	HDM
	CABEZON WATERSHED (CBZ)			
Skyview Acres Pond	CBZSA 000Q	E	Submerged Port Outlet	SPO
	CALABACILLAS OUTLET WATERSHED (CBO)			
	CALABACILLAS WATERSHED (CBS)			
	DOMINGO BACA WATERSHED (DOB)			
N. Domingo BacaFilter Basin	DOBND 000Q	E	Environmental Pond	MFS
N. Domingo Baca Sed & Debris Basin	DOBND 001Q	E	Submerged Port Outlet	SPO
	DOBND 021Q	E	Debris MH	HDM
	DOBND ???Q	E	Debris MH	HDM
Lower DOB Dam	DOBND 067Q	E	Submerged Port Outlet	SPO
N. DOB Dam	DOBND 207Q	E	Submerged Port Outlet	SPO
S. DOB Dam	DOBSD 262Q	E	Submerged Port Outlet	SPO
	EMBUDO WATERSHED (EMB)			
State Farigrounds NW Pond	EMBSF 021Q	E	Debris Screen	DSN
State Fairgrounds ???	EMBSF 001Q	E	Debris Screen	DSN
Embudo Dam Trash Rack	EMBEA438Q	E	Debris Screen	DSN
	LA CUEVA WATERSHED (LAC)			
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM
	LAC?? ???Q	E	Debris MH	HDM

TABLE II-3
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

EXISTING & CURRENTLY PLANNED STORMWATER QUALITY FACILITIES

Last Printed 9/16/2005

FACILITY NAME	FACILITY ID *(1)	STATUS *(2)	BMP TYPE	BMP ID
	NORTH DIVERSION CHANNEL WATERSHED (NDC)			
Alameda SD Outfall	NDCP2 096Q	E	Debris Screen	DSN
Girard SD Outfall	NDCGS000Q	E	Debris Screen	DSN
	NORTH PINO ARROYO WATERSHED (NOP)			
N. Pino Environmental Pond	NOPPA 000Q	E	Const. Wetland	CWB
N. Pino Debris Structure	NOPPA 001Q	E	Baffled Weir	BWS
	NORTH VALLEY EAST WATERSHED (NVE)			
PdN Pump Station	NVEPN 000Q	E	Mechanical Bar Screen	MBS
Montano Pump Station	NVEMO 000Q	E	Mechanical Bar Screen	MBS
Nature Center Pump Sta.	NVENC 000Q	E	Mechanical Bar Screen	MBS
Trellis-Campbell PS	NVETC 000Q	E	Mechanical Bar Screen	MBS
Duranes Pump Station	NVEDU 000Q	E	Mechanical Bar Screen	MBS
	PINO ARROYO WATERSHED (PIN)			
S. Pino Inlet Debris Basin	PINPA 009Q	E	Env. Pond Const. Wetland	CWB
S. Pino Inlet Debris Basin	PINPA 010Q	E	Ported Tower	SPO
	PIEDRA MARCADAS WATERSHED (PMC)			
La Orilla Outlet	PMCCC 000Q	E	Baffled Weir	BWS
Piedra Marcadas Dam	PMCPM 000Q	E	Submerged Port Outlet	SPO
	SAN ANTONIO ARROYO WATERSHED (SAN)			
San Antonio Outfall Sed & Debris Basin	SANSA 000Q	E	Submerged Port Outlet	SPO
	SAN?? ???Q	E	Debris MH	HDM
	SAN?? ???Q	E	Debris MH	HDM
	SAN?? ???Q	E	Debris MH	HDM
	SOUTH VALLEY EAST WATERSHED (SVE)			
Alcalde Pump Station	SVEAL 000Q	E	Mechanical Bar Screen	MBS
Barelas Pump Station	SVEBO 000Q	E	Mechanical Bar Screen	MBS
Bell & Commercial PS	SVEBC 000Q	E	Mechanical Bar Screen	MBS
S. Broadway Pond	SVESF 000Q	E	Debris Screen	DSN
	SOUTHWEST MESA WATERSHED (SWM)			
Pajarito Diversion Sed. Basin	SWMPD 010Q	E	Detention Basin Sed Fac.	DBS
Raymac Dam	SWMRD 000Q	E	Submerged Port Outlet	SPO
McCoy Dam	SWMMC 000Q	E	Submerged Port Outlet	SPO
	WEST BLUFF OUTFALL WATERSHED (WBO)			
W. I-40 Channel @ Coors	WBO40 075Q	E	Baffled Weir	BWS

TABLE II-3
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

EXISTING & CURRENTLY PLANNED STORMWATER QUALITY FACILITIES

Last Printed 9/16/2005

FACILITY NAME	FACILITY ID *(1)	STATUS *(2)	BMP TYPE	BMP ID
PROPOSED SWQ FACILITIES				
	BEAR CANYON ARROYO WATERSHED (BEA)			
Bear Canyon Arroyo Inlet	BEABC 000Q	P	SWQ Channel @ NDC	WQC
Bear Canyon Arroyo Inlet	BEABC 007Q	P	Debris Screen @ NDC	DSN
	CALABACILLAS ARROYO WATERSHED (CBS)			
Black Arroyo	CBSBD 000Q	P	SWQ @ Black Dam	
Calabacillas Arroyo	CBSCA 191Q	P	SWQ @ Swinburne Dam	
	CALABACILLAS OUTLET WATERSHED (CBO)			
	CAMPUS WASH WATERSHED (CAW)			
	DOMINGO BACA ARROYO WATERSHED (DOB)			
Domingo Baca	DOBDB 000Q	P	SWQ @ NDC	
	EMBUDO ARROYO WATERSHED (EMB)			
Embudo Arroyo - Fairgrounds	EMBSF 000Q	P	Basin Outfall	SPO
	GRANTLINE ARROYO WATERSHED (GRA)			
Grantline Arroyo	GRAGL 000Q	P	SWQ @ NDC	
	HAHN ARROYO WATERSHED (HAA)			
Hahn Arroyo	HAAHA 000Q	P	SWQ @ NDC	
	LA CUEVA ARROYO WATERSHED (LAC)			
La Cueva Arroyo	LACLC 000Q	P	SWQ @ NDC Diversion & Debris Only	
	NORTH CAMINO WATERSHED (NCA)			
	NORTH DIVERSION CHANNEL WATERSHED (NDC)			
Vinyard Arroyo	NDCVI 000Q	P	SWQ @ NDC	
	PIEDRA MARCADAS WATERSHED (PMC)			
Coors/PdN Pond	PMCCC 088Q	P	SWQ	
	SAN JOSE DRAIN WATERSHED (SJD)			
	SEQUOIA WATERSHED (TCS)			
	SOUTH DIVERSION CHANNEL WATERSHED (SDC)			
SDC SWQ @ Outfall	SDCSO 000Q	P		
SDC SWQ @ I-25	SDCSO 070Q	P		
	SOUTHWEST VALLEY WATERSHED (SWV)			
	TIJERAS ARROYO WATERSHED (TIJ)			

TABLE II-3
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

EXISTING & CURRENTLY PLANNED STORMWATER QUALITY FACILITIES

Last Printed 9/16/2005

FACILITY NAME	FACILITY ID *(1)	STATUS *(2)	BMP TYPE	BMP ID
	VISTA GRANDE WATERSHED (VSG)			
	VISTA MAGNIFICA WATERSHED (VMG)			

TABLE II-3
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

EXISTING & CURRENTLY PLANNED STORMWATER QUALITY FACILITIES
Last Printed 9/16/2005

FACILITY NAME	FACILITY ID *(1)	STATUS *(2)	BMP TYPE	BMP ID
OTHER AGENCY FACILITIES				
Haynes Park Wetland (Located on a tributary to the Calabcillas Watershed)	SSCAFCA	E	Debris forebay & wetland	SPO
Black Arroyo Cabezon SWQ @ Black Dam (a tributary to the Calabacillas Watershed)	SSCAFCA	P		

(1) See Figure 2 in Appendix A for Map/Locations.
(2) E= Existing; P=Proposed

TABLE II-4

AMAFCA/ALBUQUERQUE MS4
NPDES FLOATABLE PROGRAM STUDY
DEBRIS CHARACTERIZATION DATA SUMMARY

FACILITY NAME/ LOCATION	SAMPLE ID	SAMPLE DATE	SAMPLE COLLECTION DESCRIPTION	WET SAMPLE			NATURAL MATERIAL % by Vol.	MAN-MADE						COMMENTS
				VOL Gal.	WT Lb.	Density. #/cf		Fabric & Paper	Plastic	Cans Metals	Lumber	Cig. Butts	Other	
N. Pino Debris Facility	40326 NOP A	3/26/2004	Litter and Debris grab sample from plugged outlet screen, downstream of baffled weir.	8 Gal			60-70% - Tumbleweed & leaf litter	1 sock	2 bags, 1 styfm blk, cups, straws	3 cans	NA	NA	NA	
N. Pino Channel SWQ to Masthead	40326 NOP B	3/26/2004	Man-made litter collected from channel				NA							
N. Pino Environmental Pond	40407 NOP A	4/7/2004	High Water mark debris line close to inlet channel	5 Gal	3.5#	5.2	90% Seeds, light floatable mtrl.		1 bottle		2"x3"	16		
N. Pino Debris Facility	40407 NOP B	4/7/2004	Outlet grate downstream of baffle - grate plugged	10 Gal	30#	22.4, (wet)	75% saturated tumbleweed, leaves	10%	12% 4 bags, 1 sheet	3% 3 cans				
N. Pino Debris Facility	40407 NOP C	4/7/2004	Upstream of weir inlet basin, vertical sample close to inlet	7.5 Gal	10#	10	80% tumbwd, leaves, twigs	1%	9% scrap pieces					4" sediment, 18" organic debris, top 6-8" litter & seeds
N. Pino Debris Facility	40407 NOP D	4/7/2004	Upstream of weir inlet basin, vertical sample close to outlet, top 8"+/- only	5 Gal	5.5#	8.2	20% seeds, small twigs (71% total basin)	8%	60%, styrene, bottle, bags, sheet	4%	12%	1		4" sediment, 30" organic debris, top 6-8" litter plus seeds
Type 'D' Inlet grate Kathryn & Quincy, SE	40404CA WA	4/4/2004	Debris collected on top of grate in sump.	5 Gal	6#	9	3 gal, 60% sticks, leaves	1 gal, 20%	1 gal, 20%, 2 bags, scraps of cups, etc.					This debris bypassed upstream type 'C' inlets.
Barelas Pump Station No. 32	40630SV EBOA	6/30/2004	Debris collected from top of Dumpster after conveyor belt off of Mechanical Bar Screen	5 gal	6#	9	1.7 gal, 33% small sticks, leaves and seeds	3%	60%, 3.3 gal, sheet and expanded foam	4%	negl.	70		Wet debris sample material
S. Pino Debris Basin	40713PIN PAA (PINPA01 Q)	7/13/2004	Debris collected from bottom of debris basin along south side at overflow spillway	16 gal	22	10.4	14 gal, 88%	<0.5 gal	10% 1.5 gal, - mostly styrofoam, no bottles	2	negl.	50		Wet debris sample material, air dry density 5.6 #/cf
SUMMARY						10.6	64%		30% of total vol.					
									75% of litter vol.					

III. DATA COLLECTION

A. LITERATURE REVIEW

Reference documents relevant to this study and an overview are in Appendix B. A brief summary of the conclusions reached from the review of these reports and documents is presented in this section.

1. Data Limitations

Data regarding gross pollutant production, characterization, etc. is limited. A standardized description or definition of gross pollutants and floatables in stormwater runoff has not been established. As a consequence, different studies from different agencies and from different locales are not consistent, leading to confusion and to the discounting some of of the limited data available.

Data scatter, accuracy and consistency is a persistent problem in essentially all of the studies reviewed. Frequently, the effect of the BMP or facility on the quantity or characterization of the gross pollutant or floatable is indiscernible from the variation in the data due to storm event differences, length of time since the last storm, time of year, etc. (BMPRD#05,#06). Also, much of the gross pollutant data available is anecdotal or based on approximate measurements.

2. Data Protocols

Technical data from the literature was utilized directly and indirectly in formulating the LITRNO Plan. The paucity of reliable data and the underlying lack of universally accepted definitions and data protocols must be considered in the Plan development, implementation and future updates.

The Plan incorporates initial rough data protocol definitions. Formalization of monitoring and design protocols are identified as GPRP elements. As local experience accumulates and as national and international data and consistency develops, it is expected that modifications to the GPRP will be needed to conform to changing standards.

3. Data Summary

The following is brief overview of data from review of the reference documents, arranged by topic.

a. Definitions and Data Protocols

- Gross pollutants are also identified as gross solids, floatables, etc. in the literature. Sometimes the definition is limited to litter while other studies include natural debris, organic matter and coarse sediments. Due to the significant amount of organic debris and the co-mingling of litter with the organic waste in local runoff, this study defines gross pollutants as litter, organic debris and coarse sediments.
- The size limitation in gross pollutant definitions varies from 5mm (0.2" nominal) up to 4" for some roadside investigations. A size limitation of 1-3/4" is recommended for the AMAFCA/Albuquerque system.

b. Debris Characterization

- Only a portion of the gross pollutants float on the surface. Up to 80% of the gross pollutants may be buoyant neutral and may not float on the surface.
- Vegetative debris accounts for the bulk of gross pollutants, typically 60% to 90%.
- Cigarette butts are the most numerous litter item. Plastic and paper account for the largest volume of litter, in the range of 40% to 75% of litter.
- Wet (as collected) densities in the range of 8 to 32 lb/cf are reported in the literature. Approximately 10 lb/cf to 22 lb/cf was measured for local debris.

c. Generation of Gross Pollutants

- The volume of gross pollutant generated ranges from 0.5 to 21.0 cf/ac/yr.
- Caltrans has used an average generation of 10cf/ac/yr for roadway runoff.

d. BMP Data

- Data regarding the effectiveness of non-structural BMPs, such as increased sweeping, education, inlet grate designs, etc., are inconclusive.
- Gross pollutant reductions are reported for structural BMPs ranging from 10% to 85%.
- If BMPs are designed to drain within 72 hours, mosquito breeding is not typically a problem
- Most programs focus on storm water constituents and do not directly address gross pollutants. Many of these focus on treating a storm water capture volume representative of the 80th percentile storm.

- The National Stormwater BMP Database tracks reported performance data from BMPs. It does not address gross pollutants.

e. Cost Data

- Capital costs of structural BMPs range from $1,000 to $107,000/ac.
- O&M costs are estimated between $500 and $3,000 per device, such as an inlet insert.

B. LOCAL AGENCY PROGRAMS

As a part of this study, local agencies and permittees were interviewed to gather data on existing systems for gross pollutant control. This included the following agencies:

Albuquerque Metropolitan Arroyo Flood Control Authority
City of Albuquerque
New Mexico Department of Transportation – District 3
University of New Mexico, Athletic Dept., Physical Plant and South golf Course.

Local Agency Summary:

1. Funding for NPDES implementation and O&M is from the operating budget.
2. Source controls are just getting started.
3. The MS4 Storm Water Management Program (SWMP) is in place.
4. Monitoring and record keeping is spotty.
5. Approximately 55 storm water quality facilities have been constructed and are operational.

The interview forms, meeting notes and summaries are in Technical Appendix III.

C. OTHER AGENCY PROGRAMS

As part of this study, a number of out-of-state entities were interviewed by Camp Dresser and McKee (CDM) regarding their municipal programs for Gross Pollutant Control. This included the following entities:

a. City of Arlington, Texas (NCTCOG)
b. City of Los Angeles, California
c. Maricopa County, Arizona
d. City of Mesquite, Texas (NCTCOG)
e. City of Phoenix, Arizona
f. Pima County, Arizona
g. City of Tucson, Arizona

The interview forms, results of these interviews along with a bibliography and summary are contained in Technical Appendix III.

Other Agency Review Summary:

a. Only the City of Los Angeles and the North Central Texas Council of Governments (NCTCOG) have dealt with floatable/gross pollutant issues as part of their MS4 permits. However, all of the agencies have experienced problems with floatables/gross pollutants.
b. Landscaping wastes are a problem, with the City of Los Angeles estimating that landscaping waste makes up to 40-50% of its total "floatable" problem.
c. Street sweeping is an important part of all programs.
d. Operations and maintenance of the stormwater system vary from system to system, however a common problem is understaffing.
e. Only Tucson and Los Angeles have attempted to conduct floatable characterization.
f. All agencies conduct public education programs and most have chosen to target the school-aged group as their first priority.
g. Only Pima County and Los Angeles have active enforcement efforts. Only California has a bottle bill.

D. INFORMATION ON AVAILABLE CONTROL SYSTEMS, PRODUCTS AND APPROACHES

A summary of commercially available gross pollutant control systems currently in use has been extracted from the literature by the Center for Watershed Protection (CWP). The scope of the investigation included national and international programs to implement gross pollutant control measures, with a focus on areas that have similar management needs and flow conditions as the AMAFCA/Albuquerque system. Facility characteristics and equipment manufacturers are listed in Technical Appendix IV. Rreferences are listed in appendix B, SWQRD #22 through SWQRD #46.

1. Scope of Available Data

A review of the available literature and product information pertaining to gross pollutant and floatables control reveals a wide variability of approaches used and product performance. In most cases, program development and product testing have been the result of regulatory requirements for control of floatables and trash/debris as part of municipal CSO programs (New York/New Jersey), NPDES programs (Florida, Texas, and California), or other similar regulatory efforts abroad (Australia and South Africa). A common theme throughout these efforts is the importance of litter characterization and gaining an understanding of the litter and debris "footprint" of contributing drainage basins. This is necessary both for choosing the appropriate type of BMP, as well as for sizing the collection system.

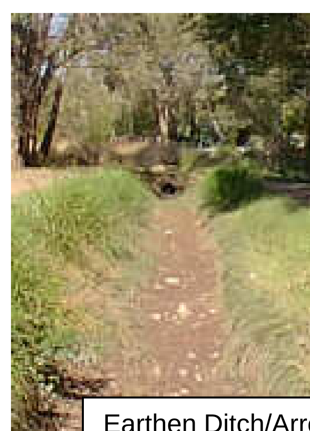
2. Pros and Cons of Various Management Approaches and Considerations for Selecting the Appropriate BMPs

   a. Central versus Distributed Gross Pollutant Collection Systems. A centralized collection system relies on large diversion or end of pipe collection approaches that attempt to collect and store accumulated gross pollutants in a limited number of locations in the drainage system. An example would be the use of weir and boom diversions to move debris out of large channel systems into a detention pond; or end of pipe netting systems placed to trap debris in runoff from a large drainage area before entering a significant water body.

Trash from stormdrain pump station

The initial costs of centralized systems are significantly higher than distributed systems, and a large land area may be necessary for debris diversions in high-flow systems. Maintenance costs, however, may be lower in the long-term with this approach. A down-side of this approach would be that the aesthetic and aquatic impacts of gross pollutants would remain unaddressed in the contributory drainage to the control location.

   b. A more distributed system involves a tailored approach to assess sub-watershed or catchment-level trash and debris characteristics, and retrofit source areas through a variety of techniques. Techniques include catch-basin modifications, trash containers, a variety of inlet trapping devices, and smaller outfall modifications utilizing trash baskets or netting devices. These techniques are generally less expensive to implement initially, frequently requiring little or minor modification to existing infrastructure, but requiring more frequent maintenance.



Earthen Ditch/Arroyo

Baramy Gross Pollutant Trap

   c. Generally, a combination of approaches provides the most cost-effective gross pollutant reduction.

AMAFCA/Albuquerque’s drainage infrastructure currently contains such a combination of approaches, and managers are seeking ways of improving upon the gross pollutant reduction performance of the existing infrastructure, as well as potential new products and technologies that can be integrated into the system. Multiple objectives, based on long-term program goals, are being considered including increased public awareness, water quality treatment goals, channel protection needs (e.g. erosion control), and operation and maintenance capacity. Another overall program consideration is the disposal of debris, considering a variety of methods including recycling, landfills and mulching. The control technologies also vary in the extent to which they provide dry storage – that is, capture and storage of gross pollutants out of the catch-basin sump area or water stream. Dewatering of the stored debris reduces the weight of material that must be removed, reduces nutrient leaching, and minimizes mosquito nuisance and vector problems.

3. Evaluation of Available Systems

The following sections describe the available types of technologies currently in use to control gross pollutants, with information on design considerations. Table 1 provides more detailed information on maintenance practice, costs and pollutant removal efficiencies (if available), flow conditions that the products are designed to operate within, and other product information. Table 2 provides detailed contact information on the manufacturers.

Inlet Devices

This category of pollutant removal devices includes screens and trash racks, catch basin inserts, and catch basin modifications. Inlet devices typically have limited roadway/highway applicability due to their high maintenance needs; they are better suited to parking lots, commercial areas, and smaller impervious areas.

a. Screens and Trash Racks are generally intended to filter out larger debris from the drainage network and rely on effective street cleaning for smaller debris removal. These devices may cause local flooding if they are inadequately maintained, and, though they may be important as part of a treatment-train approach, were found to be ineffective at gross pollutant removal in general (NYC). The use of grates and trash racks may be important, however, in keeping large woody debris, tumbleweeds, and other larger diameter debris out of the very dynamic drainage system that is found in Albuquerque.

Catch Basin Inserts generally are targeted to small drainage areas (e.g. half acre). Typically these devices have been used for water quality control and include many of the more common oil/grit separators.

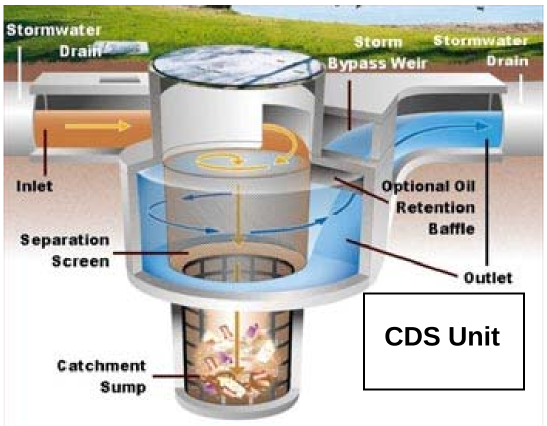
Grate Inlet Skimmer Box

There are many of these products on the market, however there is a lack of third party verification on many of them, particularly regarding their performance for gross pollutant removal. Several of the products that have been cited in the gross pollutant literature are covered in Table 1, though this list is not exhaustive. In general, these products may be suitable for use in Albuquerque in small, focused areas where maintenance can be assured, such as fast-food areas, small commercial areas, etc. Many of these devices provide some level of water quality pre-treatment, however, if not adequately maintained, water quality benefits are negligible. A general problem observed with inserts is the tendency for paper and leaf debris to dry out between storms and be washed out with the next event. The grate inlet skimmer box has been shown to be effective at capturing significant amounts of yard trimmings and vegetative debris, along with other gross pollutants.

b. Catch Basin Modifications for the purpose of gross pollutant trapping generally involve adding a baffle or hood to an existing catch basin. The catch basin hood has commonly been used in CSOs to trap sewer gases, but are also effective at capturing gross pollutants. If existing catch basins do not contain a sump area, this may also be retrofitted. Many municipal design manuals contain standard specs for the hood, and these devices are readily available and easily retrofit. The main consideration is the additional maintenance required to remove the accumulated debris. This approach may be particularly effective in catch basins that have a 180 degree alignment on inflow/outflow. A proprietary device that has seen increasing usage is the SNOUT, a more complex hood system.

c. In-line Devices

The in-line devices include a number of products that can be incorporated into the existing pipe infrastructure, either through direct insertion in a modified pipe section, or through use of a pipe diversion. These devices typically include hydrodynamic separators, cartridges and inserts, in-line netting systems, litter baskets, baffle boxes and debris baffles. These systems require careful design consideration to ensure hydraulic capacity in the system is not compromised, either by the device or consequences from inadequate maintenance. The advantage of several of these systems is that they generally have a greater capacity than catch-basin devices and can be retrofitted in ultra-urban settings, however, complications with existing infrastructure can increase installation costs. Maintenance of these systems frequently



CDS Unit

Downstream Defender

involves a vacuum truck and in some instances a crane or claw, such as with baskets or inserts that must be lifted and emptied. Care must be taken not to locate these structures under power lines or trees, or along busy roads where traffic management is a problem.

Hydrodynamic Separators were initially designed to improve upon inlet devices and sumps in terms of water quality treatment. Many of these devices are on the market and have been field tested for their water quality treatment benefits, with good results for TSS, sediment and oils. Few of them have verified information on litter/debris removal, with the exception of the CDS unit, developed in Australia, which is reported to be effective during high flows, and retains the accumulated gross pollutants already captured without wash-out from subsequent storms.

Cartridges and Pipe Inserts include a limited number of products, and these are generally either constrained by cost or lack of available data on their effectiveness. Of note are two pipe-insert designs developed by Caltrans that performed very well but had high construction costs.
In-line Netting Systems have generally had more use in lower flow environments than found in Albuquerque. These systems should be changed after every sizable storm event to avoid loss of hydraulic capacity. Baffle Boxes have had extensive use in Florida, where summer rainfall typically consists of high-intensity short duration storms. These products have been designed primarily to retain sediment, but also retain debris, particularly organic debris, on a platform above the water surface in order to reduce nutrient leaching into the system. The proprietary devices come in a number of configurations and sizes and are reported to function under relatively high flows. These products are designed to slow the incoming flow down to allow sediment and settleable solids to fall out. They also have trash screens to trap floatable debris. Regular maintenance is essential for their performance, particularly for floatable debris. Debris Weirs, Vanes and Baffle Systems are located in open channel settings, typically above a collection pond or diversion chute where the weir, vane or baffle guides gross pollutants for holding. These systems typically do not provide much in the way of water quality treatment, unless the diversion pond is designed for this purpose. Several

In-line Netting Trash Trap

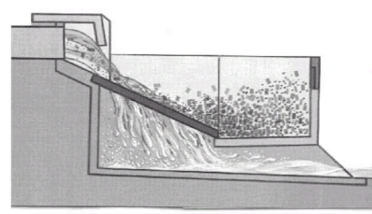
Nutrient Separating Baffle Box

of these systems are in use or under design for concrete channels in Albuquerque.

Baramy Vane Deflector

d. End of Pipe Devices

These devices are typically installed at the pipe outfall and tend to be the easiest to maintain if sited in an easily accessible location. Many of these products and designs require some headloss (e.g. drop structure) to function. Products include netting systems, litter baskets, cages and traps, and booms.



Netting Systems have undergone a number of field trials including pilot studies, primarily under rainfall conditions typical of the mid-Atlantic states. These products performed very well for gross pollutant removal and are a relatively low-cost solution under the conditions tested. Maintenance involves removing and discarding the nets, typically with a boom truck. Nets are available in heavy weights that are reported to perform under high-flow conditions. Floating net units, mounted on a floating boom, are not recommended for the Albuquerque system due to the necessity for year-round flows. They may have application on the Rio Grande, but would be difficult to maintain.

Baramy Gross Pollutant Trap

Litter Baskets, Cages and Traps include several products, all of which are designed to divert trash at an outfall into a holding area or basket, while flow continues through the system unimpeded. Several of these systems have fairly fail-safe designs that allow flows to by-pass the system regardless of the amount of debris accumulated. Most require some head-loss and are designed to operate under high flows. Several of these products have been extensively tested in Australia under similar high-intensity rainfall/runoff conditions. All require good access for a vacuum or dump truck.

Booms are more frequently used in slow moving water bodies, and operate by holding or deflecting debris into a back-water area where it can be contained and collected. These systems are generally ineffective at capturing waterlogged and neutrally buoyant material, however, they can be useful where oil spill recovery is also an issue.

Categories of BMPs were established based on national and local data and are summarized on Table III-1.

E. TRASH AND DEBRIS PUBLIC EDUCATION AND NON-STRUCTURAL TREATMENT PROGRAMS

1. Trash and Litter Generation.

A significant amount of trash and litter is generated from roadways through deliberate actions (Fresno CA study of state highways concluded that over 75% or litter was thrown deliberately) or through poor management of trash and debris hauling operations (uncovered, etc.). An adopt-a-road program should be an important aspect of an overall program for both education and litter control.

2. Message.

Develop one effective message for all groups that is dynamic and positive. Caltrans Public Education Research Study Literature Review, through its segmentation study, found that 83% of LA's population could be reached through a single, integrated, multi-faceted communications campaign. Developing one message, distributed through various media points, also is more cost-effective than developing marketing campaigns and materials for numerous "messages". "Don't Mess with Texas" and "Don't Waste Australia" are two examples among many. Keep the campaign message and mascot broad enough that sub-messages can be targeted to include other similar pollution problems such as sediments, leaking oil, nutrients, etc.

3. Multi-lingual.

Messages must have multi-lingual materials based on the local population, being sensitive to difficulties in translation – messages don't always directly translate well from English to another language.

TABLE III-1
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY

BMP CATEGORIES

BMP ID	**Gross Pollutant Study & GIS Database**	**National BMP Database BMPRD#01**	**Denver UDFCD SWQRD#17**
BWS	Baffled Weir Structure (BWS)		
CWB	Environmental Pond Sedimentation Facility (CWB)	Wetland Basins	Constructed Wetlands Basin (CWB) Sedimentatin Facility
DBS	Extended Dry Detention Basin Facility (DBS)	Detention Basin	Extended Detention Basin (EDB) Sedimentation Facility
DSN	Debris Screen - Non-mechanical (DSN)		
	Grass Filter Sedimentation Facility (GFS)	Grass Filter Strip	Grass Buffer (GB) Grass Swale Sedimentation Facility (GS)
HDM	Hydrodynamic & Debris Manholes(HDM)	Hydrodynamic Devices	
ISS	Infiltration System Sedimentation Facility (ISS)	Infiltration Basin	
MBS	Mechanical Bar Screen (MBS)		
MFS	Media Filter Sedimentation Facility (MFS)	Media Filters	Sand Filter EDB (SFB) Porous Landscape Detention (PLD) Sedimentation Facility
OWS	Oil/Water Separator (OWS)		
PPS	Porous Pavement Systems (PPS)	Porous Pavement	Modular Block Porous Pavement (MBP) Porous Pavement Detention (PPD)
RPS	Retention Pond Sedimentation Facility (RPS)	Retention Ponds	Retention Pond (RP) Sedimentation Facility
SPO	Submerged Port Outlet (SPO)		
WQC	Water Quality Channel Sedimentation Facility (WQC)	Wetland Channels & Swales	Constructed Wetlands Channel (CWC) Sedimentation Facility

4. Pursue partnerships.

   Particularly with other local agencies that have similar public education NPDES requirements, and with entities that can provide in-kind contributions on grant applications to support outreach activities.

5. School Programs.

   Incorporate educational materials into school curriculums and teacher training.

6. Illegal Dumping.

   Separate approaches should be developed for litter and illegal dumping; litter is primarily driven by behavior, while illegal dumping is driven by economic costs of disposal. Education and media campaigns help prevent littering, while strong enforcement programs help decrease the occurrence of illegal dumping in urban areas. (from Urban Litter Partnership, 1998)

7. Information Sources:

   - Adopt-A-Road Program in Collier County, FL started in 1989 and is modeled after the program started in Texas two years earlier. The program is managed by the Collier County Road Maintenance Department, growing steadily to now include 80 sponsoring groups that gather trash and other potentially more harmful pollutants from 207 miles of roadway, and almost double that amount of miles in swales lining each side of the road. The trash is bagged up, with larger debris piled near roadside stations. From there, County maintenance crews take it to the landfill. In the year 2000 an average of 50 tons of trash per month was prevented from entering the stormwater collection system via swales along these roadsides. As part of the program, signs are posted along adopted roadway segments recognizing the sponsor.

   - Healthywaterways.org contains a variety of valuable information on structuring an effective message.

F. TRASH AND DEBRIS CHARACTERIZATION FROM THE LITERATURE

1. Types of Debris

The types of debris and amount of gross pollutants delivered to the stormdrain system is important for designers and managers in order to properly size trapping systems, as well to target appropriate source reduction strategies and educational programs. The amount of litter delivered to a system is highly variable, and is dependent on a large number of factors including the following:

- The type of land use (commercial, industrial, residential, etc.);
- Socio-economic factors contributing to the level of environmental concern and awareness in the community;
- Rainfall pattern – such as that found in Albuquerque consisting of a long dry period followed by seasonal heavy rain – allows litter to build up in the drainage area until it is either picked up by collection authority, or swept into the stormdrain system by a downpour. This rainfall pattern provides the opportunity for fairly aggressive and targeted debris removal operations prior to the rainy season, but also may result in large amounts of accumulated debris being washed down the channels with the first heavy rains of the season, creating the need for larger trapping system sizes;
- Type of vegetation in the drainage area – for instance, areas that have a significant deciduous tree canopy will accumulate leaf litter in the fall, areas of significant lawn coverage may have lawn clippings delivered to the system, etc.;
- Efficiency and effectiveness of refuse removal by the local jurisdiction or property owner;
- The level and effectiveness of treatment technologies to remove litter and debris from the drainage system;
- Existence of and enforcement levels of littering regulations.

  The debris load from drainage areas with primarily residential or mixed residential/commercial land uses may consist of 67% to 85% of organic/vegetative material, with plastics and paper making up most of the remainder (from Melbourne, AUS). In urban/commercial areas, plastics have been found to make up from 57% to 66% of the debris load, with paper and styrofoam making up most of the remainder (from New York City, Australia, and S. Africa).

Data on gross pollutant constituents from several studies is compared to local data on the charts in Section II.

2. Debris Load Prediction Methods

There is currently a wide variation in reported loading rates for litter/debris from various types of land uses. This variability is due in part to inconsistencies in how debris was collected for measurement; for instance, was it dry or wet, compacted or uncompacted volume, or mass-based, etc. There has also been variability in the trapping efficiency of the techniques used to collect debris in the various studies reported, as well as inconsistencies in how land uses are categorized (e.g. urban vs. commercial/mixed use). In addition to these inconsistencies, there is a genuine variability that is to be expected from one drainage area to another, based on the factors listed above in Section IV. It is therefore highly recommended that the load prediction rates discussed here be used only as an approximation until data is collected to determine the trash and debris “footprint” for typical land uses in the Albuquerque area.

Generally, it has been found that urban/commercial areas contribute the highest trash load (Allison, et. al) consisting of organic matter (leaves/twigs), plastics, paper, Styrofoam (food containers), and cigarette butts. In this study, an approximate loading rate for urban areas is 103 pounds (dry)/acre/year. In another study conducted by Orange County, CA (June 2003), gross solid load approximations are estimated by combining results from three studies (Melbourne 2001, Caltrans 2000, and Allison 1998):

Land Use Type	Gross Solid Volume	Gross Solid Volume (design values)
Commercial	7.6 ft^3/ac/year	15.2 ft^3/ac/year
Residential	4.0 ft^3/ac/year	8.0 ft^3/ac/year
Light-Industrial	2.1 ft^3/ac/year	4.2 ft^3/ac/year

In the absence of more specific load estimations based on data collected for Albuquerque, this approach may provide planning-level load estimates.

G. BMP SELECTION AND EVALUATION CRITERIA

A review of similar studies to evaluate gross pollutant treatment technologies has yielded the following list of potential evaluation criteria that could be used to aid in selecting the most appropriate BMPs. One possible approach would be to weight the chosen criteria based on the relative importance of each to the study area.

- Maximum flow rate
- Life expectancy
- Available hydraulic head
- Litter removal efficiency
- Potential for increasing flood risk
- Aesthetics
- Long-term O&M costs and simplicity
- Available footprint/space requirements

IV. GROSS POLLUTANT REDUCTION OPTIONS

The options to reduce gross pollutants within the AMAFCA/Albuquerque system are presented in two broad categories –

- Structural BMPs consisting of physical components in the system to remove pollutants already in the system and
- Source Control BMPs to reduce the generation and/or introduction of gross pollutants.

Additional information from the data collection from other studies, reports and activities is included in Section III.

A. STRUCTURAL BMPS

1. Drain Inlet Inserts

Drain inlet inserts are proprietary BMPs consisting of flow-through insets placed in existing inlet structures to filter gross pollutants out of the flow through the insert.

Inserts typically require a high degree of maintenance and must be monitored closely during storm events to ensure the unit is not clogged or bypassing flow. Inserts are effective at removal of gross pollutants when properly maintained.

Due to the large number of inlets within the system and the maintenance requirements, drain inlet inserts are not proposed as a general BMP for the Gross Pollutant Reduction Plan. Inserts may be appropriate on a case-by-case basis for small drainage areas with a limited number of inlets and a controlled maintenance program.

2. Storm Drain Outfall Trash Traps

Outfall and end-of-pipe devices such as trash traps, screens and netting systems can be used to capture trash from an enclosed system before drainage flows into a larger system or open channel. Good access is necessary for trash and debris removal from these systems. The have an advantage over inlet inserts in being able to hold greater quantities of debris and several products are designed to function when filled with debris. They may provide a solution on a case by case basis where fairly large quantities of debris removal are desirable but ponds are not a feasible solution. Two examples in the existing system are the Girard and Alameda storm drain outfalls to the North Diversion Channel.

3. Storm Drain Hydrodynamic Pollutant Removal Devices

Hydrodynamic Separators were initially designed to improve upon inlet devices and sumps in terms of water quality treatment. Many of these devices are on the market and have been field tested for their water quality treatment benefits, with good results for TSS, sediment and oils. Few of them have verified information on litter/debris removal, with the exception of the CDS unit, developed in Australia, which is reported to be effective during high flows, and retains the accumulated gross pollutants already captured without wash-out from subsequent storms.

4. Dry Detention Basins

Dry detention basins are normally dry, detaining runoff during and after the storm event. Historically, detention basins have been used for flood control within the existing system. Extended detention basins perform water quality treatment by extending the detention time. Extended detention time is usually considered detaining the average hydrograph 24 hours with no more than 50% of the water quality volume draining in the first 24 hours. For extended detention, sedimentation is the primary removal mechanism. Floatable removal can be accomplished with outlet structures to screen or otherwise prevent litter and organic debris from exiting the detention pool. Dry detention systems can be prone to clogging resulting in bypass of accumulated debris and re-suspension of trapped materials if not regularly maintained. Several existing detention basins within the system have been retrofitted with submerged port outlets to reduce the discharge of floatables as part of the existing Gross Pollutant Reduction Plan.

Dry detention basins can be effective at removing gross pollutants. They are relatively ineffective at removal of dissolved constituents and bacteria. Addition of a shallow marsh (micro-pool wetland) in the bottom can provide additional pollutant removal and reduce the re-suspension of settled pollutants.

Due to the number of existing detention facilities, available floatable control options and the continued use of detention as a means of flood control, the use of dry detention basins is a central component of the Gross Pollutant Reduction Plan.

5. Biofilters

Biofilters consist of dense vegetation planted in an engineered soil matrix, frequently with an underdrain, designed to filter runoff as it passes through the BMP. Biofilters typically require slow velocities to avoid erosion and adequate length to provide residence time. Examples of biofilter practices include open channel filtering, bioretention areas (Rain Gardens), wet and dry swales and infiltration swales.
The detention or residence time is generally insufficient for infiltration. Biofilters can be effective in removing small amounts of gross pollutants from runoff, although they are primarily used as a water quality device. Because they are typically designed to be landscaped attractively, routine maintenance is recommended in location that collect significant amounts of gross pollutants.

Biofilters are an effective means of trapping floatables at the source and are proposed as one source control component of the Gross Pollutant Reduction Plan.

6. Media Filters

Media filters include sand, perlite/zeolite and other natural and manufactured filter media. Typically, a sedimentation basin is required prior to reduce the turbidity to minimize clogging of the media surface. Media filtering practices include surface sand filter, underground sand filter, perimeter sand filter, organic media filter, pocket sand filter and dry well.

Sand filtration is a proven technology with good gross pollutant removal and modest removals of bacteria and dissolved metals. Filtration with a sand filter is used at the Menaul Pond as one of the City's SWQ trials, including monitoring of the overall pollutant removal efficiency. This system clogs easily from the fine sediments in the stormwater runoff, requiring frequent maintenance. In general, media filters require more maintenance than other BMPs.

Media filtration is not proposed as a primary component of the Gross Pollutant Reduction Plan due to the high maintenance required. This is a viable technology for limited sites with a good maintenance program.

7. Infiltration

Infiltration is a zero discharge solution infiltrating the entire design water quality volume. Potential groundwater pollution impacts and surface water right impacts must be considered. Infiltration devices locally have a poor performance record due to clogging. Retention and re-use as irrigation by pumping is an option to infiltration. Infiltration BMPs include infiltration trench and manhole (French drains), infiltration basin, wet well and porous pavement.

Infiltration is not proposed in the Gross Pollutant Reduction Plan due to poor local performance, potential problems with groundwater quality and water right issues.

8. Wet Ponds and Wetlands

Wet ponds and wetlands are systems with a permanent pool in combination with extended detention, shallow wetland, etc. providing volume equivalent to the entire water quality storage volume. The relative size and relationship of the permanent pool, extended detention and wetland is quite varied. These systems are typically proposed for treatment of the entire spectrum of pollutants with a debris forebay to remove gross pollutants. Examples of these systems include simple wet retention ponds, wet extended detention pond, multiple wet pond systems, pocket ponds, shallow wetlands, extended detention wetland, pond/wetland system, pocket wetland, submerged gravel wetland, constructed wetland and wetland basin with open water surface.

These systems typically incorporate slow release of the stored runoff and provide good opportunity for gross pollutant removal and varied reported efficiency for removal of dissolved constituents and bacteria. Vector control for mosquitoes is a concern due to the West Nile Virus. Mosquito fish (Gambusia) are one mosquito control option. Well designed ponds contain adequate surface area, flow-through, depth and habitat diversity that will minimize mosquito problems. It should be noted however, that adequate maintenance is very important in controlling mosquito breeding in wet ponds (as well as dry ponds). Trash build-up, particularly plastic and Styrofoam containers, etc. that hold even small amounts of water can result in numerous breeding areas for mosquitoes that are difficult to manage with any sort of treatment program such as natural predators, larvicide's or spraying. Additionally, many studies have found that dry ponds are particularly problematic in terms of mosquito production if they do not drain down within 72 hours or if they contain ruts and depressions that hold water for longer periods. This is because they do not contain the stable pond ecosystem that allows for development of a predator community of insects, birds and other organisms that naturally prey on mosquitoes.

Wet ponds and wetlands are one of the available BMPs used in the Gross Pollutant Reduction Plan providing both floatable control and other pollutant removal opportunities.

9. Upstream Pollutant Control

Upstream pollutant controls are structural and/or treatment BMPs to minimize gross pollutants entering the AMAFCA/Albuquerque drainage system from drainage basins and upstream tributary areas outside the AMAFCA boundary. Two different types of upstream areas impact the system, those that are urbanized such as the flows from the Rio Rancho area on the northwest side and flows from undeveloped areas such as the Forest Service lands along the eastern foothills of the Sandias.

These controls would be accomplished by a combination of agreements with upstream urban and developing areas to provide gross pollutant controls within their drainage system and structural facilities within the AMAFCA/Albuquerque system to trap incoming gross pollutants. The runoff from the Forest Service areas are mostly organic and sediment and are considered lower priority than the litter laden runoff from upstream urban areas.

The elements in the GPRP include requiring upstream urban developments to incorporate gross pollutant removal facilities, retrofitting existing detention facilities with gross pollutant control outlets and providing gross pollutant reduction facilities on arroyos that do not have upstream detention facilities.

B. SOURCE CONTROL AND NON-STRUCTURAL BMPS

1. Runoff & Impervious Surface Reduction BMPs

These are planning and low impact development (LID) BMPs to reduce the total impervious area to reduce the runoff volume, to encourage infiltration and to slow runoff rates. Practices include maintaining areas of natural or planted vegetation, directing rooftop drainage to pervious landscaped surfaces, landscape buffers, directing impervious area runoff to pervious surfaces, water harvesting, rain gardens, rain barrels, green roofs, etc. In conjunction with litter education and other source controls, these better site design measures can reduce the amount of gross pollutants that are flushed from a site and swept downstream. This approach could be particularly useful in commercial areas, has the advantage of meeting multiple watershed management objectives and may have the effect of increasing public awareness of the problem by making the collection mechanisms more visible.

These practices are included in the GPRP as one recommended component of the stormwater quality update to the Development Process Manual (DPM).

2. Operations and Maintenance

   a. Street Sweeping

Street sweeping removes the buildup of litter and gross pollutants along the curb using vacuum assisted sweeper trucks. Some sweepers have been reported to sweep debris into storm drain inlets along the route, aggravating the delivery of gross pollutants in the system. Also, studies to measure the effectiveness of street sweeping in the reduction of gross pollutants have been inconclusive, due to the large number of variables impacting the pollutant load. Due to the inconclusive nature of a number of studies on street sweeping, there is currently active research occurring to determine the most effective types of street sweepers for gross pollutants as well as other urban pollutants. The potential benefits of street sweeping make this an important part of the GPRP, and current research efforts should be closely monitored to ensure that the most appropriate technology is included in the plan.

The City is currently conducting a litter reduction campaign and is increasing the number of street sweepers in the fleet. Street sweeping is an integral component for source control of the Gross Pollutant Reduction Plan.

   b. Inlet Cleaning

Debris and litter collect in the inlets in the system between large storm events. This is most noticeable in the fall with deciduous tree leaf fall. Typical storm runoff rates during the winter are not substantial enough to flush the collected material out of the inlets.

Annual inlet cleaning in late winter or early spring is one proposal to reduce the large volume of debris conveyed in the system. This will minimize overwhelming structural BMPs and will minimize the introduction of organic materials in the receiving waters and the corresponding increase in BOD.

Innovative partnerships should be pursued to improve the frequency of inlet cleaning. These may include such efforts as voluntary adopt-a-drain, adopt-a-road, litter block captains and urban management districts where business owners contribute to a fund to pay for drain cleaning within a defined business district. Innovative maintenance and funding approaches will also create the opportunity to implement, on a pilot basis, some of the more effective catch basin insert and gross pollutant trap technologies to control the gross pollutants at the source.

c. Good Housekeeping

Municipal and public agency operations, such as grass mowing, equipment yards, trash collection and hauling, etc., can be significant sources of gross pollutants. Good housekeeping refers to the efforts to reduce this source. A combination of education of public employees, installation of structural BMPs, reduction of litter in public spaces, adequate trash and debris collection facilities, etc. is needed. Good housekeeping program development and implementation is recommended. Education of public employees is a critical component of the good housekeeping program.

3. Education and Outreach

The education and outreach program was developed by Griffin and Associates based on existing local outreach programs such as the Ditch Safety Campaign and on information from California, Arizona, Colorado, Texas, Utah, Florida and other reports listed in Appendix B. Several studies attempted to use gross pollutant monitoring to track the effect of an education program on litter rates, i.e. drain traps to collect the amount of litter over the course of a year. Due to data scatter, most of these were inconclusive. However, all sources indicate a strong education program in conjunction with a multimedia advertising campaign, are cost effective source control measures. Florida concluded that an observed increase in litter rate was due to a reduction in the education program.

a. The program in the GPRP incorporates the following data from these sources:

- A combination of public information (events &school assemblies) and multi-media campaigns seems to work best.
- Budgets vary greatly. AZ Clean & Beautiful has a $2.2M budget for advertising, Don't Mess with TX has a $2M budget for advertising and $400,000 budgeted for public education. For comparison, NM Clean & Beautiful has a $150,000 budget for advertising.
- Most states and organizations use some form of advertising to get their message out.
  - Denver uses existing trash pick up trucks for advertising, which is cheaper than advertising on the buses. The trucks go citywide at least weekly. Albuquerque had done something like this in the late 90s.

    - Nevada uses bus stop panels and direct mailing via utility bills to promote their anti-pollution message.

- All the campaigns utilize slogans (i.e. Don't Mess With Texas, Uh Oh Better Call the Litter Hotline, The Earth is Not Your Ashtray, Keep Our Earth Clean, etc.) as well as mascots.
    - Atlanta has implemented a host of mascots that deal with the topic of pollution, including Captain Clean Stream, Bubba Biosolids and Less Waters. The mascots are based on the suggestions of 4- to 12-year-olds that were obtained by an Atlanta committee. The cost of the costumes ranges from $7,000 to $300.
    - The U.S. Environmental Protection Agency has implemented a mascot named Darby Duck. Children are encouraged to join his squad of Aquatic Crusaders. An interactive web site exists that teaches children the importance of water and the effect pollution has on the organisms that live in water.
- In addition to slogans and mascots, alternative forms of education are used to teach children about the effects of pollution on the environment.
    - The U.S. Environmental Protection Agency has developed an interactive CD-ROM which parents can purchase for their children to educate both themselves and their children about the effects of water pollution.
    - San Antonio has developed a program for high school students called the Student Water Action Team (SWAT). Students attend field trips and carry out projects in order to learn about the importance of water and what aspects of everyday life affect the water sources.
- The impact of the education program is long-term. The message needs to be repeated, and repeated, and repeated; essentially forever.

b. Target Audiences:

- Zealots (children - who will spread the word, educate their parents)
- Trash rebels (males 16 – 24)
- Businesses
- Construction Industry
- General Public

c. Potential Strategies*:*

- School Assemblies/Special Events (will reach zealots, business community, general public)

- Develop a mascot, utilize the mascot in all aspects of the public education campaign.
- Create a group in conjunction with the mascot that children can join to learn about pollution and its effects on the environment.
- Market a CD-ROM program or interactive web site to parents and teachers.
- Coordinate with schools to implement recycling programs and education in schools (will also reach the zealots and they may continue recycling at home)
- Brochures to the construction industry/trade fair booth at the AGC meetings (reaches construction industry)
- Advertising placed in local construction publications
- Broadcast email campaign to businesses/construction industry
- Website (reaches all)
- Media campaign - Billboard, TV, radio (reaches all)

d. Budget

- To effectively reach the ABQ community and change behavior, an annual education and outreach budget of $250,000 is proposed. For comparison, this was the annual public information budget for the Big I construction project.
- KNME has offered to assist by producing materials at cost and to broadcast at cost.
- Potential funding sources for the education/outreach program:
  - Increasing fines. Currently the city has a maximum litter fine of $500. There is no minimum. Other states: California ranges from $250 minimum to $2,500 maximum and tire littering fines are doubled; Colorado $20 minimum, $1,000 maximum; Utah $100 minimum and four hours of community service; Arizona $500 minimum, $2,000 maximum and six months prison, plus making restitution. Enforcement issues are discussed in Section 4.
  - Fees to the construction industry, maybe in conjunction with SWPPP or other related permits.
  - Add a charge to the driver's licenses in Bernalillo County - i.e. $1 or $.50 per license.
  - Implement fundraising techniques that will benefit the environment, i.e. cell phones that can be turned in and recycled for cash.
  - Sales generated from interactive CD-ROM program.

- Research and apply for environmental grants.
    - The U.S. Environmental Protection Agency offers a grant that is specifically used for environmental education programs.

4. Regulatory, Ordinances, Legislative and Enforcement

    a. Introduction:

Regulatory elements were researched by Juan Vigil. Legislative and local ordinances are essential to address preventive and regulatory tools to control the discharge of litter, debris, trash, floatables and other gross pollutants in the AMAFCA and the greater Albuquerque drainage system. As the lead agencies of this project AMAFCA, the City of Albuquerque, NM Department of Transportation and the University of New Mexico must develop partnerships with the State Legislature and the Executive Branch, Bernalillo County, Albuquerque Public Schools, the Middle Rio Grande Conservancy District, the Village of Los Ranchos and other surrounding communities. These partnerships are necessary to focus on the elimination of identified pollutant sources and to reduce pollutants in storm water to the maximum extent practicable. The objective is to introduce and pass legislation, enter into Joint Powers Agreements, enforce anti-litter laws and/or the adoption of ordinances that attain the goal of reducing the sources of pollutants in the area's drainage system.

    b. Legislative Initiatives:

Bottle Bill - This will require the introduction of legislation that requires a minimum refundable deposit on beer, soft drink and other containers in order to insure a high rate of recycling or reuse thereby reducing this source of debris from the drainage system. According to the Bottle Bill Resource Guide, beverage containers make up 48% of total litter for all sites, 43% for urban street and roadway litter and 42% of litter at waterway sites. Revenue from the recycling can be earmarked to educate the public not to litter.

Incentives for environmentally responsive recycling businesses - the State can create an environment, which welcomes businesses that add value to recyclables by processing to forms usable in new products or companies that make products with recycled materials. This can be done by loans, tax abatements and grants that can be used to attract the desired outcome.

    c. Joint Power Agreements:

Restricting the use of expanded styrene (Styrofoam), plastics and other floatable pollutants – the lead agencies can initiate entering into Joint Power Agreements, Joint Resolutions or Memoranda of Understanding with other local governments aimed at restricting the use of these pollutants. They would agree to use bio-degradable containers in their office coffee pools, cafeterias or other consumer uses.

d. Ordinances:

Assessment on Contractors/Special Event Permits – The City and County can set a nominal fee on all construction yard building permits and permits for Special Events that would be earmarked to support the anti-litter education and prevention campaign. There could also be a penalty assessment on any special event or construction site that does not have litter receptacles on site or that when inspected are found be a gross pollutant contributor.

Leaf-blower Issues - This ordinance would establish a penalty on any individual or business that blew leaves or other debris into public streets or rights-of way. Also, the City policy and guidance on green waste (e.g. yard waste) pick up should be reviewed to ensure that the instructions are clear. Many municipalities instruct residents to blow or rake yard waste out to the street and curb area for pick-up. Develop a clear guidance brochure for the spring and fall yard waste pick-ups instructing residents to keep leaf litter and debris out of the street and curb & gutter system. Information on back yard composting could be included.

Anti-litter Notices on fast-food carryout and grocery plastic bags – An incentive (or maybe a requirement) given to businesses which print an anti-litter message on their carryout fast foods containers and on their grocery/business plastic bags. Incentive could also be offered for those businesses that provided containers to recycle plastic bags, bottles and other gross pollutants. Based on business non-pollutant/anti-littering ranking, AMAFCA and others can present an award to those who rank high and a plastic floatable lemon to those who contribute to polluting the system.

Street Tree Landscaping – The City and County could adopt joint legislation that provides guidance on appropriate street-tree landscaping species such as narrow leaved or evergreen and to avoid large-leaved trees or trees that are known to frequently shed limbs and twigs and other plants that are problematic. Note that this concept may be in conflict with other municipal goals/objectives to increase urban tree cover for the multiple benefits provided, including slowing runoff, aesthetics, etc. Also, it has been observed that pine needles and narrow leaves collect on the upstream side of grates deflecting runoff away from the inlet structure and reducing the flood protection function of the system. Consequently, this suggestion is not proposed and is not included in the GPRP.

Organic Materials Controls - An ordinance could be adopted outlining regular maintenance requirements for commercial/industrial property owners to keep organic material out of the storm drains. Develop a joint watershed protection ordinance that focuses on the elimination of identified pollutant sources. This should include low impact development alternatives.

5. Containers

Solid waste containers and associated operations, maintenance and dumping of the containers are a source of litter eventually ending up as gross pollutants in the stormwater runoff. For purposes of this study, observed problems with containers were identified by the Project Team for inclusion in the overall GPRP.

a. Residential Roll-Out Containers – The switch to the use of the residential roll-out containers has been a significant improvement over bagged trash. The primary litter source observed with these is trash blowing out of the container during dumping.

   The GPRP proposes to emphasize bagging all trash before placing in container to minimize blowing litter. This may require modification to City and County ordinances as well as an education campaign to inform residential customers. Suggestions include:

   Advisory/educational material mailed with statement(s)
   Notice on front of new containers
   Stick on notice (i.e. bumper sticker) for front of container as part of advisory/education program.

b. Park & Special Event Containers

   Switch to small top-opening enclosures for park trash receptacles. Get rid of open barrels/containers in parks.
   Place adequate trash receptacles to prevent overflow.
   Place trash receptacles in all parks.
   Promote "LITTER FREE PARK ZONES" with signs, etc.

c. Construction Debris Roll-off Dumpsters

   Provide residential trash containers for litter disposal by workers in conjunction with each dumpster.
   Provide clearly marked trash containers at every construction site.
   Provide signage for "LITTER FREE CONSTRUCTION SITE"

d. Commercial Dumpsters

   Require new dumpster and compactor pads to be self contained and drain to the sanitary sewer system through a grease/grit trap. Require operable covers or lids on all commercial dumpsters.
   Emphasize/require bagging all trash before placing in dumpster
   Advisory/educational material mailed with statement(s)
   Notice on front of new dumpsters
   Stick-on notice (i.e. bumper sticker) for front of dumpster as part of advisory/education program or place on dumpster during pick-up.

V. MONITORING

Monitoring the results of the Gross Pollutant Reduction Plan is intended to serve several purposes –

- Satisfy the requirements of NPDES NMS000101 Permit (SWQRD#01).
- Provide data regarding the quantity and characterization of gross pollutants within the system.
- Identify system characteristics, hot spots and priorities.
- Provide data for design and/or modification of structural and source control BMPs.
- Provide improved O&M priorities, procedures and cost control.

Results of monitoring of gross pollutants by other agencies indicate an extreme variation in the data between storm events, locations, types of land use, etc. Several studies of gross pollutant monitoring concluded that the data variation was so great, that conclusive results were not possible. Based on this, the monitoring proposed in the GPRP is intended to be long term and relatively simple to allow repeatability and to provide an adequate base of data for statistical analysis.

A critical element of the monitoring program is the establishment and adherence to data protocols. Several agencies have reported that the data which is available is of limited value since the data collection and reporting were not consistent.

A. MONITORING TO MEET PERMIT REQUIREMENTS

The Permit requires the establishment of locations for monitoring floatable material (gross pollutants) in discharges to or from the permittee controlled MS4. Floatable material is to be monitored at least twice each year and the amount of material collected estimated in cubic yards (Part III.17.f&g; Part V.B.). AMAFCA/City of Albuquerque are required to have at least two floatable material monitoring stations. UNM and NMSHTD (NMDOT) are required to have at least one floatable material monitoring station each.

The North Pino Arroyo NDC inlet and the Barelas Lift Station (COA Station #32) are proposed as the specific AMAFCA/Albuquerque sites to be monitored for permit compliance. The N. Pino site is also proposed as a BMP test location to be retrofitted to provide flow and water quality constituent measurements and to capture essentially all gross pollutants. The Barelas Lift Station bar screen collects essentially all gross pollutants under normal operations and is a monitored outfall for water quality constituents, therefore no modifications are proposed.

B. SYSTEM MONITORING

Fifteen locations are proposed in the GPRP for system gross pollutant monitoring. These include a combination of neighborhoods, land uses and BMP types. All of these are existing facilities with gross pollutant removal components. The monitoring should be continued for at least two years to ensure that the desired number and type of storm events are captured, and to even out variability.

The proposed monitoring is to measure and remove the collected gross pollutants following each storm event with larger than 0.1" runoff. This is approximately a 0.3" to 0.6" rain event, depending on upstream land uses. This is estimated to be between one and five storm events per year (Table II-1). Characterization of the collected gross pollutant is proposed for approximately 10% of the samples. This will provide a measure of both the quantity and characterization of gross pollutants. If it assumed that these facilities will be maintained and cleaned as part of on-going existing O&M, the additional time for collecting and recording the data is estimated to be approximately two hours per facility per cleaning, or about 150 hours per year.

In addition to the monitoring at these specific BMPs, the City and AMAFCA currently maintain O&M records of bags of debris manually collected, tons of debris hauled to the landfill from drainage system maintenance, tonnage of material collected from street sweeping, etc. The GPRP proposes to improve the quality of this data by developing data protocols for each type of measurement, consistent with the overall data collection effort, and training the operators and O&M personnel in the implementation of the protocol. This will improve the usefulness of this data and provide a more accurate big picture of the gross pollutant generation.

C. BMP EFFECTIVENESS MONITORING

The system monitoring data will provide a general database for BMP guidelines. The intent of the BMP Effectiveness Monitoring is to provide detailed design, operation and maintenance data for specific BMPs for incorporation into design standards. The GPRP proposes that at least one BMP of each type be identified for intensive monitoring for effectiveness. This would include development of a data protocol for this monitoring and evaluation of the data in the context of the overall BMP appropriateness.

D. TRASH AND DEBRIS MONITORING GUIDEINE RECOMMENDATIONS (ADAPTED IN PART FROM RUSHTON, ET.AL., SWQRD#59)

Most trash and debris monitoring efforts have utilized discrete outfalls fitted with a trapping system, or catch-basin sumps located in strategic drainage basins with well-defined land uses and drainage characteristics. The purpose of these monitoring efforts is to develop local data on the amount of trash and debris generated by certain land use types or within a given basin, in order to better define and target management practices. The following points highlight key aspects of an effective monitoring approach for debris characterization:

- Identify representative drainage basins for each of the predominate land uses in the study area, with a focus on those basins that contain BMPs suitable for debris removal and characterization, such as well-maintained catch basin inserts, wet ponds with forebays, debris diversion weirs, etc.;

- Define land use types, percentages, and impervious coverage for the study drainages;
- Annual data accumulation measurements (rather than shorter time frequency comparisons) will aid in normalizing variations due to rainfall intensity and seasonality, community events, maintenance practices, etc.;
- Keep accurate records of: catch basin and other BMP cleanout intervals, size of the drainage basin, street sweeping practices, catch basin locations relative to drainage area land use, and maintenance practices;
- Monitoring period: minimum of one year and a minimum of 8 to 12 representative storms per year covering a range of events; due to local rain patterns, recommend a two-year monitoring period is more practical in terms of reducing seasonal variability;
- Determine whether volume-based or mass-based data will be collected, and plan accordingly. Both volume-based and mass-based calculations can be complicated by wet vs. dry collection conditions, though mass-based calculation may be more subject to this variability due to the weight of wet debris. In volume-based methods, a sample of wet debris will be less compacted than the same sample once it has dried. Drying time is recommended for either approach to obtain more consistent results from sample to sample. A volume method using a vacuum truck has been conducted by collecting the solids in the tank (with known dimensions) , allowing to dry for several days, then mixing well and sampling based on evenly split quadrants of the tank to obtain representative samples for analysis;
- Wet BMPs: calculate a good estimate of the volume of gross solids while still in the BMP, vacuum truck or after it is dumped at the disposal site. Separate litter from vegetative/organic debris and determine percentage of each. It is desirable to then place litter or samples of litter in mesh bags for drying and measuring volume. It is also desirable to further categorize trash based on a classification system such as the one developed by New York City (plastics, metals, paper, wood, polysterene, cloth/fabric, sensitive items, miscellaneous, and glass).

E. RECORDKEEPING

Records are required by the Permit and to implement and improve the GPRP. A good recordkeeping system is accurate, concise, easy to maintain, accessible, transparent, transportable and secure. The data collected from other agencies did not turn up a consistent recordkeeping system (See Section III).

The AMAFCA GIS database uses Microsoft Access™. This is a powerful tool for managing and sorting a large amount of information, but can be awkward to use for routine data entry, numeric manipulation such as statistical analysis, etc. The existing and proposed SWQ facilities within the AMAFCA/Albuquerque system have been entered into this database.

Spreadsheets, such as Excel™, appear to be the norm for tracking numerical data such as the monitoring information. These are custom made for each type of record or data set being maintained and are filled in by staff as the data accumulates. Use of spreadsheets has the advantages of flexibility and universal familiarity but requires careful control to avoid several pitfalls:

- Lack of transportability between staff or agencies,
- Lack of a data protocol, lack of familiarity or confusion for that entry,
- Inadvertent undetected errors in formulae and conversions.

VI. GROSS POLLUTANT REDUCTION PLAN DEVELOPMENT

A. INTRODUCTION

The Gross Pollutant Reduction Plan (GPRP) is the proposed implementation component of this study and outlines the tasks and activities to be undertaken to satisfy the objectives and criteria of the study.

B. ALBUQUERQUE MS4 PERMIT NO. NMS000101

One criteria for the GPRP is to satisfy the NPDES Permit (SWQRD #1) for storm water discharges in the Albuquerque MS4. Table VI-1 summarizes the permit requirements related to floatable and gross pollutant controls along with the Plan element intended to satisfy that requirement. Note that some elements (i.e., street sweeping, integration of NMDOT or UNM activities) are beyond the scope of this study and are being addressed by the individual organization responsible. These elements have been included in Table VI-1 in order to provide a more complete picture that can be tracked.
Specific issues addressed in the GPRP are discussed below.

1. Co-Permitee Responsibilities

The permit includes several requirements that include all co-permittees -AMAFCA, City of Albuquerque, NMDOT & UNM. The focus of the study and the GPRP is the AMAFCA/Albuquerque system. UNM is preparing a facility plan for their facilities that will address gross pollutants. UNM and NMDOT are participating in the development and review of the GPRP. However, the specific UNM and NMDOT response to permit requirements is not included in this version of the GPRP.

2. Gross Pollutant SWQ Facility Plans

The GPRP includes preparing a facility plan for stormwater quality facilities (SWQ) for each watershed. The intent of these SWQ plans is to identify potential regional or local facilities, right-of-way needs, etc. Specific or unique gross pollutant considerations within the watershed would be addressed, including industrial and commercial issues.

3. Installation and implementation of BMPs

Part III SWMP #17d of the permit identifies completion of the installation and implementation of BMPs and retrofit structures to control floatables and trash based on the evaluation of the MS4 floatable study (this study) by Dec. 1, 2005.

The BMP implementation strategies identified in this study are extensive and far reaching, particularly the retrofits to the existing system. Implementation of the entire gross pollutant control system within one year is beyond the fiscal and practical capability of AMAFCA, the City, NMDOT and UNM.

4. Monitoring Implementation Dates

Part III SWMP #17f and #17g of the permit require the development, installation and implementation of gross pollutant (floatable) monitoring stations, one each for UNM and NMDOT and two total for AMAFCA/Albuquerque. The due dates are Dec. 1, 2004 for UNM and NMDOT and Dec 1, 2005 for AMAFCA/Albuquerque.

Based on the data developed in this study from local, national and international data for gross pollutants; data protocols for what to monitor, how to monitor and where to monitor are not established and have profound impact on the usefulness of the data. As a result, establishment of a workable monitoring protocol will require trial and error over several storm events. The Dec. 1, 2005 due date for AMAFCA/Albuquerque allows two summer rain seasons for developing the protocol and is a realistic target, but the Dec. 1 2004 due date for UNM/NMDOT is not practical.

5. Education Plan

The education plan in the GPRP outlines broad programmatic elements to be addressed by this non-structural BMP. Development of specific education materials is required to implement the plan. The permit requires revision of the existing education and outreach program to include public reporting of illicit discharges and improper disposal of materials by Dec. 1, 2004.

6. Industrial and Commercial Area Floatable Controls

Part III SWMP #17e of the permit requires implementation of source control of floatables in industrial and commercial areas by Dec. 1, 2005.

The GPRP includes identification of unique industrial and commercial issues within the SWQ Facility Plans. It is anticipated that the priority class system will be used for these issues in the SWQ plans allowing implementation of the Class A and R1 BMPs by Dec. 1, 2005.

7. Municipal Operations

Part III SWMP#21.a.1.a of the permit requires development and implementation of an O&M program with a training component addressing maintenance activities, procedures, controls to reduce floatables and gross pollutants in the MS4 with a due date of Dec. 1, 2004.

This is addressed in the GPRP as an element of the education plan (Section III.A) and as an element of O&M (Section III.D). It is anticipated that most of the O&M procedures and activities related to overall NPDES compliance are already in-place and that review and perhaps modifications to address floatables is all that will be required. The critical timing issue is to update the O&M procedures in time to get them incorporated into the municipal education and training program.

C. SOURCE CONTROL BMPS

Source control BMPs are contained in Section II of the GPRP.

D. IMPLEMENTATION AND O&M BUDGET ESTIMATES

The operation and maintenance (O&M) of the gross pollutant removal facilities is a major design issue and a significant component of the life-cycle cost of the facilities. Local experience indicates that design for ease of O&M is an overriding consideration and frequently has been underestimated.

1. Basic Cost Data

Cost information for O&M is sparse. For purposes of budgeting, the following assumptions have been used.

a. Labor & Equipment Rates.

   3-man manual pick-up crew - $62/hour
   Vacuum-truck or hydrojet - $150/hour
   Loader & dump truck –

b. Storm Data

   From Table II-1 – approximately 85% of storms produce less than 0.1” of runoff. Average 62 storm events/year
   Therefore, 15% of storms greater than 0.1” runoff = 9 storm events/year with runoff greater than 0.1” (neglecting regional distribution, etc.).

c. Inlet Cleaning –

   0.5 hrs vacuum-truck - $75/time
   Clean inlets annually
   Annual cleaning between leaf fall and spring storms – a 2-3 month window would require up to 50 vacuum trucks.
   Annual budget @ $112/inlet for 16,000 inlets = $1,800,000/year.

d. Inlet Inserts

   0.5 hrs vacuum-truck - $75/time
   Clean after each 0.1” runoff event – 9 storms/year average
   Annual budget - $675/inlet insert/year.

e. Hydrodynamic or Debris Manhole

   1 hour vacuum-truck - $150/time
   Clean after each 0.1” runoff event – 9 storms/year average
   Annual budget - $1,350/debrisMH/year
   Assuming 50 such devices, the annual budget would be $67,500

f. Reported O&M Cost Data

   Data from Caltrans (BMPRD#19, BMPRD#20) estimates 21 to 24 person-hours per storm season for each gross solids removal device. Depending on the equipment associated with this estimate, this equates to $1,000 to $4,000/device/year.
   Other data (BMPRD#14) estimates $500/year for inlet inserts and 3-5% of construction cost for extended detention basins, filters, etc.

2. Major & Regional Facility O&M

The following budget estimates are based on available local cost data.

a. Detention Basins (and associated channels)

   In 2003 and 2004, AMAFCA utilized manual clean-up crews to remove litter from detention basins at a typical cost between $1,000 to $3,000 per basin for six months (Technical Appendix II). For budget purposes, an average annual cost of $4,000 to manually clean major and public use detention basins is assumed. A cost of $2,000 per basin is assumed for minor detention basins. For estimating purposes, 25 major and 30 minor detention basins are assumed resulting in an annual budget of $160,000.

b. North & South Diversion Channels

   In 2003 and 2004, AMAFCA utilized manual clean-up crews to remove litter from the NDC and SDC at a total cost of approximately $22,000 for six months. For budget purposes, an annual budget of $40,000 is assumed.

c. Regional SWQ Facilities – Limited Debris Retention

   For estimating purposes, these are identified as major SWQ facilities located on major tributaries that do not have the capacity to store the anticipated annual debris load. Examples are N. and S. Pino Debris and Environmental Pond facilities, La Orilla Outlet Baffled Weir, etc. Due to the quantity of debris collected in these facilities and the unsightly nature of the trash, clean-out more frequently than annually is anticipated.

   Clean-out for each runoff event larger than 0.1”, 9 times annually.

Four hours of loader/dump truck time per clean-out.
$800/clean-out * 9 events = $7,200/major SWQ/year.
If 20 of such facilities are assumed, this is $144,000 annually.

d. Regional SWQ Facilities – Annual Volume Debris Retention

The design criteria proposed in this report is to provide the capacity within the SWQ facility to store the captured annual gross pollutant load. In this event, only periodic inspections and annual clean-out would be anticipated, assuming these did not become unsightly messes.

Assuming an annual clean-out and a 50% mid-season clean-out, the budget estimate is $800/clean-out*1.5 = $1,200/SWQ/year.
Assuming 60 such facilities, this is $72,000 annually.

e. Monitoring

Monitoring and data collection will add O&M cost. This will be in the form of additional maintenance to ensure that the facilities are cleaned between the monitored storm events, measuring and weighing the removed pollutants, recordkeeping and reporting.

For estimating purposes, assume that the facility will be cleaned after each storm with a predicted runoff depth greater than 0.05". This is approximately 30% of the storms, or 18 events/year on average. Assume measuring and weighing take an additional 4 hours per monitored event. Monitoring occurs for events larger than 0.1" runoff, or 9 times/year.

$200/hr*18clean-outs*4hrs/clean-out +$200/hr*9monitored events @4hrs/time = $21,600/year/monitored facility. Assuming 10 monitored facilities, this is $216,000 annually.

3. O&M SUMMARY

Annual O&M budget estimates, based on these rough assumptions, are:

55 Detention Basins - $16,000
North and South Diversion Channels - $40,000
20 Regional SWQ Facilities w/ limited storage – $144,000
60 Regional SWQ Facilities w/ storage - $72,000
Monitoring of 10 sites– $216,000
Annual Cleaning of 16,000 Inlets - $1,800,000
50 Hydrodynamic/Debris Manholes - $67,500

TABLE VI-1
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY
PERMIT CONFORMANCE MATRIX

PERMIT REQUIREMENT			GPRP PROGRAM ELEMENT
Permit Ref. Sec.	Description	RESPONSIBLE AGENCY	Description
II.A.6.c	Implement a program to reduce the discharge of floatables w/ source controls and where necessary, structural BMPs	Co-Permitees	This is the GPRP
II.A.10.a	Public Education program to promote, publicize and facilitate public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4.	Co-Permitees	Education Program
Part III. SWMP #3a	List all SWQ facilities by basin in SWMP w/ record of maintenance and inspections.	Co-Permitees	SWQ Facilities identified in DFPR. O&M Records to be added.
Part III. SWMP #3b	Include target number of structures per quarter in inspection and maintenance program.	Co-Permitees	GPRP O&M
Part III. SWMP #5c	Revise street sweeping program w/ increased frequencies, account for leaf litter, de-icing operations & proximity to water bodies and conveyances.	AMAFCA/ COA	SWMP update. Additional street sweepers have been added to the City fleet, NMDOT & COA have increased freeway sweeping.
Part III. SWMP #5d	Certification of the implementation of revised street sweeping program.	AMAFCA/ COA	
Part III. SWMP #16a	Public education program revisions for public reporting of illicit discharges or improper disposal of materials.	AMAFCA/ COA	Education Program

TABLE VI-1
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY
PERMIT CONFORMANCE MATRIX

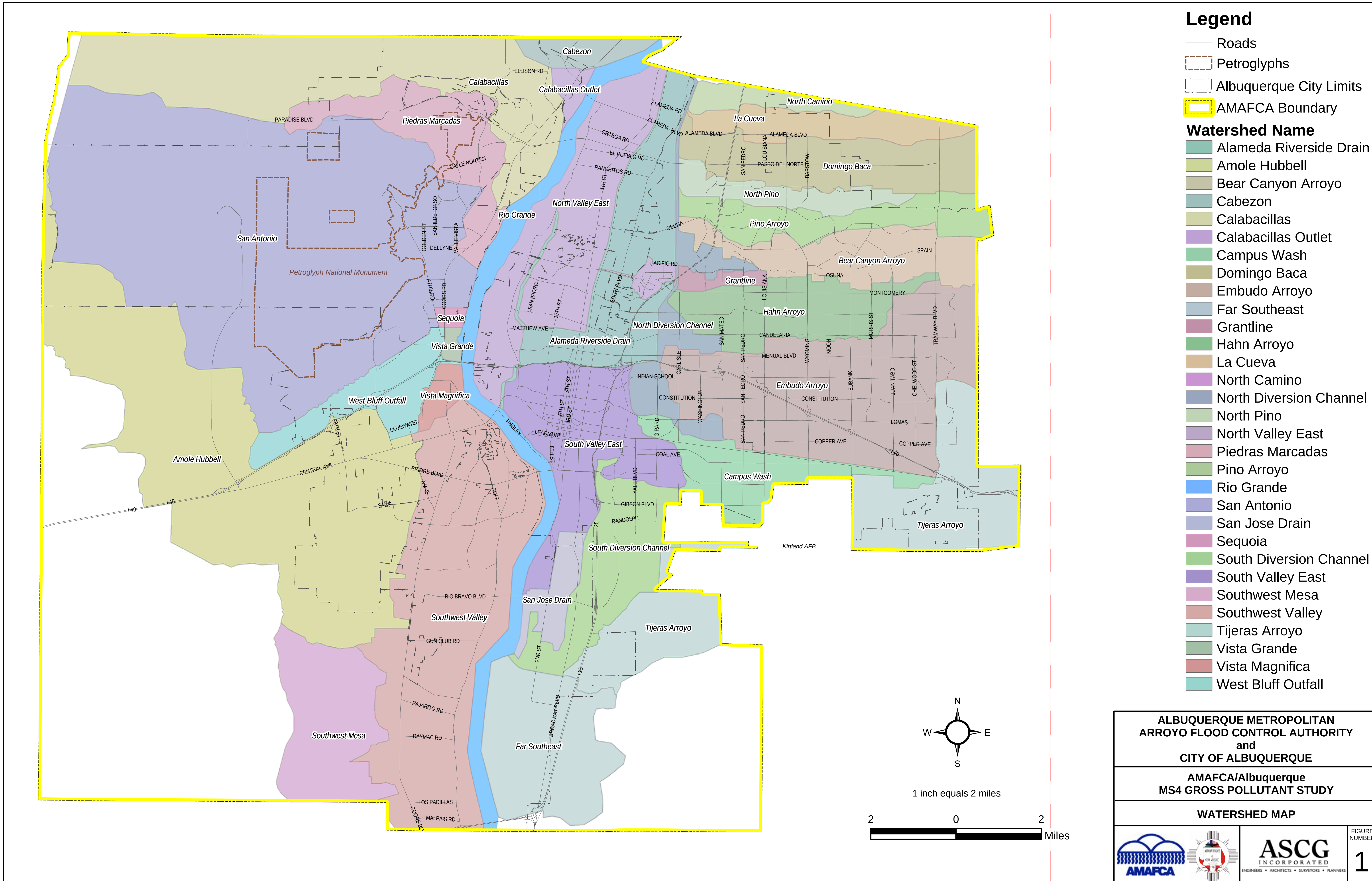
PERMIT REQUIREMENT			GPRP PROGRAM ELEMENT
Permit Ref. Sec.	Description	RESPONSIBLE AGENCY	Description
Part III. SWMP #16b	Certification of the implementation of the revised public education program.	AMAFCA/ COA	
Part III. SWMP #17a	Develop a program to reduce the discharge of floatables and trash from the North Diversion Channel (NDC). Submit results of a study to determine the most effective structural or treatment control BMPs.	AMAFCA/ COA	Gross Pollutant Study & GPRP
Part III. SWMP #17b	Begin installation of permanent BMPs to control the discharge of floatables and debris to the NDC to the MEP	AMAFCA/ COA	Off-site and NDC BMPs (Tables GPRP-1 & GPRP-2)
Part III. SWMP #17c	Conduct evaluations of trash reduction needs from entire MS4 and determine the most effective structural or treatment control BMPs to reduce floatables discharged through the MS4	Co-Permitees	Gross Pollutant Study & GPRP
1	all conveyances discharging directly to the Rio		
2	upstream contributing systems		
3	possible retrofits of detention basins		
4	source control for floatables in commercial and industrial areas.		
5	Evaluation results in Report format with recommendations and milestones for		
Part III. SWMP #17d	Complete installation and implementation of BMPs and retrofit structures to control floatables and trash based on Item 17.c above	Co-Permitees	GPRP BMPs

TABLE VI-1
AMAFCA/ALBUQUERQUE MS4
FLOATABLE & GROSS POLLUTANT STUDY
PERMIT CONFORMANCE MATRIX

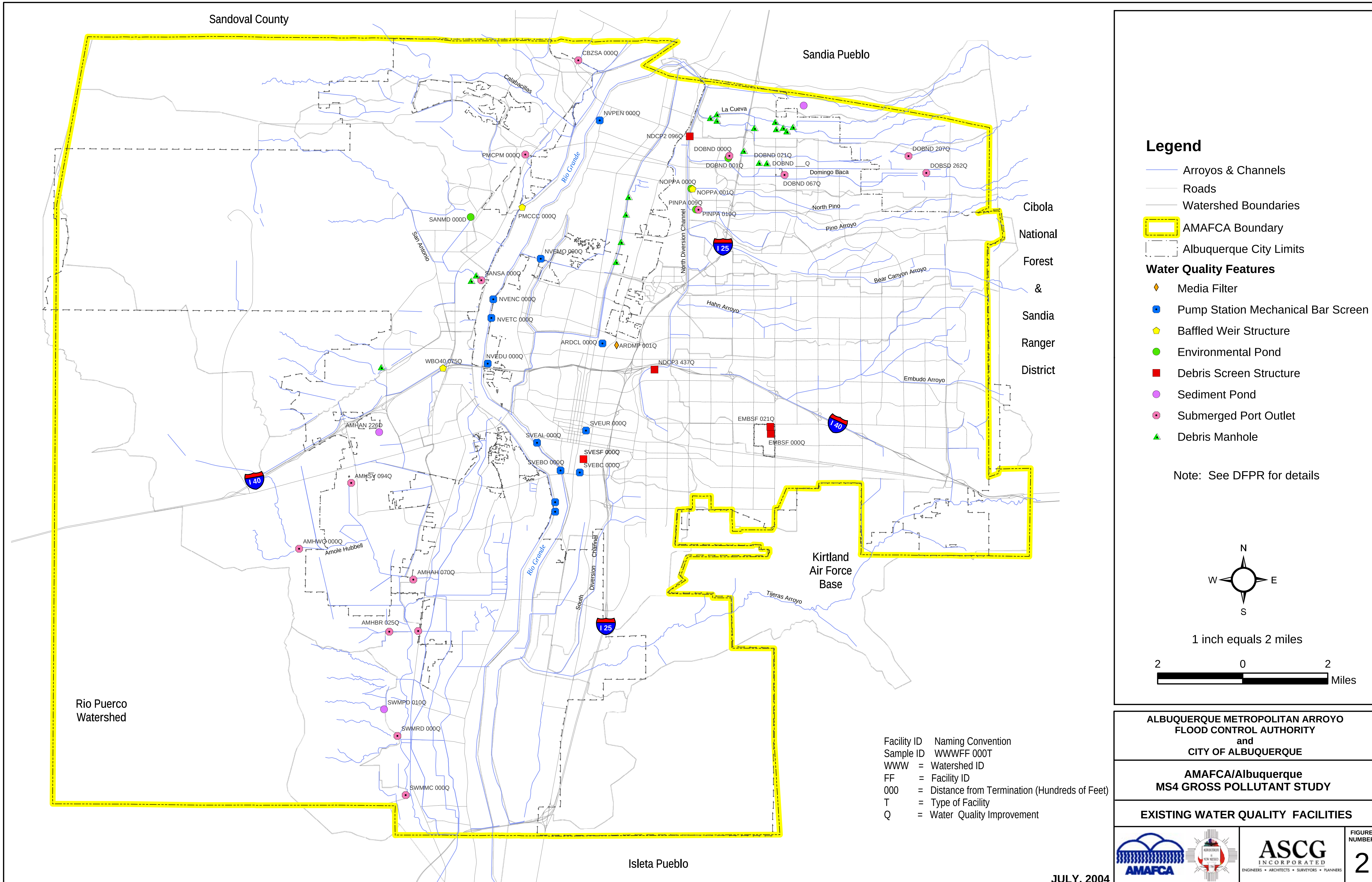
PERMIT REQUIREMENT			GPRP PROGRAM ELEMENT
Permit Ref. Sec.	Description	RESPONSIBLE AGENCY	Description
Part III. SWMP #17e	Begin implementation of source control of floatables in industrial and commercial areas	AMAFCA/ COA	GPRP
Part III. SWMP #17f	Develop a floatable monitoring program, install a floatable monitoring location and commence monitoring (1 each).	NMDOT/ UNM	GPRP Monitoring
Part III. SWMP #17g	Develop a floatables monitoring program, install two floatable monitoring locations and commence monitoring	AMAFCA/ COA	GPRP Monitoring
Part III. SWMP #21.a.1.a	Good Housekeeping for Municipal Operations - Develop and implement an O & M program w/ a training component addressing maintenance activities, procedures, controls to reduce floatables and other pollutants in	Co-Permitees	GPRP O&M
Part V.B	Floatables Monitoring. Locations for monitoring floatable material in discharges to or from their MS4 at least twice per year (measured in cubic yards)		
	Albuquerque/AMAFCA – two stations	AMAFCA/ COA	GPRP Monitoring
	NMDOT & UNM – one station each	NMDOT/ UNM	
Reference: NPDES Permit No. NMS000101 issued Oct. 31, 2003, effective Dec. 1, 2003			

APPENDIX A

FIGURE 1- WATERSHED MAP
FIGURE 2 – EXISTING WATER QUALITY FACILITIES



Legend
Roads
Petroglyphs
Albuquerque City Limits
AMAFCA Boundary
Watershed Name
Alameda Riverside Drain
Amole Hubbell
Bear Canyon Arroyo
Cabezon
Calabacillas
Calabacillas Outlet
Campus Wash
Domingo Baca
Embudo Arroyo
Far Southeast
Grantline
Hahn Arroyo
La Cueva
North Camino
North Diversion Channel
North Pino
North Valley East
Piedras Marcadas
Pino Arroyo
Rio Grande
San Antonio
San Jose Drain
Sequoia
South Diversion Channel
South Valley East
Southwest Mesa
Southwest Valley
Tijeras Arroyo
Vista Grande
Vista Magnifica
West Bluff Outfall
Cabezon
Calabacillas
Calabacillas Outlet
North Camino
La Cueva
Piedras Marcadas
Domingo Baca
North Pino
North Valley East
Rio Grande
Pino Arroyo
San Antonio
Petroglyph National Monument
Bear Canyon Arroyo
Grantline
Hahn Arroyo
Sequoia
North Diversion Channel
Vista Grande
Alameda Riverside Drain
Embudo Arroyo
West Bluff Outfall
Vista Magnifica
South Valley East
Amole Hubbell
Campus Wash
Tijeras Arroyo
Kirtland AFB
South Diversion Channel
San Jose Drain
Southwest Valley
Tijeras Arroyo
Southwest Mesa
Far Southeast
N
W
E
S
1 inch equals 2 miles
2
0
2
Miles
ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY and CITY OF ALBUQUERQUE
AMAFCA/Albuquerque MS4 GROSS POLLUTANT STUDY
WATERSHED MAP
AMAFCA
ASCG INCORPORATED
ENGINEERS • ARCHITECTS • SURVEYORS • PLANNERS
FIGURE NUMBER
1


Sandoval County
Sandia Pueblo
Cibola National Forest & Sandia Ranger District
Kirtland Air Force Base
Rio Puerco Watershed
Isleta Pueblo
Rio Grande
North Diversion Channel
South Diversion Channel
Calabacillas
San Antonio
La Cueva
Domingo Baca
North Pino
Pino Arroyo
Bear Canyon Arroyo
Hahn Arroyo
Embudo Arroyo
Tijeras Arroyo
Amole Hubbell
I 25
I 40
CBZSA 000Q
NVPEN 000Q
NDCP2 096Q
PMCPM 000Q
DOBND 000Q
DOBND 001Q
DOBND 021Q
DOBND 067Q
DOBND 207Q
DOBSD 262Q
NOPPA 000Q
NOPPA 001Q
PINPA 009Q
PINPA 010Q
SANMD 000D
PMCCC 000Q
NVEMO 000Q
SANSA 000Q
NVENC 000Q
NVETC 000Q
ARDCL 000Q
ARDMP 001Q
WBO40 075Q
NVEDU 000Q
NDCP3 437Q
EMBSF 021Q
EMBSF 000Q
AMHAN 226D
SVEUR 000Q
SVEAL 000Q
SVESF 000Q
SVEBO 000Q
SVEBC 000Q
AMHSY 094Q
AMHWO 000Q
AMHAH 070Q
AMHBR 025Q
SWMPD 010Q
SWMRD 000Q
SWMMC 000Q
Legend
Arroyos & Channels
Roads
Watershed Boundaries
AMAFCA Boundary
Albuquerque City Limits
Water Quality Features
Media Filter
Pump Station Mechanical Bar Screen
Baffled Weir Structure
Environmental Pond
Debris Screen Structure
Sediment Pond
Submerged Port Outlet
Debris Manhole
Note: See DFPR for details
N
W
E
S
1 inch equals 2 miles
2
0
2
Miles
Facility ID Naming Convention
Sample ID WWWFF 000T
WWW = Watershed ID
FF = Facility ID
000 = Distance from Termination (Hundreds of Feet)
T = Type of Facility
Q = Water Quality Improvement
ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY and CITY OF ALBUQUERQUE
AMAFCA/Albuquerque MS4 GROSS POLLUTANT STUDY
EXISTING WATER QUALITY FACILITIES
AMAFCA
ASCG INCORPORATED
ENGINEERS • ARCHITECTS • SURVEYORS • PLANNERS
FIGURE NUMBER 2
JULY, 2004

APPENDIX B

REFERENCE DOCUMENTS

AMAFCA/ALBUQUERQUE MS4
GROSS POLLUTANT STUDY

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
BMPRD#01	National Stormwater BMP Database Data Elements			
BMPRD#02	Determining Urban Stormwater Best Management Practice (BMP) Removal Efficiencies Task 3.4 - Final Data Exploration and Evaluation Report	25-Jun-00	GeoSyntec Consultants, UDFCD, URS, UWRRC, EPA	National Stormwater BMP Database
BMPRD#03	Development of Performance Measures Task 3.1 Determining Urban Stormwater BMP Removal Efficiencies	2-Jul-99	URS Greiner Woodward Clyde, UDFCD, UWRRC, EPA	National Stormwater BMP Database
BMPRD#04	Monitoring Guidelines for Measuring Stormwater Gross Pollutants		Gordon England, Betty Rushton	SW Florida Water Management Dist.
BMPRD#05	A Scientific Approach to Evaluating Storm Water Best Management Practices for Litter	16-Apr-00	Caltrans/URS - Lippner, Churchwell, Allison, Moeller, Johnston	CALTRANS, California Water Env. Assoc. 72nd Conf.
BMPRD#06	Results of the CALTRANS Litter Management Pilot Study	2001	Caltrans/URS - Lippner, Johnston, Combs, Walter, Marx	CALTRANS, Transportation Research Record 1743
BMPRD#07	Litter Index Survey and Keep America Beautiful	2002	Keep America Beautiful	
BMPRD#08	NSW Litter Survey Program: Proposed method for surveying litter in NSW	Aug-03	Waste Management Section of NSW EPA	NSW Environment Protection Authority
BMPRD#09	Cigarette Facts Educational Materials		CigaretteLitter.Org	
BMPRD#10	"After the Storm" Educational Materials	Jan-03	EPA	US EPA

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
BMPRD#11	Guides for Decision Makers			National Center for Environmental Decision-Making Research
BMPRD#12	Florida Litter Study: 1995 (Executive Summary)	Jan-96	Florida Center for Solid and Hazard Waste Management	Florida Legislature and Florida Dept of Environmental Protection
BMPRD#13	Florida Litter Study: 1997	Nov-97	Florida Center for Solid and Hazard Waste Management	Florida Legislature and Florida Dept of Environmental Protection
BMPRD#14	Overview of Conventional Stormwater Runoff Water Quality BMP Characteristics and Performance	19-May-00	Scott Taylor, PE	Stormwater Runoff Water Quality Science/Engineering Newsletter
BMPRD#15	Definitions of BMP Categories and Types			Chesapeake Bay Program's Urban Storm Water Workgroup
BMPRD#16	CALTRANS Public Education Research Study Literature Review CTSW-RT-01-045	27-Aug-01		Caltrans Environmental Program
BMPRD#17	CALTRANS Public Education Litter Monitoring Study 2001-2002 CTSW-RT-02-021	Sept. 2002		CALTRANS
BMPRD#18	CALTRANS Public Education Research Study Final Report CTSW-RT-03-043	01-Jun-03		Caltrans Storm Water Program

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
BMPRD#19	Phase I Gross Solids Removal Devices Pilot Study: 2000-2002 Final Report CTSW-RT-03-072.31.22	01-Oct-03	State of California Dept. of Transportation	Caltrans
BMPRD#20	Phase II Gross Solids Removal Device Pilot Study: 2001-2003 CTSW-RT-03-097.31.22	01-Nov-03	State of California Dept. of Transportation	Caltrans
BMPRD#21	Phase II and III Gross Solids Removal Devices Operations and Maintenance Plan (includes Health and Safety Plan) Monitoring Season 2002-2003 CTSW-RT-02-071	01-Nov-02	State of California Dept. of Transportation	Caltrans
BMPRD#22	Storm Water Treatment BMP New Technology Report SW-04-069.04.02	01-Apr-04	State of California Dept. of Transportation	Caltrans
BMPRD#23	Let's Talk Dirty - COA PWD Hydrology and Flood Protection Online	28-May-03		City of Albuquerque Website - Public Education
BMPRD#24	Scoop that Poop - COA PWD Hydrology and Flood Protection Online	29-May-03		City of Albuquerque Website - Public Education
BMPRD#25	Flood Protection "Ditch Safety" - COA PWD Hydrology and Flood Protection Online	29-May-03		City of Albuquerque Website - Public Education
BMPRD#26	Storm Water Pollution Prevention - COA PWD Hydrology and Flood Protection Online	27-May-03		City of Albuquerque Website - Public Education

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
BMPRD#27	Stormwater Program SPLASH Newsletters (9 total)	1999-2001	Stormwater Management Division	City of Los Angeles, Dept. of Public Works, Bureau of Sanitation
BMPRD#28	Storm Water Monitoring and BMP Development Status Report SW-04-069.04.01	Apr-04	Caltrans	California Dept. of Transportation Division of Environmental Analysis
BMPRD#29	Urban Sotrmwater BMP Performance Monitoring - A Guidance Manual for Meeting the National Stormwater BMP Database Requirements **EPA-821-B-02-001**	Apr-02	GeoSyntec Consultants, UDFCD, URS, UWRRC, EPA	US EPA and American Society of Civil Engineers (ASCE)
BMPRD#30	Stormwater Best Management Practices, Mosquitoes and West Nile Virus	2004	Monte Deatrich & Warren S. Brown, PE	Tri-County Health Dept. & UDFCD
BMPRD#31	Cleans All Gross Pollutant Trap			Rocla Water Quality
GENRD#11	Drainage Facilities Planning Review (Draft) GENRD#1 thru GENRD#10 are listed within GENRD#11	19-Mar-04	ASCG Incorporated	AMAFCA
GENRD#12	Characterizing Higher Frequency Storm Events in the Albuquerque Area	Dec. 2003	Pierce Runnels	UNM Master's Project CE 588

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
GENRD#13	Stormwater Strategies *Community Responses to Runoff Pollution* , Glossary Only	May-99	Peter Lehner, George Aponte Clarke, Diane Cameron, and Andrew Frank	Natural Resources Defense Council
GENRD#14	Terms of the Environment Abbreviations and Acronyms	Download 3/29/04		U.S. Environmental Protection Agency
GENRD#15	"Runoff Remedies" Article on stormwater regulations options to treat runoff.	Nov/Dec 2002	Roberta Baxter	Erosion Control Magazine Forester Communications, Inc. Santa Barbara, CA
GENRD#16	Litter Management Study; A Stormwater Perspective	Volume 8, November 1, 2000	Gary Lippner and Glenn Moeller CSU - Sacramento Office of Water Programs	American Sweeper Magazine/Caltrans
GENRD#17	Litter Management Study; A Stormwater Perspective	Volume 8, November 1, 2000	Roger Sutherland Pacific Water Resources, Oregon	American Sweeper Magazine
GENRD#18	Terms of the Environment Glossary	Download 3/29/04		U.S. Environmental Protection Agency
GENRD#19	Southwest Valley Flood Damage Reduction Study	Volume 3, March 2003	Resource Technology, Inc.	U.S. Army Corps of Engineers, Albuquerque District
SWQRD#01	NPDES PERMIT NO. NM000101 Albuquerque Municipal Separate Storm Sewer System	1-Dec-03	US EPA REGION 6	AMAFCA, Albuquerque, NMDOT, UNM

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
SWQRD#02	Assessing and Monitoring Floatable Debris	Aug-02	USEPA Oceans and Coastal Protection Div.	
SWQRD#03	COA/AMAFCA Storm Water Management Program	April 2004 Draft	City of Albuquerque	COA/AMAFCA
SWQRD#04	Characterization of Urban-Source Floatables (Report and PowerPoint)	1999?	HydroQual, Inc & NYC DEP - Newman, Leo & Gaffoglio -	NYC Dept. of Environmental Protection
SWQRD#05	Stormwater Monitoring Guide	2001	Isco, Inc.	Isco, Inc. Lincoln, Nebraska
SWQRD#06	Working Together to Restore the Anacostia Watershed - Annual Report	2001	Anacostia Watershed Restoration Committee	DC, Maryland, Montgomery County, NPS, Prince George's County, USACE, USEPA
SWQRD#07	NPDES Storm Water Program Question and Answer Document Volume II	Jul-93		US EPA
SWQRD#08	Economic Benefits of Runoff Controls	Sep-95		US EPA
SWQRD#09	Stormwater Bet Management Practices		Everglades Stormwater Program	South Florida Water Management District www.sfwmd.gov
SWQRD#10	PowerPoint - CIV3264 Urban Water and Wastewater Systems Assembling the Treatment Train			Monash, Australia's International University

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REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
SWQRD#11	Stormwater Gross Pollutants Industry Report	Dec-97	Robin Allison, Francis Chiew and Tom McMahon	Cooperative Research Centre for Catchment Hydrology www-civil.eng.monash.edu.au
SWQRD#12	Guidance Manual for the Monitoring and Reporting Requirements of the NPDES Storm Water Multi-Sector General Permit	Jan-99		US EPA
SWQRD#13	Developing Successful Runoff Control Programs for Urbanized Areas	Jul-94	Robert Losco, Urban Water Quality Specialist	Northern Virginia Soil and Water Conservation District
SWQRD#14	2002-2003 Litter Data Reporting Protocols CTSW-RT-02-068	Dec-02	Caltrans Monitoring and Water Quality Research Program	California Dept. of Transportation Environmental Program
SWQRD#15	2002-2003 Stormwater Quality Data Reporting Protocols CTSW-RT-02-067	Dec-02	Caltrans Monitoring and Water Quality Research Program	California Dept. of Transportation Environmental Program
SWQRD#16	Guidance Manual: Stormwater Monitoring (Second Edition) CTSW-RT-00-005	Jul-00	State of California Dept. of Transportation	Caltrans
SWQRD#17	Drainage Criteria Manual Vol. 3 - Best Management Practices	Sep-99	Urban Drainage and Flood Control District, CH2MHILL	Urban Drainage and Flood Control District (Denver CO) www.udfcd.org

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REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
SWQRD#18	2000 Maryland Stormwater Design Manual Volumes I & II	2000	Maryland Deparatment of the Environment, Center for Watershed Protection	Maryland Department of the Environment www.mde.state.md.us
SWQRD#19	NPDES Manual - Storm Water Management Guidelines for Construction and Industrial Activities, Revision 1	Dec-03	NMDOT, Albuquerque, AMAFCA, SSCAFCA, Eberline Services, Inc.	NMDOT, Albuquerque, AMAFCA, SSCAFCA
SWQRD#20	Experience with Best Management Practices in Colorado	Apr-03	Conference Proceedings	Colorado Assoc. of Stormwater and Floodplain Managers and UDFCD
SWQRD#21	Stormwater Sand Filter Sizing and Design - A unit Operations Approach	2002	Ben R. Urbonas, PE	Urban Drainage and Flood Control District (UDFCD), Denver, CO
SWQRD#22	Stormwater Gross Pollutants Industry Report	Dec. 1997	Allison, Robin, Francis Chiew and Tom McMahon	Cooperative Research Centre for Catchment Hydrology
SWQRD#23	A Decision-Support System for determining Effective Trapping Strategies for Gross Pollutants	Apr-98	Allison, R.A., F.H.S. Chiew and T.A. McMahon	Cooperative Research Centre for Catchment Hydroogy
SWQRD#24	The removal of urban litter from stormwater conduits and streams	Jul-98	Armitage, Neil, Albert Rooseboom, Christo Nel and Peter Townsend	Report to the Water Research Commission by the University of Stellenbosch
SWQRD#25	The removal of urban litter from stormwater conduits and streams: Paper 1 – The quantities involved and catchment litter management options	Apr-00	Armitage, Neil and Albert Rooseboom	*Water SA, Vol. 26, No. 2*

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
SWQRD#26	Trash Total Maximum Daily Loads for the Los Angeles River Watershed	27-Nov-00	California Regional Water Quality Control Board	California Regional Water Quality Control Board
SWQRD#27	EPA Stormwater Technology Fact Sheet – Baffle Boxes	Sep-01	USEPA Municipal Technology Branch, Washington D.C	USEPA Municipal Technology Branch, Washington D.C
SWQRD#28	EPA Combined Sewer Overflow Technology Fact Sheet – Floatables Control	Sep-99	USEPA Municipal Technology Branch, Washington D.C.	USEPA Municipal Technology Branch, Washington D.C.
SWQRD#29	EPA Combined Sewer Overflow Technology Fact Sheet – Screens	Sep-99	USEPA Municipal Technology Branch, Washington D.C.	USEPA Municipal Technology Branch, Washington D.C.
SWQRD#30	EPA Combined Sewer Overflow Technology Fact Sheet – Netting Systems for Floatables Control	Sep-99	USEPA Municipal Technology Branch, Washington D.C.	USEPA Municipal Technology Branch, Washington D.C.
SWQRD#31	Evaluating Innovative Stormwater Treatment Technologies Under the Environmental Technology Verification (ETV) Program	Sep-02	Hackett, Donna B., John Schenk and Mary Stinson	NSF International and USEPA/NRMRL
SWQRD#32	NJCAT Technology Verification Report – CDS Technologies, Inc.	Jun-03	New Jersey Corporation for Advanced Technology (NJCAT)	
SWQRD#33	Floatables Management Study: Control Technologies	Jan-04	North Central Texas Council of Governments (NCTCOG).	
SWQRD#34	Trash and Debris Best Management Practice (BMP) Evaluation (Appendix E2)	Jun-03	RBF Consulting	Orange County, CA Stormwater Program
SWQRD#35	Monitoring Guidelines for Measuring Gross Pollutants	2000	Rushton, Betty and Gordon England	Southwest Florida Water Management District.

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
SWQRD#36	Investigation of Structural Control Measures for New Development, Final Report	Nov-99	Larry Walker Associates, Inc.	Sacramento Stormwater Management Program
SWQRD#37	Update of the 1999 Catch Basin Retrofit Feasibilty Study Technical Memorandum	26-Jun-02	Santa Clara Valley Urban Runoff Pollution Prevention Program	
SWQRD#38	Structural Stormwater Quality BMP Cost – Size Relationship Information from the Literature	23-Jan-04	Taylor, Andre	Cooperative Research Centre for Catchment Hydrology
SWQRD#39	Retrofitting TxDOT Drainage Structures to Improve Stormwater Quality	Sep-01	H. Landphair, D. Thompson, M.Teal	Texas Transportation Institute
SWQRD#40	Cooks River Stormwater Management Plan, Section 8 Action Plan		Cooks River Catchment Management Association of Councils, New South Wales, AU	www.canterbury.nsw.gov.au/cookssmp/cooksmp_8.htm
SWQRD#41	Better Site Design: A Handbook for Changing Development Rules in Your Community	Aug-98	Center for Watershed Protection	
SWQRD#42	Illicit Discharge Detection and Elimination – A Guidance Manual for Program Development and Technical Assessments	Jun-04	Center for Watershed Protection and Dr. Robert Pitt, University of Alabama	
SWQRD#43	Pollution Source Control Practices (ver. 1.0). Urban Subwatershed Restoration Manual Series, Manual 8	Apr-04	Center for Watershed Protection	
SWQRD#44	Operation, Maintenance and Management of SWM Systems	1997	Livingston, Eric, Earl Shaver and Joseph Skupien	www.epa.gov/owow/nps/wmi

AMAFCA/ALBUQUERQUE MS4
GROSS POLLUTANT STUDY

APPENDIX 'B'
REFERENCE DOCUMENTS

REFERENCE NUMBER	TITLE	DATE	AUTHOR	PREPARED FOR/ PUBLISHED IN
SWQRD#45	High-Efficiency Sweeping	Nov-98	Minton, Gary R., Bill Lief and Roger Sutherland	Stormwater Treatment Northwest, vol. 4, no. 4
SWQRD#46	Effectiveness of Street Sweeping for Stormwater Control	December, 1999	Walker, T.A. and T.H.F. Wong	Cooperative Research Centre for Catchment Hydrology
SWQRD#47	AMAFCA/Albuquerque MS4 Gross Pollutant Study	August 2004 (Draft)	ASCG, Incorporated	AMAFCA & City of Albuquerque
SWQRD#48	Catching the Rain - A Great Lakes Resource Guide for Natural Stormwater Management	2004	American Rivers, Washington, D.C.	
SWQRD#49	Integrated Receiving Water Impacts Report	2000	Los Angeles County Department of Public Works	Los Angeles County Department of Public Works