CITY OF BALTIMORE

COMPREHENSIVE WATER AND WASTEWATER PLAN

Last Amended
AUGUST 2006

MARTIN O'MALLEY, MAYOR

BUREAU OF WATER & WASTEWATER
JAY SAKAI, HEAD

DEPARTMENT OF PUBLIC WORKS
GEORGE L. WINFIELD, DIRECTOR

CITY OF BALTIMORE

SHEILA DIXON, Mayor

DEPARTMENT OF PUBLIC WORKS

BUREAU OF WATER AND WASTEWATER
300 Abel Wolman Municipal Building
Baltimore, Maryland 21202

May 30, 2007

Ms. Virginia F. Kearney, Acting Director
Water Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore. MD 21230

Dear Ms. Kearney:

The Baltimore City Council recently adopted the 2006 Baltimore City Water and Sewerage Plan (Plan). Enclosed for your review are six (6) copies of the Plan, including a certification of consistency of the Plan with the City's Comprehensive Plan and the City Council resolution which adopts the Plan.

I am submitting these documents as a prerequisite for the review of and action on the Plan by the Maryland Department of the Environment. If you have any questions on this matter, please call Gary Wyatt of my staff at (410) 396-1460.

Sincerely,

JAY SAKAI
BUREAU HEAD

Attachments

JS/gaw

Cc: Mr. George Winfield
Mr. Jaswant Dhupar
Mr. Gary Wyatt

SHEILA DIXON
Mayor

DOUGLAS B. MCCOACH, III
Director

BALTIMORE CITY COMPREHENSIVE WATER AND WASTEWATER PLAN

2006 REVISION

STATEMENT OF CERTIFICATION

In accordance with the requirements of the State of Maryland the planning aspects of the 2006 Revision to the Baltimore City Comprehensive Water and Wastewater Plan have been found to be in agreement with the Baltimore City Comprehensive Plan. It should be recognized that changes in the scheduling and costs of projects could occur during the review and approval period of the revision process.

Douglas McCoach III, Director
Baltimore City Department of Planning

5·18·2007
Date

CITY OF BALTIMORE
RESOLUTION 07 - 021
Council Bill 06-0529

Introduced by: The Council President
At the request of: The Administration (Department of Public Works)
Introduced and read first time: October 16, 2006
Assigned to: Land Use and Transportation Committee
Committee Report: Favorable
Council action: Adopted
Read second time: December 7, 2006

A RESOLUTION OF THE MAYOR AND CITY COUNCIL CONCERNING

The Comprehensive Water and Wastewater Plan for Baltimore City

FOR the purpose of adopting a Comprehensive Water and Wastewater Plan for Baltimore City; and providing for a special effective date.

Recitals

WHEREAS, The State of Maryland requires certain counties and the City of Baltimore to review once every 3 years a comprehensive water and wastewater plan and to adopt amendments or revisions thereof if such revisions or amendments are deemed necessary by the governing body of the county or the Maryland Department of the Environment; and

WHEREAS, Acting on behalf of the City of Baltimore, the Department of Public Works has prepared a plan as aforementioned; and

WHEREAS, The City's Capital Improvement Program shall automatically become part of the Comprehensive Water and Wastewater Plan upon approval of the annual Ordinance of Estimates; and

WHEREAS, As minor technical information is received that revises, but does not materially alter the Comprehensive Water and Wastewater Plan after it has been adopted, it may be added to the plan as appropriate replacement pages; and

WHEREAS, The Public Hearing as required by the State has been held.

SECTION 1. BE IT RESOLVED BY THE MAYOR AND CITY COUNCIL OF BALTIMORE, That the Comprehensive Water and Wastewater Plan for Baltimore City, dated 2006, is adopted.

SECTION 2. AND BE IT FURTHER RESOLVED, That in the event it is judicially determined that any word, phrase, clause, sentence, paragraph, section, or part in or of this plan, or the application thereof to any person or circumstance, is invalid, the remaining revisions and the

EXPLANATION: Underlining indicates matter added by amendment.
~~Strike out~~ indicates matter stricken by amendment.

dlr06-1037~3rd/05Dec06
remcc/cb06-0529~3rd/nbr

application of such provisions to other persons or circumstances shall not be affected thereby. The Mayor and City Council hereby declaring that they would have ordained the remaining provisions of this plan without the word, phrase, clause, sentence, paragraph, section, or part, or the application thereof, so held invalid.

SECTION 3. AND BE IT FURTHER RESOLVED, That this Resolution takes effect on the date it is enacted.

Certified as duly passed this JAN 2 2 2007 day of _____, 20__

President, Baltimore City Council

Certified as duly delivered to His Honor, the Mayor,

this JAN 2 2 2007 day of _____, 20__

Chief Clerk

Approved this 6th day of FEB, 2007

Mayor, Baltimore City

Approved For Form and Legal Sufficiency

This 30th Day of 1/07.

Assistant Solicitor

A TRUE COPY

Edward J. Gallagher
Director of Finance

dlr06-1037-3rd/05Dec06
remcc/cb06-0529-3rd/nbr

COMPREHENSIVE WATER AND WASTEWATER PLAN
BALTIMORE CITY, MARYLAND

TABLE OF CONTENTS

CHAPTER I - OBJECTIVES AND ORGANIZATION

General I-1
City Water and Sewer Agencies I-2
Definitions I-4
Metric Conversion I-6

CHAPTER II - BALTIMORE CITY PROFILE

General II-1
Physical II-1
Population II-4
Land Use II-4
Goals to Meet Maryland Department of Planning Draft Water and Sewer Planning Principles, February 2, 2004 II-9
Principle 1 – Support Smart Growth II-9
Principle 2 – Maintain and Improve Existing Systems II-11
Principle 3 – Manage Service Area Expansions II-11
Principle 4 – Expand System Capacity Based On Need II-12
Principle 5 – Present A Capital Program Based On Need II-13
Principle 6 – Allocate Capacity to Support Smart Growth II-14
Principle 7 – Protect Water Quality and Water Supply Sources II-14
Principle 8 – Assure Adequate User Structure Rate II-15
Principle 9 – Incorporate Subsidiary Plans II-16
Summaries of Other County Water and Wastewater Plans II-17
Baltimore County II-17
Anne Arundel County II-19
Howard County II-20
Carroll County II-21
Harford County II-23

CHAPTER III - WATER SUPPLY AND DISTRIBUTION

Introduction III-1
The Baltimore Water Distribution System III-1
Service Area Boundary (URDL) III-2
Zones of Service and Demands III-6
Water Supply Sources III-16
Impounded Supplies – Gunpowder Falls & Patapsco River III-18
Operation of Impounding Supplies III-18
Reservoir Improvements III-20
Susquehanna Pumped Supply III-20
Operation of Susquehanna Pumped Supply III-21
Susquehanna Supply Improvements III-21

TABLE OF CONTENTS (CONT'D)

CHAPTER III - WATER SUPPLY AND DISTRIBUTION (CONT'D)

Reservoir Pollution III-21
Reservoir Watershed Management III-22
Forest Management Plan III-24
Water Treatment III-25
Purification Plants III-25
Montebello Filtration Plants No. 1 and No. 2 III-27
Ashburton Filtration Plant III-28
Water Distribution III-28
Method of Distribution by Zones III-29
First Zone III-29
Second Zone III-31
Colgate Second Zone III-32
Eastern Third Zone III-33
Western Third Zone III-34
Fourth Zone III-34
Fifth Zone III-35
Distribution System Projects III-35
Pumping Stations III-36
Storage Facilities III-36
Uncovered Finished Water Reservoirs III-37
Central System Studies III-38
Water Finance III-41
Maryland Water Conservation Plumbing Fixtures Act III-42

CHAPTER IV – WASTEWATER COLLECTION AND TREATMENT

Introduction IV-1
Discharge Permits IV-2
Population Projections and Flow Estimates IV-2
Wastewater Collection Systems IV-5
Consent Decree IV-5
Other Collection System Projects IV-9
Wastewater Treatment Plants IV-10
Back River Wastewater Treatment Plant IV-10
Future Development of Back River WWTP IV-11
Patapsco Wastewater Treatment Plant IV-12
Future Development of Patapsco WWTP IV-12
Summary of Wastewater Facilities Master Plan IV-13
Jurisdictional Flow Allocation/Agreements IV-14
Wastewater Finance IV-15

LIST OF TABLES AND FIGURES

CHAPTER I - OBJECTIVES AND ORGANIZATION

Figure 1-1	Organizational Chart	I-3

CHAPTER II - BALTIMORE CITY PROFILE

Table 2-1	Population Projections for Baltimore City	II-4
Figure 2-1	Generalized Topography & Water Surface Patterns	II-3
Figure 2-2	Population Distribution	II-5
Figure 2-3	Existing Land Use	II-6
Figure 2-4	Zoning Distribution	II-7
Figure 2-5	Priority Funding Areas	II-10

CHAPTER III – WATER SUPPLY AND DISTRIBUTION

Table 3-1	Existing and Ultimate Service Areas by Pressure Zone	III-6
Table 3-2	Estimate of Population and Water Supplied FY 2004	III-7
Table 3-3	Water Supply Demands and Population Served	III-8
Table 3-4	Raw Water Quantities FY 2004	III-16
Table 3-5	Inventory of Existing Impounded Supplies	III-17
Table 3-6	Inventory of Existing Water Treatment Facilities	III-26
Table 3-7	Recommended Central System Improvement Projects	III-40
Figure 3-1	Present Water Service Area and Major Supply and Treatment Facilities	III-3
Figure 3-2	Future Baltimore City and County Water Service Area	III-5
Figure 3-3	Water Supply Demand Summary	III-15
Figure 3-4	Reservoir Watersheds	III-19
Figure 3-5	Supply Schematic of Central System	III-30

CHAPTER IV – WASTEWATER COLLECTION AND TREATMENT

Table 4-1	List of Discharge Permit Numbers	IV-2
Table 4-2	Sewerage Demands and Planned Capacity Back River WWTP	IV-3
Table 4-3	Sewerage Demands and Planned Capacity Patapsco WWTP	IV-4
Table 4-4	Patapsco Sewerage System Allocations	IV-15
Figure 4-1	Wastewater System Service Area	IV-6

APPENDIX

Exhibit A	Six-Year Capital Improvement Program
Exhibit B	Water Distribution System Map
Exhibit C	Sewage System Map
Exhibit D	Interjurisdictional Agreements for Water and Wastewater

COMPREHENSIVE WATER AND WASTEWATER PLAN
BALTIMORE CITY, MARYLAND

CHAPTER I

OBJECTIVES AND ORGANIZATION

GENERAL

Title 9, Subtitle 5, Health-Environmental Article of the Annotated Code of Maryland establishes requirements for the preparation of "County Plans" which will guide the development of water and sewerage facilities consistent with population growth and economic development to minimize adverse effects on legitimate water use. Regulations of the State Departments the Environment and Natural Resources promulgate the law. The State Department of the Environment Regulation 26.03.01 establishes procedures for implementing the law.

This Comprehensive Water and Wastewater Plan has been developed in accordance with the Maryland State Department of the Environment's Regulation 26.03.01 for Planning Water Supply and Sewerage Systems. The objective of this comprehensive plan is to guide the development of the ultimate water and wastewater systems consistent with population growth, comprehensive planning, and economic development so that an ample supply of water may be collected, treated and delivered to points where needed and so that collected wastewaters may be treated and disposed of to prevent or minimize adverse effects on legitimate water uses.

This plan, as adopted by resolution of the Mayor and City Council and approved by the State Department of the Environment is consistent with policy of the City for development of water and wastewater systems. Adoption of the plan as revised and amended shall follow the adoption process; i.e., proposed changes shall be presented at public hearings, adopted by resolution of the Mayor and City Council and approved by the Maryland State Department of the Environment.

Every three years following the last triennial review, the City Council will review the entire Comprehensive Water and Wastewater Plan and adopt changes or revisions as

necessary. During the time period between these triennial reviews, the City Council may adopt "special amendments" to the Plan as necessary or required. These "special amendments" are not considered as a review of the plan, but are done only to keep the Plan current.

Incorporated as part of this Plan is the City's six-year Capital Improvement Program (CIP) for water and wastewater facilities for years 2007 through 2012. That CIP is included herewith under Exhibit A. Subsequent annual updates to the City's CIP as adopted by the Mayor and City Council shall be henceforth recognized and referenced as part of this Plan.

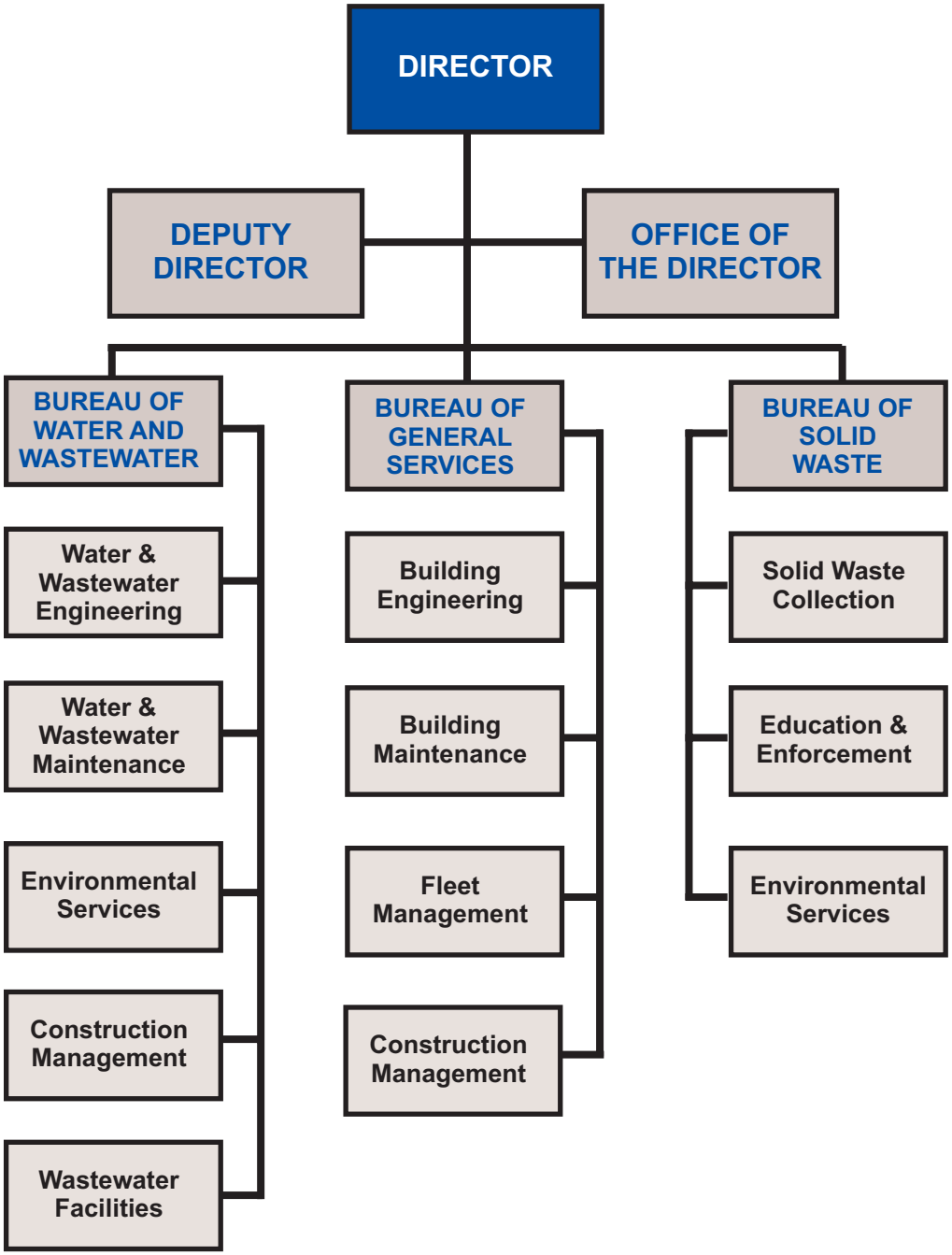
CITY WATER AND SEWER AGENCIES

Responsibility for management and operation of water and sewerage facilities is vested in the Department of Public Works. Organization of the Department is shown in Figure 1-1. In the Department, the Bureau of Water and Wastewater, through its Water and Wastewater Engineering Division, provides the planning, design, and construction guidance of (a) raw water collection and storage, water purification, pumping, and distribution facilities and (b) wastewater treatment, pumping and collection facilities.

Within the Water and Wastewater Engineering Division, the Wastewater Analyzer Office consists of Baltimore City engineers working cooperatively with Baltimore County engineers on evaluating and continuously updating the existing and future capacities of the sanitary sewer conveyance system. The Water Analyzer Office of the Water and Wastewater Engineering Division is responsible for evaluating the existing and future capacities of the Baltimore Metropolitan water distribution system.

The Water and Wastewater Maintenance Division is responsible for the operation and maintenance of the water and wastewater distribution and collection systems. The Division of Construction Management is responsible for the construction of the water and wastewater systems. The City Department of Health assists in the review of private disposal facilities.

DEPARTMENT OF PUBLIC WORKS ORGANIZATION CHART



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Comprehensive Water and Wastewater Plan

ORGANIZATION CHART

Date: **2006**

Figure: **1-1**

The Environmental Services Division is responsible for operating the water purification and distribution facilities, chemical and bacteriological examination of the three water supply reservoirs and the tributary streams, and the monitoring of the water quality of the treatment water throughout the entire distribution system including the counties. The Division is responsible for regulating industrial wastewater discharges to the municipal sanitary sewer system and operating the water and wastewater laboratories.

The Wastewater Facilities Division is responsible for the operation and maintenance of the wastewater treatment plants and pumping stations, and is also responsible for managing the wastewater treatment residuals disposal program.

DEFINITIONS

The following are definitions of terms used within the Comprehensive Water and Wastewater Plan, as provided in Regulation 26.03.01 of the State Department of the Environment's Regulations for Planning Water Supply and Sewerage Systems:

A. "CITY PLANS" - a comprehensive plan for the provision of adequate water supply systems and sewerage systems, whether publicly or privately owned, throughout the City and all amendments and revisions thereto.

B. "APPROVING AUTHORITY" - one or more officials, agents, or agencies of local government designated by the local governing body or specified by other provisions of Title 9, Subtitle 5, County Water and Sewerage Plans to take certain actions as a part of implementing this section.

C. "DEPARTMENT" - the State Department of the Environment.

D. "A SEWERAGE SERVICE AREA" - that area served by, or potentially served by, a system of sanitary sewers connected to a treatment plant, or in a very large system, sub-areas as delineated by the county.

E. "A WATER SERVICE AREA" - that area served by, or potentially served by, a single distribution system under control of a single utility, or, in very large system, sub-areas as delineated by the county.

F. "COMMUNITY SEWERAGE SYSTEM" - any system, whether publicly or privately owned, serving two or more individual lots, for the collection and disposal of sewerage or industrial wastes of a liquid nature, including

various devices for the treatment of such sewage and industrial wastes.

G. "COMMUNITY WATER SUPPLY SYSTEM" - a source of water and distribution system, including treatment and storage facilities, whether publicly or privately owned, serving two or more individual lots.

H. "MULTI-USE SEWERAGE SYSTEM" - a single system serving a single lot, whether owned or operated by an individual or group of individuals under private or collective ownership, and serving a group of individuals for the collection and disposal of sewage or industrial wastes of a liquid nature. Various devices for the treatment of such sewage and industrial wastes having a treatment capacity in excess of 5,000 GPD are included.

I. "MULTI-USE WATER SUPPLY SYSTEM" - a single system of piping, pumps, tanks, or other facilities utilizing a source of ground or surface water to supply a group of individuals on a single lot and having a capacity in excess of 5,000 GPD.

J. "INDIVIDUAL SEWERAGE SYSTEM" - a single system of sewers and piping treatment tanks or other facilities serving only a single lot and disposing of sewage or individual wastes of a liquid nature, in whole or in part, on or in the soil of the property, into any waters of this State, or by other methods.

K. "INDIVIDUAL WATER SUPPLY SYSTEM" - a single system of piping, pumps, tanks, or other facilities utilizing a source of ground or surface water to supply only a single lot.

L. "NON-POINT SOURCE" - pollution originating from land run-off where no specific outfall can be identified.

M. "EXISTING SERVICE AREA" - means that area which is currently served.

N. "UNDER CONSTRUCTION" - a work or works of community water supply and community sewerage systems where actual work is progressing or where a notice to proceed with a contract for such work has been let as the adoption date of this plan, its amendment, or revision.

O. "FINAL PLANNING STAGES" - a work or works of community water supply or sewerage systems for which contract plans and specifications have been completed.

P. "IMMEDIATE PRIORITY" - a work or works of community water supply and community sewerage system for which the beginning of construction is scheduled to start within 2 years following the date of adoption of the plan, its amendment and revision thereof.

Q. "FIVE OR SIX-YEAR PERIOD" - that period, depending upon the City's Capital Improvement Program, 5 or 6 years following the date of adoption of the plan, its amendment or revision by the City.

R. "TEN-YEAR PERIOD" - that period of the 6 or 7 through 10 years following the date of adoption of the plan, its amendment or revision by the City.

METRIC CONVERSION

1 INCH = 2.54 CENTIMETERS (CM)

1 FOOT = 0.3048 METERS (M)

1 MILE = 1.609 KILOMETERS (KM)

1 SQUARE MILE = 2.59 SQUARE KILOMETERS (SKM)

1 ACRE = 0.4046 HECTARES (HA)

1 GALLON = 3.785 LITRES (L)

1 BILLION GALLONS = 3.785 MILLION CUBIC METERS (MCM)

1 MILLION GALLONS PER DAY = 3.785 THOUSAND CUBIC METERS PER DAY (TCMD)

1 MILLION GALLONS PER DAY= 3.785 MILLION CUBIC LITERS PER DAY

COMPREHENSIVE WATER AND WASTEWATER PLAN
BALTIMORE CITY, MARYLAND

CHAPTER II

BALTIMORE CITY PROFILE

GENERAL

Baltimore City (the City) is the core of a metropolitan area extending into five adjacent counties (Anne Arundel, Baltimore, Carroll, Harford and Howard) and has approximately 2,512,500 inhabitants. The City includes 92 square miles, 13 of which are water-covered.

In the heart of the Mid-Atlantic region, the port city of Baltimore is a dynamic urban center fueled by a diverse economy, internationally renowned universities and medical centers, and an extraordinary collection of historic and cultural resources. Industries such as health care and life sciences, international finance and banking, hospitality and entertainment, and maritime commerce attract a highly educated and productive workforce that includes the nation's highest concentration of residents with advanced degrees.

PHYSICAL

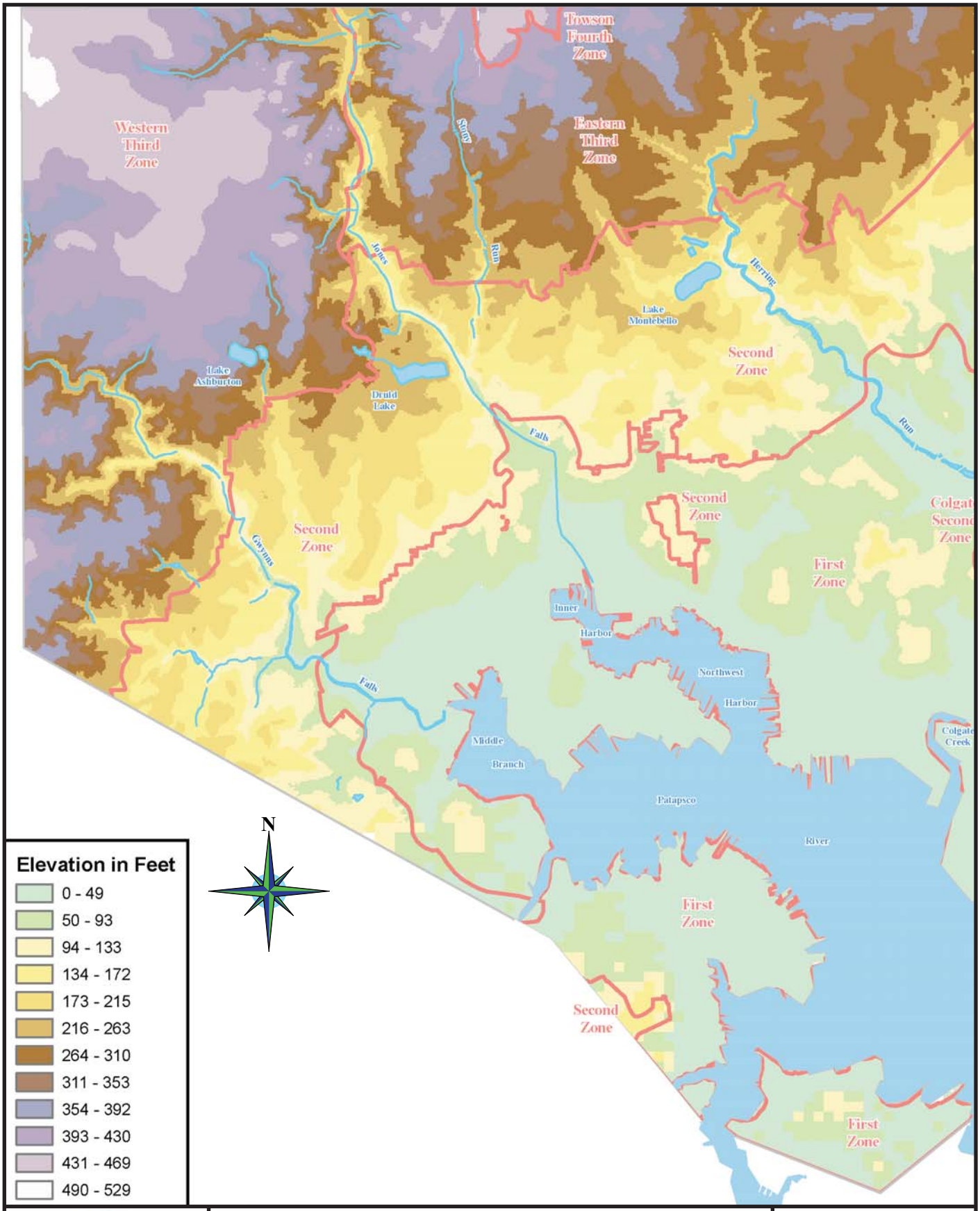
The land area of Baltimore City is split into two physiographic regions: the Piedmont Plateau and the Atlantic Coastal Plain. The separation is roughly parallel to the Chesapeake Bay shore, through western Baltimore City in a northeast - southeast direction. The boundary of the two physiographic regions is called the "Fall Line". The Piedmont Plateau is characterized by underlying Precambrian crystalline rocks: gabbro, schist, granite, and gneiss. The land surface is higher and more rugged than that of the coastal plain due to the greater resistance to erosion. The Piedmont aquifer provides a relatively poor water supply, because water is contained in joints and fractures in the rock, leading to irregular and non-homogeneous water bearing zones. The coastal plain is characterized by underlying soft, unconsolidated sediments of the Lower Cretaceous, Upper Cretaceous and Pleistocene ages. The sediments of the Upper and Lower

Cretaceous may be divided into three formations: the Patuxent formation (Lower Cretaceous) and the Anne Arundel clay and Patapsco formations (Upper Cretaceous). Both the Patuxent and Patapsco are important water bearing formations. Figure 2-1 summarizes the general topographic characteristics of Baltimore City.

Owing to the great difference in water-bearing properties of the crystalline rocks in the Piedmont Plateau and the unconsolidated sediments in the Coastal Plain, ground water in the Baltimore region occurs under two widely different sets of conditions. In the crystalline rocks, the water is contained chiefly in joints and other fractures which are not uniform in size and gradually disappear with depth. Consequently, the water-bearing zones are very irregular and non-homogeneous. The sand and gravel in the Coastal Plain sediments are considerably more porous and permeable and form relatively uniform and wide spread aquifers. Except in areas of outcrop, the water in the water-bearing formations in the Coastal Plain occurs under artesian conditions. Development of ground water supplies within Baltimore City was for the most part limited to industrial use. The use of ground water resources in the Baltimore area reached a peak in 1942. Salt water intrusion and acid contamination resulted in a continuous decline in ground water use.

Baltimore City lies entirely within two major watersheds, the Patapsco River Basin and the Back River Basin. The total drainage area of the two river basins is 673 square miles. Of the total drainage area, 238 square miles are in Baltimore County, 200 square miles in Carroll County, 89 square miles in Baltimore City, 85 square miles in Anne Arundel County, and 60 square miles in Howard County. The City works in concert with the Chesapeake Bay Program initiatives and addresses the impact of elements such as total maximum daily loads (TMDLs) that affect the waterways negatively. Major measures are being undertaken at the two wastewater treatment plants in the City to develop enhanced nutrient removal (ENR) as discussed in more detail in Principle 7 of this chapter.

The surface waters of Baltimore City are designated as Class I or Class IV waters by the Maryland Department of Health and Mental Hygiene. Class I waters are to be protected for use as water contact recreation, for fish and other aquatic life and for wildlife. Class IV waters are designated recreational trout waters capable of holding or supporting adult trout for put and take fishing and managed as a special fishery by periodic stocking and seasonal catching. Only the stream listed here have been designated as Class IV, the



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Comprehensive Water and Wastewater Plan

GENERALIZED TOPOGRAPHY & WATER SURFACE PATTERNS

Date: **2006**

Figure: **2-1**

remaining streams in the City are designated as Class I: (a) Jones Falls from North Avenue to Lake Roland Dam; (b) Herring Run and all tributaries above Interstate 95; (c) Stony Run and all tributaries; (d) Dead Run and all tributaries. Water quality standards have been developed for Class I and Class IV waterways and can be obtained through the Maryland Department of Health and Mental Hygiene.

POPULATION

The population projections for Baltimore City covering the time span from the last census in 2000 to the year 2030 are presented in Table 2-1. A map illustrating the population distribution based upon the 2000 Census is presented in Figure 2-2 (Source: City of Baltimore Department of Planning).

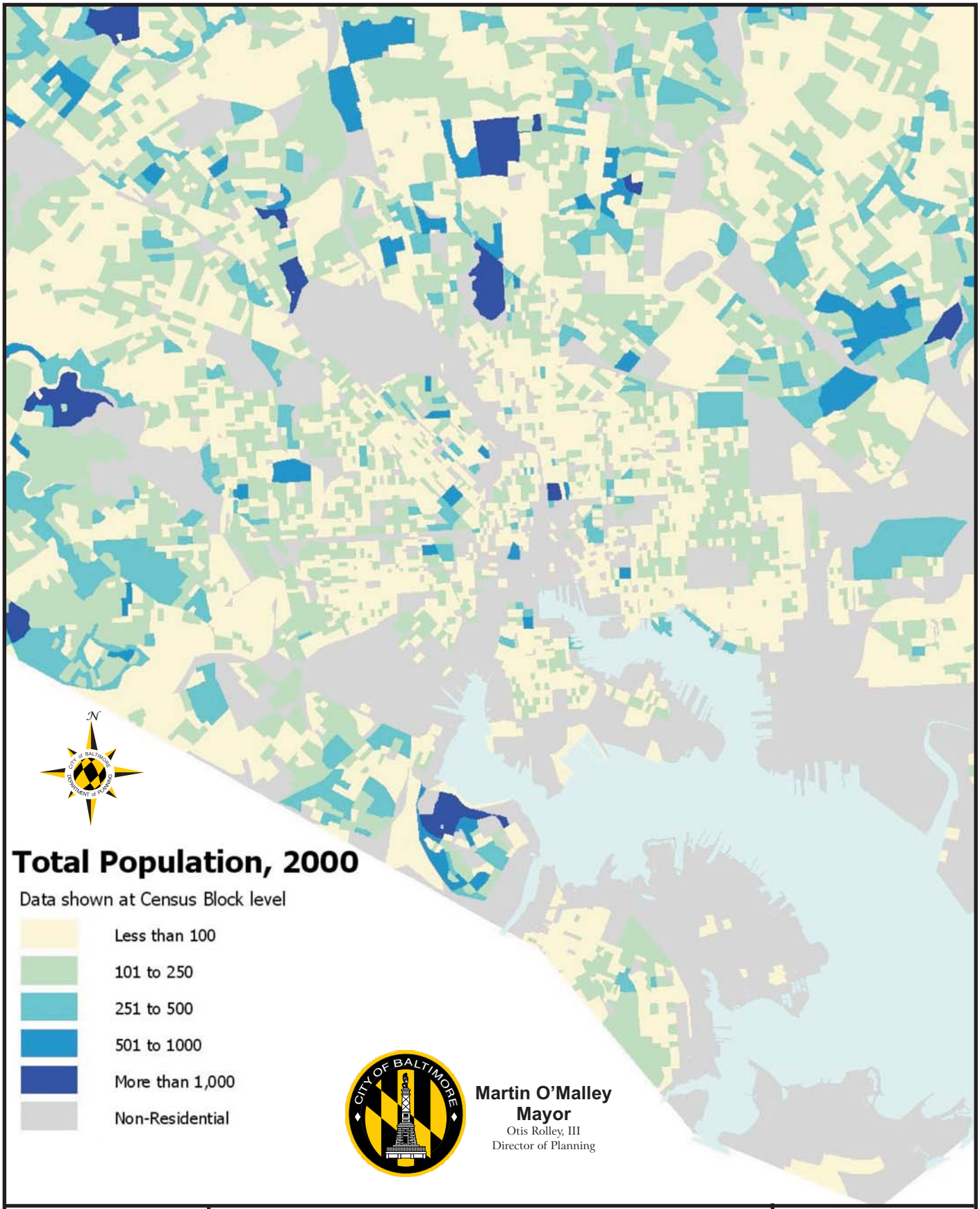
TABLE 2-1

POPULATION PROJECTIONS FOR BALTIMORE CITY

Year	Population	Source
1995	701,685	Census Bureau Revised Estimate
2000	651,154	Census Bureau Enumeration
2005	653,300	Round 6 Cooperative Forecasts, BMC (Approved Dec. 16, 2003)
2010	656,200	Round 6 Cooperative Forecasts, BMC (Approved Dec. 16, 2003)
2015	658,900	Round 6 Cooperative Forecasts, BMC (Approved Dec. 16, 2003)
2020	661,100	Round 6 Cooperative Forecasts, BMC (Approved Dec. 16, 2003)
2025	661,500	Round 6 Cooperative Forecasts, BMC (Approved Dec. 16, 2003)
2030	661,500	City Department of Planning Estimate

LAND USE

The City has a wide range of land usage. The existing land use patterns are presented in Figure 2-3 (Source: City of Baltimore Department of Planning). In Figure 2-4 (Source: City of Baltimore Department of Planning), the City's current land zoning distribution is shown, with 'R' for residential zoning areas, 'B' for commercial, and 'M' for industrial.



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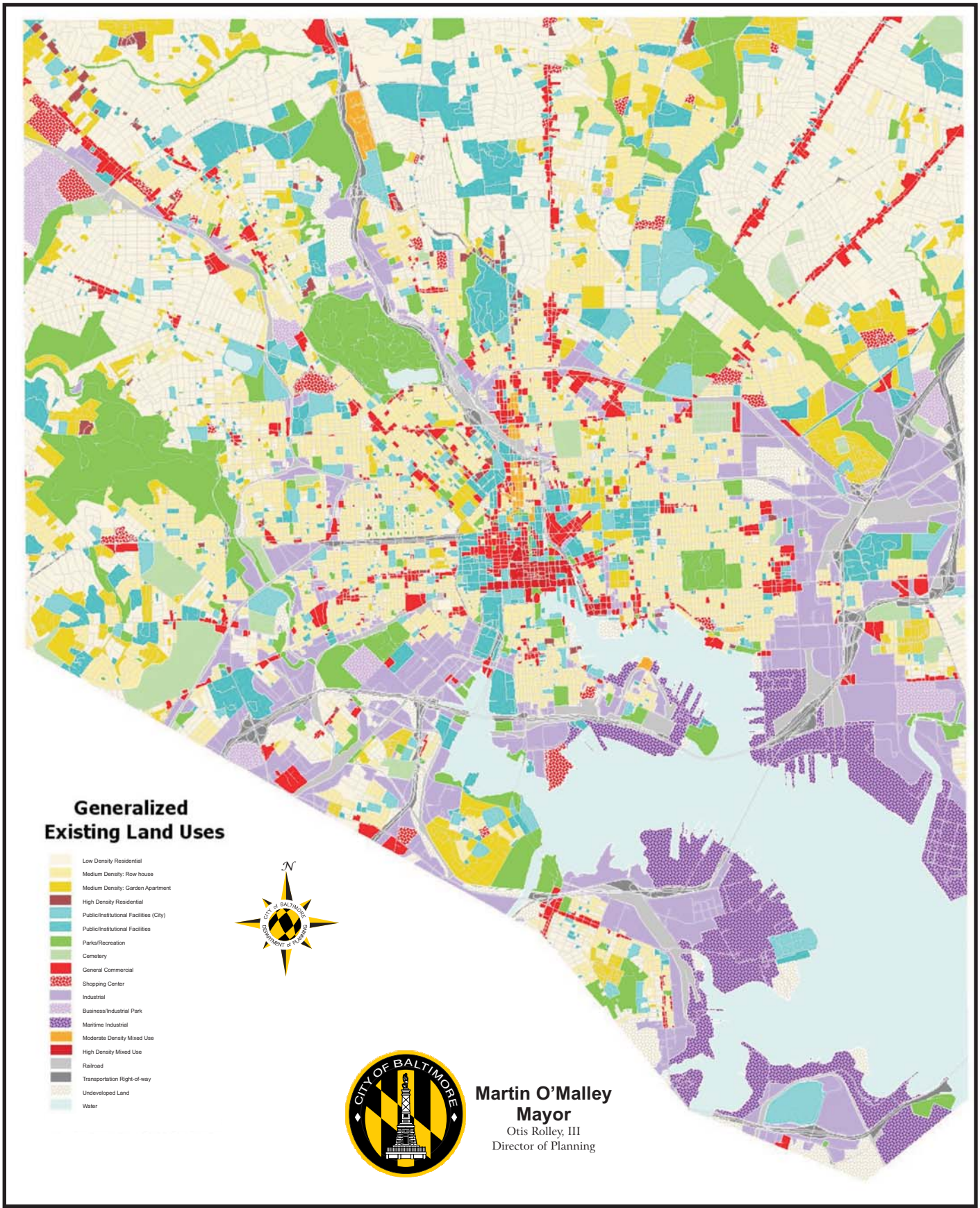
POPULATION DISTRIBUTION

Date: **2006**

Figure: **2-2**



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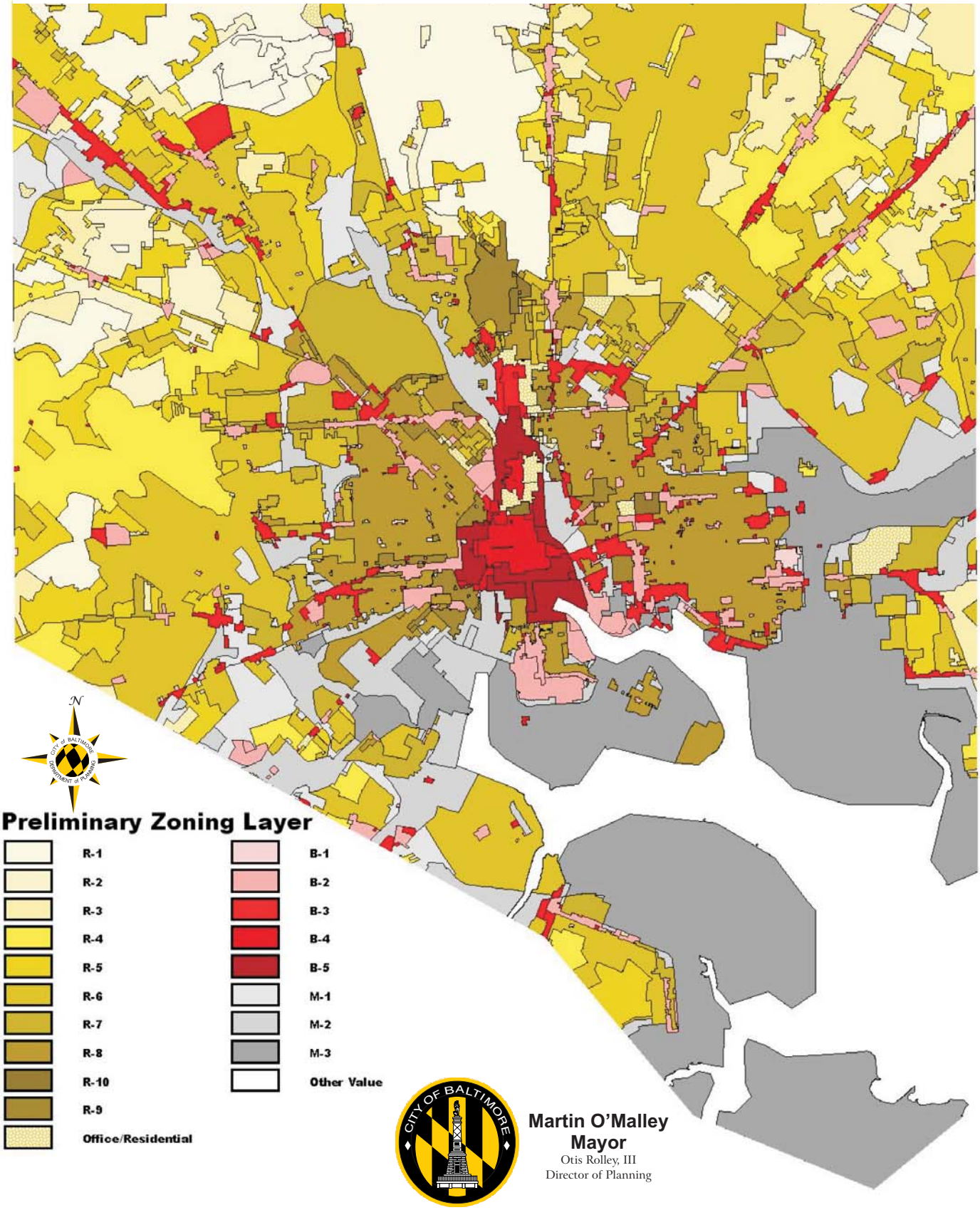
Comprehensive Water and Wastewater Plan

EXISTING LAND USE

Date: **2006**

Figure: **2-3**



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Comprehensive Water and Wastewater Plan

ZONING DISTRIBUTION

Date: **2006**

Figure: **2-4**

Land use within the City is densely developed and typical of older urban areas. Land use is implemented through the citywide zoning code and localized urban renewal plans and planned unit developments. Uses range from heavy industrial zones to commercial to single family residential. The significant trend affecting land use in the first half of this decade is a steady increase in investment activity leading to infill development, redevelopment, and conversion from industrial to other uses. This development was initially prevalent in waterfront areas and continues. More recently, development activity is occurring near transportation nodes and where larger tracts of land are available. For example, from 2000 to 2005, 142 new construction or renovation projects creating 9,002 new residential units were completed or are under construction. There are also plans for 66 additional projects creating more than 10,000 new units. Prior to this reinvestment activity, population loss and a shift to a service economy were the major trends affecting land use in Baltimore. The population losses of the 60s, 70s and 80s continued through the 1990s leading to vacant housing and disinvestment. The revised 2003 U.S. Census estimate showed, however, that these losses have significantly slowed and population is leveling out. At the same time, industrial uses declined. The combination of investment in waterfront areas and the shift to a service economy has led to a number of conversions of land use. For example, in the immediate waterfront area, a maritime industrial overlay zone was enacted in 2004 to balance the demand for deepwater frontage properties for port related uses with the demand for mixed use developments in industrially zoned areas.

Overall, in Baltimore, it can be said that land use is relatively stable although types of uses are changing. As is described in subsequent sections, the water and sewer needs are to adequately serve new development through updating the existing infrastructure, as opposed to additional new infrastructure. For example, the City has several redevelopment projects underway to revitalize certain areas of town, such as the Biotech Park in East Baltimore north of Johns Hopkins Hospital and the Locust Point area. New infrastructure is not required to meet the future needs of these redevelopment areas, only rehabilitation of the existing systems.

It should also be noted that the update of the City Comprehensive Plan has been completed. A comprehensive update to the zoning will follow. This would constitute the first major update to the City's zoning in over thirty years.

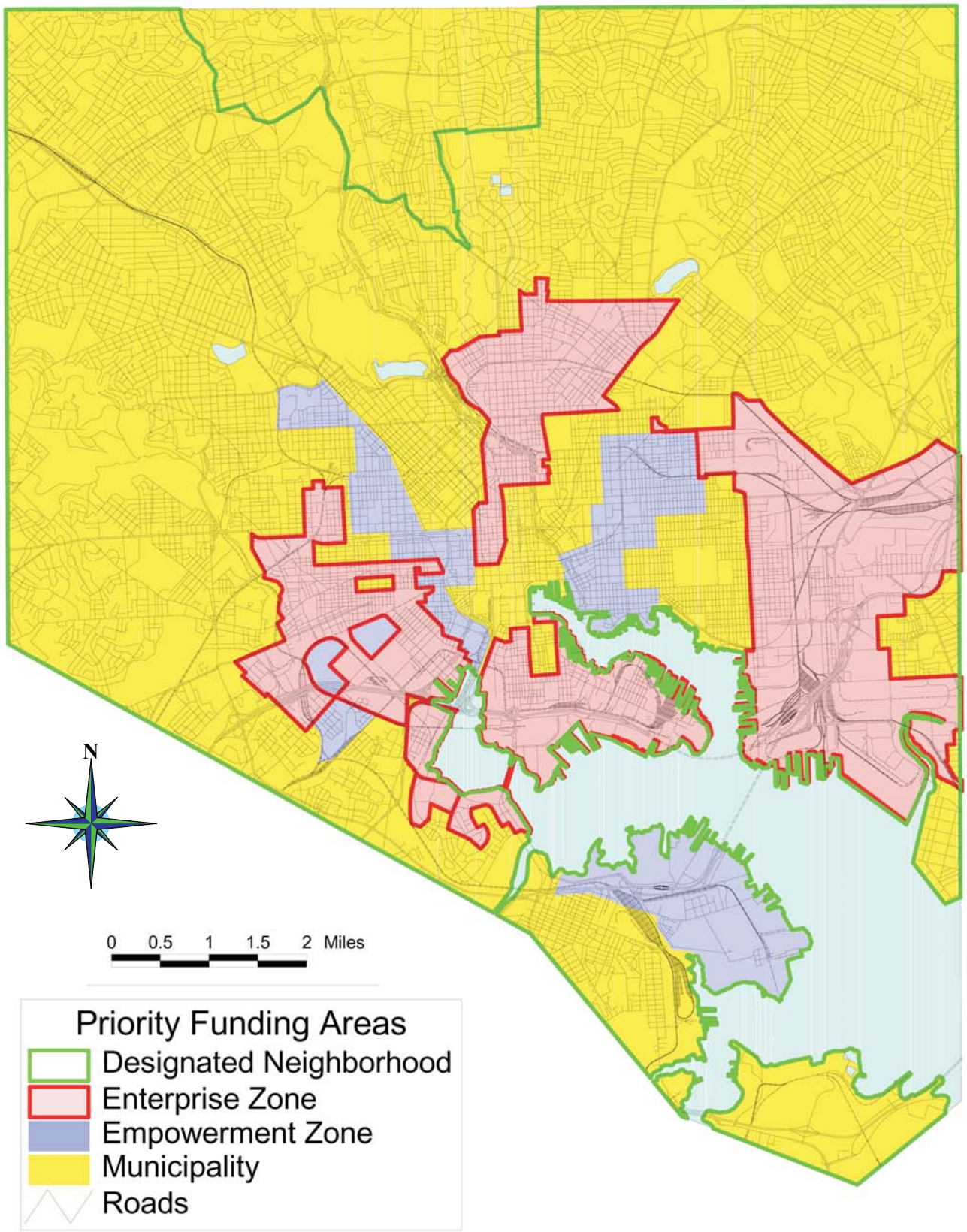
GOALS TO MEET MARYLAND DEPARTMENT OF PLANNING DRAFT WATER AND SEWER PLANNING PRINCIPLES, FEBRUARY 2, 2004

PRINCIPLE 1 – Support Smart Growth

Baltimore City is entirely in a Priority Funding Area (PFA) as shown in Figure 2-5 (Source: Maryland Department of Planning). The City is promoting development by strategically targeting and leveraging investments and supporting improvements that enhance the City's livability and marketability for homeowners, businesses and tourists. The priority is ensuring that strong renovation and maintenance programs are in place to assure the integrity of the water and wastewater systems.

Unlike surrounding suburban jurisdictions, development in the City, for the large part, takes form in redevelopment and infill development projects. For example, in Locust Point, the recent implementation of the maritime industrial overlay zone provides for the conversion of some industrial sites to mixed uses, including residential uses. A hydraulic analysis determined that there was no adverse impact on the existing water and wastewater systems that serve the area. Analyses of similar projects have resulted in the same conclusion.

Redevelopment in the City does not generally require increased capacity in the water and wastewater systems and is evaluated on a case by case basis. The City maintains an updated and calibrated hydraulic model to evaluate any changes to the system. Demands are projected based on proposed square footage and typical usage rates for the designated land use. The age and condition of existing infrastructure is taken into account during the assessment. Existing flows and pressures are monitored at the City's treatment plants, as well all pumping stations and storage facilities. Future flows are evaluated with the surrounding jurisdictions at their maximum allowable withdrawal limits to assure that capacities for each development are indeed available in relation to all other commitments and increasing flows from other jurisdictions.



Source: Maryland Department of Planning

Comprehensive Water and Wastewater Plan

PRIORITY FUNDING AREAS

Date: **2006**

Figure: **2-5**

Expansion of the systems to service area in Baltimore County is implemented according to long range plans and is limited in area by the established Baltimore County Metropolitan District (BCMD) and the Urban Rural Demarcation Line (URDL). These boundaries are discussed in more detail in Chapter 3. Existing policies, practices, and zoning restrictions support controlled expansion. Public water and wastewater facilities extended into the surrounding counties are subject to approval by Baltimore City. Should an upgrade to the systems be necessary, the counties will fund the improvements if it is determined that the improvement is made solely for the counties. Otherwise, a shared cost is agreed upon between the City and counties.

PRINCIPLE 2 – Maintain And Improve Existing Systems

Maintenance and improvements to existing water and sewer systems are major priorities with Baltimore City, and significant funds are allocated in the annual Capital Improvement Program (CIP) to address ongoing issues such as water distribution system improvements to repair or replace old, broken or damaged appurtenances; the capital sewer maintenance program; sewer replacement projects; small sewer extensions; and corrections to infiltration and inflow of storm water into sanitary sewers. A copy of the 2005 CIP which itemizes projects and costs for water and sewer projects is provided in Exhibit A of the Appendix.

Much of the water and wastewater systems that currently serve the City have been in place for many years. Continued maintenance of older mains and appurtenances and installation of new mains and minor appurtenances has met the needs of the system in the past. The expanded growth in the adjacent counties over the years, however, has created the necessity for major improvements projects to the City's water and wastewater systems. The City's current six-year CIP provides over $645 million for the water system, and the City currently has in place a commitment to undertake $900 million worth of improvements to the sewer system in the next 14 years due to the City's Consent Decree.

PRINCIPLE 3 – Manage Service Area Expansions

As noted in Principle 1, Baltimore City is entirely in a PFA designated area and

cannot be expanded. It is anticipated that the service needs of the City should be the same in ten years as they are today as there is little area for expansion and it has been demonstrated that rehabilitation of existing structures for redevelopment will not pose a major threat to the existing water or sanitary sewer systems, assuming ongoing maintenance and improvement upgrades continue to be performed as pledged in the CIP. The City also provides treated water to Baltimore County, Howard County and Anne Arundel County, and supplies raw water to Carroll and Harford Counties.

Baltimore County is the largest entity adjacent to the City that utilizes the City public water and sewer facilities. The Urban Rural Demarcation Line (URDL) and Baltimore County Metropolitan District (BCMD), both of which fall outside the City boundary, limit the area available for expansion in adjacent Baltimore County. As mentioned previously, the URDL and BCMD are discussed in more detail in Chapter 3. No expansions to the URDL or BCMD are permitted unless it can be proven that the existing water and/or sewer systems are adequate or there is a health threat. It is a longstanding Baltimore County policy that the URDL is intended to limit public water and sewer service, even though the BCMD has two larger areas outside the URDL.

PRINCIPLE 4 – Expand System Capacity Based On Demonstrated Needs

Baltimore City and County do not intend to extend water and sewer systems beyond the area established by the URDL. As noted in Principle 1, it has been demonstrated by several redevelopment projects in the City that the changes in use do not necessarily redirect the system capacity and therefore do not materially affect distribution of water or sewage collection. Early on in the planning process water and sewer systems in the City were created to ensure that adequate capacity would be available to serve the adjacent counties within the boundaries established. Development within those boundaries has been controlled by zoning and jurisdictional regulations in the counties to limit growth. Efficient use of land and public services and orderly development has resulted because of adherence to those boundaries which were created according to population, household and economic projections identified in engineering studies.

There is still room for expansion of the water and sewer systems in Baltimore County within the URDL and with Baltimore City approval. Howard, Carroll, and Harford Counties may also be requesting additional expansion of service, but Baltimore City will have control of those expansions as well based on conditions relating to the available capacity and funding participation established in existing agreements. Future water demands will be addressed by the expansion of the Montebello Water Filtration Plants, as well as the proposed Fullerton Treatment Plant. The City has been in negotiations with the Susquehanna River Basin Commission (SRBC) to ensure there will be adequate water available for the Fullerton Treatment Plant, which is planned to draw raw water from the Susquehanna River. This major facility is expected to meet anticipated demands through the year 2025 and beyond. This treatment plant is discussed in more detail in Chapter 3. Existing sewer facilities have adequate capacity to handle flows and anticipated treatment requirements, with the exception of enhanced nitrogen removal. Sewer facility projects are discussed in Chapter 4.

PRINCIPLE 5 – Present A Capital Program Based On Demonstrated Needs

The annual six year Capital Improvement Program (CIP) adopted by Baltimore City is the manifestation of research based on the analyses of system needs for new, rehabilitated or expanded facilities that are identified by long range engineering studies and empirical evidence shown by the condition of existing facilities. Baltimore and Howard Counties provide funds for new projects that serve only their own jurisdictions. Baltimore City and the counties coordinate in the effort to address the needs of the entire system and identify projects in their respective CIP programs. The six-year Baltimore City CIP for 2007 to 2012 encumbers funds of over $645 million for the water system and over $900 million for the sewer system to address on-going efforts to sustain the existing system and provide for major new facilities.

Much of this work will directly impact streams and waterways throughout the City, so the City's Planning Department staff, working with Department of Public Works (DPW) staff, recommends that all sewer work and stream restoration be closely coordinated. To the extent possible, stream restoration should be a component of any contract involving substantial sewer line work that affects any stream in need of restoration. Close coordination should be possible, since the stream and sewer

functions are both housed under the Bureau of Water and Waste Water within DPW. The capital improvement planning process can assist in coordination of funding from multiple sources to accomplish this goal. Shorter periods of disruption and potential cost savings should result.

Chapter 3 discusses the planned water system improvement projects in more detail and Chapter 4 the sewer projects. As mentioned previously, the City's CIP is provided in Exhibit A of the Appendix.

PRINCIPLE 6 – Allocate Capacity To Support Smart Growth

All of Baltimore City is within a PFA designated area; therefore all allocations for water and wastewater service in the City will meet state PFA requirements. Water supply to adjacent counties is controlled by jurisdictional agreements with the City. These agreements allocate water based on predetermined quantities reached by analyzing land uses, growth projections and zoning restrictions. Sewer allocations to adjacent counties relative to capacity at the treatment plants are set by the City and enforced through agreements as well.

PRINCIPLE 7 – Protect Water Quality And Water Supply Sources

The City, Baltimore County, Carroll County, Maryland Department of Agriculture, and Baltimore Metropolitan Council (BMC) signed and affirmed a Reservoir Watershed Management Agreement in 1984 which committed them to specific goals, policies, actions and implementing mechanisms intended to protect the quality of the water in City's three raw drinking water reservoirs: Liberty, Loch Raven and Prettyboy Reservoirs. It was updated in 1990 and reaffirmed in 2003. The BMC, funded by the signatories to the agreement, provides coordination and program administration to the Reservoir Watershed Protection Committee and the Reservoir Watershed Technical Group who work towards meeting the goals of the agreement. Those goals are:

- Prevent increased phosphorous and sediment loadings into the three reservoirs
- Reduce current phosphorous loadings in Liberty, Loch Raven and Prettyboy Reservoirs to acceptable levels as soon as possible

The City also owns and manages 17,580 acres of forested watershed immediately surrounding each reservoir, which provides critical protection from certain direct runoff loads.

In another on-going effort to address water quality concerns related to forestry activities in the City's watersheds, the City authorized the Maryland Department of Natural Resources to develop a Forest Management Plan. In 2002, a report was delivered to the City. More detailed information on this effort is provided in Chapter 3.

In addition, the City presently has a Drinking Water Regulations Compliance Evaluation underway which will ensure the City is meeting current drinking water regulations, and provides guidance for how to meet future regulations, such as the Stage 2 Disinfection and Disinfection Byproducts Rule (D/DBR) and the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

The recent Bay Restoration Fund allows Maryland to achieve more nutrient reductions through upgrading wastewater treatment plants with enhance nitrogen removal, upgrading septic systems in critical areas, and implementing cover crop on agricultural land. Recent findings in the draft Comprehensive Wastewater Facilities Master Plan by Whitman Requardt and Associates have determined that the ability to reduce influent total nitrogen (TN) levels at the Back River and Patapsco Wastewater Treatment Plants by the current biological nitrogen removal (BNR) technology to acceptable levels might not be possible. Therefore, the City has initiated two projects, one at each plant, to develop enhanced nutrient removal (ENR).

PRINCIPLE 8 – Assure Adequate User Structure Rate

The City's water and sewer systems are fairly old and require on-going maintenance of existing piping and facilities associated with operation of the system. The water filtration plants and wastewater treatment plants, as well as pumping stations and other large facilities, are continuously being updated to keep pace with anticipated growth as identified by population projections and the latest technologies. Maintenance of facilities is an on-going effort funded by allocated funds in the City's CIP. In addition,

the City is obligated by a Consent Decree to upgrade and improve existing deficiencies in the sanitary sewer system within the next 14 years at a cost of $900 million.

Baltimore City's user rate structure incorporates both anticipated capital project costs as well as operating and maintenance expenses necessary for proper water and wastewater system maintenance. The City has substantially increased both the capital and operating budget expenditures to address the aging infrastructure and to comply with requirements of the wastewater system Consent Decree. In order to pay for anticipated water and wastewater system maintenance costs, the City has developed a financial plan for the utilities that call for annual 9% rate increases. On April 14, 2004, the City Board of Estimates approved an annual water and wastewater rate increase of 9% effective April 15, 2004, April 15, 2005, and April 15, 2006. Historically, the City has raised water and wastewater rates substantially over that last decade to meet the increased costs of water and wastewater system integrity, as shown by the historical rate increases below:

Wastewater Utility Rate Increases:		Water Utility Rate Increases:	
April 1996	19% increase	April 1996	19% increase
June 1998	8% increase	June 1998	8% increase
May 2000	15% increase	May 2000	19% increase
April 2002	10% increase	April 2002	16% increase
April 2003	9% increase	April 2003	9% increase
April 2004	9% increase	April 2004	9% increase

PRINCIPLE 9 – Incorporate Subsidiary Plans

The City's systems encompass all of Baltimore City and all public water and wastewater service within the URDL in Baltimore County. The City's water distribution and sewer collection systems also serve eastern portions of Howard County and northern parts of Anne Arundel County. The City's raw water sources also provide water to Carroll and Harford Counties. These counties are full partners in the planning process which assures that their operating and capital programs, allocation policies and practices, as well as service areas, are reflected in all of the Water and Wastewater Plans. Future service areas in the counties are well established and mutual approval by

the individual county and Baltimore City must be obtained before a change can be implemented. A summary of each of the other county Water and Wastewater Plans is provided in the next section.

SUMMARIES OF OTHER COUNTY WATER AND WASTEWATER PLANS

BALTIMORE COUNTY

The Baltimore County Master Plan 2010 was adopted on February 22, 2000 under County Council Resolution 8-00. It was prepared in accordance with Section 523 of the Baltimore County Charter. The Water and Sewer Plan was adopted as an amendment to the Baltimore County Master Plan 2010 on February 20, 2003 under County Council Resolution 17-03. The Water and Sewer Plan is both supplementary to and in conformance with the Baltimore County Master Plan 2010.

Population and land use trends continue to change in Baltimore County. The estimated population is expected to grow by 9.7% from 754,292 in 2000 to 827,107 in 2025. These figures are from the Baltimore County triennial 2003 Comprehensive Water and Wastewater Plan. Baltimore County's 640 square miles that nearly surrounds Baltimore City has changed from rural into an urban-rural mix over the years. Approximately 90% of the population lives within the URDL line where public water and sewer are available, and the other 10% reside in rural areas outside the URDL. The growth areas of White Marsh and Owings Mills were established in 1979 as an effort to address Smart Growth. These areas function as town centers containing a wide mix of residential and commercial growth management. The planning and zoning processes in the County assure continued monitoring of growth compatible with existing and proposed water and sewer facilities.

Baltimore County receives all of its public water from the City's water system. Raw water sources that supply the system emanate from the three water reservoirs, Loch Raven, Prettyboy, and Liberty, located in Baltimore County, and from the Susquehanna River. Baltimore County uses about 99 million gallons per day (MGD) from the City system which is approximately 38% of the average day water demand of 261 MGD. Commerce and industry use about 30% of the 99 MGD, while residential

consumption accounts for the remaining 70%. Legal, financial and practical arrangements for the operation and maintenance of the County water system are defined by agreements between the two jurisdictions. Baltimore County builds and finances improvements that serve the County only; the City maintains and operates the County's system. The County participates in funding projects in the City that benefit the County as well. Cost participation is based on a percentage of the project cost as determined by the percent of benefit to the County. The URDL and BCMD limit expansion of the water system in the County. These boundaries were established with the knowledge that the water system is adequate to serve this entire area. There are approximately 30,000 wells that serve as drinking water supplies to approximately 70,000 rural residents of Baltimore County.

Baltimore County constructs, operates and maintains all sewage collection and pumping facilities within the County. There are 3,000 miles of sewers and 111 pumping stations in twenty-two (22) sewersheds broken down into eighty (80) sub-sewersheds. County generated sewage is treated and disposed of at the City owned and operated Back River and Patapsco WWTPs. The County pays a share of upgrading the City's major facilities, as well as maintenance and operational costs, based on the total flow conveyed from the County to the City's treatment plants. In 1995, the total flow to Back River WWTP was 159.9 MGD, and in 2003 the flow only increased to 168.9 MGD, both within the planned capacity of 175.0 MGD. Baltimore County contributes approximately 41% of the sewage flow at Back River WWTP. At the Patapsco WWTP adequate capacity is also available for County flows with a planned capacity of 87.5 MGD. In 1995, flows were 71.3 MGD, and by 2005, projected flows are only 81.0 MGD. Baltimore County contributes approximately 48% of the sewage flow at the Patapsco WWTP.

A recent development has occurred since adoption of the 2003 Comprehensive Water and Sewer Plan. Baltimore County and state and federal officials have reached agreement for the County to make more than $800 million in repairs and improvements to the sewer system and pay a $750,000 fine assessed for past spills that violate the Clean Water Act. The agreement, called a consent decree, gives the County 14 ½ years to make changes and upgrades, and take part in three environmental projects at an estimated cost of an additional $4.5 million. This consent decree is similar to the City's

consent decree which requires the City to make $900 million worth of repairs and improvements.

ANNE ARUNDEL COUNTY

The Anne Arundel County Master Plan for Water Supply and Sewerage Systems 2003 Update, reflects the policies of Anne Arundel County's 1997 General Development Plan and efforts of the community Small Area Plans. Anne Arundel County's plan enables them to fully utilize their groundwater resources and reduce reliance on the City's water supply. Only a relatively small area of Anne Arundel County's wastewater conveyance system discharges to the City's Patapsco Wastewater Treatment Plant (WWTP). The plan shows that current water and wastewater facilities owned and operated by the City are adequate to meet the forecasted interim and long-term demands of Anne Arundel County.

Population and land usage trends are to be expected for Anne Arundel County. The population was estimated at 460,900 people in 1995 and has grown by 5% to 489,656 people in 2000. With the Census 2000, the projected 2025 population was revised and is now expected to be 562,925 people. This represents a 15% increase from 2000 to 2025. Historically, Anne Arundel County has one of the highest increases in the number of people in Maryland, although the rate of population growth overall has been declining since 1970. Anne Arundel County's existing land use represents "a variety of development types, ages, qualities and conditions, and also demonstrates the close inter-relationship between living places and working places, between land use and transportation." Most of the residential development growth is near the principal urban centers such as Baltimore and Glen Burnie, as well as the BWI, Piney Orchard, Odenton, and Maryland City corridors.

Although Anne Arundel County is striving for reduced reliance on the City, a significant portion of Anne Arundel County's water supply is currently purchased from the City. Existing agreements give Anne Arundel County the right to purchase up to 32.5 MGD. However, in 2002, Anne Arundel County only used 18 MGD (max day) and 8.4 MGD (average day) of water from the City, not fully utilizing the City's supply. Anne Arundel County's existing well production capacity is 60 MGD and estimated future well

potential is an additional 51 MGD (not including those wells in rural service areas). Therefore, a total capacity of 111 MGD is considered readily feasible in the future. The projected ultimate demand after 2010 is 122.4 MGD (max day) based on build-out occurring by the year 2043. Therefore, only 12 MGD would be needed from the City's supply, which is well below the allotted amount in the agreement. Since Anne Arundel County is limited by the maximum groundwater supply potential, any deficiency between future demands and Anne Arundel County's ability to develop new well fields could be met by purchasing water from the City up to 32.5 MGD.

Approximately 18,000 acres in the Baltimore City Sewer Service Area (SSA) in Anne Arundel County discharges sanitary sewer flows to the Patapsco WWTP. Through an agreement with the City, Anne Arundel County is allotted an average daily flow of 6.390 MGD. Current daily flow in this SSA is 3.404 MGD and future total capacity required is estimated as 6.08 MGD; therefore, there is no immediate need for additional capacity. Anne Arundel County has also joined forces with Howard County to study alternatives for providing future treatment capacity for this area separate from the City's treatment plant if necessary.

HOWARD COUNTY

Howard County is a small county that has established land use patterns to assure balanced growth. The general plan does not recommend major changes to land use designations and reinforces limits of the planned growth boundary. The boundary encourages more compact development patterns in eastern Howard County, allowing more efficient provision of public services and facilities. Water and sewer facilities connected to the City's systems are adequate to serve Howard County. The majority of development is limited to the eastern portion of the County by a growth boundary. The western part of the County remains rural and is not served by public water and sewer.

The County obtains most of its water supply from Baltimore City, up to 38.5 MGD, and up to 3.0 MGD from the Washington Suburban Sanitary System (WSSC). Both of these numbers are the daily maximum allowed under the current agreements. The current agreements with the City obligate Howard County to limit its water usage to certain amounts from each zone. The County uses water from both the Second and

Western Third Zones. These agreements also require the County to pay for any major facility improvements to the City's water system which are constructed solely for the benefit of Howard County. Four meters calculate the volume of water taken by the County and the City is reimbursed according to fixed rates.

The sanitary sewer collection system in Howard County is discharged almost entirely to the Howard County owned and maintained Little Patuxent Treatment Plant. A very small diversion sends sewage to the Patapsco WWTP in Baltimore City. Agreements in place between Howard County and Baltimore City state that the County is allowed to send 10.4 MGD to the City's treatment facility. Current flows from the County amount to only 6.0 MGD. Projections for the year 2020 anticipate that an allocation of 10.3 MGD will be needed to meet growth demands; therefore the current agreement in place will be adequate. Howard County pays the City according to agreements for the volumetric flow sent to the treatment plant.

CARROLL COUNTY

Carroll County is located in central Maryland, and it is approximately west and northwest of Baltimore City. It extends northerly to the Pennsylvania line and it borders on Baltimore, Howard and Frederick Counties. A ridgeline running in the northeast-southwest direction drains northwesterly toward the Monocacy River and southeasterly toward the Gunpowder and Patapsco Rivers. Carroll County is the smallest of the six jurisdictions by population in the Baltimore Regional Planning Area, comprised of Baltimore City, and the counties of Anne Arundel, Baltimore, Harford and Howard. However, due to the Liberty Reservoir being an important water source for the Baltimore metropolitan water system, it is located in a significant, environmentally sensitive area. Carroll County is predominately rural with 26% of the population living in eight (8) incorporated towns on only 4% of the land area. Population has been increasing steadily since 1960. Census figures showed increases of 30.7% in 1970, 39.6% in 1980, 28.0% in 1990, and 22.3% in 2000.

All eight of the incorporated towns in Carroll County are served by community owned water and sewer systems. Approximately 42% of the population is connected to publicly owned community water systems and 39% to publicly owned community

sewerage systems. There are no large privately owned community water or sewerage systems. Publicly and privately owned individual wells and sewage disposal systems are located throughout the County in areas not served by community systems. Carroll County is predominantly rural in character with 66% of unincorporated land area zoned agricultural and 18% zoned conservation, leaving only 9% zoned residential and 2% zoned commercial or industrial. The remaining 5% is the eight municipalities, roads and major bodies of water. Water Resource Management Areas for existing and future water supplies have been identified and provide guidance for protective measures. Carroll County's watershed management approach is consistent with requirements of the Clean Water Act and the Reservoir Watershed Agreement in which the County also participates.

The quality of groundwater for the County's drinking water source is generally excellent. An active program of groundwater development for Community Planning Areas (CPA) has been followed. Water for the Sykesville-Freedom area is drawn directly from the Liberty Reservoir, for which the quantity is regulated by an agreement with Baltimore City. The agreement permits an average withdrawal rate of 2.4 MGD and the County shall not exceed a maximum rate of 90 million gallons over a 30 day period. Carroll County is a signatory to the 1984 Action Strategy for the reservoir watersheds. It is acknowledged that demands in this County will exceed the existing groundwater supplies after the year 2000 and additional surface supplies will be needed. The County is actively pursuing further development of this water source.

Since this plan was approved, Carroll County and Baltimore City entered into a lease and agreement signed February 16, 2005 by the City Board of Estimates for a 15-year nominal lease of 1.6 acres in the Liberty Watershed adjacent to the Freedom Water Treatment Plant. The County has indicated that this increase will allow for the expansion of the plant to serve existing residents in the Freedom District. The new agreement allows the County to draw an annual average daily flow of 4.2 MGD or a maximum flow of 180 MGD over any 30-day period from the Liberty Reservoir. Carroll County also recently joined in the reaffirmation of the Reservoir Watershed Management Agreement, which resolved differences between Carroll County and neighboring jurisdictions regarding watershed protection.

The 2003 Carroll County Master Plan for Water & Sewerage describes plans to address the effort to provide adequate sewerage facilities to the eight incorporated towns in conformity with identified service areas. The various municipal sewerage systems are regulated by the State of Maryland requirements for private systems. Records and reports must be sent to the State regularly for monitoring to ensure that the health, welfare and safety of consumers are protected. Connections to a community sewerage system are controlled by Carroll County relative to established sewer service areas.

HARFORD COUNTY

The Harford County Water and Sewer Master Plan maintains the concept of a planned development corridor, the Development Envelope, that was presented in earlier land use plans. It is the focal point of the County's growth management program, which ensures that planned development is located in suitable areas that can be provided with adequate public facilities. Systems operated by Harford County, the cities of Aberdeen and Havre de Grace, the Maryland-American Water Company, Aberdeen Proving Ground, and several smaller water systems provide the water and sewer systems within the Development Envelope.

The population in Harford County in 2000 was 218,590 and it is expected to reach 236,400 by 2010, an increase of 4.3%. The increase in population is anticipated in the Development Envelope and will be served by public water and sewer. There is adequate existing or planned capacity in the water and sewer facilities in Harford County to serve the needs of estimated growth to 2010.

The source of the County's potable water is a combination of surface water and groundwater. Surface water is taken from the Susquehanna River for treatment at the Havre de Grace Treatment Plant and from groundwater for treatment at the Perryman Treatment Plant. The Abingdon Treatment Plant was originally designed to take raw water from the City's Deer Creek Pumping Station which pulls water from the Susquehanna River at the Conowingo Dam, but because of complexities in the system operation, this plant has been receiving raw water from the City's Loch Raven Reservoir for the past 12 years. After improvements to Deer Creek Pumping Station are complete

within the next few years, raw water will then be supplied to the Abingdon Treatment Plant from this pumping station. The Abingdon Treatment Plant has a design capacity of 10 MGD. This plant provides approximately 60% of the daily water supply to the Harford County water system. Harford County has agreements with Havre de Grace and Baltimore City for allocations and funding. In accordance with the February 3, 1993 agreement between Baltimore City and Harford County, the City agrees to sell to the County 20 MGD of raw water in any 24-hour period to supply the Abingdon Treatment Plant. The County has the option to purchase an additional 10 MGD (to total 30 MGD) from the City if the City judges that it is able to supply the additional 10 MGD without materially affecting its ability to supply its other users.

It is estimated that approximately 64% (117,000) of the total existing population is presently served by the County central sewerage facilities and by municipal or privately owned systems. All sewage treatment facilities must satisfy the requirements of their National Pollutant Discharge Elimination System Permit continually.

COMPREHENSIVE WATER AND WASTEWATER PLAN
BALTIMORE CITY, MARYLAND

CHAPTER III

WATER SUPPLY AND DISTRIBUTION

INTRODUCTION

The City of Baltimore has the primary responsibility of providing water service to the Baltimore Metropolitan area. Chapter 539 of the Legislative Acts of 1924, known as the Metropolitan District Act, requires Baltimore City to furnish water to the Metropolitan District of Baltimore County at cost. Portions of Anne Arundel and Howard Counties are served by request and formalized in a series of agreements that are described in Exhibit D of the Appendix. The City also provides raw water to Harford and Carroll Counties. The City is essentially fully developed while major urban expansion continues in the surrounding county areas. Growth in water demand is expected primarily from future development outside City boundaries. In order to meet anticipated environmental regulations and meet increasing demands for water, the City is continuously engaged in the planning and development of improvements to maintain the system in sound physical condition. A list of the Capital Improvement Projects (CIP) for the City's water system totaling over $682 million for the years 2007 through 2012 are provided in Exhibit A of the Appendix. Descriptions of the water related projects can be found throughout this chapter.

THE BALTIMORE WATER DISTRIBUTION SYSTEM

The Baltimore distribution system, also known as the Central System, functions as the common water system for the City of Baltimore and the Baltimore County Metropolitan District. In addition, the system serves as a source of supply of filtered water for independent distribution systems in Anne Arundel and Howard Counties, as well as a source of raw water supply for Carroll County and Harford County.

The Baltimore Central System delivers filtered water to an estimated 1,600,000 consumers within a service area of approximately 291 square miles (753 skm). During Fiscal Year 2005 the Baltimore Central System supplied an annual average 241 MGD of

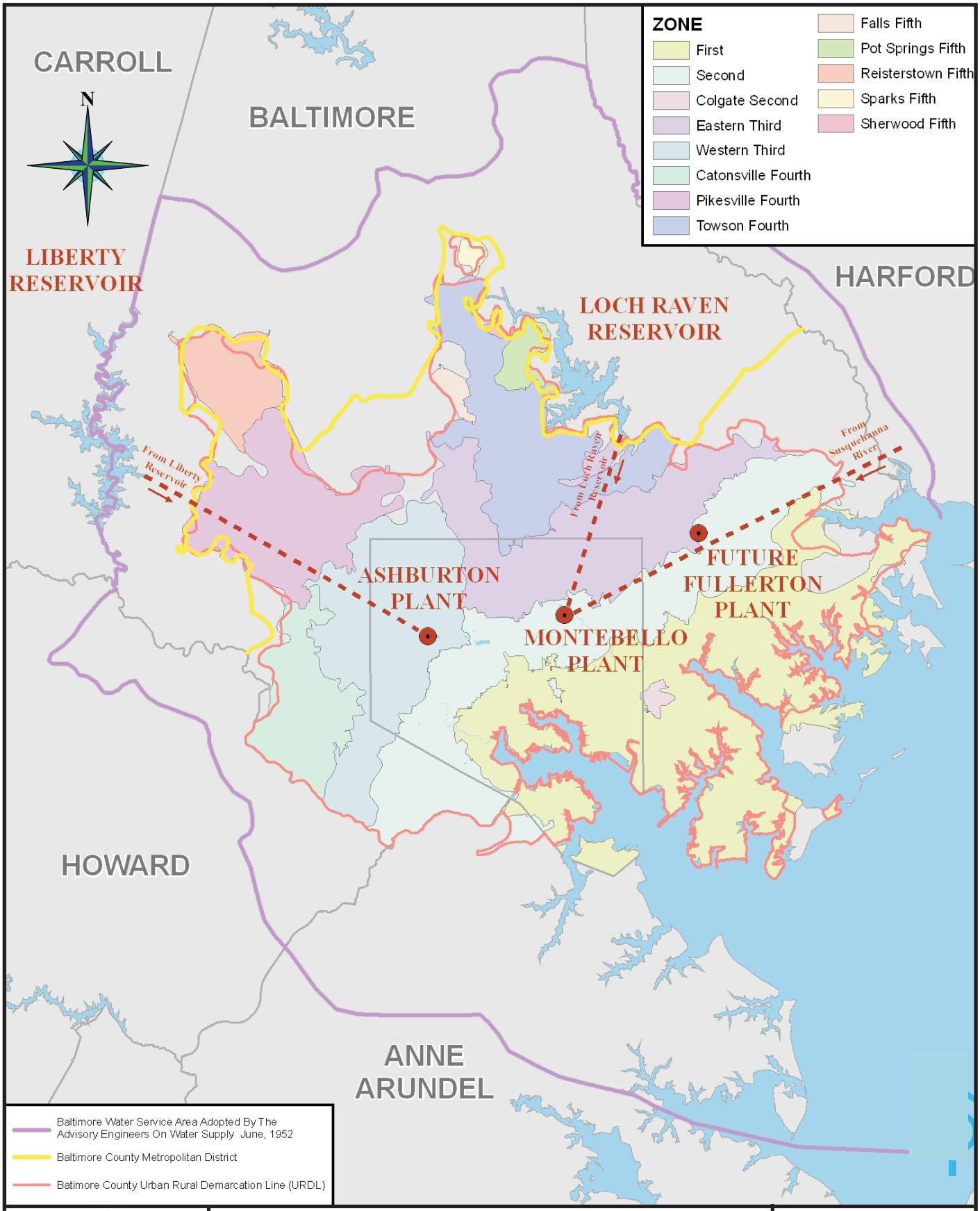
filtered water to the Baltimore metropolitan area (912 MLD) including Anne Arundel and Howard Counties. The City of Baltimore has an area of approximately 82 square miles (212 skm) and a population of approximately 659,000. The Fiscal Year 2005 annual average water supplied to the City was 107 MGD (405 MLD). To date, all areas of the City are being served or have the capacity to be served with existing facilities.

The development, operation, and maintenance of the major distribution facilities in the system are the responsibility of Baltimore City. The raw water supplies located on the Gunpowder, Patapsco, and Susquehanna Rivers, treatment facilities at Montebello and Ashburton, as well as all distribution facilities located within the boundaries of the City, are owned and operated by the City. Facilities located in neighboring Baltimore County are generally built by the County, but are operated and maintained by the City. At one time, Baltimore City owned and maintained a portion of the water distribution system in the Brooklyn Park area of Anne Arundel County. Ownership and maintenance of this system has recently been transferred to Anne Arundel County. Howard County both owns and operates the distribution system within its boundaries.

SERVICE AREA BOUNDARY (URDL)

The present service area of the Baltimore Central System, illustrated in Figure 3-1, encompasses all of the jurisdictional area of Baltimore City and a major portion of Baltimore County. Not shown in this figure are the areas within Howard County and Anne Arundel County that are also serviced by the Central System on a wholesale account basis, nor the areas within Harford and Carroll Counties which are supplied raw water. Predicting future service area expansions is an important planning step in determining future water system requirements.

Previous studies and water agreements have established several boundaries to define the ultimate limits of the area to be served. These boundaries are shown on Figure 3-1. In a report dated December 15, 1953 by the Board of Advisory Engineers (Report on Future Sources of Water Supply and Appurtenant Problems), an ultimate service boundary was established that encompassed an area of 709 square miles. By comparison, the area that is presently served by the Central System today is only 499.5 square miles, which includes 96.0 square miles and 112.4 square miles for the service areas of Anne Arundel



Achieving is working dpw together

Comprehensive Water and Wastewater Plan

PRESENT WATER SERVICE AREA & MAJOR SUPPLY & TREATMENT FACILITIES

Date: **2006**

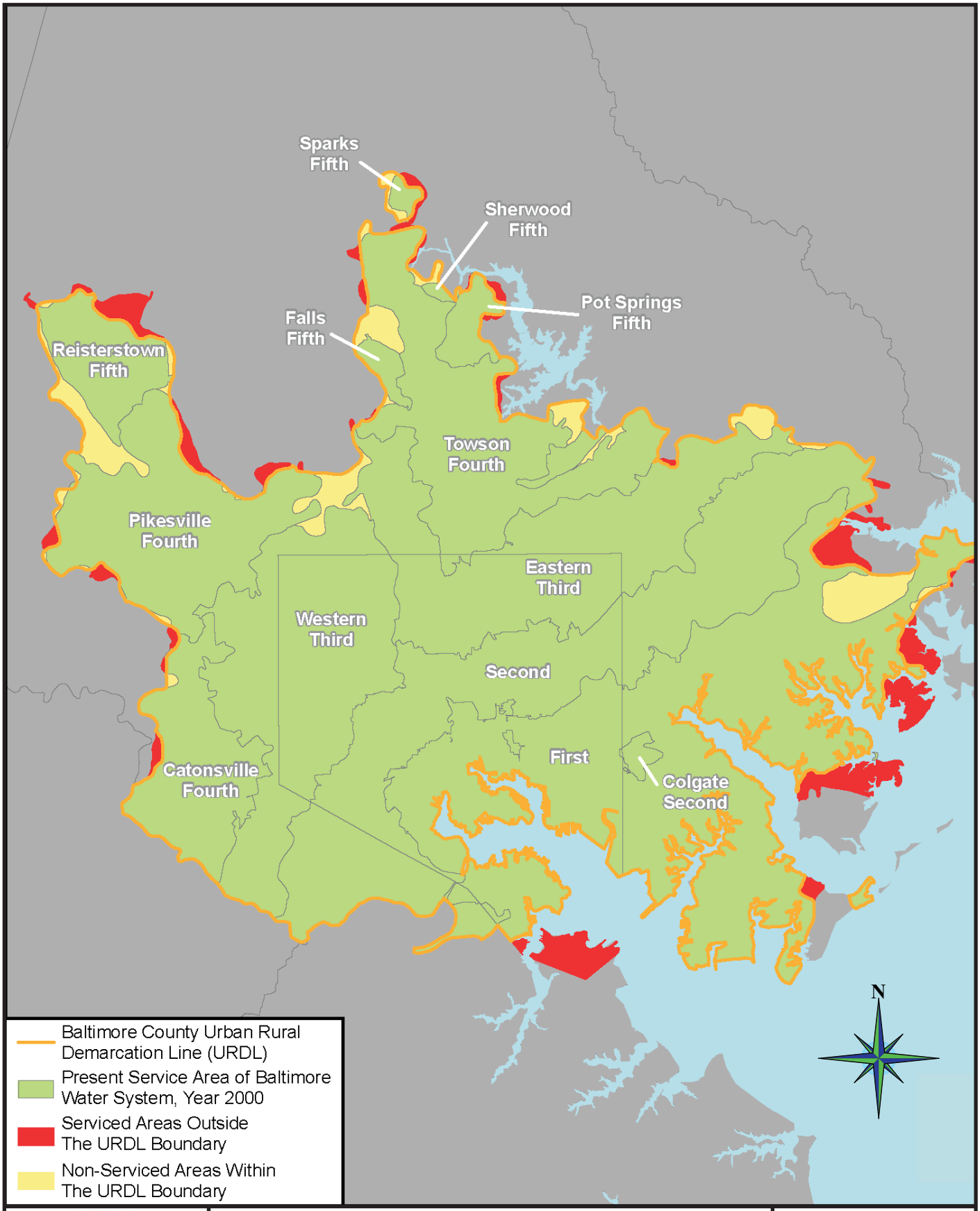
Figure: **3-1**

County and Howard County, respectively.

The City is required by statute to furnish water to the Baltimore County Metropolitan District (BCMD) under a 1924 Legislative Act by the Maryland General Assembly. The boundary line used to define the limits of the BCMD extends, in certain portions, well beyond another boundary Baltimore County established two decades ago as a “line in the sand” against development called the Urban-Rural Demarcation Line (URDL). Present Baltimore County zoning limits proposed water service to only that area contained within the URDL. Despite a few areas where water service has already extended beyond the URDL, Baltimore County, for the most part, has been successful in limiting water service to within the intended growth boundary (URDL). Today there remains only about 11.5 square miles of unserviced area that lies inside the URDL. Figure 3-2 shows those areas that remain to be provided public water service in the future as well as those areas presently serviced but outside the URDL.

The incongruity between the BCMD line and the URDL has existed for a long time and could represent a significant issue in establishing future service population and ultimate system demands if the state law is ever enforced to extend water and wastewater service to the BCMD line. The Baltimore County Water Analyzer Office has indicated that there are no plans, current or future, to extend water service beyond the URDL. The development of future projected demands, therefore, reflects only that area within the URDL plus any areas where water service has already been provided outside the URDL. Future projected demands and the timing of additional capital facilities and capacity development is dependant on Baltimore County’s ability to control growth beyond present URDL limits which they have successfully accomplished in most areas.

Presented in Table 3-1 are the existing and ultimate areas of service in Baltimore City and County for each of the thirteen pressure zones. The area within the City's border is presently fully serviced and no further expansion of the water system is possible. All service area growth that is expected will occur in the outlying regions in Baltimore County. The region of greatest expected growth is the Sherwood Fifth Zone, which will nearly double in size, followed by the Sparks Fifth and Falls Fifth Zones. Overall though, the service area of the Central System is only expected to grow 4.0 percent until it reaches the limits of the defined service boundary (URDL). However, it should be noted that other variables will



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Comprehensive Water and Wastewater Plan

BALTIMORE CITY & COUNTY WATER SERVICE AREA

Date: 2006

Figure: 3-2

TABLE 3-1

EXISTING AND ULTIMATE SERVICE AREAS BY PRESSURE ZONE

	Zone	Existing (sq mi)	Ultimate (sq mi)	Growth (%)
Baltimore City	First	27.23	27.23	0.0%
	Second	21.25	21.25	0.0%
	Colgate Second	0.02	0.02	0.0%
	Eastern Third	14.34	14.34	0.0%
	Western Third	18.33	18.33	0.0%
	Towson Fourth	0.33	0.33	0.0%
	City Total	81.51	81.51	0.0%
Baltimore County	First	55.26	58.03	5.0%
	Second	29.74	29.82	0.3%
	Colgate Second	0.86	0.86	0.0%
	Eastern Third	21.34	22.68	6.3%
	Western Third	17.23	18.56	7.7%
	Catonsville Fourth	15.26	15.37	0.7%
	Pikesville Fourth	26.29	28.01	6.5%
	Towson Fourth	28.20	30.09	6.7%
	Falls Fifth	1.39	1.86	33.6%
	Pot Springs Fifth	3.09	3.09	0.0%
	Reisterstown Fifth	9.70	11.02	13.6%
	Sherwood Fifth	0.29	0.54	82.4%
	Sparks Fifth	0.97	1.30	33.7%
Baltimore County Total		209.63	221.22	5.5%
Overall Total		291.14	302.74	4.0%

affect the demand projections in the larger zones more than the service area will, such as an increase in per capita usage which is based on historical trends.

ZONES OF SERVICE AND DEMANDS

The Central System is divided into 13 pressure zones and five major areas of service.

Each zone is designed to meet limiting ground elevations in a particular area of the Central System. Ground elevations range from sea level to 752 feet (229 m). Baltimore City lies in the First Zone, the Second Zone, the Colgate Second Zone, the Eastern Third Zone, the Western Third Zone, and the Towson Fourth Zone. Elevations served in the City range from sea level to 460 feet (140.2 m).

Table 3-2 lists the estimated populations and treated water supplied by jurisdiction for the Fiscal Year 2005, not including Carroll and Harford Counties since they only use raw water. Table 3-3 lists the historic and projected water supply demands for the years 2000, 2005, 2010, 2015, 2020 and 2025, broken down by political jurisdiction and service zone. The population projections contained in these tables were developed for the Central System Report, March 2003. In the determination of future demands it was assumed that by the year 2025, all available land within the URDL would be serviced and that water service outside the URDL would not extend beyond what is already being supplied. To be conservative, it was also assumed that the surrounding jurisdictions would be at their maximum withdrawal limits, as stated in current written agreements with the City, by the year 2025. Figure 3-3 depicts graphically projected Central System demands through year 2025.

TABLE 3-2

ESTIMATE OF POPULATION SUPPLIED WITH CITY TREATED WATER AND WATER SUPPLIED AS OF FISCAL YEAR 2005

JURISDICTION	ESTIMATED POPULATION	WATER SUPPLIED (MGD)
Baltimore County	651,373 (1)	97.44
Howard County	206,833(2)	24.82
Anne Arundel County	93,083(2)	11.17
TOTAL COUNTIES	951,289	133.43
Baltimore City	658,863 (1)	107.25
GRAND TOTAL	1,610,152	240.68

Notes: (1) Population based on Central System Report, March 2003, Rummel Klepper & Kahl, LLP
(2) Population is total demand divided by 120 gallons per capita per day consumption

TABLE 3-3
WATER SUPPLY DEMANDS AND POPULATION SERVED WITH CITY TREATED WATER
BY ZONES AND POLITICAL SUB-DIVISION
YEAR 2000

Baltimore Metropolitan Service Area	Population Served (1) (x 1000)	GPCD Gallons	Liters	Demand (Avg Day) MGD	MLD	Capacity (Max Day) MGD	MLD
FIRST ZONE							
City	174	273	1033	54.67	206.95	84.74	320.77
Balto. Co.	147	162	613	27.42	103.80	42.50	160.88
A.A. Co.	-	-	-	5.10	19.31	7.91	29.94
TOTAL	321	236	893	87.19	330.05	135.15	511.60
SECOND ZONE							
City	229	105	397	30.00	113.56	49.19	186.20
Balto. Co.	85	102	386	10.80	40.88	17.72	67.08
A.A. Co.	-	-	-	3.79	14.35	6.21	23.51
Howard Co.	-	-	-	3.69	13.97	6.06	22.94
TOTAL	314	104	394	48.28	182.76	79.18	299.73
COLGATE							
SECOND ZONE							
City	0.49	69	261	0.04	0.15	0.06	0.23
Balto. Co.	7.85	69	261	0.62	2.35	0.89	3.37
TOTAL	8.34	69	261	0.66	2.50	0.95	3.60
WESTERN							
THIRD ZONE							
City	138	103	390	17.01	64.39	23.30	88.20
Balto. Co.	69	107	405	8.84	33.46	12.11	45.84
Howard Co.	-	-	-	16.83	63.71	29.80	112.80
TOTAL	207	104	394	42.68	161.56	65.21	246.85
EASTERN							
THIRD ZONE							
City	116	91	344	12.70	48.07	20.83	78.85
Balto. Co.	86	98	371	10.05	38.04	16.48	62.38
TOTAL	202	94	356	22.75	86.12	37.31	141.23
TOWSON							
FOURTH ZONE							
City	2	141	534	0.25	0.95	0.42	1.59
Balto. Co.	87	141	534	14.80	56.02	24.72	93.58
TOTAL	89	141	534	15.05	56.97	25.14	95.16
CATONSVILLE							
FOURTH ZONE							
Balto. Co.	45	142	538	7.64	28.92	12.23	46.30
PIKESVILLE							
FOURTH ZONE							
Balto. Co.	75	124	469	10.73	40.62	18.46	69.88
REISTERSTOWN							
FIFTH ZONE							
Balto. Co.	30	103	390	3.72	14.08	6.48	24.53
POT SPRINGS							
FIFTH ZONE							
Balto. Co.	11	111	420	1.37	5.19	2.73	10.33
SHERWOOD							
FIFTH ZONE							
Balto. Co.	0.4	111	420	0.05	0.19	0.11	0.42
FALLS							
FIFTH ZONE							
Balto. Co.	5	99	375	0.60	2.27	1.26	4.77
SPARKS							
FIFTH ZONE							
Balto. Co.	2	136	515	0.36	1.36	0.92	3.48

(1) Based on Actual Usage and 2000 Census Data

NOTE: Raw water supplied to Carroll and Harford Counties not reflected in table

TABLE 3-3 (Continued)
WATER SUPPLY DEMANDS AND POPULATION SERVED WITH CITY TREATED WATER
BY ZONES AND POLITICAL SUB-DIVISION
YEAR 2005

Baltimore Metropolitan Service Area	Population Served (x 1000)	GPCD Gallons	Liters	Demand (Avg Day) MGD	MLD	Capacity (Max Day) MGD	MLD
FIRST ZONE							
City	172	278	1052	54.81	207.47	88.79	336.11
Balto. Co.	146	175	662	29.33	111.01	47.50	179.79
A.A. Co.	-	-	-	6.95	26.31	11.26	42.62
TOTAL	318	242	916	91.08	344.79	147.55	558.52
SECOND ZONE							
City	227	112	424	31.75	120.19	52.61	199.16
Balto. Co.	87	108	409	11.88	44.95	19.61	74.24
A.A. Co.	-	-	-	4.20	15.90	7.46	28.24
Howard Co.	-	-	-	5.20	19.68	8.67	32.82
TOTAL	314	111	420	53.03	200.72	88.36	334.46
COLGATE							
SECOND ZONE							
City	0.48	73	276	0.03	0.13	0.06	0.22
Balto. Co.	7.66	73	276	0.64	2.44	0.92	3.48
TOTAL	8.14	73	276	0.68	2.57	0.98	3.70
WESTERN							
THIRD ZONE							
City	135	105	397	17.04	64.50	23.46	88.81
Balto. Co.	69	111	420	9.24	34.98	12.73	48.20
Howard Co.	-	-	-	20.50	77.60	33.94	128.48
TOTAL	204	107	405	46.78	177.08	70.13	265.48
EASTERN							
THIRD ZONE							
City	114	96	363	13.08	49.51	21.77	82.40
Balto. Co.	88	98	371	10.44	39.52	17.39	65.82
TOTAL	202	97	367	23.52	89.03	39.16	148.22
TOWSON							
FOURTH ZONE							
City	1	147	556	0.24	0.91	0.43	1.64
Balto. Co.	87	147	556	15.36	58.14	25.86	97.89
TOTAL	88	147	556	15.60	59.05	26.29	99.53
CATONSVILLE							
FOURTH ZONE							
Balto. Co.	44	144	545	7.68	29.07	12.29	46.51
PIKESVILLE							
FOURTH ZONE							
Balto. Co.	79	128	485	11.68	44.23	20.45	77.40
REISTERSTOWN							
FIFTH ZONE							
Balto. Co.	32	106	401	4.09	15.49	7.32	27.71
POT SPRINGS							
FIFTH ZONE							
Balto. Co.	11	120	454	1.47	5.57	2.96	11.19
SHERWOOD							
FIFTH ZONE							
Balto. Co.	0.4	120	454	0.06	0.22	0.12	0.44
FALLS							
FIFTH ZONE							
Balto. Co.	4.9	104	394	0.64	2.41	1.41	5.35
SPARKS							
FIFTH ZONE							
Balto. Co.	2.5	156	591	0.45	1.70	1.23	4.66

NOTE: Raw water supplied to Carroll and Harford Counties not reflected in table
Source of Data: Central System Report, March 2003, Rummel Klepper & Kahl, LLP

TABLE 3-3 (Continued)
WATER SUPPLY DEMANDS AND POPULATION SERVED WITH CITY TREATED WATER
BY ZONES AND POLITICAL SUB-DIVISION
YEAR 2010

Baltimore Metropolitan Service Area	Population Served (x 1000)	GPCD Gallons	Liters	Demand (Avg Day) MGD	MLD	Capacity (Max Day) MGD	MLD
FIRST ZONE							
City	170	278	1052	54.45	206.12	92.02	348.34
Balto. Co.	145	175	662	29.22	110.62	49.39	186.97
A.A. Co.	-	-	-	8.07	30.55	13.64	51.63
TOTAL	315	242	916	91.74	347.29	155.06	586.95
SECOND ZONE							
City	223	111	420	30.88	116.87	51.96	196.70
Balto. Co.	90	108	409	12.25	46.37	20.53	77.70
A.A. Co.	-	-	-	5.20	19.68	8.65	32.74
Howard Co.	-	-	-	7.10	26.88	11.95	45.24
TOTAL	313	110	416	55.43	209.81	93.09	352.37
COLGATE							
SECOND ZONE							
City	0.47	73	276	0.03	0.13	0.06	0.22
Balto. Co.	7.6	73	276	0.64	2.44	0.92	3.48
TOTAL	8.07	73	276	0.68	2.57	0.98	3.70
WESTERN							
THIRD ZONE							
City	133	105	397	16.68	63.14	23.20	87.81
Balto. Co.	70	111	420	9.24	34.98	12.92	48.92
Howard Co.	-	-	-	23.30	88.20	38.08	144.15
TOTAL	203	107	405	49.22	186.32	74.20	280.88
EASTERN							
THIRD ZONE							
City	112	96	363	12.84	48.60	21.94	83.04
Balto. Co.	91	100	379	11.04	41.79	18.79	71.14
TOTAL	203	98	371	23.88	90.40	40.73	154.17
TOWSON							
FOURTH ZONE							
City	1	147	556	0.24	0.91	0.43	1.64
Balto. Co.	87	147	556	15.36	58.14	25.88	97.98
TOTAL	88	147	556	15.60	59.05	26.32	99.62
CATONSVILLE							
FOURTH ZONE							
Balto. Co.	45	147	556	7.84	29.66	12.54	47.47
PIKESVILLE							
FOURTH ZONE							
Balto. Co.	84	128	485	12.28	46.49	21.86	82.75
REISTERSTOWN							
FIFTH ZONE							
Balto. Co.	34	111	420	4.50	17.03	8.33	31.52
POT SPRINGS							
FIFTH ZONE							
Balto. Co.	11	123	466	1.52	5.75	3.05	11.54
SHERWOOD							
FIFTH ZONE							
Balto. Co.	0.4	123	466	0.06	0.22	0.13	0.48
FALLS							
FIFTH ZONE							
Balto. Co.	5.1	106	401	0.68	2.56	1.55	5.87
SPARKS							
FIFTH ZONE							
Balto. Co.	2.59	156	591	0.46	1.74	1.32	5.01

NOTE: Raw water supplied to Carroll and Harford Counties not reflected in table
Source of Data: Central System Report, March 2003, Rummel Klepper & Kahl, LLP

TABLE 3-3 (Continued)
WATER SUPPLY DEMANDS AND POPULATION SERVED WITH CITY TREATED WATER
BY ZONES AND POLITICAL SUB-DIVISION
YEAR 2015

Baltimore Metropolitan Service Area	Population Served (x 1000)	GPCD Gallons	Liters	Demand (Avg Day) MGD	MLD	Capacity (Max Day) MGD	MLD
FIRST ZONE							
City	173	278	1052	55.33	209.45	97.37	368.58
Balto. Co.	145	162	613	29.24	110.69	51.47	194.83
A.A. Co.	-	-	-	9.18	34.75	16.16	61.17
TOTAL	318	237	897	93.75	354.88	165.00	624.59
SECOND ZONE							
City	221	110	416	30.50	115.45	52.16	197.45
Balto. Co.	93	108	409	12.62	47.77	21.57	81.65
A.A. Co.	-	-	-	5.81	21.99	9.93	37.59
	-	-	-	8.80	33.31	13.20	49.97
TOTAL	314	109	413	57.73	218.53	96.86	366.65
COLGATE							
SECOND ZONE							
City	0.5	74	280	0.04	0.15	0.06	0.23
Balto. Co.	7.6	74	280	0.64	2.42	0.92	3.48
TOTAL	8.1	74	280	0.68	2.57	0.98	3.71
WESTERN							
THIRD ZONE							
City	133	105	397	16.69	63.18	23.37	88.46
Balto. Co.	71	111	420	9.39	35.54	13.14	49.74
Howard Co.	-	-	-	26.01	98.46	42.22	159.82
TOTAL	204	107	405	52.09	197.18	78.73	298.02
EASTERN							
THIRD ZONE							
City	111	96	363	12.75	48.26	22.19	84.00
Balto. Co.	95	102	386	11.56	43.76	20.11	76.12
TOTAL	206	98	371	24.31	92.02	42.30	160.12
TOWSON							
FOURTH ZONE							
City	2	147	556	0.25	0.95	0.43	1.63
Balto. Co.	87	147	556	15.45	58.48	25.95	98.23
TOTAL	89	147	556	15.70	59.43	26.38	99.86
CATONSVILLE							
FOURTH ZONE							
Balto. Co.	45	149	564	7.99	30.25	12.79	48.42
PIKESVILLE							
FOURTH ZONE							
Balto. Co.	88	128	485	12.92	48.91	23.26	88.05
REISTERSTOWN							
FIFTH ZONE							
Balto. Co.	35	115	435	4.90	18.55	9.31	35.24
POT SPRINGS							
FIFTH ZONE							
Balto. Co.	11	127	481	1.55	5.87	3.11	11.77
SHERWOOD							
FIFTH ZONE							
Balto. Co.	0.4	127	481	0.06	0.23	0.13	0.49
FALLS							
FIFTH ZONE							
Balto. Co.	5	107	405	0.71	2.69	1.69	6.40
SPARKS							
FIFTH ZONE							
Balto. Co.	2.5	156	591	0.45	1.70	1.30	4.92

NOTE: Raw water supplied to Carroll and Harford Counties not reflected in table
Source of Data: Central System Report, March 2003, Rummel Klepper & Kahl, LLP

TABLE 3-3 (Continued)
WATER SUPPLY DEMANDS AND POPULATION SERVED WITH CITY TREATED WATER
BY ZONES AND POLITICAL SUB-DIVISION
YEAR 2020

Baltimore Metropolitan Service Area	Population Served (x 1000)	GPCD Gallons	Liters	Demand (Avg Day) MGD	MLD	Capacity (Max Day) MGD	MLD
FIRST ZONE							
City	174	279	1056	55.86	211.44	101.65	384.78
Balto. Co.	145	175	662	29.22	110.62	53.19	201.34
A.A. Co.	-	-	-	10.00	37.85	17.50	66.24
TOTAL	319	243	920	95.08	359.90	172.34	652.36
SECOND ZONE							
City	219	110	416	30.13	114.04	52.10	197.22
Balto. Co.	96	108	409	13.00	49.21	22.50	85.17
A.A. Co.	-	-	-	6.50	24.61	11.18	42.32
Howard Co.	-	-	-	8.80	33.31	13.20	49.97
TOTAL	315	109	413	58.43	221.16	98.98	374.68
COLGATE							
SECOND ZONE							
City	0.49	74	280	0.05	0.17	0.06	0.22
Balto. Co.	7.5	74	280	0.64	2.44	0.92	3.48
TOTAL	7.99	74	280	0.69	2.61	0.98	3.70
WESTERN							
THIRD ZONE							
City	133	104	394	16.68	63.14	23.50	88.94
Balto. Co.	71	111	420	9.48	35.89	13.34	50.51
Howard Co.	-	-	-	28.60	108.26	46.36	175.49
TOTAL	204	107	405	54.76	207.29	83.20	314.95
EASTERN							
THIRD ZONE							
City	111	96	363	12.72	48.15	22.58	85.49
Balto. Co.	98	103	390	12.12	45.88	21.61	81.81
TOTAL	209	99	375	24.84	94.03	44.20	167.30
TOWSON							
FOURTH ZONE							
City	1	147	556	0.24	0.91	0.43	1.64
Balto. Co.	87	147	556	15.36	58.14	25.90	98.03
TOTAL	88	147	556	15.60	59.05	26.33	99.66
CATONSVILLE							
FOURTH ZONE							
Balto. Co.	45	152	575	8.15	30.84	13.03	49.33
PIKESVILLE							
FOURTH ZONE							
Balto. Co.	92	128	485	13.54	51.24	24.77	93.77
REISTERSTOWN							
FIFTH ZONE							
Balto. Co.	37	119	450	5.32	20.12	10.42	39.43
POT SPRINGS							
FIFTH ZONE							
Balto. Co.	11	130	492	1.58	5.96	3.19	12.06
SHERWOOD							
FIFTH ZONE							
Balto. Co.	0.5	130	492	0.07	0.26	0.14	0.52
FALLS							
FIFTH ZONE							
Balto. Co.	5.5	108	409	0.74	2.79	1.84	6.96
SPARKS							
FIFTH ZONE							
Balto. Co.	2.68	156	591	0.48	1.83	1.41	5.35

NOTE: Raw water supplied to Carroll and Harford Counties not reflected in table
Source of Data: Central System Report, March 2003, Rummel Klepper & Kahl, LLP

TABLE 3-3 (Continued)
WATER SUPPLY DEMANDS AND POPULATION SERVED WITH CITY TREATED WATER
BY ZONES AND POLITICAL SUB-DIVISION
YEAR 2025

Baltimore Metropolitan Service Area	Population Served (x 1000)	GPCD Gallons	Liters	Demand (Avg Day) MGD	MLD	Capacity (Max Day) MGD	MLD
FIRST ZONE							
City	176	279	1056	56.45	213.69	106.69	403.86
Balto. Co.	145	175	662	29.21	110.57	55.20	208.95
A.A. Co.	-	-	-	10.00	37.85	17.50	66.24
TOTAL	321	244	924	95.66	362.11	179.39	679.06
SECOND ZONE							
City	218	109	413	29.75	112.62	52.07	197.11
Balto. Co.	99	108	409	13.43	50.84	23.50	88.96
A.A. Co.	-	-	-	7.12	26.95	12.46	47.17
Howard Co.	-	-	-	8.80	33.31	13.20	49.97
TOTAL	317	109	413	59.10	223.72	101.23	383.20
COLGATE							
SECOND ZONE							
City	0.5	75	284	0.04	0.15	0.06	0.23
Balto. Co.	7.4	75	284	0.64	2.42	0.91	3.44
TOTAL	7.9	75	284	0.68	2.57	0.97	3.67
WESTERN							
THIRD ZONE							
City	133	104	394	16.64	62.99	23.63	89.45
Balto. Co.	72	111	420	9.55	36.15	13.56	51.33
Howard Co.	-	-	-	29.70	112.43	50.50	191.16
TOTAL	205	107	405	55.89	211.57	87.69	331.94
EASTERN							
THIRD ZONE							
City	110	96	363	12.62	47.77	22.97	86.95
Balto. Co.	101	105	397	12.78	48.38	23.25	88.01
TOTAL	211	101	382	25.40	96.15	46.22	174.96
TOWSON							
FOURTH ZONE							
City	2	147	556	0.25	0.95	0.43	1.63
Balto. Co.	87	147	556	15.39	58.26	26.01	98.46
TOTAL	89	147	556	15.64	59.20	26.44	100.09
CATONSVILLE							
FOURTH ZONE							
Balto. Co.	45	154	583	8.30	31.42	13.28	50.27
PIKESVILLE							
FOURTH ZONE							
Balto. Co.	97	128	485	14.20	53.75	26.41	99.97
REISTERSTOWN							
FIFTH ZONE							
Balto. Co.	39	122	462	5.73	21.69	11.53	43.65
POT SPRINGS							
FIFTH ZONE							
Balto. Co.	10	133	503	1.60	6.06	3.24	12.26
SHERWOOD							
FIFTH ZONE							
Balto. Co.	0.5	133	503	0.07	0.26	0.15	0.57
FALLS							
FIFTH ZONE							
Balto. Co.	6	109	413	0.77	2.91	1.99	7.53
SPARKS							
FIFTH ZONE							
Balto. Co.	3	156	591	0.49	1.85	1.48	5.60

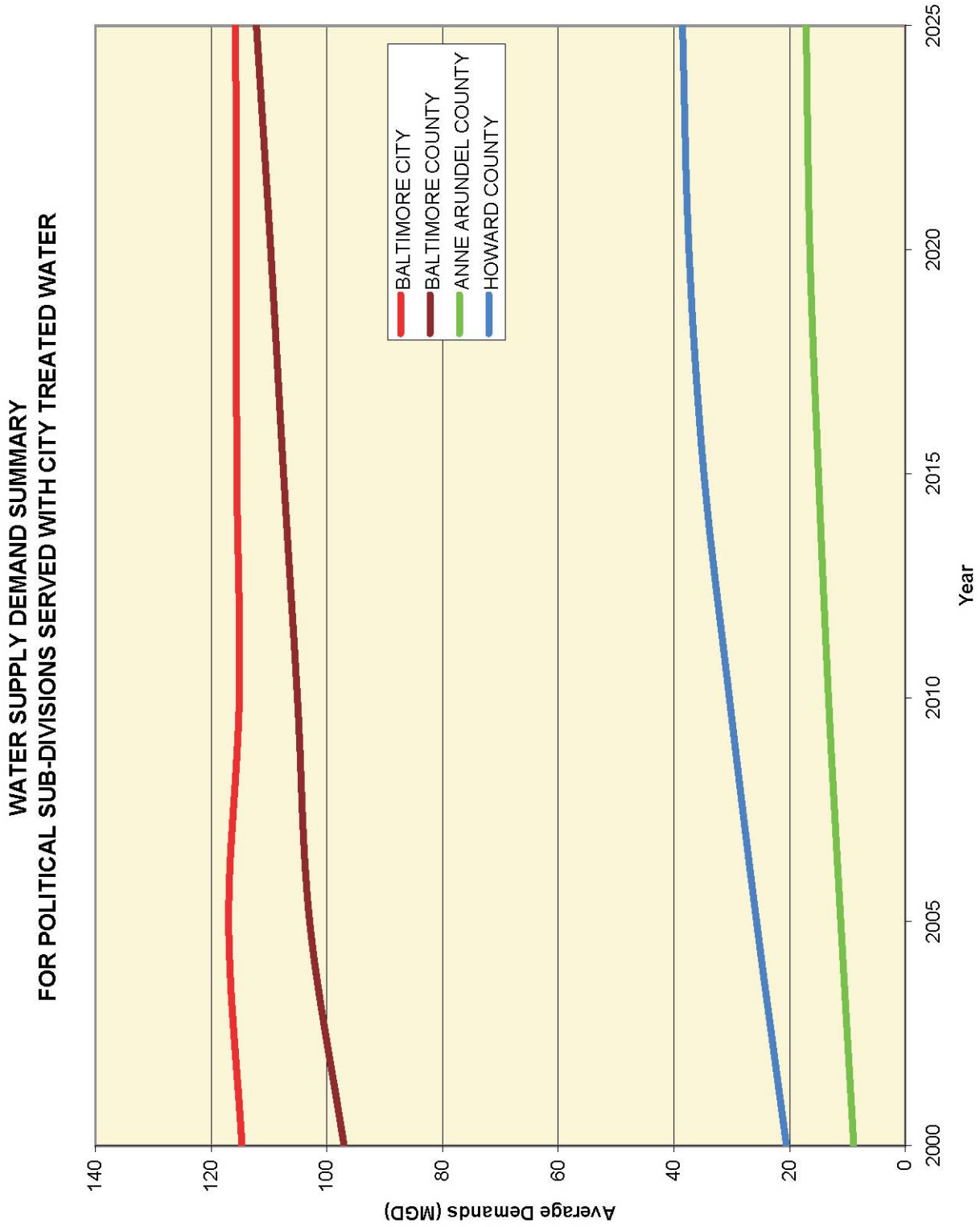
NOTE: Raw water supplied to Carroll and Harford Counties not reflected in table
Source of Data: Central System Report, March 2003, Rummel Klepper & Kahl, LLP

TABLE 3-3 (Continued)
WATER SUPPLY DEMANDS AND POPULATION SERVED WITH CITY TREATED WATER
BY ZONES AND POLITICAL SUB-DIVISION

Average Demands Summary

Baltimore Metropolitan Service Area	2000 Demand MGD	2005 Demand MGD	2010 Demand MGD	2015 Demand MGD	2020 Demand MGD	2025 Demand MGD
FIRST ZONE						
City	54.67	54.81	54.45	55.33	55.86	56.45
Balto. Co.	27.42	29.33	29.22	29.24	29.22	29.21
A.A. Co.	5.10	6.95	8.07	9.18	10.00	10.00
TOTAL	87.19	91.08	91.74	93.75	95.08	95.66
SECOND ZONE						
City	30.04	31.78	30.91	30.54	30.17	29.79
Balto. Co.	11.42	12.52	12.89	13.26	13.64	14.07
A.A. Co.	3.79	4.20	5.20	5.81	6.50	7.12
Howard Co.	3.69	5.20	7.10	8.80	8.80	8.80
TOTAL	48.94	53.70	56.10	58.41	59.12	59.78
THIRD ZONE						
City	29.71	30.12	29.52	29.44	29.40	29.26
Balto. Co.	18.89	19.68	20.28	20.95	21.60	22.33
Howard Co.	16.83	20.50	23.30	26.01	28.60	29.70
TOTAL	65.43	70.30	73.10	76.40	79.60	81.29
FOURTH ZONE						
City	0.25	0.24	0.24	0.25	0.24	0.25
Balto. Co.	33.17	34.72	35.48	36.36	37.04	37.89
TOTAL	33.42	34.96	35.72	36.61	37.28	38.14
FIFTH ZONES						
Balto. Co.	6.10	6.71	7.21	7.67	8.18	8.66
TOTALS						
City	114.67	116.95	115.12	115.56	115.67	115.75
Balto. Co.	97.00	102.96	105.08	107.48	109.69	112.16
A.A. Co.	8.89	11.15	13.27	14.99	16.50	17.12
Howard Co.	20.52	25.70	30.40	34.81	37.40	38.50

NOTE: Raw water supplied to Carroll and Harford Counties not reflected in table
Source of Data: Central System Report, March 2003, Rummel Klepper & Kahl, LLP



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Comprehensive Water and Wastewater Plan

WATER SUPPLY DEMAND SUMMARY

Date: **2006**

Figure: **3-3**

WATER SUPPLY SOURCES

The water supplied to the residents of Baltimore City and adjacent territory is obtained from three sources: the Gunpowder Falls, the north branch of the Patapsco River, and the Susquehanna River. Table 3-4 shows the quantities of raw water usage in Fiscal Year 2005 for those three sources. All three sources are classified as surface supplies and Table 3-5 provides pertinent data on the impounded raw water supplies. The Central System does not make use of ground water as a source of supply, however, there are some industrial and commercial wells located in the City. The locations of these wells may be obtained from well permit records on file at the Maryland Department of the Environment (MDE).

TABLE 3-4

RAW WATER QUANTITIES
FISCAL YEAR 2005

	WITHDRAWN
Gunpowder Falls	174 MGD (657 MLD)[1]
N. Branch Patapsco River	85 MGD (324 MLD)[2]
Susquehanna River (Conowingo Pool)	0 MGD (0 MLD)

1 Includes 5.82 MGD (22.0 MLD) supplied to Harford County

2 Includes 0.07 MGD (0.26 MLD) supplied to Carroll County

The Central System's three raw water sources (Gunpowder Falls, N. Branch Patapsco River and Susquehanna River) are expected to meet anticipated raw water needs through the year 2025. However, in the near future, the City will need to rely on the Susquehanna River during more than just drought conditions. The City is also currently investigating alternative supply sources through the Alternative Water Source Development project to ensure that future demands beyond 2025 can be met. This project involves the evaluation of new water sources, to augment existing surface water supplies that could be used under routine, drought, or emergency conditions. Alternative sources under investigation include desalinization, groundwater, wastewater reclamation, and other developed/underdeveloped surface water supplies. An interim report titled Alternative Water Sources Development and Evaluation Study has been submitted to the City.

TABLE 3-5

INVENTORY OF EXISTING IMPOUNDED SUPPLIES

Facility	Crest Elev. Above Sea Level (feet)	Spillway Length (feet)	Total Length of Dam (feet)	Height of Crest Above Stream Bed (feet)	Flooded Area of Crest Elev. (acres)	Length of Shoreline at Crest Elev. (miles)	Area of Land Owned (acres)	Date Water First Overflowed Crest	Capacity of Reservoir (bil/gal)	Safe Yield (MGD)	Average Stream Flow (MGD)
Prettyboy Dam (Gunpowder River)	520 (158.5 m)	448 (136.5 m)	692.5 (210.9 m)	130 (39.6 m)	1500 (607 ha)	46 (74 km)	7380 (2987 ha)	9/23/33	19.7 (75 MCM)	46 (174 TCMD)	264 (999 TC)
Loch Raven Dam (Gunpowder River)	240 (73.2 m)	288 (87.8 m)	650 (198.1 m)	82 (25 m)	2400 (971 ha)	50 (80 km)	8000 (3237 ha)	5/20/23	23.7 (90 MCM)	97 (368 TCMD)	
Liberty Dam (Patapsco River)	420 (128 m)	480 (146.3 m)	704 (314.6 m)	160 (48.8 m)	3100 (1254 ha)	82 (132 km)	9200 (3723 ha)	2/6/56	43.3 (164 MCM)	94 (356 TCMD)	122 (462 TCMD)

Notes: Capacity does not take into account loss of storage due to silt infill
Safe Yield is the maximum continuous rate of withdrawal from a supply source during the most severe anticipated drought conditions
(Source: Hillen Pumping Station and Transmission Main Study, Volume II, September 1993, Rummel Klepper & Kahl, LLP)

DESIGN CAPACITIES OF PUMPED SUPPLIES[1]

Conowingo Dam Intake (Susquehanna River)	Existing	250 MGD (946 TCMD)
	Ultimate	500 MGD (1,893 TCMD)
Deer Creek Pumping Station	Existing	100 MGD (3 pumps @ 50 MGD each) (189 TCMD)
	Ultimate	200 MGD (5 pumps @ 50 MGD each) (189 TCMD)

1 - Actual allowable withdrawals are controlled by an agreement between the City of Baltimore and the Susquehanna River Basin Commission (SRBC)

IMPOUNDED SUPPLIES - GUNPOWDER FALLS & PATAPSCO RIVER

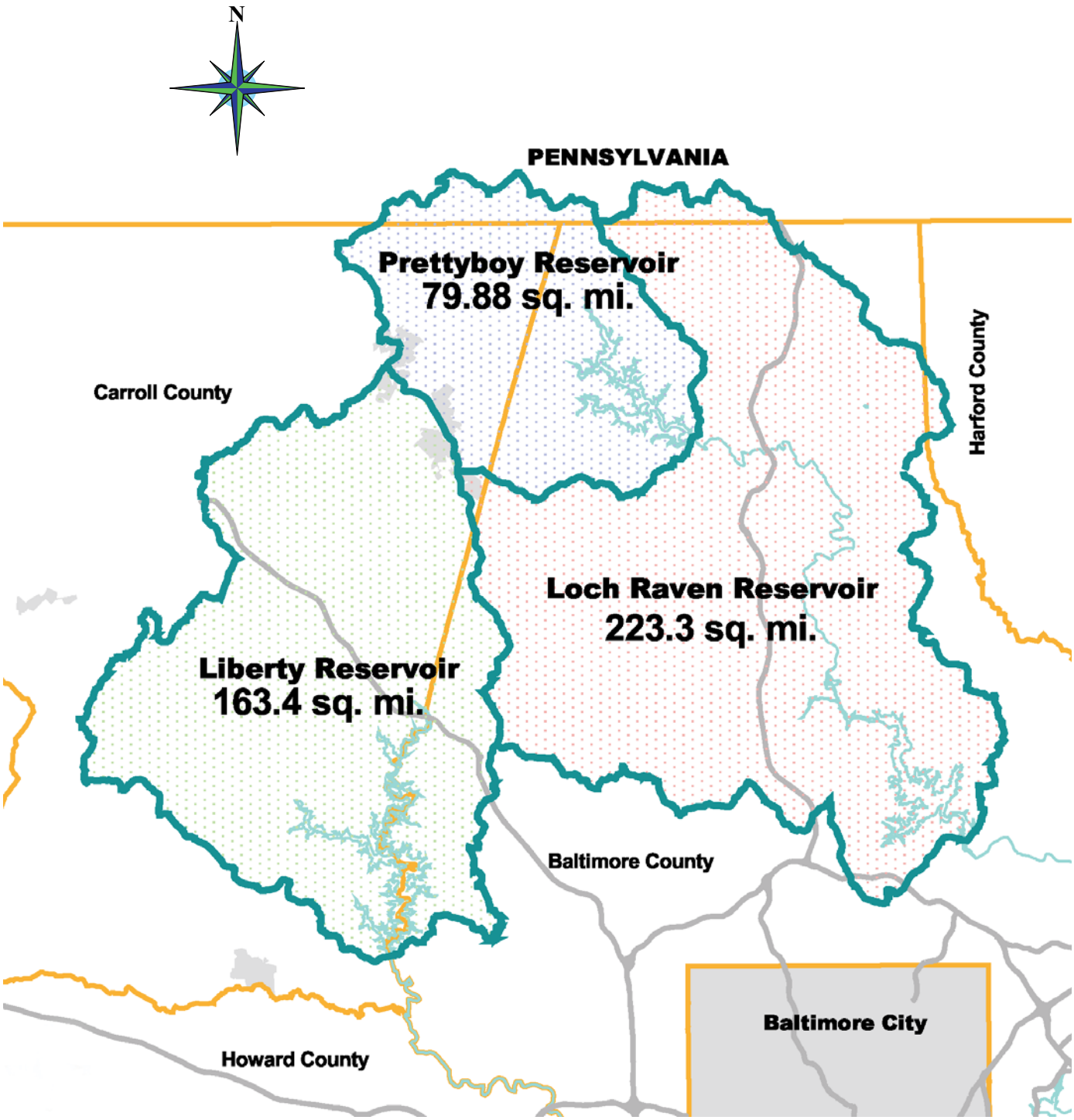
The Gunpowder Falls supply has a watershed above Loch Raven Dam of 303 square miles (784.8 skm). Two dams are located on this stream; one at Loch Raven and the other farther upstream near the mouth of Prettyboy Creek. The reservoirs formed have a total combined capacity of 43 BG (163 MCM). In Fiscal Year 2004, approximately 163 MGD (617 MLD) was withdrawn from Loch Raven Reservoir. The development of the Patapsco River, with a watershed of 164 square miles (424.8 skm), consists of the Liberty Dam near Falls Run on the north branch of the river, and the Liberty Reservoir with a capacity of 43 BG (163 MCM). In Fiscal Year 2004, approximately 100 MGD (379 MLD) was withdrawn from Liberty Reservoir. Figure 3-4 shows each of the City's raw water reservoirs and the limits of their corresponding watersheds.

OPERATION OF IMPOUNDED SUPPLIES

Under normal operating conditions, water flows by gravity from the Loch Raven Reservoir to the Montebello Water Filtration Plants (WFP) through the Gunpowder Falls-Montebello Tunnel. The tunnel is 12 feet (3.66 m) in diameter, concrete lined, and 7 miles in length.

When the water level in Loch Raven Reservoir drops a few feet below the crest of the dam, the discharge valves at Prettyboy Dam are opened to generally maintain a pool elevation in Loch Raven Reservoir sufficient to maintain gravity flow to the Montebello WFP. During periods of severe drought when storage levels drop and gravity flow cannot be sustained, water can be pumped from the Loch Raven Reservoir to the Montebello WFP by a low lift pumping station located at the plants. The station, called the Montebello Raw Water Distribution Center, was constructed in 1958 in connection with the Susquehanna Water Supply Project. The station contains three 120 MGD (454 TCMD) pumps and has recently been refurbished.

Water from Liberty Reservoir flows by gravity through a concrete lined tunnel 12 miles (19.31 km) in length, 10 feet (3.048 m) in diameter, to Ashburton WFP. Three low lift pumps at the Ashburton WFP can pump water from the reservoir whenever reservoir levels fall too low for gravity flow.



Comprehensive Water and Wastewater Plan

RESERVOIR WATERSHEDS

Date: 2006

Figure: 3-4

RESERVOIR IMPROVEMENTS

The City has completed several improvement projects and studies involving the reservoirs and dams. Improvements at the Loch Raven Dam have recently been undertaken to increase the spillway capacity by raising the non-overflow portion of the dam 28 feet and maintaining the crest at elevation 240 feet. Floodgates 15 feet high were added to the roadway adjacent to the dam to be closed in cases of emergency. In addition, the structural integrity of the dam was reinforced by adding 85 feet of concrete to the base of the dam. The mass of concrete placed amounted to 7,000 cubic feet of conventional concrete and 63,000 cubic feet of roller compacted concrete. Rehabilitation of the Prettyboy Dam, including electrical and mechanical improvements as well as site work, has been recently completed. Structural improvements are in process of being addressed with installation of an underwater anchorage system to stabilize the connection of the dam to the gatehouse. Finally, a study has been completed for new ground maintenance buildings at all three reservoirs: Loch Raven, Prettyboy, and Liberty. The buildings will provide storage areas for equipment and facilities for maintenance staff. Existing deteriorating maintenance facilities will be demolished.

There are several other projects planned currently underway involving improvements to the reservoirs and their related appurtenances. The planned Liberty Dam Restoration Project will include the restoration of concrete surface abutments, interior electrical distribution system upgrades, lighting upgrades, cleaning of existing structure drainage system, and other minor site work such as installation of security fencing and handrails, and the replacement of bar screens at the intake structure. Evaluations are also underway to develop alternative approaches to inspect the condition of the Loch Raven and Liberty water conduits. In addition, the City is developing options for rehabilitation of the Montebello Raw Water Tunnel Dewatering Facility.

SUSQUEHANNA PUMPED SUPPLY

The Susquehanna supply includes the Conowingo intake, the Deer Creek Pumping Station, and connecting tunnels and pipelines. The intake has an existing design capacity of 250 MGD (946 TCMD) with provisions for an ultimate design capacity of 500 MGD (1893 TCMD). The pumping station presently contains three 50 MGD (189 TCMD) pumps to

provide a safe operating capacity of 100 MGD. There are also spaces for two additional 50 MGD pumps. Plans are underway to expand the capacity of the Deer Creek P.S. to the ultimate design safe capacity of 200 MGD. Raw water flows from the Conowingo intake to the Deer Creek Pumping Station through a 144-inch and 108-inch (365.8 cm to 274.3 cm) diameter tunnel. A 108-inch and 96-inch diameters (274.3 cm to 243.8 cm) pipeline connects Deer Creek Pumping Station and Montebello WFP. The total length of the Susquehanna Transmission Main is approximately 38.3 miles (61.64 km).

OPERATION OF SUSQUEHANNA PUMPED SUPPLY

All water taken from the Susquehanna River must be pumped. The amount of raw water that can be taken from the river is limited to 250 MGD (946 TCMD) during non-trigger flow conditions and 64 MGD (243 TCMD) during trigger flow conditions as established by an agreement between Baltimore City and the Susquehanna River Basin Commission (SRBC) in 2002. Trigger flows are minimum stream flow limits established by the SRBC.

SUSQUEHANNA SUPPLY IMPROVEMENTS

The City is planning to upgrade the Deer Creek Pumping Station and increase the capacity to meet future needs. This project is currently in the design phase and will include the installation of two new pumps, replacement of all obsolete electrical gear, provisions for a second primary electric feeder, improvements to mechanical valves and electrical service appurtenances, and automation of station operations to effectively control systems and minimize additional staffing.

RESERVOIR POLLUTION

Loch Raven, Prettyboy, and Liberty Reservoirs have been experiencing water quality problems related to algal blooms for the past several decades. Algae are microscopic free floating plants that grow to nuisance levels (blooms) in water bodies such as the reservoirs and the Chesapeake Bay when they become over-enriched with nutrients such as nitrogen and phosphorus. All three of the City owned reservoirs are over enriched, primarily from excessive phosphorus pollution originating from agricultural and urban runoff and to a lesser extent from point sources. The last incidence in the water system related to blue/green

algae was experienced in 1981. For more detailed information regarding reservoir pollution and trends in water quality, refer to the Water Quality Assessment of the Reservoirs, November 2004, prepared by the Reservoir Technical Group.

Sedimentation infill is another contributing factor to pollutants in the reservoirs. The City paid for bathymetric surveys of Loch Raven and Prettyboy Reservoirs which were conducted by the Maryland Geological Survey and the U.S. Geological Survey (USGS). The results of these surveys found that there is reduced capacity available in each reservoir as a result of significant sediment accumulation. The sediment in Loch Raven Reservoir was also analyzed as a part of this project and slightly elevated levels of zinc and lead were found. For more information, refer to the Bathymetric Survey and Sedimentation Analysis of Loch Raven and Prettyboy Reservoirs, 1999.

A Source Water Assessment has also been conducted by the City and MDE for Liberty and Loch Raven Reservoirs. Three main tools were used: source water delineation, contaminant surveys, and susceptibility analysis. The report documented the potential threats to and susceptibility of the reservoirs from accidental leaks or spills in these watersheds.

RESERVOIR WATERSHED MANAGEMENT PROGRAM

The Reservoir Watershed Management Program had its roots in area-wide water quality planning begun in the 1970s, and it is based on a formal agreement signed in June 1984. The signatory entities have been working together cooperatively ever since that time, and much has been accomplished under the “umbrella” of the Reservoir Program. A reaffirmation of the original 1984 Agreement was signed in February 2003, and called for the development of a new reservoir agreement and action strategy.

The 1984 Reservoir Watershed Management Agreement was signed in June 1984 and was reaffirmed by the signatory entities in 1990 and again in 2003. In 2003 those entities were: Baltimore City, Baltimore County, Carroll County, Baltimore County Soil Conservation District (SCD), Carroll County SCD, Maryland Department of Agriculture, predecessor to the Maryland Department of the Environment (MDE), and the Regional Planning Council (predecessor to the Baltimore Metropolitan Council). The signatories were

chosen because of their definite roles in or resources they could provide to the overall problem of protecting the City's three reservoirs.

The purpose of the 1984 Agreement was to commit the signatory parties to protecting the three metropolitan water supply reservoirs by preventing any increase in the amount of nutrients, such as phosphorus (P), and sediment entering the reservoirs, as well as reduce the current level of nutrients to "acceptable" levels. During the 1970s, it was found that all three lakes were accumulating sediments from the tributaries and were experiencing higher levels of nutrient "over-enrichment" resulting in seasonal algal problems. These accumulated sediments reduce storage capacity, and excessive algae increases treatment costs and causes taste and odor problems.

This agreement endorsed the implementation of a very detailed Watershed Action Strategy, which sets forth the specific policies, initiatives, and resource commitments that state and local agencies will have to pursue to achieve the goals of the agreement. It serves as the "benchmark" against which progress is measured. Implementation was assigned to a policy board, consisting of local elected officials or agency heads, and a technical committee (the Reservoir Watershed Technical Group), which consisted of an employee from each signatory entity. Actual implementation of specific commitments in the Action Strategy is performed by the state and local agencies who work through their planning and zoning programs, regulatory programs, public works departments, and other programs which provide direct assistance to landowners.

The Reservoir Watershed Technical Group typically meets monthly at the Baltimore Metropolitan Council (BMC). Representatives from the Maryland Department of Natural Resources and the adjacent counties, as well as interested citizens also attend. The group discusses new issues of concern relating to the reservoirs, reviews local rezoning proposals, reviews changes in local comprehensive water and sewerage plans, shares new watershed-related technical information among the members, and plans/implements cooperative projects which are intended to benefit the reservoir watersheds in keeping with the goals of the agreement. There is frequent communication among members between meetings; with some members coordinating on an almost daily basis. This allows the group to respond quickly when new issues arise.

A new Action Strategy will be developed retaining many of the same key commitments in the 1984 and 1990 Action Strategies as well as adding new goals and commitments which grow out of the issues highlighted in the technical papers. Some new issues will result in negotiations among jurisdictions and agencies. This new Action Strategy will supersede the earlier ones and is expected to be completed some time in 2005, along with the development and signing of a new Reservoir Watershed Management Agreement. In this agreement, new institutional arrangements need to be recognized, goals need to be reaffirmed and augmented, and new agencies may be invited to sign the pact along with the original signatories. This new version will supersede the 1984 Agreement. Again the public and news media will be invited to attend the signing ceremony. Following the signing, the Reservoir Watershed Technical Group will take actions to begin implementing the commitments in the new Action Strategy.

The City strongly supports employment of effective measures to protect the region's water supply from the adverse impacts of development and other activity, and understands "the importance of not overdeveloping the reservoir watersheds as a means of protecting water quality" as stated in the Reservoir Program Technical Report.

FOREST MANAGEMENT PLAN

Baltimore City retained the MDE to prepare a report assessing the health of the forests in the watersheds contributing to the three reservoirs that supply water to the Baltimore City water system: Loch Raven, Prettyboy, and Liberty. MDE submitted to the City in late 2002 the Comprehensive Forest Conservation Plan for Long-Term Watershed Protection on the City of Baltimore's Reservoirs. This major study collected 4,000 under story and over story samples on all three watersheds to determine if existing conditions met intensity and density requirements established by US Forest Service criteria. Examples of some issues identified were lack of diversity of forest plants, deer browse pressure, fear of weather affects on mass pine tree areas, and lack of seedlings for forest replenishment. The report concluded that the watersheds are not providing optimal protection to the reservoirs in their present condition. Recommendations for the next 10 years included introducing sylvaculture, adding seedlings and deer control measures, and developing forest replenishment with an appropriate mix of trees and shrubs.

WATER TREATMENT

In order to produce water that will meet the accepted standards for public consumption, it may be necessary to use any or all of the following treatments: chlorination, chemical treatment, coagulation, sedimentation, filtration, and fluoridation. Accepted standards require the finished water to be free of all organisms of a pathogenic nature. In addition, there are limitations to the concentration in the finished water of chemical constituents which are considered harmful or otherwise undesirable.

To meet these requirements, guidelines for water quality standards have been outlined by "The Safe Drinking Water Act", passed by Congress in 1974, and last amended in 1996. The bill formally outlines standards for the quality of drinking water and requires the Environmental Protection Agency (EPA) to issue regulations and act as the governing agency in this matter. These primary regulations are listed in the most recent revisions to the Code of Maryland Regulations (COMAR) 26.04.01, Quality of Drinking Water in Maryland. Secondary regulations regarding corrosivity were promulgated by Federal Regulations, Chapter 40 CFR, Section 143, Revised January 30, 1991. These standards represent the minimum requirements to be met by all public water distribution systems unless specifically excluded. The City of Baltimore is in compliance with all regulations and requirements pertaining to the quality of drinking water.

PURIFICATION PLANTS

Baltimore City owns and operates three water filtration plants: Montebello WFP No. 1, Montebello WFP No. 2 and Ashburton WFP. Table 3-6 lists the existing treatment facilities for the Baltimore water distribution system, including capacities and peak flows. During Fiscal Year 2005, Montebello WFP No. 1 treated 87 MGD (329MLD), Montebello WFP No. 2 treated 81 MGD (307 MLD), and Ashburton WFP treated 85MGD (322 MLD).

The proposed capacity of the three existing treatment plants, including improvements to the Montebello plants discussed below, will be 483 MGD. From the maximum day demands shown in Table 3-3, the existing treatment plants will not be able to meet future demands. Therefore, there are plans to construct a fourth treatment plant, the Fullerton Treatment Plan, to meet these future needs. The study phase for the

TABLE 3-6

INVENTORY OF EXISTING WATER TREATMENT FACILITIES

	Municipal Montebello Plant No. 1	Municipal Montebello Plant No. 2	Municipal Ashburton Plant
Water Source	Gunpowder and Susquehanna Rivers		Patapsco River
Plant Coordinate Location	917,124 E 547,464 N	915,923 E 547,759 N	895,645 E 542,673 N
Rated Plant Capacity	128 MGD (485 TCMD)	112 MGD (424 TCMD)	120 MGD (454 TCMD)
Average Production Fiscal Year 2005	87 MGD (303 MLD)	81 MGD (284 MLD)	85 MGD (360 MLD)
Maximum Peak Flow	Total of Plants 1 and 2 240 MGD, 318 MGD** (910 TCMD, 1205 TCMD**)		165 MGD (625 TCMD)
Usable Storage Capacity	Plants 1 and 2 15.5 MG (59 TCM)	Druid Lake 218.5 MG (828 TCM)	Lake Ashburton 70.4 MG (267 TCM)
Planned Expansion	Under Design	Under Design	None
Method of Solids Removal*	Lagoon/On-Site Treatment	Lagoon/On-Site Treatment	Lagoon*
Operating Agency	Baltimore City	Baltimore City	Baltimore City

* Ultimate disposal of solids: co-disposal with Back River WWTP solids

** Ultimate capacity

proposed future Fullerton Treatment Plant is underway and is scheduled to be complete by October 2008. It is proposed that this plant will treat water primarily from the Susquehanna River and will supply water by gravity to the First Zone. According to the Central System Report, March 2003, the recommended plant capacity is 120 MGD (454 MLD) and it will be needed by the year 2015.

MONTEBELLO FILTRATION PLANTS NO. 1 AND NO. 2

The Montebello complex comprises two complete plants. The first, located on the east side of the 3900 block of Hillen Road, was put into operation in 1915, and has 32 filter units with a design capacity of 128 MGD (484 TCMD). The second plant is located on the west side of Hillen Road directly opposite the first plant, has 28 filter units with a design capacity of 112 MGD (424 TCMD) and was placed in service in 1928. Over the years, both plants have undergone numerous improvements and upgrades to maintain compliance with ever increasingly stringent water quality standards. Presently, design is nearly complete for the construction of a new combined filter building and related chemical feed systems. When completed, these improvements will increase the capacity of these plants to 318 MGD (1205 TCMD). This and other significant projects at the Montebello WFP are listed below. A total of approximately $145,506,000 is designated for projects at this facility in the current CIP.

- Combined Filtration – evaluation, design and construction of major upgrades including new modern filtration complex that will filter settled water from both treatment plants; new settled water conduit; new rapid mix facilities; new lime, polymer and primary coagulant chemical feed and storage systems new associated instrumentation and control systems; provisions for additional chlorine disinfection application points; modernization of HVAC and secondary electrical systems; and provisions for an emergency power source for all critical system components [DESIGN PHASE-ON HOLD]

- Water Recycle Program – study, design and construction of a water recycling facility to reduce the demand on raw water supplies and minimize the impact on the environment by recycling partially treated water [STUDY PHASE]

- Improvements to the Gatehouse – replace roof and hoist crane, and repair masonry wall damaged when the roof partially collapsed [COMPLETE]

ASHBURTON FILTRATION PLANT

The Ashburton Plant was put into service in 1956, and is located at 3001 Druid Park Drive. This plant has a rated capacity of 165 MGD (625 TCMD) with 20 filter units. There are currently two major projects underway to upgrade this facility by replacing outdated equipment and improve performance. Project descriptions are listed below:

- Filtration Plant Renovations – design and construction of upgrades to filtration, chemical feed systems, instrumentation, water quality monitoring, mechanical and electrical systems, dredging and disposal of residuals from Lake Ashburton, and address ADA issues and space utilization for expanded support functions of the water treatment plant; and study, design, and construction of improvements to Lake Ashburton to enhance water circulation within the lake [CONSTRUCTION PHASE]

- Wash Water Lake Rehabilitation – design and construction of improvements including internal repairs identified under the current emergency work for embankment stabilization, internal baffling, and stormwater facilities [2 YEAR CONSTRUCTION PHASE]

WATER DISTRIBUTION

The distribution system consists of a network of mains varying in size from 4-inch (10.16 cm) to 108-inch (274.32 cm) in diameter. The majority of these mains are of cast iron, but some of the larger sizes, that is, 16-inches (40.64 cm) and larger in diameter, are of steel or reinforced concrete. More than 4524 miles of main were in service in the distribution system at the end of 1993. There are 1546 miles (2487 km) of water mains in Baltimore City alone. In addition, the City owns 105 miles (169 km) of water mains in Baltimore County and used to own 23 miles (37 km) in Anne Arundel County until recently turning this area over to Anne Arundel County. Exhibit B in the Appendix illustrates all water mains 12 inches and larger within the City boundaries. The water mains connect a series of pumping stations, reservoirs and elevated storage tanks in five major zones of service.

Each zone is designed and maintained to supply water at a minimum 40 pounds per square inch (psi) pressure to the consumers in the area and to provide adequate flow for fire suppression. The City has an extensive cleaning and lining program to rehabilitation older unlined cast-iron mains and to restore their flow capacity to new pipe status. The City also has programs to identify and inspect certain critical large diameter water mains as well as a

system-wide valve exercising program. The Central System Report, March 2003, prepared by Rummel, Klepper & Kahl, LLP, addresses various distribution system and treatment capacity issues to assure adequate supply through year 2025. Planning and construction of water supply and distribution facilities within the County's boundary is the responsibility of Baltimore County with a statutory right of approval by Baltimore City as per the 1972 Agreement. A summary of this report is provided in a later section.

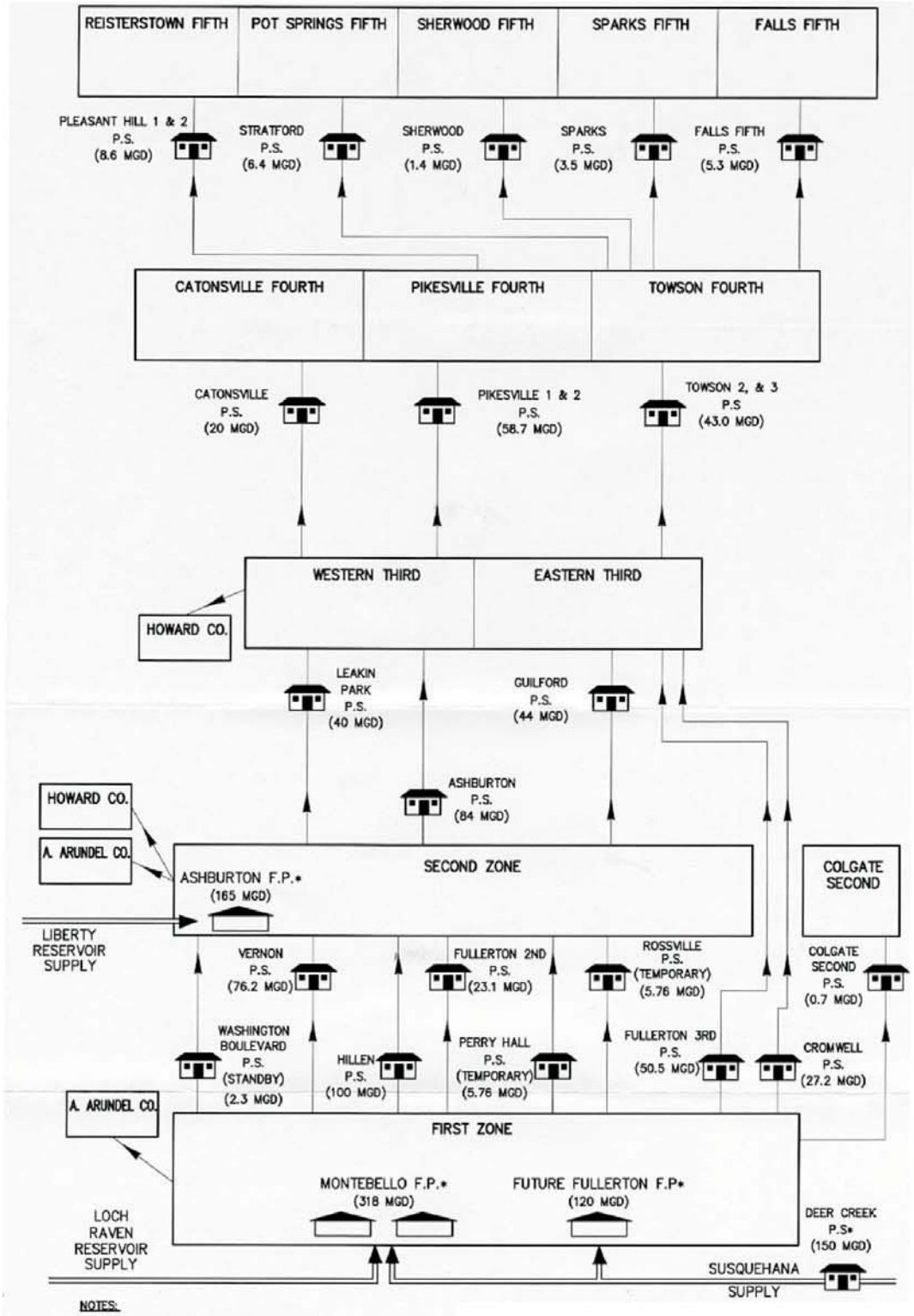
METHOD OF DISTRIBUTION BY ZONES

Under the present operating system the Montebello WFP supplies water to the First Zone by gravity and to the Second and Third Zones by pumping. The Ashburton WFP supplies water to the Second Zone by gravity, and to the Third, Fourth, and Fifth Zones by pumping. Figure 3-5 is a supply schematic diagram of the principal elements of the Baltimore water supply and distribution system. The First and Second Zones contain approximately 46 percent of the land in the distribution system, with consumption in those zones of approximately 56 percent of the filtered water supply. Most of the heavy industry within the Baltimore Metropolitan region is located in the First Zone. The Second Zone supplies water to considerable commercial and light industrial developments. Both the First and the Second Zones, also, supply water to large residential developments within their limits. The Third, Fourth and Fifth Zones contain the remaining 54 percent of the land in the distribution system, with consumption in those zones comprising approximately 46 percent of the filtered water supply. The consumption in these zones is predominantly residential with some commercial and industrial demands present.

More detailed information regarding each of the zones of service is provided in the Central System Report by Rummel, Klepper & Kahl, LLP (RK&K) dated March 2003.

FIRST ZONE

The First Zone of service of the Central System presently serves the tidal areas of Baltimore City, Baltimore County, and the northeastern part of Anne Arundel County. The total land area served by the First Zone is 82 square miles (212 skm) or about 28 percent of the entire water service of the Central System. The elevations that are served range from



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Comprehensive Water and Wastewater Plan

SUPPLY SCHEMATIC OF CENTRAL SYSTEM

Date: **2006**

Figure: **3-5**

sea level to about 150 feet (46 m). The average annual demand for the zone is 87.2 MGD (330 MLD).

The First Zone serves an area of 27 square miles (69.9 skm) in Baltimore City with a population of 174,000. The annual average demand for the City portion of this zone is 54.67 MGD (207 MLD). The principal industrial areas of the City and the Counties are located in this service area. In types of use, water consumption is 33% percent domestic, 42% percent public-commercial and 25% percent industrial. With industry slowly continuing to leave the City and surrounding areas, the industrial percentage is estimated to drop over the next 20 years. With respect to the entire water service area in the City, the First Zone contains a little over one-fourth of the population but uses approximately 48% of the water, because of the large industrial and public-commercial demands. It should be noted that the per capita value in the City is significantly higher (as shown in Table 3-3) than the Baltimore County per capita value, most likely due to this high percentage of industrial demand in the City.

Water is supplied by gravity to the First Zone by the Montebello WFP, which is at an elevation of 215 feet (58 m). At the present time, storage facilities in the zone include 15.5 MG (59 TCM) usable storage at the filtered water reservoirs at Montebello WFP; about 218.5 MG (828 TCM), between the elevations 200 (60.96 m) and 214.5 feet (57 m), at Druid Lake; and 3.7 MG (14 TCM) at the Curtis Bay Tank overflow elevation 208.96 feet (63.69 m) for balancing storage in the area south of the harbor.

SECOND ZONE

The Second Zone is a long narrow area of approximately 51 square miles (132 skm) that extends diagonally across the Baltimore water service area from Brooklyn and St. Denis in the southwest to the vicinity of the Baltimore County Beltway between Belair Road and Pulaski Highway in the northeast. This zone also supplies water to portions of Anne Arundel and Howard Counties. Approximately 42 percent of the area is in Baltimore City. Ground elevations in the zone range from below 100 feet (30.48 m) to 285 feet (87 m). The annual average demand for the zone is 48.28 MGD (183 MLD).

In Baltimore City, the Second Zone serves an area of 21 square miles (54 skm) with a population of approximately 229,000. The average annual demand for the City portion of this zone is 30 MGD (114 MLD), or 26 percent of the total demand in the City. The types of use in the Second Zone are as follows: 68% percent domestic; 29% percent public-commercial; 3% percent industrial. This zone is primarily residential with supporting commercial districts and the distribution of demands is not expected to change considerably.

Water is supplied to the Second Zone by gravity from the Ashburton WFP and is pumped to the zone by the Vernon, Hillen and Fullerton Second Pumping Stations. Vernon Pumping Station takes suction from the Druid Lake water supply in the First Zone. Hillen Pumping Station takes suction from the Montebello Finished Water Reservoirs and the Fullerton Second Pumping Station currently takes suction from the Fullerton transmission main, both in the First Zone. Storage is provided for the zone by the Guilford Reservoir, which has a usable storage capacity of 6.5 MG (25 TCM), Lake Ashburton, which has a usable storage capacity of 70.4 MG (267 TCM), and the Perry Hall Tank, which has a usable storage capacity of 1.0 MG (3.79 TCM). The overflow elevation of Guilford Reservoir is 341.4 feet (104 m). The Lake Ashburton and Perry Hall Tank overflow elevations are both 353 feet (108 m).

COLGATE SECOND ZONE

The Colgate Second Zone of service supplies water to about 0.86 square mile (2.2 skm) of land in Baltimore County and 0.02 square mile (0.05 skm) in Baltimore City within the area served by the First Zone. The Colgate Pumping Station takes suction from the First Zone and pumps into the 0.30 MG (1.14 TCM) Colgate elevated storage tank. This system supplies 0.04 MGD (0.15 MLD) to predominantly residential consumers in the City. Ground elevations vary from 52 feet (16 m) to 160 feet (48.77 m) and the overflow elevation of the Colgate Tank is 258 feet (78.64 m).

EASTERN THIRD ZONE

The Eastern Third Zone serves a "U-shaped" area of about 36 square miles (93 skm), with approximately 40% within the City. Ground elevations in the zone range from 136 (41.5 m) to 440 feet (134 m). The average annual demand is 22.75 MGD (86 MLD). This zone also supplies water to portions of Howard County.

The entire zone is predominantly residential with supporting business areas and some light industry. The type of use is: 68% percent domestic; 29% percent public-commercial; and 3% percent industrial. These percentages are projected to remain about the same over the next 20 years. The annual average demand in Baltimore City is 12.7 MGD (48 MLD) serving a population of 116,000.

Water is supplied to the Eastern Third Zone primarily by the Guilford Pumping Station, which takes suction from the Guilford Reservoir in the Second Zone. This supply is supplemented by pumpage from the Cromwell Pumping Station and Fullerton Third Pumping Station. The Cromwell Pumping Station takes suction from the old 144-inch (365.76 cm) unlined Loch Raven-Montebello Tunnel about 4.5 miles (7.24 km) north of the Montebello WFP. This tunnel was put into service in 1881 for the conveyance of Gunpowder Falls water from the old Loch Raven Dam to Lake Montebello, but had been placed in reserve in 1940 when the new Gunpowder Falls-Montebello lined tunnel was put into service. For the operation of the Cromwell Pumping Station, the old tunnel was closed north of the Station. Filtered water is sent through the tunnel from Montebello WFP by gravity. The pumping station takes suction from a shaft to the tunnel, gives secondary treatment to the water as may be required, and discharges the water into the northeastern part of the zone. The Fullerton Third Pumping Station currently takes suction from the Fullerton transmission main in the First Zone.

All three pumping stations discharge into the Towson Reservoir, which is the only storage facility in the Eastern Third Zone. The Towson Reservoir is located in Baltimore County but serves both the City and County. Suction is taken from this reservoir by the Towson Pumping Station, which supports upper zones in the distribution system. The Towson Reservoir has a usable capacity of 9.0 MG (34 TCM) at an overflow elevation of 515.5 feet (157.12 m).

WESTERN THIRD ZONE

The Western Third Zone serves a large, sprawling area of approximately 36 square miles (93 skm). It extends beyond the Baltimore City boundary to Pikesville on the northwest and to the Patapsco River on the west and south. In land surface elevations, it ranges from 36 feet (11 m) to 492 feet (150 m). The annual average demand for the zone is 42.68 MGD (162 MLD).

The Western Third Zone is predominantly residential, with numerous housing developments, shopping centers, small mercantile districts, and light industries. In types of use, the water consumption is 33% percent domestic; 66% percent public-commercial; and 1.0% percent industrial. The commercial percentage is projected to increase and the residential percentage decrease over the next 20 years. The annual average demand in the City is 17.01 MGD (64.5 MLD) and the population served is 138,000. The area served in the City is 18 square miles (47 skm).

Water is supplied to the zone by the Ashburton and Leakin Park Pumping Stations, which both take suction from Lake Ashburton. Storage is provided by three (3) facilities; the Melvin Avenue Tank at Catonsville, with a usable capacity of 2.08 MG (7.9 TCM) at overflow elevation 567.4 feet (172.94 m); the Pikesville Reservoir, with a usable capacity of 17.4 MG (66 TCM) at the same overflow elevation; and the Catonsville Reservoir with a usable capacity of 17.94 MG (68 TCM) at an overflow elevation of 567.4 feet. All storage facilities are located in Baltimore County.

FOURTH ZONE

The Fourth Zone of service includes the Pikesville, Catonsville and Towson Fourth Zones. Both Pikesville and Catonsville Fourth Zones lie totally within Baltimore County and do not provide any service to Baltimore City. Only a very small area, 0.33 square mile (0.85 skm), of the Towson Fourth Zone is located within the limits of Baltimore City. The zone serves approximately 1,500 City residents and has a City annual average demand of 0.25 MGD (0.95 MLD): less than one percent of the total demand in the zone. The type of usage

in the City is almost entirely domestic with no industrial consumption. This distribution is not projected to change significantly in the next 20 years.

Water is supplied to the Towson Fourth Zone by the Towson Pumping Station. The total storage capacity in the zone is 13 MG (49 TCM) and is provided by the Mays Chapel Reservoir, usable capacity 11 MG (42 TCM); Stratford elevated tank, capacity 1.0 MG (3.8 TCM); and Cub Hill elevated tank 1.0 MG (3.8 TCM). All three facilities are located in central Baltimore County.

FIFTH ZONE

The Fifth Zone of service includes the Pot Springs, Sherwood, Reisterstown, Sparks and Falls Fifth Zones, all of which lie totally within Baltimore County and do not provide any service to Baltimore City.

DISTRIBUTION SYSTEM PROJECTS

The City's CIP contains numerous projects to improve, maintain, upgrade, and inspect the distribution system. These projects are described below, many of which are recurring projects required to keep the system up to date and functioning efficiently.

- Water Distribution System Improvements – repair or replacement of water supply equipment that is old, broken, or damaged on a contractual basis [ONGOING]
- Water Infrastructure Rehabilitation – program to rehabilitate water mains by cleaning and cement lining, looping dead end water mains, abandoning stubs, and replacing appurtenances in various communities as necessary [ONGOING]
- Water Main Installation – installation of new water mains as needed to provide adequate water pressure and flows to serve users and fight fires, and performed in conjunction with other City agencies such as the Office of Transportation [ONGOING]
- Water System Cathodic Protection – program to monitor the effects of the light and heavy rail systems and other corrosive sources have on the water distribution system [ONGOING]
- Valve and Hydrant Replacement – repair and replacement of water valves and fire hydrants, and urgent cleaning and lining of water mains that are broken or damaged [ONGOING]

- Meter Replacement Program – program to replace aging water meters with automated meter technology and convert in-house meters to outside pit settings, and also test, repair, and replace large meters [ONGOING]

- Water System Audit – comprehensive program to reduce the percentage of water losses through verifying water production and distribution records, testing master meters, analyzing large and small meter consumption, properly sizing large and small meters, analyzing non-metered usage, recommending cost effective a small meter change-out program, analyzing meter pits for confined space issues, identifying areas of leakage in the distribution system, evaluating existing City practices regarding master and large meter calibrations, and recommending improvements to the City's existing procedures [ONGOING]

- Monitoring Water Transmission Mains – inspection program to evaluate the condition of pre-stressed concrete pipelines used to transmit potable water throughout the Baltimore Water System; program utilizes acoustic and electromagnetic techniques to perform inspections [ONGOING]

- Mapping Program (Water) – program to provide updated and additional water utilities information such as construction dates, material manufacturer, etc. and to coordinate with GIS system which includes utilities, land base and property information [ONGOING]

- Reservoir Valve Improvements – evaluation, repair or replacement of water reservoir valves that are aged and malfunctioning [2005]

PUMPING STATIONS

There are 21 filtered water pumping stations in active or standby use in the Central System. The combined nominal capacity of all the pumping stations is approximately 608 MGD (2,304 TCMD) with one pump on standby at each station.

Areas in the City are supplied with water by ten pumping stations; Vernon, Hillen, Ashburton, Leakin Park, and Guilford Pumping Stations which are located in the City; and Colgate, Fullerton Second, Fullerton Third, Towson, and Cromwell Pumping Stations which are located in Baltimore County. The safe capacity of the pumping stations serving the City is roughly 400 MGD (1,516 TCMD). Also located in the City, but seldom used is the Washington Boulevard Pumping Station. Its purpose is to pump water from the First Zone to the Second Zone and currently operates on standby.

There is currently only one finished water pumping station improvement project in the City's CIP. Upgrades to the Leakin Park Pumping Station, presently under construction, include the installation of two additional pumps, expansion of associated electrical systems, and renovations to auxiliary systems. Construction is expected to be complete late 2006.

STORAGE FACILITIES

Of the total 385 MG (1,459 TCM) of finished water storage with the Central System, more than 314 MG (1,190 TCM) of elevated and ground storage is concentrated in the First and Second Zones. Storage facilities located in the City include the Montebello Finished Water Reservoirs, Druid Lake, Lake Ashburton, Guilford Reservoir, and the Curtis Bay Tank. Pikesville Reservoir, Towson Reservoir, Colgate Tank, Melvin Avenue Tank, Perry Hall Tank, and Catonsville Reservoir are located in Baltimore County but serve both the City and County. The combined capacity of these facilities is 362 MG (1,372 TCM).

UNCOVERED FINISHED WATER RESERVOIRS

The requirements set forth in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), require the City to cover or abandon its uncovered finished water reservoirs in the near future. The LT2ESWTR, will have a major impact on the City which currently has six uncovered finished water reservoirs in the Central System. The City currently has projects in the works to replace or cover four of these reservoirs: Pikesville Reservoir, Towson Reservoir, Montebello No. 2 Finished Water Reservoir and Guilford Reservoir. Lake Ashburton and Druid Lake are two remaining reservoirs to be covered or replaced. Due to the large size and complexity of these facilities, the City conducted feasibility studies in 2004 to evaluate possible options for covering or replacing these reservoirs. The Investigation of Water Storage Locations First and Second Zones Report, July 2004, identifies the necessary volume and location of new storage facilities which will allow Lake Ashburton and Druid Lake to be abandoned as finished water facilities.

Also, there is an ongoing Earthen Dam Improvement Program involving the rehabilitation of interior/exterior slopes of fence lines, outfall/overflow structures, regrading slope surfaces, and other incidental work. This project is now in construction and is expected to be completed in late 2006.

CENTRAL SYSTEM STUDIES

A draft Central System Report was completed by the Baltimore County Water Analyzer Office in 1989, with the assistance of Howard and Anne Arundel County staff. Until recently, this was the most up to date report that evaluated the City's water distribution system and proposed improvements projects.

In 1999, RK&K began the undertaking of updating the City's hydraulic model and Central System Report. An updated hydraulic model was created from the City's Geographical Information Systems (GIS) database using the software program WaterCAD by Haestad Methods. All 8-inch and larger water mains in both the City and Baltimore County are included in the hydraulic model, along with all the pumping stations and storage facilities. The hydraulic model was used to evaluate the City's system under current and future conditions, conduct fire flow and storage analysis, as well as water quality and operations investigations. Water demands were projected through the year 2025 (shown previously in Table 3-3). Various projects to improve the Central System, as recommended under that study, are summarized in Table 3-7. The final report was submitted to the City in March 2003.

In addition to the long range planning projects shown in Table 3-7, the report also provided short-term and system-wide recommendations. Those recommendations, with the status shown in the brackets, are listed below.

- Rehabilitation of older mains to improve areas with low fire flow availability and decrease excessive headlosses [ONGOING]
- Construction of additional transmission/discharge mains to improve low fire flow availability and increase reliability of the pumping stations [ONGOING]
- Modification of pump controls to operate pumping stations more efficiently [SOME STATIONS HAVE BEEN REVISED]
- Elimination of uncovered finished water reservoirs and construction of additional storage [TOWSON RESERVOIR, MONTEBELLO PLANT NO. 2 RESERVOIR AND GUILFORD RESERVOIR ARE UNDER DESIGN; CONSTRUCTION OF REPLACEMENT STORAGE FOR PIKESVILLE RESERVOIR IS UNDERWAY; AND AN INVESTIGATION TO REPLACE LAKE ASHBURTON AND DRUID LAKE HAS

BEEN COMPLETED]

- Implementation of operational efficiency improvements [NONE TO DATE]

- Confirmation of existing system service boundary and renewal of jurisdictional agreements [BALTIMORE COUNTY REAFFIRMED THAT URDL BOUNDARY WILL NOT BE CROSSED; BOTH CARROLL AND HARFORD COUNTIES HAVE OR ARE IN THE PROCESS OF RENEGOTIATING RAW WATER AGREEMENTS; HOWARD COUNTY AND ANNE ARUNDEL COUNTY AGREEMENTS HAVE BEEN REVIEWED BUT NO NEW NEGOTIATIONS HAVE BEEN INITIATED]

- Implementation of a new raw water management strategy to ensure drought management and maximize water storage in the City's three reservoirs [PREVIOUS RAW WATER MANAGEMENT STRATEGIES HAVE BEEN REVISED]

- Relocation of water quality sampling locations [BEING CONSIDERED UNDER DRINKING WATER REGULATIONS COMPLIANCE EVALUATION PRESENTLY UNDERWAY]

TABLE 3-7

Summary of Recommended Central System Improvement Projects							
Year Needed	**Project Description**	**Zone**	**Size/ Capacity**	**Approx. Length (LF)**	**Estimated Cost**	**Status (if applicable)**	**General Notes**
2005	Montebello WTP	1	318 MGD	n/a	$88,000,000	Design on hold	
2005	Fullerton Reservoir	1	40 MG	n/a	$25,000,000	design 90% complete (Gannett Fleming)	
2005	Chapel Hill Tank	2	2.0 MG	n/a	$3,400,000	design 99% complete (WRA)	
2005	Hillen/Ashburton By-Pass Main	2	64"	3,400	$5,500,000	completed	
2005	Honeygo Boulevard Main Extension	2	16"/20"	3,300/4,600	$820,000	20 inch main has been installed	Chapel Hill Tank area, WAO recommendation
2005	Gerst Main (north of Chapel Hill Tank)	2	12"	3,400	$300,000		WAO recommendation
2005	Belair Road Main (W. Marsh to Joppa)	3E	24"	8,800	$3,000,000	Design complete (RK&K)	
2005	Putty Hill Main (to Towson Reservoir)	3E	24"	8,400	$1,700,000	completed	
2005	Perry Hall Road Main to Belair Road	3E	42"	17,150	$6,500,000		WAO recommendation
2005	Belair Road Main (to Northern Parkway)	3E	24"	5,150	$1,100,000	Design on hold	
2005	Leakin Park Pumping Station	3W	80 MGD	n/a	$3,750,000	currently under construction	adding 2 pumps (20 MGD each), WAO recomm.
2005	Catonsville Main (LP PS to Rt. 40)	3W	48"	8,300	$5,000,000	completed	
2005	Catonsville Main (parallel to Rt. 40)	3W	42"	10,200	$8,100,000	construction 99% complete (WRA)	
2005	Rolling Road Transmission	3W	16"	11,000	$1,180,000	design 97% complete (Wallace Montg.)	
2005	Catonsville Pumping Station	4C	20 MGD	n/a	$500,000	completed	adding 4th pump (11 MGD)
2005	Rolling Road Tank Transmission	4C	24"	7,800	$3,400,000	design 97% complete (PHRA)	
2005	Owings Mills Reservoir	4P	5.6 MG	n/a	$3,000,000	completed	
2005	Falls Pumping Station	5F	5.3 MGD	n/a	$615,000	completed	adding 3rd pump (2.7 MGD)
2005	Hartfell and Killoran Road Parallel Mains	5P	16"	3,300	$400,000		not required, reduces high headloss near PS
2005	Bond Avenue Tank	5R	2 MG	n/a	$1,800,000		WAO recommendation
2005	Yale Avenue Main	2	16"	1,000	$200,000		improves fire flows
2005	Elmtree Street Main	2	12"	1,000	$100,000		improves fire flows
2005	47th Street Main	2C	12"	1,400	$140,000		improves fire flows
2005	Liberty Road Main	3W	12"	2,000	$200,000		improves fire flows
2005	Old Pimlico Road Main	3W	16"	4,000	$530,000		improves fire flows
2005	Clays Road Main	4C	12"	1,600	$160,000		improves fire flows and pressures
2005	New Connection at Rutledge Road	4T	12"	100	$10,000		with Mays Chapel Discharge, improves fire flows
2005	Timonium Road Main	4T	12"	900	$90,000		improves fire flows
2010	Pulaski Highway Main	1	16"/20"/24"/36"	4,000/2,500/3,800/6,200	$3,600,000		WAO recommendation
2015	Fullerton WTP	1	120 MGD	n/a	$130,000,000	study phase 20% complete	WAO recommendation
2015	Pleasant Hill Pumping Station 1	5R	13 MGD	n/a	$1,000,000	currently under design (RK&K)	replacing 2 pumps (4.3 MGD each)+assoc. piping
2015	Reisterstown and Pleasant Hill Road Main	5R	16"	4,300	$600,000		addt'l transmission main required w/PS upgrade
2015	Deer Creek Pumping Station	RAW	200 MGD	n/a	$22,000,000	design 60% complete (PHRA)	renovate intake, add two pumps (50 MGD each)
2020	Marriottsville Road Main	4P	24"	3,500	$900,000		Lyons Mill Rd and Liberty Rd
2025	Ebenezer Road	1	12"	8,500	$1,500,000		WAO recommendation
2025	Perry Hall & Philadelphia Road Main	2	24"/30"	15,600/9,000	$9,000,000		WAO recommendation
2025	Lord Baltimore Extension Main	4C	12"	5,600	$1,000,000		WAO recommendation, not req'd but helps system

NOTE: General Notes column lists reason for project, all projects recommended by RK&K, 'WAO recommendation' means project previously recommended by the Water Analyzer Office (WAO) but has not been included in CIP yet; costs include escalation 3.2% per year

WATER FINANCE

In November 1978, the voters of the City approved the Charter Amendment establishing the Water Utility as a separate enterprise and requiring that the Water Utility be financially self-sustaining and operated without profit or loss to the other funds or programs of the City. In addition, the Charter Amendment requires the City to approve a separate budget for the Water Utility.

As required by the Charter Amendment, the City Council adopted Ordinance 941 in December 1978 establishing, among other things, a mechanism for the determination of rates and charges. Ordinance 941 requires that the Board of Estimates, upon the recommendation of the Director of Finance and the Director of Public Works, establish rates and charges sufficient to make the Water Utility self-supporting at all times ant that it adjust the rates if the projected statement of results for the immediate prior year resulted in a loss or deficit. In addition, Ordinance 941 requires that the rates so established shall be at a level sufficient to recover any accumulated deficit from prior years.

The City Board of Estimates establishes rates and charges for customers within Baltimore City as well as the wholesale rates for treated water charged to Howard and Anne Arundel Counties and the wholesale rate for untreated water charged to Carroll County. Under a 1992 Agreement, the City supplies Harford County with untreated water at cost. Under provisions of Chapter 539 of the Laws of Maryland of 1924, the City is obligated to supply water to Baltimore County at cost. The current method of determining cost to serve Baltimore County is set out in a City-County Water Agreement dated September 20, 1972, as amended by 1991 Arbitration Panel ruling. Among the costs apportioned are the costs of operation and maintenance and administration, major repairs and capital projects during construction.

Customers in Baltimore County are served through individual meters but are billed by the City at rates recommend by the County with City concurrence, rather than on the basis of rates established by the City. Following the end of each fiscal year, when the information for the Water Utility's actual cost for that period and the County's share of usage is available, City and County officials meet to reach agreement on costs to be paid by the County, based on the Arbitration Panel's decision. If the revenues from billings to County

customers exceed the agreed costs, the City remits the excess to the County within 60 days; if there is a shortfall, the County must pay the difference to the City within 60 days.

The revenues of the Water Utility are primarily derived from water sales, with a minor amount of revenues generated by charges for other services and rental income, penalty charges for late payment and interest earnings on investments. Water Utility customers in Baltimore City and Baltimore County are billed quarterly on the basis of a minimum quarterly charge and consumption charges per one hundred cubic feet.

Because of escalating operating and capital costs related to aging infrastructure, homeland security, and meeting federal and state environmental laws and regulations, the City approved 9% annual rate increases effective April 15th in the years 2004, 2005, and 2006. In order to mitigate the impact on the City's low-income customers, a Low Income Assistance Program was initiated in April 2005. This crisis intervention program was initiated to prevent water service cut-off due to delinquency. It is expected that the recent annual rate increases as well as projected future rate increases will provide an incentive for some customers to implement conservation measures. The Utility is also taking internal measures to promote water conservation efforts and reduce unaccounted for water through a comprehensive program of water main rehabilitation, water system audits, valve exercising, and securing fire hydrants to prevent unauthorized access.

MARYLAND WATER CONSERVATION PLUMBING FIXTURES ACT

As part of the 1984 Chesapeake Bay Initiatives, the General Assembly enacted HB 976, which amended the water and sewerage planning law, and the Secretary of Health and Mental Hygiene proposed to adopt this as a new Regulation .07 under COMAR 10.17.01, Planning Water Supply and Sewerage Systems.

The purpose of this action is to satisfy the legal mandate of HB 976, a 1984 amendment to Title 9, Subtitle 5 (Section 9-505), Health-Environmental Article, Annotated Code of Maryland, which requires that counties document in their water and sewerage plans their programs for compliance with the Maryland Water Conservation Plumbing Fixtures Act (MWCPEA), Article 56, Section 445, Annotated Code of Maryland.

The Building Inspections Section under the Neighborhood Progress Administration/DHCD is responsible for enforcement of MWCPFA in the City of Baltimore. Building Permits for new buildings and major renovations are now issued with a stipulation for compliance with MWCPFA. Final field approval is also predicated on these conditions.

Currently, the City is using the 1987 BOCA Code with amendments as the basis for its Building Code. The Program for Compliance with the MWCPFA will be to update our current Plumbing Code and adopt the regulations set forth in the State Planning Code and enforces them accordingly.

COMPREHENSIVE WATER AND WASTEWATER PLAN
BALTIMORE CITY, MARYLAND

CHAPTER IV

WASTEWATER COLLECTION AND TREATMENT

INTRODUCTION

The Baltimore Wastewater System serves most of Baltimore City and sections of Baltimore, Anne Arundel and Howard Counties. Areas within the City are essentially fully developed, while major urban expansion continues to occur in the adjacent county areas. Growth in wastewater requirements is expected to result primarily from future development outside City boundaries. In order to meet anticipated increasing demands and to meet environmental regulations for sanitary sewer services, it is necessary to maintain the system in sound physical condition. The City is continuously engaged in the planning and development of improvements to the system to meet these demands. A list of the Capital Improvement Projects (CIP) for the City's wastewater system for the years 2007 through 2012 are provided in Exhibit A of the Appendix and total over $ 1.04 billion. Descriptions of the wastewater related projects can be found throughout this chapter.

The wastewater system comprises a network of sanitary sewers, force mains and pumping stations which are tributary to two wastewater treatment plants. The planning and engineering of the wastewater system are the responsibility of the Bureau of Water and Wastewater. The operation and maintenance of the pumping stations and wastewater treatment plants are the responsibility of the Wastewater Facilities Division, Bureau of Water and Wastewater. Maintenance of the sanitary sewers in Baltimore City is the responsibility of the Utility Maintenance Division, Bureau of Water and Wastewater.

The 201 Facility Plans for the Back River and Patapsco Wastewater Conveyance Systems, approved by the Maryland Department of the Environment (MDE) in March 1992, investigated the probable performance of the City's sanitary sewer system over a twenty year planning period. The study involved a comprehensive inflow and infiltration (I/I) monitoring program and hydraulic modeling of all sewers 12-inches in diameter or larger,

resulting in the development of a prioritized schedule of sewer system improvements in each of the City's 8 major sewersheds. The City began undertaking these sewershed studies in 1995 starting with the Jones Falls and Herring Run Sewersheds. The Gwynns Falls, Gwynns Run and High Level Outfall followed next. With the City's Consent Decree, which will be discussed in more detail in a later section, these sewersheds will be re-evaluated along with the remaining sewersheds which have yet to be evaluated in more detail since the 201 Facility Plan. The City has also completed a Comprehensive Wastewater Facilities Master Plan in September of 2004. This plan focused on the City's two treatment plants with respect to capacity and water quality.

DISCHARGE PERMITS

A list of the City's discharge permit numbers is provided in Table 4-1. A complete list of all permit holders in the City can be obtained through MDE.

TABLE 4-1

LIST OF DISCHARGE PERMIT NUMBERS

FACILITY NAME	DISCHARGE PERMIT NUMBER
Baltimore City Composting Facility	97DP2304
Montebello Water Filtration Plant	98DP0630
Ashburton Water Filtration Plant	98DP0681
Patapsco Wastewater Treatment Plant	98DP0580
Back River Wastewater Treatment Plant	89DP0581
Bowley's Lane Landfill	97SW0254
Cold Spring Landfill	97SW1211
Quarantine Road Landfill	02SW0257
Reedbird Avenue Landfill	97SW0252
Woodberry Quarry Landfill	97SW0255
Baltimore City Municipal Separate Storm Sewers	99DP3315

POPULATION PROJECTIONS AND FLOW ESTIMATES

Detailed drainage area population projections are presented in Tables 4-2 and 4-3 for both wastewater treatment plants. These projections are adapted from the Comprehensive Wastewater Facilities Master Plan by Whitman, Requardt and Associates (WRA), in September 2004.

TABLE 4-2

SEWERAGE DEMANDS AND PLANNED CAPACITY
BACK RIVER WASTEWATER TREATMENT PLANT
FULL DIVERSION PRIOR TO 1990 POPULATIONS

Jurisdiction	Population			Treatment Capacity	
	Total	Served	Unserved	Demand (MGD)	Planned (MGD)
1980 (1)(2)					
City	736,958	735,797	1,161		
Baltimore Co.	502,516	451,553	50,963		
Total	1,239,474	1,187,340	52,124	181.2	175.0
1990(2)					
City	602,392	602,392	0		
Baltimore Co.	410,711	386,441	24,270		
Total	1,013,103	988,833	24,270	156.2	175.0
2000(3)					
City	548,320	548,320	0		
Baltimore Co.	400,379(4)	395,241	5,138		
Total	948,699	943,561	5,138	147	152
2020(3)					
City	560,274	560,274	0		
Baltimore Co.	413,925	413,925	0		
Total	974,199	974,199	0	152	180

Notes:

(1) Population and flows from the Gwynns Falls service area have been allocated to the Back River and Patapsco WWTP reflecting the partial diversion of the Gwynns Falls service area thru the Southwest Diversion pressure sewer to the Patapsco WWTP
(2) 1980 and 1990 data was obtained from the Back River 201 Facility Plan
(3) 2000 and 2020 population data was obtained from the Comprehensive Wastewater Facilities Master Plan by WRA, dated September 2004
(4) Assumes 1.3% unserved based on 201 Facility Plan

TABLE 4-3

SEWERAGE DEMANDS AND PLANNED CAPACITY
PATAPSCO WASTEWATER TREATMENT PLANT
FULL DIVERSION PRIOR TO 1990 POPULATIONS

Jurisdiction	Population			Treatment Capacity	
	Total	Served	Unserved	Demand (MGD)	Planned (MGD)
1980 (1)(2)					
City	48,436	48,436	0		
Baltimore Co.	100,227	88,240	11,987		
Howard Co.	32,015	20,934	11,081		
Anne Arundel Co.	29,940	22,220	7,720		
Total	210,618	179,830	30,788	26.0	52.5
1990(2)					
City	124,492	124,492	0		
Baltimore Co.	216,253	213,638	2,615		
Howard Co.	51,111	44,513	6,598		
Anne Arundel Co.	34,459	24,276	10,183		
Total	426,315	406,919	19,396	66.7	70.0
2000(3)					
City	102,842	102,842	0		
Baltimore Co.	248,876	248,876	0		
Howard Co.	52,330	52,330	0	5.2	11.5
Anne Arundel Co.	30,956	27,891	3,065	3.4	6.4
Total	435,004	431,939	3,065	65	70
2020(3)					
City	97,802	97,802	0		
Baltimore Co.	265,605	265,605	0		
Howard Co.	68,150	68,150	0	10.3	11.5
Anne Arundel Co.	36,457	34,999	1,458	5.5	6.4
Total	468,014	466,916	1,458	65	81

Notes:

(1) Population and flows from the Gwynns Falls service area have been allocated to the Back River and Patapsco WWTP reflecting the partial diversion of the Gwynns Falls service area thru the Southwest Diversion pressure sewer to the Patapsco WWTP

(2) 1980, and 1990 data was obtained from the Back River 201 Facility Plan

(3) 2000 and 2020 population data was obtained from the Comprehensive Wastewater Facilities Master Plan by WRA, dated September 2004

WASTEWATER COLLECTION SYSTEMS

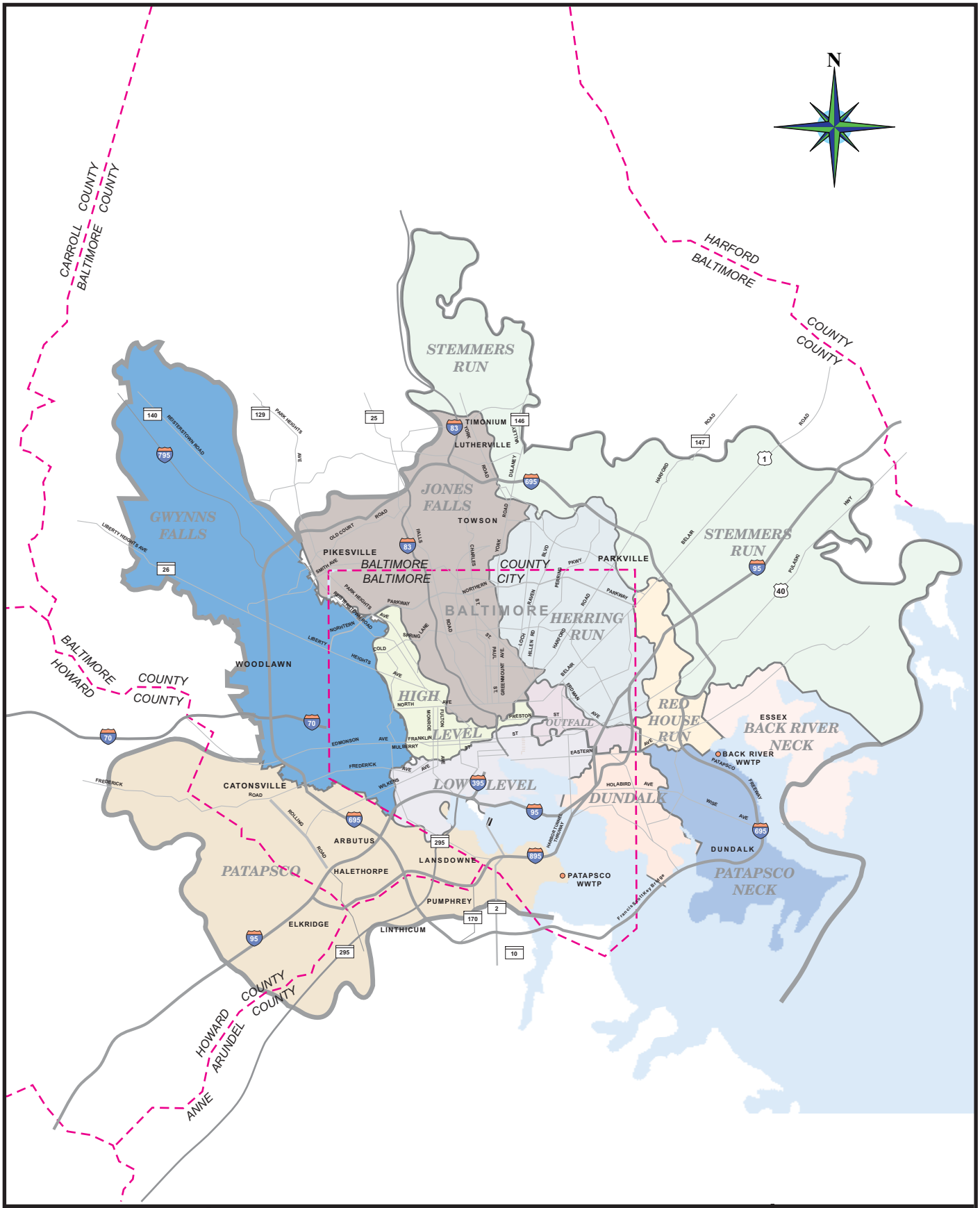
A complete description of each of the wastewater collection systems may be found in the previously approved Comprehensive Water and Wastewater Plan, as well as in the Comprehensive Wastewater Facilities Master Plan prepared by WRA in September 2004. Figure 4-1 illustrates the drainage areas for each of the wastewater collection systems. A map of the system piping is provided in Exhibit C of the Appendix. There are no areas with combined sewer systems within the City's limits.

The collection system infrastructure is aging and the City has known inflow and infiltration problems. These issues will be addressed in the near future as part of the City's Consent Decree which is discussed in the next section.

CONSENT DECREE

Baltimore City entered into a Consent Decree in September 2002 with the Environmental Protection Agency (EPA), which requires the City to conduct $900 million worth of improvements over the next fourteen (14) years. These projects are listed below and included in the CIP in Exhibit A of the Appendix. A copy of the Consent Decree can be obtained on the City's web page (www. BaltimoreCity.gov).

The Consent Decree compliments the ongoing efforts made by the City to eliminate sanitary sewer overflows (SSO) and combined sewer overflows (CSO), as well as upgrade and rehabilitate its wastewater collection system. The City also plans to implement a capacity assurance, management, operations, and maintenance (CMOM) program. These improvements will ultimately protect Baltimore's harbor, Maryland's streams, the Chesapeake Bay and the property of the citizens of Baltimore.



Achieving is working dpw together

Comprehensive Water and Wastewater Plan

WASTEWATER SYSTEM SERVICE AREA

Date: **2006**

Figure: **4-1**

The City has hired a consultant to assist with management of the SSO/CSO Consent Decree Compliance Program. This ongoing program includes Consent Decree program management, program management for the City's sewershed projects, a City-wide hydraulic model, Geographic Information System (GIS) and Management Information System (MIS) enhancements, pumping station evaluations, valve inspection and repair, and an Emergency Response Plan. The projects listed in the Consent Decree are provided below.

General

- Sewer System Rehabilitation & Evaluation Programs – inspection, evaluation and analysis of collection system to include flow monitoring and rainfall gauging, hydraulic modeling, cleaning, CCTV with bypass pumping as needed, manhole inspections, smoke and dye testing, and planning and design for rehabilitation projects (point repair of sewers and manholes, lining and replacement of sewers, new sewers for additional capacity, and enforcement action and disconnection of illegal connections to system) for the Low Level, Main Outfall, Dundalk, Patapsco, Herring Run, High Level, Gwynns Falls and Jones Falls Sewersheds

Upper Jones Falls

- Western Run Interceptor Improvements – design and construction of improvements to conveyance system to rehabilitate or replace sewers as necessary to correct SSO's into adjacent streams or back-ups into basements or houses [CONSTRUCTION COMPLETE]

- Upper Jones Falls Interceptor Improvements – design and construction to rehabilitate 15,000 lineal feet (LF) of 42- to 48-inch sewer [CONSTRUCTION PHASE]

- New Jones Falls Pressure Sewer, Lower Section – design and construction of 1,600 LF of replacement pressure sewer in Broadway from Oliver Street to East Chase Street connecting to the High Level Outfall [CONSTRUCTION COMPLETE]

- Jones Falls Pumping Station (PS) Capacity Upgrade – study, design, and construction of upgrade for existing station to handle 55 MGD [CONSTRUCTION PHASE]

- New Jones Falls Force Main/Pressure Sewer – design and construction of new force main/pressure sewer to handle increased flows from an upgraded JFPS, as well as additional flows from future PS in Stony Run and Greenmount Avenue Interceptors [CONSTRUCTION PHASE]

Lower Jones Falls

- Lower Jones Falls Interceptor Improvements – design and construction of improvements to conveyance system to upgrade capacity and reduce infiltration and inflow, [CONSTRUCTION PHASE]

- Stony Run Pumping Station and Interceptor Improvements – design and construction of new 20 MGD PS, new 24-inch force main, new upsized replacement sewer, and rehabilitation of portions of existing sewer [CONSTRUCTION PHASE]

- Maryland Avenue Interceptor Improvements – design and construction to replace 4,800 LF of existing 12- to 24-inch sewer with new 12- to 36-inch sewer, excluding proposed 901 North Howard Street project, and to improve siphon/SSO [CONSTRUCTION COMPLETE]

- Greenmount Avenue Interceptor Improvements – design and construction of new sewer to transport flows directly to the High Level Outfall and possible rehabilitation of existing sewer [DESIGN PHASE]

<u>Herring Run</u>

- Moores Run Interceptor Improvements – design and construction of 13,300 LF of 36- to 54-inch replacement sewer in the lower section [CONSTRUCTION PHASE]

<u>Gwynns Falls</u>

- Powder Mill System Improvements – design and construction to rehabilitate 12,000 LF of 12- to 24-inch sewer and 33,000 LF of 8- to 10-inch sewer [CONSTRUCTION PHASE]

- Dead Run System Improvements – design and construction to rehabilitate 10,000 LF of 8- to 12-inch sewer [CONSTRUCTION COMPLETE]; and clean, inspect and rehabilitate 20,000 LF of 12- to 24-inch sewer [CONSTRUCTION PHASE]

- Maidens Choice Interceptor Improvements – cleaning and inspection of interceptor, and design and construction to rehabilitate 12,400 LF of 12- to 24-inch sewer [CONSTRUCTION PHASE]

<u>High Level Sewershed</u>

- Gwynns Run Interceptor Improvements – design and construction of 15,000 LF of 18- to 42-inch sewers from Liberty Heights to Baltimore Street [CONSTRUCTION PHASE]

- Gwynns Run System Improvements – design and construction of improvements to conveyance system to reduce clear water infiltration and inflow, replace sewers, install supplemental gravity and pressure sewers, and eliminate SSO structures [CONSTRUCTION PHASE]

<u>Wastewater Facilities</u>

- Westport PS Rehabilitation – design and construction of pump and bar screen replacement, and rehabilitation of emergency generator and ventilation systems [CONSTRUCTION COMPLETE]

- Locust Point PS Rehabilitation – design and construction of pump and valve replacement, and rehabilitation of emergency generator, lighting, ventilation and control systems [CONSTRUCTION COMPLETED]

OTHER COLLECTION SYSTEM PROJECTS

There are several other improvement projects in the City's CIP which are not associated with the Consent Decree. These projects, listed below, include general maintenance and upkeep of the system, as well as some specific projects.

- Hawkins Point Sewerage Design – design and construction of a new public sewer system to connect the remainder of the Hawkins Point service to City collection conveyance systems, including Quarantine Road Landfill [STUDY COMPLETE, CURRENTLY IN DESIGN PHASE]

- Sewer Replacement Projects – unscheduled replacement and improvements to sewers which are necessary to continue proper conveyance of waste water overflows through unserviceable sewers due to badly deteriorated pipe, unrepairable leaks, and other major sewer failures [ONGOING]

- Small Sewer Extensions and Improvements – construction of needed sewers to connect existing dwellings to the sewage system [ONGOING]

- I/I Correction Program – program designed to detect and correct infiltration and inflow of clear water into sanitary sewers [ONGOING]

- Mapping Program (Wastewater) – continuation of City's program to provide updated citywide base maps which include topography, utility, and building lines [ONGOING]

- Southwest Diversion Pressure Sewer Improvements – design and construction of improvements to existing pressure sewer [2006]

- Hampden Avenue Interceptor Improvements – design and construction to replace 8,290 LF of existing 12- to 24-inch sewer with new 24- to 27-inch sewer [2008]

- Barclay Street Interceptor Improvements – design and construction to replace 6,600 LF of 12- to 22-inch sewer with new 15- to 24-inch sewer [2008]

- Biddison Run Interceptor Improvements [DESIGN COMPLETE]

- Eastern Avenue Pumping Station Improvements – renovations to station due to age and condition of facility [2006]; replacement of aged 42" valves [2006]

- McComas Street Pumping Station Force Main Improvements – evaluation, design, and construction of improvements due to a number of emergency repairs [2006-2008]

- Locust Street Pumping Station Force Main Improvements – evaluation, design, and construction of improvements due to a number of emergency repairs required over the past several years [2006-2008]

- Quad Avenue Pumping Station Force Main Improvements – evaluation, design, and construction of improvements due to a number of emergency repairs required over the past several years [2007-2009]

- Dundalk Avenue Pumping Station Force Main Improvements – evaluation, design, and construction of improvements due to a number of emergency repairs required over the past several years [2007-2009]

- Brooklyn Avenue Pumping Station Force Main Improvements – evaluation, design, and construction of improvements due to a number of emergency repairs required over the past several years [2007-2009]

WASTEWATER TREATMENT PLANTS

Wastewater within the City's collection system is treated at the Back River and Patapsco Wastewater Treatment Plants (WWTP). The City has given consideration to the Chesapeake Bay Agreement and EPA requirements when developing priorities for future projects, such as point discharges and addressing biological nutrient removal (BNR) and enhanced nutrient removal (ENR).

BACK RIVER WASTEWATER TREATMENT PLANT

The Back River WWTP is an advanced treatment facility having a nominal capacity of 180 MGD. The plant presently serves a population of approximately 944,000 in Baltimore City and County. The plant is situated on a 466-acre site on the west shore of Back River, approximately two miles east of the Baltimore City line. The Back River service area is approximately 140 square miles, 60 of which lies within Baltimore City.

For more detailed information regarding the Back River WWTP, refer to the previously approved Comprehensive Water and Wastewater Plan or the Comprehensive Wastewater Facilities Master Plan by WRA in September 2004.

FUTURE DEVELOPMENT OF BACK RIVER WWTP

The Back River Facilities Plan, utilizing 1980 census data, developed reduced population and flow projections for the Back River service area. A total of approximately $310,000,000 is designated for projects at the Back River WWTP in the FY-06 CIP. Detailed future requirements at Back River WWTP are in the approved Back River Wastewater Treatment Plant 201 Facility Plan. The following improvements are some significant projects that will be undertaken as part of a construction program through 2009:

- Digester Renovations – design and construct seven additional gravity belt thickeners, the conversion of six existing high rate digesters to operate as second phase digesters and two new acid phase anaerobic digesters. [DESIGN PHASE]

- Gravity Thickener Renovations – design and construction of replacement or renovation of the turntable drives, structural elements, walkways, bridges, weirs, baffles, and domes on six gravity thickeners [CONSTRUCTION]

- Blower Building Renovations – design and construction of renovations to the controls of air blowers in blower building 2 [CONSTRUCTION]

- Biological Nutrient Removal Enhancement – study, design and construction of modifications to existing biological nutrient removal facilities to optimize the removal of ammonia and nitrogen. Project also includes evaluation of ENR alternatives, ,pilot and full scale testing, preliminary design report and design of the first stage of ENR improvements [DESIGN]

- Primary Tank Renovations – design and construction of renovation of primary settling tanks 3, 4, 5, 6, and 7, including replacement of turntable with a precision bearing drive, refurbishing the arms, squeegees, weir and scum baffle replacement, and the renovation of mechanical systems [DESIGN]

- Back River Secondary Clarifier Rehabilitation – rehabilitation and/or replacement of mechanical drives, structural steel elements of the sludge collector arms, and reinforced concrete repair work associated with the rehabilitation of the secondary clarifiers [CONSTRUCTION]

- Gravity Belt Thickener Additions and Modifications – evaluation, design, and construction of modifications to the existing gravity belt thickeners and additional units to replace aging thickening facilities [2007-2009]

- Wastewater Facilities Security Improvements – evaluation of existing security levels and assessment of requirements of upcoming Federal regulations for the Bureau's wastewater treatment facilities [DESIGN]

- Primary Settling Tanks Rehabilitation – rehabilitation of Raw Sludge Pumping Stations A, B and C and new Flow Distribution Structure to improve distribution of primary effluent to the activated sludge/BNR (plants) [DESIGN]

PATAPSCO WASTEWATER TREATMENT PLANT

The Patapsco WWTP is an advanced treatment facility having a nominal capacity of 70 MGD. The plant is situated on a 65-acre site in the southern part of the City at Wagner's Point, north of the Curtis Bay area. This plant serves a population of approximately 432,000, located in portions of the City as well as portions of Baltimore, Anne Arundel and Howard Counties.

For more detailed information regarding the Patapsco WWTP, refer to the previously approved Comprehensive Water and Wastewater Plan or the Comprehensive Wastewater Facilities Master Plan by WRA.

FUTURE DEVELOPMENT OF PATAPSCO WWTP

The Patapsco Facilities Plan, utilizing 1980 census data, has developed increased population and flow projections for the plant service area. A total of approximately $294,000,000 is designated for projects at the Patapsco WWTP in the current CIP. The following are some projects of significance for efficient operation of the plant.

- Enhanced Biological Nutrient Removal – design and construct all facilities required for ENR if required and funded by State grant funds [DESIGN PHASE]

- Patapsco Return Sludge Pumping Station No. 1 -replacement of Return Activated Sludge and Waste Activated Sludge Pumps, HVAC, and structural improvements to Return Sludge Pump Station No. 1 as well as Chemical Feed improvements at Return Sludge Pumping Station No. 2 [2005]

- Gravity Sludge Thickener Rehabilitation – rehabilitation and/or replacement of the mechanical drives, structural steel elements of the sludge collector arms, and reinforced concrete repair work associated with the rehabilitation of the gravity sludge thickeners at the plant [DESIGN]

- Wastewater Facilities Security Improvements – evaluation of existing security levels and assessment of requirements of upcoming Federal regulations for the Bureau's wastewater treatment facilities [DESIGN]

- Primary Electrical System Improvements – Increase capacity and replace electrical feeders, transformers, switchgears and motor control centers associated with the 13.2 KV to 480 V system throughout the plant [CONSTRUCTION]

SUMMARY OF WASTEWATER FACILITIES MASTER PLAN

Whitman, Requardt and Associates, LLP (WRA) prepared a Comprehensive Wastewater Facilities Master Plan in September 2004. The purpose of the plan was to determine what improvements were needed for a 20 year planning period (2000 – 2020) with respect to capacity and water quality. According to this report, the facilities at the Back River Plant have adequate capacity to handle future flows and most anticipated treatment requirements (excluding ENR requirements), including solids handling, for the 20 year period. Based on the 2020 flow projections for the Patapsco Wastewater Treatment Plant service area, 81 MGD has been established as the plant capacity to meet demands for the 20 year planning period. The only major issue facing the City's wastewater facilities is the reduction of total nitrogen (TN). Therefore, the focus of the report was to provide planning level information suitable to discuss various future treatment options required for Back River and Patapsco Treatment Plants. The plan also addressed several other significant issues including: water quality, population, wastewater flows and characteristics, existing facilities, solids production and sludge management, and costs to reduce, convey and treat inflow. The report summarized several findings and recommendations, which are listed below.

Findings:

- Current service area populations, wastewater flows and sludge production for Back River and Patapsco systems are predicted to remain relatively constant throughout the planning period.
- For TN reduction to levels of 3 to 5 mg/L, carbon oxidation/nitrification suspended growth plus deep bed denitrification filter is most cost effective.
- Back River and Patapsco wastewater may contain sufficient non-biodegradable organic nitrogen to limit achievable effluent TN to 4 to 5 mg/L.

- Continued discharge of 50 MGD (+/-) of Back River Plant effluent to Mittal Steel formerly Bethlehem Steel may reduce upgrade costs.
- The level of pollutants being released from sediments in Back River and Patapsco River exceeds the levels in the effluent of the respective plant.
- Due to the extent of recently completed and current improvement/rehabilitation contracts at both plants, in general, they are in condition to perform through the planning period.
- Specific facilities are currently being evaluated to determine requirements for rehabilitation/improvements. Back River facilities include the Primary Effluent Channel, plant effluent outfall and exterior lighting.
- Construction of a second Primary Effluent Channel will offer reliability and the opportunity to add flow distribution facilities to enhance the balancing of flows between Activated Sludge Plants Nos. 2 and 3.
- The current sludge management plan for Back River and Patapsco is successful, provides flexibility, reliability and redundancy and has adequate capacity to continue beneficial reuse of all sludge throughout the planning period. (Privatization contracts will require renewal when they expire.)
- An estimated $6,000,000 is justified for measures to reduce inflow by 1 MGD, and the corresponding capacity to convey and treat that rate of flow.

Recommendations:

- Pursue discussions with Mittal Steel to insure continuation of discharge of Back River Plant effluent to the Patapsco River.
- After treatment goals/limits are finalized with MDE, determine apparent best ENR treatment alternative for Back River Plant.
- Implement remaining necessary improvements/rehabilitation contracts at Back River and Patapsco
- Continue current sludge management plan for both plants.

JURISDICTIONAL FLOW ALLOCATION/AGREEMENTS

Information regarding the jurisdictional flow allocations is provided in the previously approved Comprehensive Water and Wastewater Plan. The current flow

allocation figures are provided in Table 4-4. A list of the inter-jurisdictional agreements is provided in Exhibit D of the Appendix.

TABLE 4-4

PATAPSCO SEWERAGE SYSTEM ALLOCATIONS

Jurisdiction	@ 73 MGD Plant Capacity (1) (MGD)
Baltimore City	19.6
Baltimore County	34.7
Howard County	10.0
Anne Arundel County	6.39
TOTAL	70.69

(1) Current permitted capacity, allocations established under Patapsco Memorandum of Understanding

WASTEWATER FINANCE

In November 1978, the voters of the City approved the Charter Amendment establishing the Wastewater Utility as a separate enterprise and requiring that the Wastewater Utility be financially self-sustaining and operated without profit or loss to the other funds or programs of the City. In addition, the Charter Amendment requires the City to approve a separate budget for the Wastewater Utility.

As required by the Charter Amendment, the City Council adopted Ordinance 941 in December 1978 establishing, among other things, a mechanism for the determination of rates and charges. Ordinance 941 requires that the Board of Estimates, upon the

recommendation of the Director of Finance and the Director of Public Works, establish rates and charges sufficient to make the Wastewater Utility self-supporting at all times and that it adjust the rates if the projected statement of results for the immediate prior year resulted in a loss or deficit. In addition, Ordinance 941 requires that the rates so established shall be at a level sufficient to recover any accumulated deficit from prior years.

The City Board of Estimates establishes wastewater rates and charges for customers within Baltimore City. The City is obligated by statute to provide wastewater treatment and disposal services to Baltimore County at cost. The current method of determining the cost to serve Baltimore County is set out in a City-County Sewerage Agreement dated March 6, 1974, which establishes the methods by which the County's share of the Wastewater Utility's costs is to be determined. Among the costs to be apportioned are the costs of operation, maintenance and administration, major repairs and capital projects during construction. Portions of Anne Arundel and Howard Counties as well as BWI Airport discharge wastewater into the system through Baltimore County, and Baltimore County recovers the costs attributable to the treatment of such wastewater from those entities. An agreement exists with Anne Arundel County to determine cost with respect to a portion of that County's wastewater which is discharged directly into the City system.

The revenues of the Wastewater Utility are primarily derived from wastewater service charges, with a minor amount of revenues generated by charges for other services and interest earnings on investments. Wastewater service is billed to customers in Baltimore City on the basis of a minimum quarterly charge and flow charges per one hundred cubic feet of metered water consumption. Customers with higher than normal concentrations of pollutants in their wastewater are assessed a surcharge designed to recover the costs of treating such higher-strength wastes.

EXHIBIT A

Six-Year Capital Improvement Program

2006

Amounts in Thousands

551-233 Wastewater Collection System - Annual Improvements

Description: Funds are needed for an on-going capital maintenance program for collection systems.

Location: Various Locations

Impact on FY 2007 Operating Budget: 0

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	3,993	1,000	1,000	Zero	Zero	Zero	Zero	5,993
401	Waste Water Utility Funds	318	0	0	1,000	1,000	1,000	1,000	4,318
902	County Grants	5,771	1,000	1,000	1,000	1,000	1,000	1,000	11,771
Total		10,082	2,000	2,000	2,000	2,000	2,000	2,000	22,082

551-401 Sewer Replacement Projects

Description: This on-going program makes available capital funds for unscheduled replacement and improvements to sewers.

Location: Citywide

Impact on FY 2007 Operating Budget: 0

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	9,381	0	0	0	0	0	0	9,381
401	Waste Water Utility Funds	4,550	2,000	2,000	2,000	2,000	2,000	2,000	16,550
Total		13,931	2,000	2,000	2,000	2,000	2,000	2,000	25,931

551-403 Small Sewer Extensions and Improvements

Description: Funds are needed for small sewer extensions and improvements such as those needed to connect existing dwellings to the sewage system.

Location: Citywide

Impact on FY 2007 Operating Budget: 0

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	1,082	0	0	0	0	0	0	1,082
401	Waste Water Utility Funds	3,500	0	750	750	750	750	750	7,250
Total		4,582	0	750	750	750	750	750	8,332

551-404 Infiltration / Inflow Correction Program

Description: Funds are needed for a Department of Public Works on-going program designed to detect and correct the infiltration / inflow of clear water into sanitary sewers.

Location: Citywide

Impact on FY 2007 Operating Budget: 0

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	15,424	Zero	Zero	Zero	Zero	Zero	Zero	15,424
401	Waste Water Utility Funds	125	2,000	2,000	2,000	2,000	2,000	2,000	12,125
Total		15,549	2,000	2,000	2,000	2,000	2,000	2,000	27,549

Amounts in Thousands

551-410 Improvements to Herring Run Interceptor- Phase 1 SC 836

Description: Funds are needed for study, design, and construction of app. 24,000 LF of the Herring Run Interceptor Sewer.

Location: High Level Sewer Shed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	1,100	1,550	0	10,850	14,570	0	0	28,070
902	County Grants	0	950	0	6,650	8,930	0	0	16,530
Total		1,100	2,500	0	17,500	23,500	0	0	44,600

551-440 Hawkins Point Sewerage Study

Description: Funds are needed to study and design a new public sewer system in the Hawkins Point area to connect to the Baltimore collection/conveyance system. Also includes design and construction for Phases I and II. SC808 - Hawkins Point Sewer Design.

Location: Hawkins Point Area

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	5,254	2,000	0	0	0	0	0	7,254
Total		5,254	2,000	0	0	0	0	0	7,254

551-444 Eastern Avenue Pump Station Improvements

Description: Funds are needed to construct improvements to the Eastern Avenue Pump Station due the age and condition of the facility.

Location: Eastern Avenue

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	11,000	7,000	0	0	0	0	0	18,000
Total		11,000	7,000	0	0	0	0	0	18,000

551-526 Back River Digester Renovations SC-8526

Description: Funds are needed for the sealing and structural repair of concrete of two digesters for the storage of digested sludge. Construct Acid Phase Reactor (APR) Tank, additional GBTs, and Equalization Tank.

Location: 8201 Eastern Ave

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	3,288	0	17,500	0	0	0	27,500	48,288
902	County Grants	3,279	0	17,500	0	0	0	27,500	48,279
Total		6,567	0	35,000	0	0	0	55,000	96,567

Amounts in Thousands

551-528 Patapsco WWTP - Enhanced Nutrient Removal - Proj 877

Description: Funds are needed for the design and construction of all facilities required for Enhanced Nutrient Removal (ENR) at Patapsco Wastewater Treatment Plant if required and funded by State grant funds.

Location: Patapsco WWTP

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	2,734	0	6,400	6,400	0	0	0	15,534
690	Other State Funds	9,500	0	80,000	80,000	0	0	0	169,500
902	County Grants	5,811	0	13,600	13,600	0	0	0	33,011
Total		18,045	0	100,000	100,000	0	0	0	218,045

551-533 Annual Facilities Improvements

Description: Funds are needed to rehabilitate, repair, and/or replace wastewater facility systems to maintain the operational function and performance reliability of aging systems.

Location: Various Locations

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	3,000	1,000	1,000	1,000	1,000	1,000	1,000	9,000
902	County Grants	3,000	1,000	1,000	1,000	1,000	1,000	1,000	9,000
Total		6,000	2,000	2,000	2,000	2,000	2,000	2,000	18,000

551-557 Enhanced Nutrient Removal at Back River WWTP

Description: Funds are needed for the design and modifications to existing Biological Nutrient Removal (BNR) Facilities to optimize the removal of ammonia and nitrogen from the Back River Wastewater Treatment Plant effluent. (SC-802 Secondary Clarifier Improvements)

Location: 8201 Eastern Blvd

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	1,450	0	0	0	0	0	0	1,450
690	Other State Funds	2,900	0	75,000	125,000	0	0	0	202,900
902	County Grants	1,450	0	0	0	0	0	0	1,450
Total		5,800	0	75,000	125,000	0	0	0	205,800

Amounts in Thousands

551-561 Primary Tank Renovations - SC-829

Description: Funds are needed for the renovation of Primary Settling Tank Nos. 3,4,5,6,7 at the Back River Wastewater Treatment Plant.

Location: 8201 Eastern Blvd

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	750	0	7,500	0	0	0	0	8,250
902	County Grants	750	0	7,500	0	0	0	0	8,250
Total		1,500	0	15,000	0	0	0	0	16,500

551-569 Urgent Sanitary A/E Services

Description: Funds are needed for the rehabilitation, investigation and design of sanitary sewers at various locations.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	2,500	750	0	2,250	0	2,250	0	7,750
Total		2,500	750	0	2,250	0	2,250	0	7,750

551-604 Stony Run Interceptor and Pumping Station SC 819R, SC 838, SC 839, SC 847

Description: Funds are needed to construct a 20 mgd PS near Sisson Street and 28th Street, install approx. 2,100 ft of force main, rehabilitate approx. 18,200 ft. of 12" to 21" and construct approx. 8,300 ft. of 15" to 60" San. Sewers. Subj. to EPA/MDE Consent Decree

Location: Lower Jones Falls Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	39,079	19,100	0	0	0	0	0	58,179
902	County Grants	1,841	900	0	0	0	0	0	2,741
Total		40,920	20,000	0	0	0	0	0	60,920

551-606 Rehab of Existing Jones Falls Force Main / Pressure Sewer

Description: Funds are needed for the rehabilitation of the existing Jones Falls Force Main and Pressure Sewer. Subject to EPA/MDE Consent Decree.

Location: Upper Jones Falls Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	0	343	2,244	0	0	2,587
902	County Grants	0	0	0	657	4,291	0	0	4,948
Total		0	0	0	1,000	6,535	0	0	7,535

Amounts in Thousands

551-609 Southwest Diversion Pressure Sewer Improvements

Description: Funds are needed for improvements to the existing pressure sewer. Subject to EPA/MDE Consent Decree.

Location: Gwynns Falls Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	980	1,600	0	0	0	0	0	2,580
902	County Grants	1,520	2,400	0	0	0	0	0	3,920
Total		2,500	4,000	0	0	0	0	0	6,500

551-611 Sewer System Rehabilitation Program - Low Level Sewershed

Description: Funds are needed for the rehabilitation, repair, and replacement of wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Low Level Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	0	1,737	0	7,237	7,237	16,211
902	County Grants	0	0	0	63	0	263	263	589
Total		0	0	0	1,800	0	7,500	7,500	16,800

551-612 Sewer System Rehabilitation Program - Main Outfall Sewershed

Description: Funds are needed for the rehabilitation, repair and replacement of the wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Main Outfall Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	0	0	1,934	0	3,424	5,358
902	County Grants	0	0	0	0	466	0	826	1,292
Total		0	0	0	0	2,400	0	4,250	6,650

551-613 Sewer System Evaluation Program - Main Outfall Sewershed

Description: Funds are needed for the inspection, evaluation and analysis of the wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Main Outfall Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	7,042	0	0	0	0	7,042
902	County Grants	0	0	1,358	0	0	0	0	1,358
Total		0	0	8,400	0	0	0	0	8,400

Amounts in Thousands

551-614 Sewer System Rehabilitation Program - Dundalk Sewershed

Description: Funds are needed for the rehabilitation, repair and replacement of the wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Dundalk Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	1,500	0	0	1,185	0	0	1,659	4,344
902	County Grants	0	0	0	315	0	0	441	756
Total		1,500	0	0	1,500	0	0	2,100	5,100

551-616 Sewer System Rehabilitation Program - Patapsco Sewershed

Description: Funds are needed for the rehabilitation, repair and replacement of wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Patapsco Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	0	0	0	0	2,870	2,870
902	County Grants	0	0	0	0	0	0	330	330
Total		0	0	0	0	0	0	3,200	3,200

551-617 Sewer System Evaluation Program - Patapsco Sewershed

Description: Funds are needed for the inspection, evaluation and analysis of wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Patapsco Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	6,189	0	0	0	0	6,189
902	County Grants	0	0	711	0	0	0	0	711
Total		0	0	6,900	0	0	0	0	6,900

551-619 Sewer System Evaluation Program - Low Level Sewershed

Description: Funds are needed for the inspection, evaluation and analysis of wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Low Level Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	20,554	0	0	0	0	0	20,554
902	County Grants	0	746	0	0	0	0	0	746
Total		0	21,300	0	0	0	0	0	21,300

Amounts in Thousands

551-620 Sewer System Rehabilitation Program - High Level Sewershed

Description: Funds are needed for the rehabilitation, repair and replacement of wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: High Level Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	0	1,800	0	0	8,000	9,800
Total		0	0	0	1,800	0	0	8,000	9,800

551-621 Sewer System Evaluation Program - High Level Sewershed

Description: Funds are needed for the inspection, evaluation, and analysis of wastewater collection and conveyance systems. Subject to EPA/MDE Consent Decree.

Location: High Level Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	14,100	0	0	0	0	0	14,100
Total		0	14,100	0	0	0	0	0	14,100

551-622 Sewer System Rehabilitation Program - Gwynns Falls Sewershed

Description: Funds are needed for the rehabilitation, repair and replacement of wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Gwynns Falls Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	0	0	1,127	0	0	6,008	7,135
902	County Grants	0	0	0	373	0	0	1,992	2,365
Total		0	0	0	1,500	0	0	8,000	9,500

551-623 Sewer System Evaluation Program - Gwynns Falls Sewershed

Description: Funds are needed for the inspection, evaluation and analysis of wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Gwynns Falls Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	9,463	0	0	0	0	0	9,463
902	County Grants	0	3,137	0	0	0	0	0	3,137
Total		0	12,600	0	0	0	0	0	12,600

Amounts in Thousands

551-624 Sewer System Rehabilitation Program - Herring Run Sewershed

Description: Funds are needed for the rehabilitation, repair and replacement of the wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Herring Run Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	2,137	0	0	0	0	11,447	11,447	25,031
902	County Grants	113	0	0	0	0	1,253	1,253	2,619
Total		2,250	0	0	0	0	12,700	12,700	27,650

551-626 Sewer System Rehabilitation Program - Jones Falls Sewershed

Description: Funds are needed for the rehabilitation, repair and replacement of the wastewater collection and conveyance system. Subject to EPA/MDE Consent Decree.

Location: Jones Falls Sewershed

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	2,300	0	0	0	10,081	10,081	10,081	32,543
902	County Grants	0	0	0	0	1,619	1,619	1,619	4,857
Total		2,300	0	0	0	11,700	11,700	11,700	37,400

551-627 Wet Weather Program

Description: Funds are needed for the Compliance Program under the draft SSO/CSO Consent Decree.

Location: Citywide

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	16,800	4,950	0	4,950	0	4,950	0	31,650
902	County Grants	200	50	0	50	0	50	0	350
Total		17,000	5,000	0	5,000	0	5,000	0	32,000

551-681 Wastewater Facilities Security Improvements

Description: Funds are needed to evaluate the existing security levels and assess requirements of upcoming Federal regulations for the Bureau`s wastewater treatment facilities.

Location: Back River and Patapsco WWTPs

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	250	2,500	0	0	0	0	0	2,750
902	County Grants	250	2,500	0	0	0	0	0	2,750
Total		500	5,000	0	0	0	0	0	5,500

Amounts in Thousands

551-683 Rehabilitation of Patapsco WWTP Gravity Sludge Thickeners

Description: Funds are needed to rehabilitate and/or replace the mechanical drives, structural steel elements of the sludge collector arms, and reinforced concrete repair work associated with the rehabililtation of the gravity sludge thickeners at the Patapsco WWTP.

Location: Patapsco WWTP

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	160	1,600	0	0	0	0	0	1,760
902	County Grants	340	3,400	0	0	0	0	0	3,740
Total		500	5,000	0	0	0	0	0	5,500

551-684 Patapsco Improvements to Existing Facilities

Description: Funding is needed for the renovation of existing Reactor facilities at the Patapsco Wastewater Treatment Plant. (These existing facilities are outside of the scope of the Enhanced Nutrient Removal project

Location: Patapsco WWTP

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	320	0	2,560	0	0	0	2,880
902	County Grants	0	680	0	5,440	0	0	0	6,120
Total		0	1,000	0	8,000	0	0	0	9,000

551-685 Back River WWTP Scum Facilities Improvements

Description: Funds are needed for the renovation of scum and grease handling facilities at the Back River Wastewater Treatment Plant.

Location: 8201 Eastern Blvd.

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	500	0	4,000	0	0	0	4,500
902	County Grants	0	500	0	4,000	0	0	0	4,500
Total		0	1,000	0	8,000	0	0	0	9,000

551-752 McComas St Pump Station Force Main Improvements

Description: Funds are needed to evaluate, design and construct improvements to the McComas Street Pump Station Force Main due to a number of emergency repairs.

Location: McComas Street

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	200	0	650	0	0	0	0	850
Total		200	0	650	0	0	0	0	850

551-753 Locust St Pump Station Force Main Improvements

Description: Funds are needed to evaluate, design, and construct improvements to the Locust Street Pump Station Force Main due to a number of emergency repairs required over the past several years.

Location: Locust Street

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	200	700	0	0	0	0	0	900
Total		200	700	0	0	0	0	0	900

551-754 Quad Ave Pump Station Force Main Improvements

Description: Funds are needed to evaluate, design, and construct improvements to the Quad Avenue Pump Station Force Main due to a number of emergency repairs required over the past several years.

Location: Quad Ave

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	145	0	470	0	0	0	615
902	County Grants	0	55	0	180	0	0	0	235
Total		0	200	0	650	0	0	0	850

551-755 Dundalk Ave Pump Station Force Main Improvements

Description: Funds are needed to evaluate, design, and construct improvements to the Dundalk Avenue Pump Station Force Main due to a number of emergency repairs required over the past several years.

Location: Dundalk Ave

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	322	0	643	0	0	0	965
902	County Grants	0	178	0	357	0	0	0	535
Total		0	500	0	1,000	0	0	0	1,500

Amounts in Thousands

551-756 **Brooklyn Ave Pump Station Force Main Improvements**

Description: Funds are needed to evaluate, design, and construct improvements to the Brooklyn Avenue Pump Station Force Main due to a number of emergency repairs required over the past several years.

Location: Brooklyn Ave

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
302	Waste Water Revenue Bonds	0	494	0	0	0	0	0	494
902	County Grants	0	6	0	0	0	0	0	6
Total		0	500	0	0	0	0	0	500

Amounts in Thousands

557-031 Water Distribution System - Improvements

Description: Funds are needed to repair or replace water system appurtenances that are old, broken or damaged. These improvements are to be done on a contractural basis.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	5,391	2,000	2,000	2,000	2,000	2,000	2,000	17,391
402	Water Utility Funds	85	0	0	0	0	0	0	85
902	County Grants	7,532	2,000	2,000	2,000	2,000	2,000	2,000	19,532
Total		13,008	4,000	4,000	4,000	4,000	4,000	4,000	37,008

557-099 Mapping Program - Water Supply System

Description: This project is to continue the DPW GIS system development by providing updated and additional water utilities information such as construction dates, material manufacturer, etc.

Location: Citywide

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
100	General Obligation Bonds	92	0	0	0	0	0	0	92
301	Water Revenue Bonds	900	0	0	0	0	0	0	900
402	Water Utility Funds	4,589	0	0	0	0	0	0	4,589
902	County Grants	0	2,000	0	0	0	0	0	2,000
Total		5,581	2,000	0	0	0	0	0	7,581

557-100 Water Infrastructure Rehabilitation

Description: Funds are needed for an ongoing program to rehabilitate water infrastructure by cleaning and cement lining, looping dead end water mains, abandoning stubs, and replacing appurtenances in various communities as necessary.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	28,085	10,000	7,750	8,750	4,750	5,750	3,750	68,835
402	Water Utility Funds	0	0	2,250	1,250	5,250	4,250	6,250	19,250
902	County Grants	224	0	0	0	0	0	0	224
Total		28,309	10,000	10,000	10,000	10,000	10,000	10,000	88,309

Amounts in Thousands

557-101 Water Mains - Installation

Description: Funds are needed to install water mains as needed to provide adequate water pressure and flows to serve users and fight fires. Such work will be performed in conjunction with work required by other city agencies such as the Dept. of Transportation.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	9,738	0	0	0	0	0	0	9,738
402	Water Utility Funds	92	2,000	2,000	2,000	2,000	2,000	2,000	12,092
902	County Grants	4,500	1,000	5,500	1,000	1,000	1,000	1,000	15,000
Total		14,330	3,000	7,500	3,000	3,000	3,000	3,000	36,830

557-130 Water System Cathodic Protection

Description: This program will monitor the effects the light and heavy rail systems and other corrosive sources have on the water distribution system. The work will be performed by city personnel or by consultants.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	1,481	334	334	334	334	334	334	3,485
402	Water Utility Funds	546	0	0	0	0	0	0	546
902	County Grants	679	166	166	166	166	166	166	1,675
Total		2,706	500	500	500	500	500	500	5,706

557-133 Meter Replacement Program

Description: Aging water meters throughout the Baltimore metropolitan area are to be replaced with automated meter technology, and in-house meters are to be converted to outside pit settings. This program is also to include large meter testing,repair and replacement.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	5,708	0	0	0	0	0	0	5,708
402	Water Utility Funds	5,875	2,000	500	2,000	500	2,000	500	13,375
902	County Grants	7,896	2,000	500	2,000	500	2,000	500	15,396
Total		19,479	4,000	1,000	4,000	1,000	4,000	1,000	34,479

Amounts in Thousands

557-300 Water Facilities - Annual Improvements

Description: Funds are needed for the repair and maintenance of water treatment and conveyance facilities as required that result from unanticipated failures of equipment, operating systems or facilities.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	5,795	915	915	915	915	915	915	11,285
402	Water Utility Funds	0	0	0	0	0	0	0	0
902	County Grants	3,359	585	585	585	585	585	585	6,869
Total		9,154	1,500	1,500	1,500	1,500	1,500	1,500	18,154

557-312 Montebello Plants Combined Filtration

Description: Filtration Plants constructed in the early 20th century need major upgrades to existing filter boxes and controls.

Location: 3901 Hillen Rd

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	2,492	0	0	74,588	0	0	0	77,080
902	County Grants	1,639	0	0	47,687	0	0	0	49,326
Total		4,131	0	0	122,275	0	0	0	126,406

557-400 Valve and Hydrant Replacement - Annual

Description: Funds are needed to repair or replace water valves, fire hydrants, and the cleaning and lining of related piping that is broken or damaged on an urgent "as-needed" basis.

Location: Citywide

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	8,535	0	0	0	0	0	0	8,535
402	Water Utility Funds	4,664	3,000	3,000	3,000	1,000	1,000	1,000	16,664
902	County Grants	5,853	3,000	3,000	3,000	1,000	1,000	1,000	17,853
Total		19,052	6,000	6,000	6,000	2,000	2,000	2,000	43,052

Amounts in Thousands

557-638 Water Audit

Description: Funds are needed to perform a Water Audit of the Baltimore Water System.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	620	305	305	305	305	305	305	2,450
902	County Grants	380	195	195	195	195	195	195	1,550
Total		1,000	500	500	500	500	500	500	4,000

557-689 Urgent Needs Water Engineering Services

Description: Funds are needed to provide for Architectual/Engineering Consultant Services on an as-needed basis to investigate, report, recommend, design and prepare biddable documents for the repair or rehabilitation of facilities within the water system.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	1,260	315	630	0	630	0	630	3,465
902	County Grants	740	185	370	0	370	0	370	2,035
Total		2,000	500	1,000	0	1,000	0	1,000	5,500

557-709 Finished Water Reservoir Improvements

Description: Funds are needed for design of covers and/or replacement structures at the Druid Lake, Ashburton, Towson and Montebello Reservoirs including valve replacements and control improvements. This will also include improvements to Ashburton Lake gate house.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	2,775	0	11,719	21,350	0	0	0	35,844
902	County Grants	4,725	0	23,281	13,650	0	0	0	41,656
Total		7,500	0	35,000	35,000	0	0	0	77,500

Amounts in Thousands

557-727 Deer Creek Pumping Station Improvements

Description: This Pumping Station needs to be brought up to date to replace all obsolete electric gear, provide a second primary electric feeder, add one additional pump unit, improvements to all mechanical valves and replace electrical service & appurtenances.

Location: 942 Craigs Corner Rd, Darlington 21078

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	1,688	0	0	10,675	0	0	0	12,363
902	County Grants	912	0	0	6,825	0	0	0	7,737
Total		2,600	0	0	17,500	0	0	0	20,100

557-730 Fullerton Water Filtration Plant

Description: The project consists of the design and construction of a new water filtration plant in the Fullerton Area of Baltimore County. The facility is needed to treat water from the Susquehanna River and will have an initial capacity of approximately 100 MGD.

Location: Belair Road - Baltimore County

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	400	0	0	0	1,000	0	13,000	14,400
902	County Grants	3,600	0	0	0	9,000	0	117,000	129,600
Total		4,000	0	0	0	10,000	0	130,000	144,000

557-731 Montebello Water Recycle Program WC-1131

Description: This project is to consist of the study, design and construction of a water recycling facility at the Montebello Water Treatment Plant. The facility is to reduce the demand on raw water supplies and minimize the impact on the environment.

Location: 3901 Hillen Road

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	1,319	0	0	10,370	0	0	0	11,689
902	County Grants	781	0	0	6,630	0	0	0	7,411
Total		2,100	0	0	17,000	0	0	0	19,100

Amounts in Thousands

557-732 Monitoring Water Transmission Mains

Description: Funds are needed to perform an inspection program to evaluate the condition of prestressed pipelines used to transmit potable water throughout the City`s water distribution system.

Location: Various

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
402	Water Utility Funds	750	0	250	250	250	250	250	2,000
902	County Grants	750	0	250	250	250	250	250	2,000
Total		1,500	0	500	500	500	500	500	4,000

557-915 Maintenance Buildings at Prettyboy and Loch Raven Dams

Description: Funds are needed to evaluate condition of the existing maintenance facilities at the Prettyboy and Loch Raven Dams, design recommended improvements, and construct improvements.

Location: Prettyboy Dam and Loch Raven Dam

Impact on FY 2007 Operating Budget:

Source of Funds		Appr. To Date	2007	2008	2009	2010	2011	2012	Total
301	Water Revenue Bonds	488	0	3,050	0	2,440	0	0	5,978
902	County Grants	312	0	1,950	0	1,560	0	0	3,822
Total		800	0	5,000	0	4,000	0	0	9,800

EXHIBIT B

Water Distribution System Map

2006

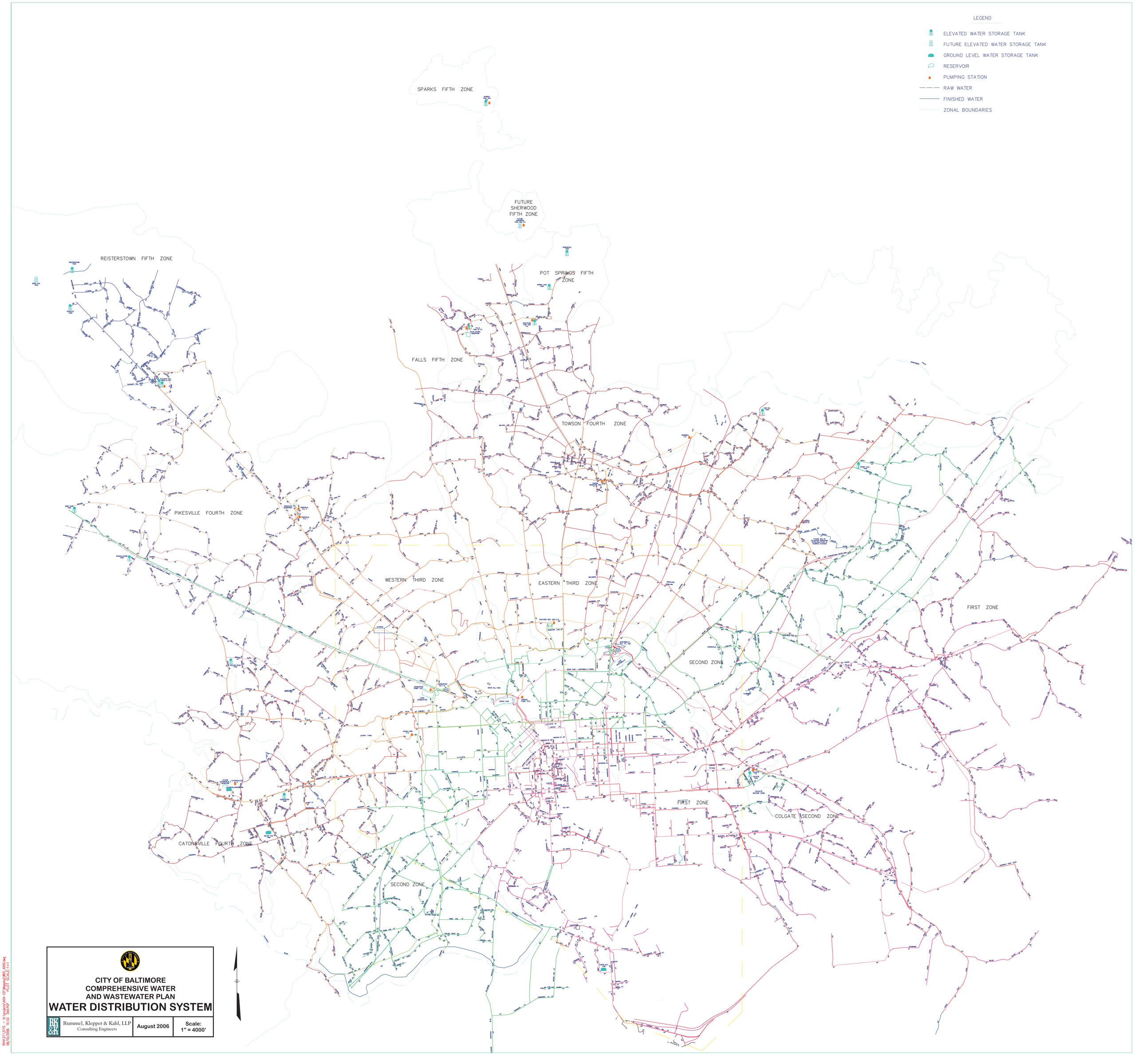
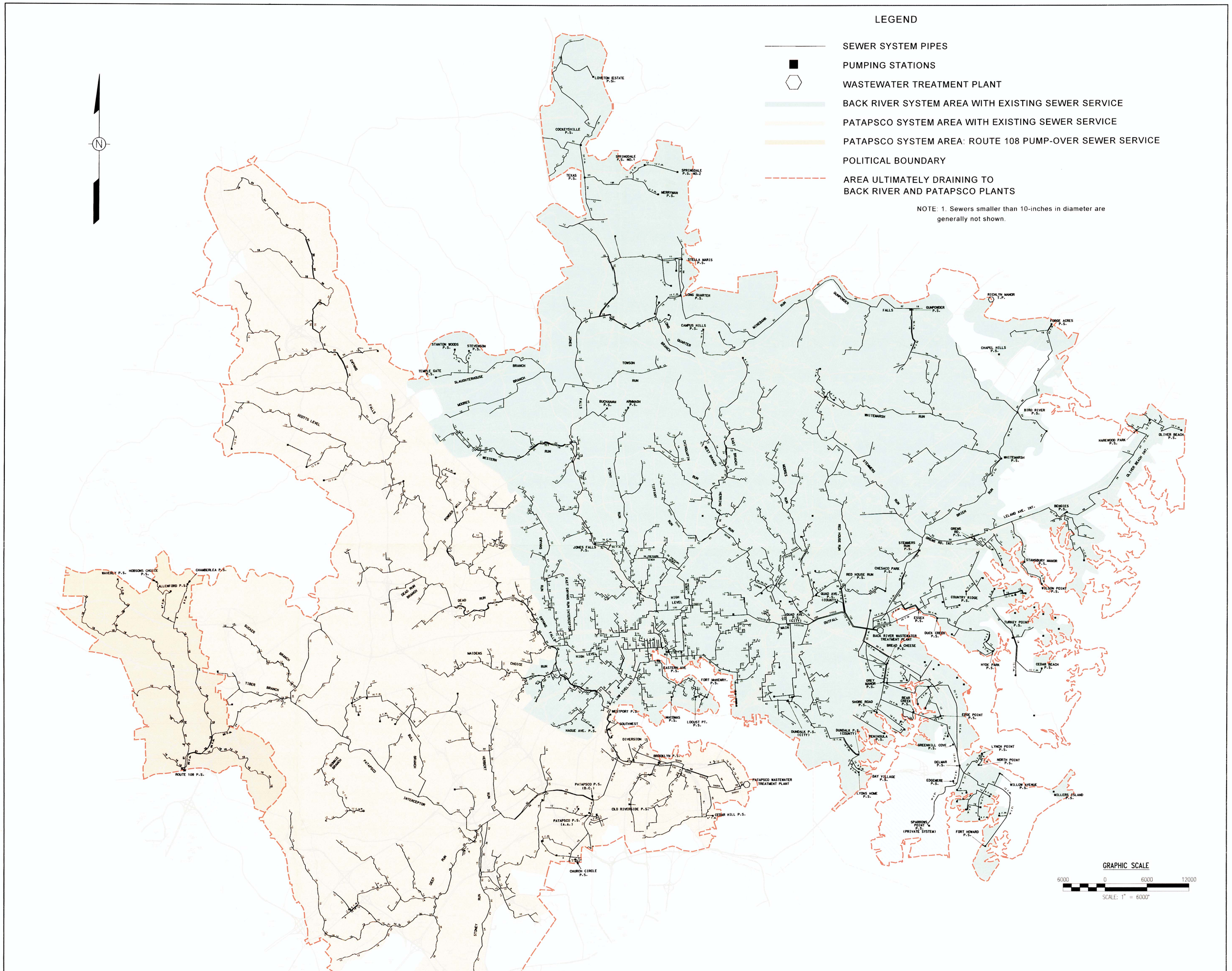

LEGEND
ELEVATED WATER STORAGE TANK
FUTURE ELEVATED WATER STORAGE TANK
GROUND LEVEL WATER STORAGE TANK
RESERVOIR
PUMPING STATION
RAW WATER
FINISHED WATER
ZONAL BOUNDARIES
SPARKS FIFTH ZONE
FUTURE SHERWOOD FIFTH ZONE
REISTERSTOWN FIFTH ZONE
POT SPRINGS FIFTH ZONE
FALLS FIFTH ZONE
TOWSON FOURTH ZONE
PIKESVILLE FOURTH ZONE
WESTERN THIRD ZONE
EASTERN THIRD ZONE
FIRST ZONE
SECOND ZONE
FIRST ZONE
COLGATE SECOND ZONE
CATONSVILLE FOURTH ZONE
SECOND ZONE
CITY OF BALTIMORE
COMPREHENSIVE WATER
AND WASTEWATER PLAN
WATER DISTRIBUTION SYSTEM
Rummel, Klepper & Kahl, LLP
Consulting Engineers
August 2006
Scale:
1" = 4000'

EXHIBIT C

Sewage System Map

2006



CITY OF BALTIMORE
COMPREHENSIVE WATER
AND WASTEWATER PLAN
SANITARY SEWER SYSTEM

Rummel, Klepper & Kahl, LLP
Consulting Engineers

August 2006

Scale:
1" = 6000'

CITY OF BALTIMORE

COMPREHENSIVE WASTEWATER FACILITIES
MASTER PLAN

BACK RIVER & PATAPSCO SYSTEM MAP

APRIL, 2004

FIGURE 2-3

WHITMAN, REQUARDT & ASSOCIATES, LLP
Engineers, Architects and Planners

EXHIBIT D

Interjurisdictional Agreements for Water and Wastewater

2006

EXHIBIT D
INTERJURISDICTIONAL AGREEMENTS FOR WATER AND WASTEWATER

WATER AGREEMENTS

Mayor and City Council of Baltimore and County Commissioners of Anne Arundel County

*Extension of water mains to the First Precinct Dated June 18, 1929**
Transfer responsibility of operation and maintenance of water system to Anne Arundel County
*Dated January 2, 2002**

Mayor and City Council of Baltimore, the Carroll County Sanitary Commission and the County Commissioners of Carroll County

Revised agreement for supplying additional raw water from Liberty Reservoir to Carroll County
*Dated February 16, 2005**

Mayor and City Council of Baltimore and Baltimore and Baltimore County, Maryland

For construction and/or improvement re: raw water, treatment and filtered water facilities which will benefit Baltimore City and Baltimore County and other political subdivisions.
*Dated September 20, 1972**

Baltimore City and County Commissioners of Howard County, Baltimore County, Anne Arundel County and Howard County Metropolitan Commission

Extension of water mains
*Dated October 29, 1969**

Baltimore City and Harford County

Raw water supply
*Dated February 3, 1993**

Mayor and City Council of Baltimore, Baltimore County, Maryland and Howard County

Extension of water mains and constructing appurtenant works
*Dated November 6, 1957, July 9, 1986**

Mayor and City Council of Baltimore and the Susquehanna River Basin Commission (SRBC)

Agreement to establish the City's unfettered right to withdraw water from the river up to 250,000,000 gallons per day and other parameters.
*Dated September 5, 2001**

2003 Declaration of Reaffirmation of the 1984 Reservoir Watershed Management Agreement

Reaffirm goals for the reservoirs set forth in the original agreement, and the policy and program commitments set forth in the two Action Strategies (1984 and 1990).
Dated: February 24, 2003

WASTEWATER AGREEMENTS

Mayor and City Council of Baltimore and Baltimore County Maryland

For continuing operation of sewer systems, and to establish a method for computation and payment of costs incurred by the City and County in connection with the jointly used sewerage system.
*Dated: March 6, 1974**

Mayor and City Council of Baltimore and Anne Arundel County Sanitary Commission

For disposal of sewerage and establishing a method for payment to the City
*Dated: August 28, 1968**

Patapsco Sewerage System Memorandum of Understanding, Baltimore City, Baltimore County, Anne Arundel County and the Department of the Environment

For formalizing how capacities established by the state will be shared among the jurisdictions.
Dated: June 4, 1984

* Agreements available at the Baltimore City Bureau of Water and Wastewater