AGENDA

Meeting Type:	S
Date:	09/17/1991
SUBJECT	

City of Charlotte, City Clerk's Office

The City Council of the City of Charlotte, North Carolina, the Board of County Commissioners for the County of Mecklenburg, and the School Board convened for a joint meeting on Tuesday, September 17, 1991, at 12 30 p m in Room 267 of the Charlotte-Mecklenburg Government Center with County Commissioner Chairman, Rod Autrey presiding Councilmembers present were Tom Mangum, Hoyle Martin, Roy Matthews, Richard Vinroot and Lynn Wheeler

County Commissioners present were Chairman Rod Autrey, and Patsy Kinsey

School Board Members present were Susan Burgess, Sharon Bynum, Arthur Griffin, Jr , Jane McIntyre, and Jan Richards

ABSENT Mayor Sue Myrick, Councilmembers Stan Campbell, Dan Clodfelter, Ann Hammond, Pat McCrory, Cyndee Patterson and Ella Scarborough, County Commissioners Ken Andrews, Dough Booth, Edna Chirico, Peter Keber and Bob Walton, School Board Members George Battle, Joe Martin and John Tate, III

* * * * * * *

INVOCATION

Chairman Autrey requested they have a moment of silence for Councilmember Scarborough, who lost her husband the day before, and her family before the invocation

Mr Autrey then led the invocation

* * * * * * *

PROPOSED STATE WATERSHED RULES AND CLASSIFICATIONS

Wanda Towler, Assistant County Manager, gave a presentation on the watershed protection program and Mountain Island Lake

There was no quorum of the City Council or the County Commissioners

* * * * * * *

ADJOURNMENT

The meeting was adjourned at 1 18 p m.

Pat Sharkey, City Clerk

Length of Meeting 43 Minutes
Minutes Completed September 19, 1991

mpl

The City Council of the City of Charlotte, North Carolina, the Board of County Commissioners for the County of Mecklenburg, and the School Board convened for a joint meeting on Tuesday, September 17, 1991, at 12 30 p m in Room 267 of the Charlotte-Mecklenburg Government Center with County Commissioner Chairman, Rod Autrey presiding Councilmembers present were Tom Mangum, Hoyle Martin, Roy Matthews, Richard Vinroot and Lynn Wheeler

County Commissioners present were Chairman Rod Autrey, and Patsy Kinsey

School Board Members present were Susan Burgess, Sharon Bynum, Arthur Griffin, Jr , Jane McIntyre, and Jan Richards

ABSENT Mayor Sue Myrick Councilmembers Stan Campbell, Dan Clodfelter, Ann Hammond, Pat McCrory, Cyndee Patterson and Ella Scarborough, County Commissioners Ken Andrews, Dough Booth, Edna Chirico, Peter Keber and Bob Walton, School Board Members George Battle, Joe Martin and John Tate, III

* * * * * * *

INVOCATION

Chairman Autrey requested they have a moment of silence for Councilmember Scarborough, who lost her husband the day before, and her family before the invocation

Mr Autrey then led the invocation

* * * * * * *

PROPOSED STATE WATERSHED RULES AND CLASSIFICATIONS

Wanda Towler, Assistant County Manager, gave a presentation on the watershed protection program and Mountain Island Lake

There was no quorum of the City Council or the County Commissioners

* * * * * * *

ADJOURNMENT

The meeting was adjourned at 1 18 p m

Pat Sharkey, City Clerk

Length of Meeting 43 Minutes
Minutes Completed September 19, 1991

mpl

The City Council of the City of Charlotte, North Carolina, the Board of County Commissioners for the County of Mecklenburg, and the School Board convened for a joint meeting on Tuesday, September 17, 1991, at 12 30 p m in Room 267 of the Charlotte-Mecklenburg Government Center with County Commissioner Chairman, Rod Autrey presiding Councilmembers present were Tom Mangum, Hoyle Martin, Roy Matthews, Richard Vinroot and Lynn Wheeler

County Commissioners present were Chairman Rod Autrey, and Patsy Kinsey

School Board Members present were Susan Burgess, Sharon Bynum, Arthur Griffin, Jr , Jane McIntyre, and Jan Richards

ABSENT Mayor Sue Myrick, Councilmembers Stan Campbell, Dan Clodfelter, Ann Hammond, Pat McCrory, Cyndee Patterson and Ella Scarborough, County Commissioners Ken Andrews, Dough Booth, Edna Chirico, Peter Keber and Bob Walton, School Board Members George Battle, Joe Martin and John Tate, III

* * * * * * *

INVOCATION

Chairman Autrey requested they have a moment of silence for Councilmember Scarborough, who lost her husband the day before, and her family before the invocation

Mr Autrey then led the invocation.

* * * * * * *

PROPOSED STATE WATERSHED RULES AND CLASSIFICATIONS

Wanda Towler, Assistant County Manager, gave a presentation on the watershed protection program and Mountain Island Lake

There was no quorum of the City Council or the County Commissioners

* * * * * * *

ADJOURNMENT

The meeting was adjourned at 1 18 p m

Pat Sharkey, City Clerk

Length of Meeting 43 Minutes
Minutes Completed September 19, 1991

mpl

MECKLENBURG COUNTY
Board of County Commissioners

Joint City/County/School Board

Luncheon

Tuesday, September 17, 1991

12:00 Noon

CMGC - Room 267

Hosted by the Board of County Commissioners
Rod Autrey, Chairman, presiding

Agenda

Opening Remarks

Update on Watershed

8-1 73

600 East Fourth Street • P O Box 31787 • Charlotte, North Carolina 28231 • (704) 336-2472

9/17/91 12:30 p.m.

Joint meeting

Mayor
Campbell
Cloffelter
Hammond
McCrory
Marguim ✓
Martin ✓
Mathews ✓
Patterson
Scarborough absent
Vinroot ✓
Wheeler ✓

no quorum

Autrey
Magnum
Wheeler

Autrey - Chair ✓
Andrews
Booth
Chirico
Kiser
Kinsey ✓
Walton

Battle - Chair
Burgin ✓
Bynum ✓
Griffin ✓
McIntyre ✓
Martin
Richards ✓
Tate

watershed

Planning Liaison

Autry	moment of silence and prayer
Autry Wanda Towler	Road committee / Asst. County Manager watershed protection program Mountain Island Lake
WS-I low dev. WS-IV high dev.	runoff 1/91 May 1, 1991 - report from Consultant
Marvin Bethune Towler	Chair of committee / County Attorney proposed / draft by Jan 1992 go ahead received 9/16/91 receive comments by end October (refer hand out)
Autry Towler Matthews Towler	WS IV Lincoln, Gaston

Autry
Bethune
Autry
Bethune
Wheeler
Autry
Wheeler
Autry
Towler

Autry
Towler
Autry
Towler
Autry

Tayler
Wheeler
Bethune
Vinroot

Lincoln WS-IV

vote expressed where they were . . .

involved for a year
Board rule in August
on State guidelines

effective local watershed
for Mountain Island
Lake

① criticism of Board
② due process ?

Autrey
Vinroot
Autrey
Vinroot
Autrey
Kirkey

Mangum
Bethune
Matthews
Bethune
Mangum
Autrey
Mangum
Bethune

Autrey

8/16
due process ?
Catawba River Basin
(1) State
(2) Mecklenburg County

WS, V. 5 mls

put at low level

Lake Norman &
Lake Wylie watershed

adjourn 1:18 pm

MECKLENBURG COUNTY

Office of the County Manager

MEMORANDUM

TO: Board of County Commissioners

FROM: Wanda P. Towler, Assistant County Manager

DATE: July 12, 1991

SUBJECT: Response from CMUD on Watershed Issues

During the budget workshops, you questioned the feasibility of relocating CMUD's water intake from its present site in a cove to the main channel of Mountain Island Lake.

Attached is CMUD's response, which indicates that the cost would be prohibitively expensive compared to the benefits. Additionally, the cove location is rated above the main channel based on the likelihood and nature of spills.

Please let me know if you have additional questions.

WPT/kg

Attachment

cc: Gerald G. Fox, County Manager
John Barry, Environmental Protection Director

600 East Fourth Street • P O Box 31787 • Charlotte North Carolina 28231 • (704) 336 2472

31202

July 1, 1991

Ms. Edna W. Chirico, County Commissioner
600 East Fourth Street
Post Office Box 31787
Charlotte, North Carolina 28231

Subject. Questions For Watershed Policy Recommendation

Dear Ms. Chirico:

We have received your June 21, 1991 letter in which you raised two questions concerning the Mountain Island Watershed in order that you might make a recommendation on watershed policy. The answers to your questions are as follows:

(1) The cost of moving CMUD's existing intake into the main channel would be prohibitively expensive compared to the benefits received. The quality of the water in Mountain Island Lake, including the cove in which the intake is located, is excellent and the slight improvement in the main channel would not warrant moving the intake there. While moving the intake would eliminate the effects of toxic spills in the intake cove, it would expose the main channel intake to spills in the rest of the lake, particularly those from the McGuire Nuclear Power Plant.

(2) We have been considering ways in which to serve our lake fronts with sanitary sewer systems for several years now and have formulated a set of general guidelines, a copy of which is attached. There has been a lot of experimentation and innovative solutions to this problem throughout the country, and we have kept abreast of it. The guidelines reflect what we feel are the more practical solutions to this problem. We do not have a master plan or detailed maps at this time.

Please do not hesitate to contact us should you have additional questions or require more information.

Very truly yours,
Charlotte-Mecklenburg Utility Department

Joe C. Stowe, Jr., Director

JFF/vc

Administration Division 5100 Brookshire Boulevard Charlotte NC 28216 704/399 2221
Charlotte-Mecklenburg Utility Department

SEWER SYSTEMS SERVING LAKE FRONT PROPERTIES.

1. Property lying within the natural drainage areas of Lakes Wylie, Mt. Island, and Norman that require the pumping of wastewater for treatment will be developed with sewer systems utilizing conventional gravity outfalls, gravity street mains and conventional pumping station in conjunction with small diameter common force mains installed along publicly dedicated roadways. These common force mains will be an extension of the gravity street system designed to serve lake front properties that cannot feasibly or economically be served by a conventional gravity collection system.

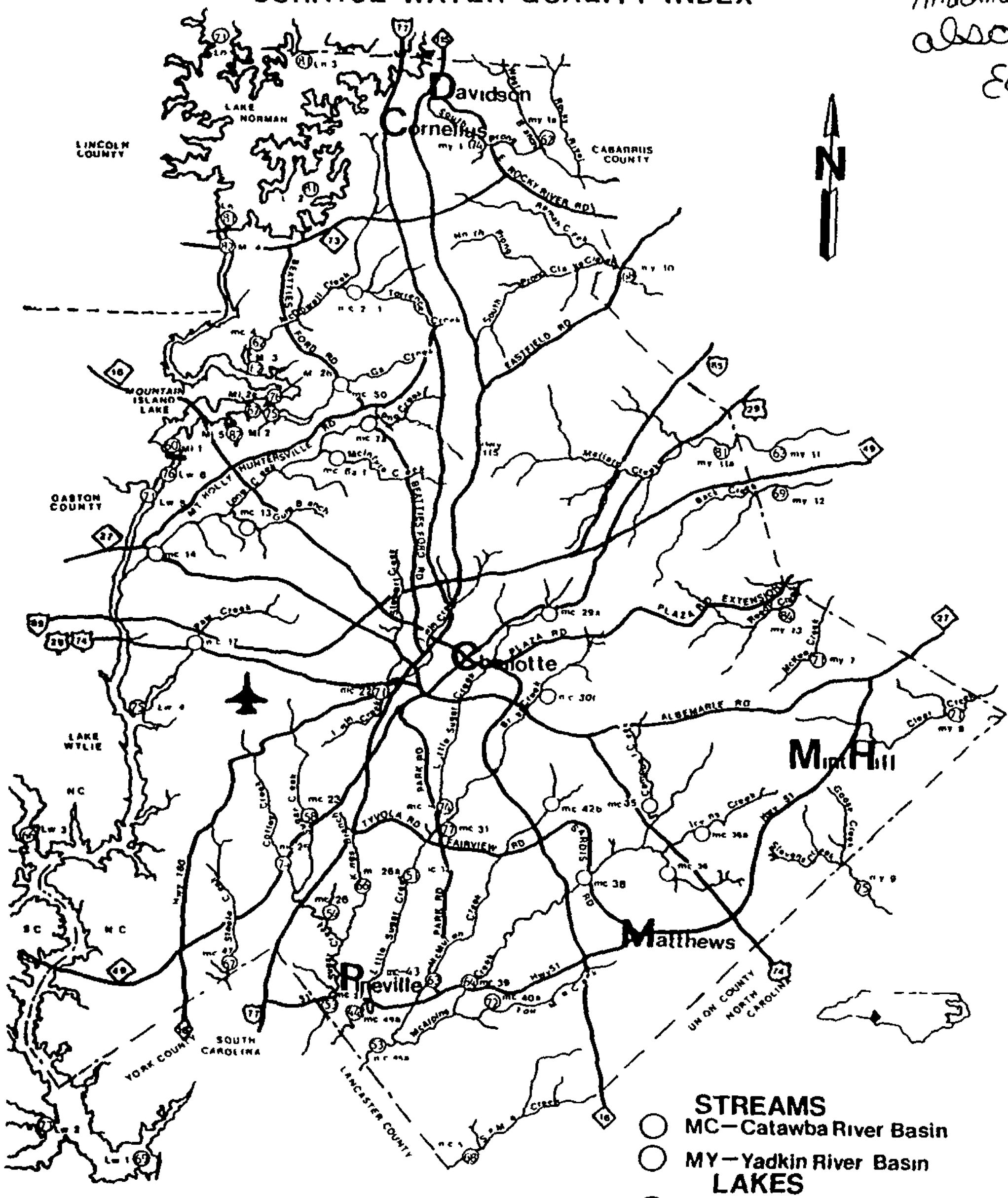
2. Properties served by a common force main will utilize a grinder pump to transfer wastewater into the common force main. Each customer will be connected to the common force main through an individual service connection located at the road right-of-way. The customer will be responsible for the ownership and maintenance of the grinder pump and related pressure line from the pump to the service connection. It will be the customer's responsibility to select and install a grinder pump capable of operating at the various dynamic head conditions of the receiving common force main.

3. Service connections utilizing grinder pumps will not be permitted on force mains that are used as a discharge line for conventional pumping stations.

4. The installation of common force mains along public streets as a means of providing public sewer service to individual properties is to be used only in selected drainage areas common to lakefront development on Lakes Wylie, Mt. Island and Norman.

MECKLENBURG COUNTY
SURFACE WATER QUALITY INDEX

~~Attachment C~~
also FYI
EdNA



STREAMS
- MC—Catawba River Basin
- MY—Yadkin River Basin

LAKES
- LN—Lake Norman
- MI—Mountain Island
- LW—Lake Wylie

0 1 2 3 4 5 MILES

WATER QUALITY INDEX SCALE

0–25	25–50	50–70	70–90	90–100
POOR	FAIR	AVERAGE	GOOD	EXCELLENT

APRIL 1991

LEVEL OF SERVICE AND COST

- PROGRAM COSTS BASED ON

  1) POLICY DECISIONS

  - Philosophy
  - Program Priorities
  - Levels of Service
  - Water Quality Program

  2) EXISTING DATA

  - Existing expenditures
  - Pilot basin inventory

  3) OTHER CITIES' EXPERIENCE

- ORGANIZING TOTAL COSTS OF SERVICE

  - 5 Functional areas
    - -Administration
    - -Engineering
    - -Operations
    - -Regulation
    - -Capital Improvements

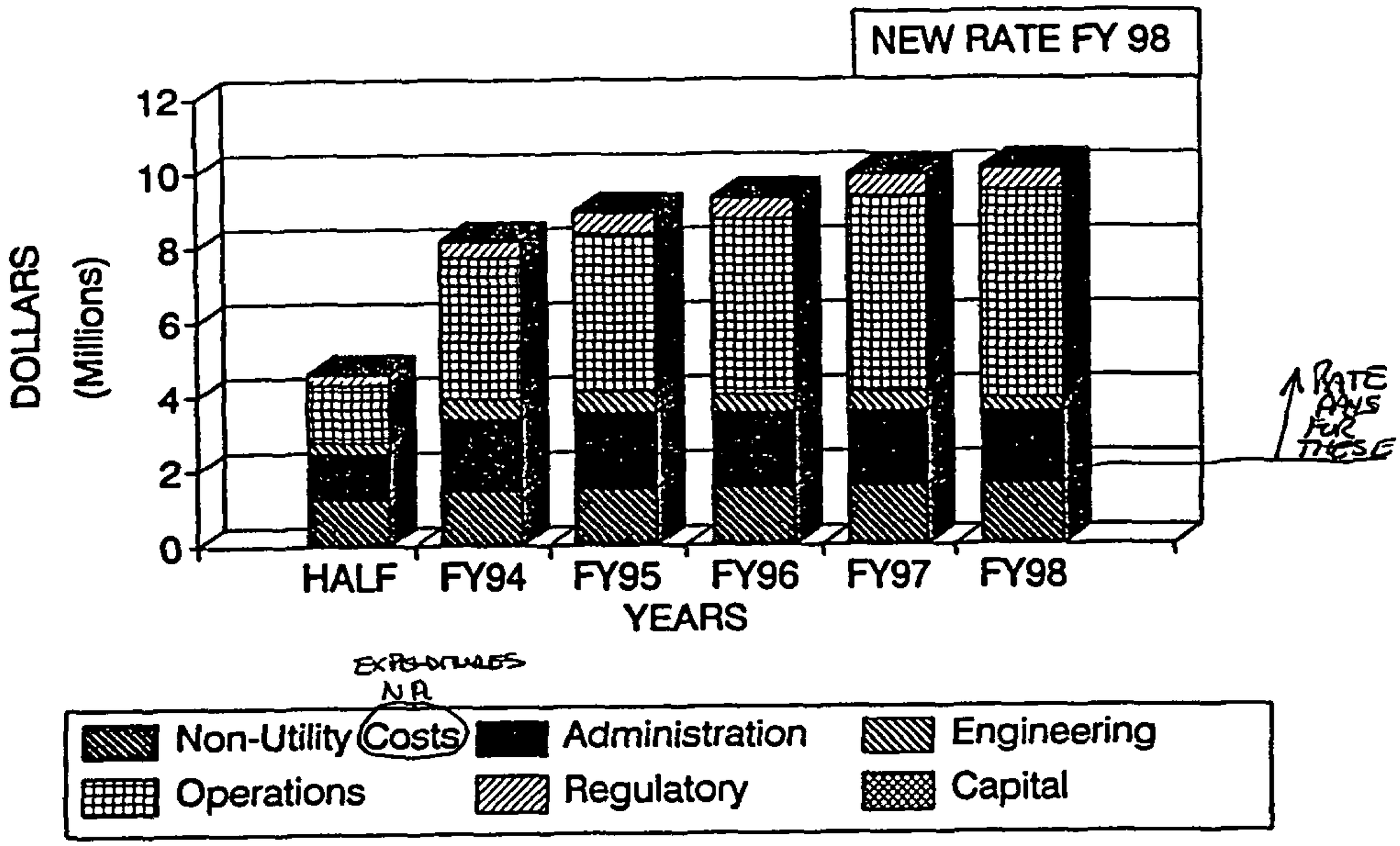
- PROGRAM OPTIONS OFFER PERSPECTIVE

Existing Program, Utility, and Minimum For EPA <----------> Comprehensive Program Implemented at Maximum Practical Speed

Spending $1.50 Now.
$50 Mil - 5 yrs.
Current rate $30 Mil

MINIMAL PROGRAM

RATE = $1.85-$2.25/MO/ERU



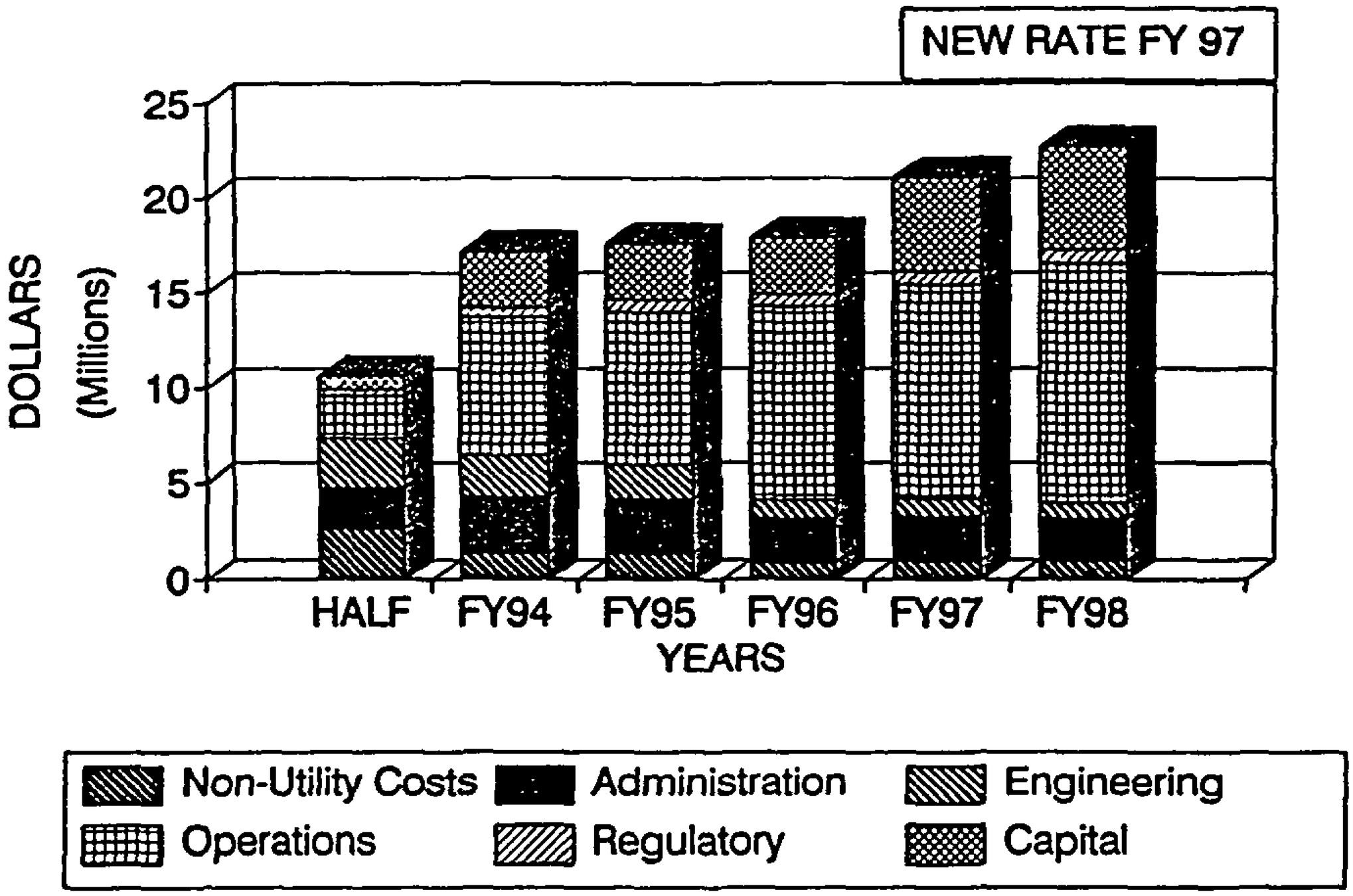
- Existing services, utility implementation, and water quality requirements
  - satisfies EPA water quality requirements
    - not a comprehensive program
  - no additional remedial or routine maintenance (CURRENT 2 Part time / Mil/yr)
    - no increase in capital improvements (CURRENT 1.3 Mil)
  - public information for water quality only
    - does not meet City Council's goals

19 Million Repair Backlog Remedial only not routine 4.3 Mil
CURRENT 5.82

4.50 → 5.75

EXPEDITED PROGRAM

RATE = $4.05-$4.95/MO/ERU

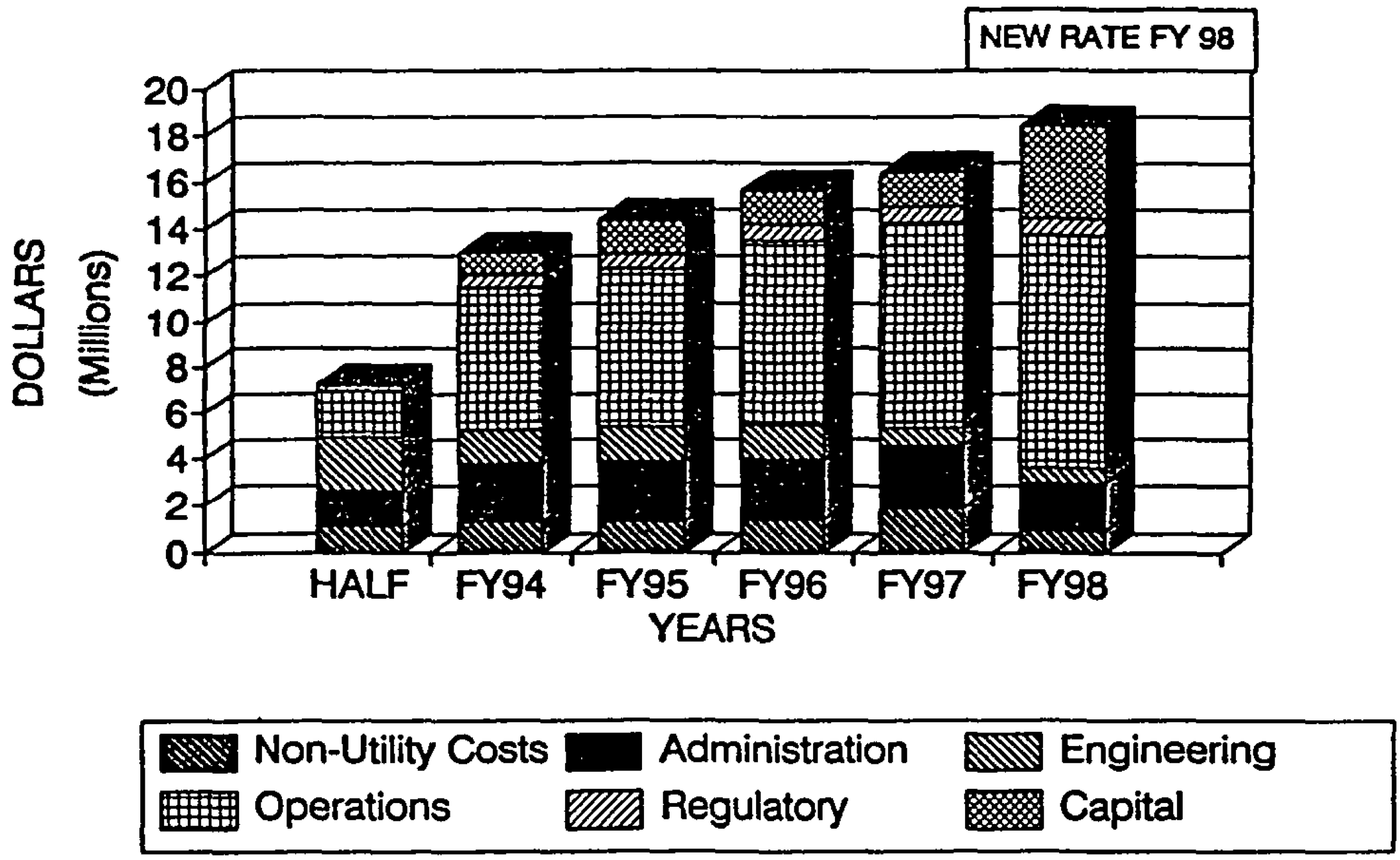


- implements accelerated, comprehensive storm water utility program
- satisfies EPA water quality requirements
- meets maintenance service levels in 5 years
- short term capital expenditures of $15.25 M
  - $40 M capital bond package in year 5
  - extensive public information activities
- expedites attainment of City Council's goals

80 mil - 5 yr

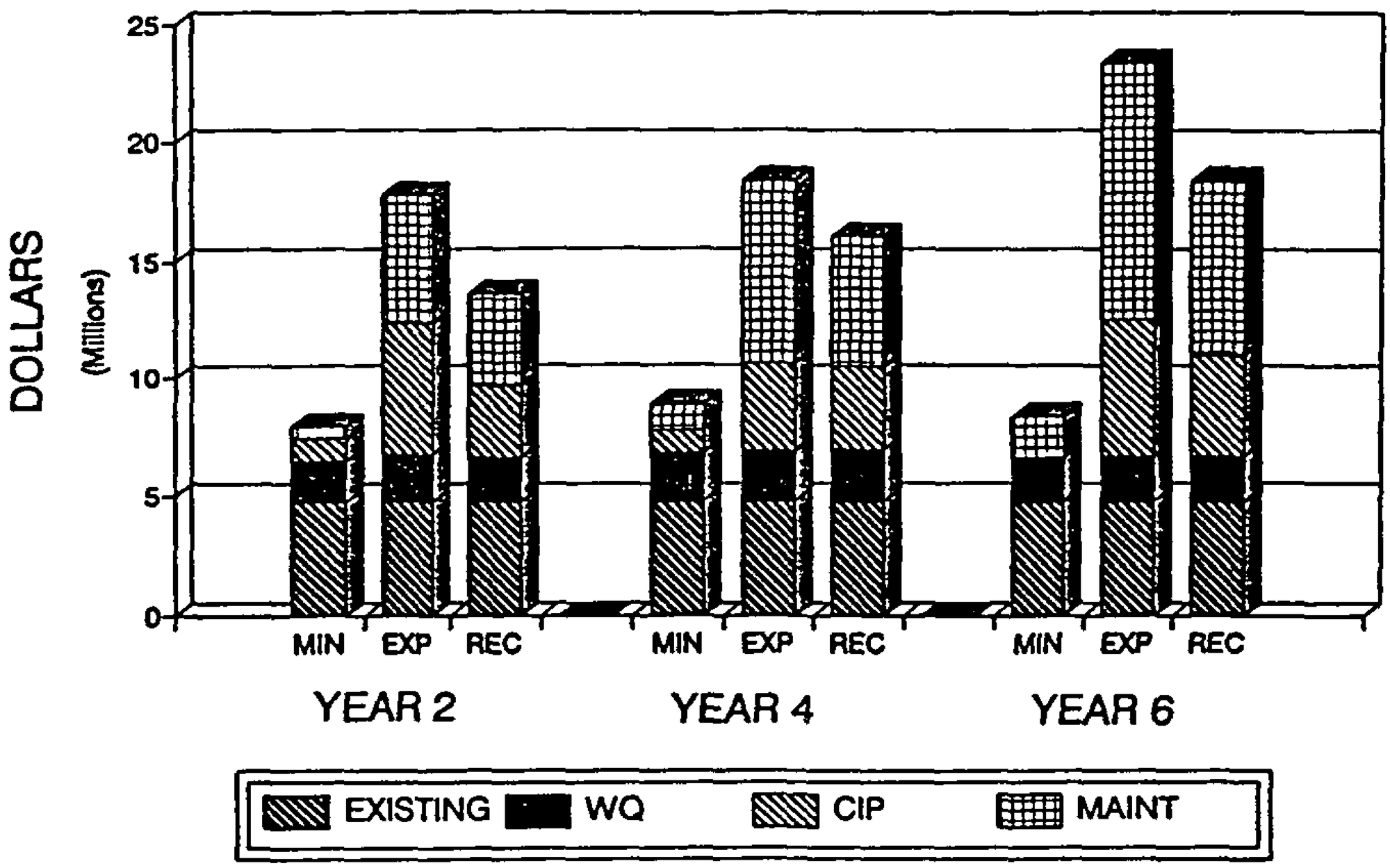
RECOMMENDED PROGRAM

RATE = $3.24-$3.96/MO/ERU



- implements comprehensive storm water utility program
- satisfies EPA water quality requirements
- meets maintenance service levels in 10 years
- short term capital expenditures of $8.5 M in 6 years
- $40 M capital bond package in year 6
- limited public information activities
- attains City Council's goals

PROGRAM ALTERNATIVES
MINIMAL, EXPEDITED, RECOMMENDED



ERU (EDU, or ESU)

EQUIVALENT RESIDENTIAL UNIT

2400 - 3200 SF IMP. AREA NAT. AVG FOR SFR

		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
EXIST.	STORM WATER MGMT FUNCTIONAL AREAS	FY 93 1/2 YEAR	FY94	FY95	FY96	FY97	FY98
590,000	ADMIN, FIN MGMT & PROG PLANNING • Financial Management • Program Planning • Public Awareness	$1,590,444	$2,556,249	$2,591,398	$2,629,358	$2,745,356	$2,105,744
X	PLANNING, DESIGN, ENGINEERING • Master Planning • Field Engineering • BMP Programs	$2,318,500	$1,499,500	$1,544,416	$1,475,105	$783,250	$649,046
3000,000	OPERATIONS AND MAINT • Routine Maintenance • Remedial Maintenance • Spill Response	$1,998,000	$6,236,280 Remedial 2200	$6,889,582	$8,027,069	$8,957,915	$10,131,308
730,000 X	REGS AND ENFORCEMENT • Permit Administration • Inspections • Monitoring and Sampling	$372,100	$564,344	$706,020	$727,517	$745,334	$764,577
1,300,000	CAPITAL IMPROVEMENTS • Short Term Capital • Long Term Capital • Easements and ROW	$500,000	$1,500,000	$2,000,000	$2,000,000	$2,000,000	$4,000,000
5,620,000	****** GRAND TOTALS	$6,779,044	$12,356,373	$13,731,416	$14,859,050	$14,731,855	$17,650,675

COMPARISON OF WATER SUPPLY WATERSHED PROTECTION PLANS

LOCATION	FUNDING				BUFFER RESTRICTIONS	BMP'S ALLOWED	DEVELOPMENT DENSITY RESTRICTIONS
	ADDITION TO TAX BASE	UTILITY TAX	LOCAL BONDS	STATE GRANTS			
FLORIDA (Statewide Plan)	No	Yes - Based upon amount of land owned and land use	No	Yes	Encouraged - Local governments decide	Yes	No[1]
GEORGIA Local ordinace adopt state model or develop their own	Yes	Yes	Yes	No	100 - 150 feet	Yes	Yes Depends upon soil type present
AUSTIN, TEXAS	No	Yes - Based upon amount of land owned and land use (5 million / year)	No	No	100 - 150 feet	Yes	No[1]
WISCONSIN MILWAUKEE RIVER WATERSHED	No	Yes - Based upon amount of land owned and land use (7 million / year)	No	Yes	Encouraged - Local governments decide	Encouraged	No[1]
BELLEVUE, WASH	No	Yes - Based upon amount of land owned and land use (7 3 million / year)	No	Yes	15 - 50 feet	Yes	No[1]
BUZZARDS BAY, MASSACHUSETTS (Pilot Plan)	Undecided	Undecided	Undecided	Yes	100 feet	Yes	No[1]
N C (Proposed)	Undecided	Undecided	Undecided	Yes (?)	100 feet	Yes - Depends upon WS classification	Yes
MECKLENBURG COUNTY (Proposed)	Undecided	Undecided	Undecided	Undecided	100 feet	No - Only extended area	Yes

NOTES 1) These plans rely on performance standards and density restrictions are an option if the performance standards cannot be obtained with the BMP's available

MOUNTAIN ISLAND LAKE

Reasons the N C Environmental Management Commission (EMC) should classify Mountain Island Lake WS-IV instead of WS-III, and reasons the Mecklenburg County Commission should adopt a Resolution asking the EMC to do that

1 The current water quality is well within State standards A WS-IV classification will maintain sufficient water quality well within State standards

2 A WS-IV classification will foster the growth of tax base and property taxes while maintaining water quality well within State standards A WS-III classification would restrict unnecessarily the growth of taxes without significant improvement in water quality

3 A WS-IV classification will allow Mecklenburg County to retain zoning control over this vast area (Mountain Island Watershed), whereas a WS-III classification would essentially take such control out of the hands of local elected officials and turn it over to the State environmental agencies

4 A WS-IV classification will foster balanced growth consistent with the 2005 Plan while still maintaining water quality well within State standards A WS-III classification would essentially stop this growth (due to the inability to expand the McDowell Treatment Plant to serve the residential and industrial growth potential of the I-77 corridor) as well as under-utilize the current infrastructure, i e , new Highway 16, sewer trunk line, county parks, etc

5 A WS-IV classification will provide the potential for quality, affordable housing in this area of the County while still maintaining water quality well within State standards, whereas a WS-III classification would restrict such potential since densities would be severely restricted Under a WS-IV, roads, water and sewer could be economically brought into the critical area, whereas under a WS-III, this could not occur and septic tanks would be the primary means of sewage treatment

6 A WS-IV classification is consistent with the indications that the State will classify Lake Norman (from which comes 96% of the water flowing through Mountain Island Lake) a WS-IV A WS-III classification for Mountain Island would be inconsistent with this as well as with the State water classification criteria

NORTH CAROLINA
ASSOCIATION OF REALTORS® INC
REALTOR®

RECEIVED SEP 2 6 1991

September 25, 1991

Letter sent to all North Carolina Senators and Representatives

The purpose of this letter is two-fold First, to thank you on behalf of our 17,000 members state-wide for your services to our Association as a member of the North Carolina General Assembly; and, second, to call to your attention a problem we feel could have disastrous effect on our State and its citizens

We want to extend our sincere appreciation to you for giving of your time and expertise for the benefit of our membership and all citizens of our State Among our membership we count many strong and dedicated Democrats, and many strong and dedicated Republicans We may thus be divided among party affiliation, but we are of one mind in protecting private property rights of the citizens of North Carolina We sincerely appreciate your interest and dedication to the preservation of private property rights also

Now, for the problem we wish to call to your attention In 1989 the General Assembly enacted into law House Bill 156, the Watershed Protection Act This new law authorized the Environmental Management Commission to establish rules for the protection of water supply watersheds The North Carolina Association of REALTORS® is solidly in favor of protecting our watersheds, but we are very concerned that the plan adopted by EMC goes far beyond what is needed Development, construction, and progress in many of our 100 counties could be restricted by over 50 percent!

Enclosed is a copy of our statement filed with the EMC protesting these restrictive regulations We seek your assistance in reversing the stringent actions taken by the Commission by your personal influence as a state legislator with members of the Commission If a common sense solution cannot be achieved by such means, then we ask that you and your fellow members of the Assembly give the Commission more definitive guidelines Your actions in remedying this unhealthy economic condition and infringement of private property rights will be lauded by the citizens of this State and most certainly by the 17,000 members of our Association

Sincerely yours,

Nick Angel
President

Ben Ball
President-Elect

Mike Quinto
Treasurer

James L. Bichsel
Executive Vice President

cc NCAR Executive Committee
72 Local Board Presidents
NCAR State and Local Legislative Committee
NCAR Political Affairs Committee
Board Executive Officers

2901 SEAWELL ROAD P O BOX 7918 GREENSBORO, NC 27417 0918 • 919 294 1415 • NC WATS 800 443 9956 • FAX 919 299 7872

President
Nick Angel
PO Box 748
Kernersville N C 27285

President Elect
Benjamin K Ball
4030 Arendell St
Morehead City N C 28557

EQUAL HOUSING

Treasurer
Mike Quinto
211 W Lexington Ave
High Point N C 27262

Executive Vice President
James L Bichsel
PO Box 7918
Greensboro N C 27417

POSITION

of the

NORTH CAROLINA ASSOCIATION OF REALTORS®

on the proposed

WATER SUPPLY WATERSHED PROTECTION RULES

of the

ENVIRONMENTAL MANAGEMENT COMMISSION

September, 1991

Introduction

The North Carolina Association of REALTORS® supports reasonable efforts to maintain quality water sources for all North Carolinians We do believe, however, that government regulation of our watershed areas should involve only the least amount of restrictions which are necessary to insure safe water supplies

Recently, some persons have tried to convince the public that persons and groups who oppose the excessive, overreaching and unnecessary parts of the proposed rules are also opposed to good quality, safe water supplies Of course these allegations are untrue and we are confident that the members of the Environmental Management Commission are intelligent enough to dismiss such unfounded assertions

Home Ownership

The overreaching nature of the proposed rules will cause a substantial reduction in available and affordable housing in many areas of the State In some of the over-regulated areas, only one single-family residence will be allowed per two acres of land Home buyers who must have two acres of land for their home rather and 1/4 or 1/2 acre will naturally pay much more for the house and lot, thereby driving home prices up while reducing the number of homes that can be built in the area The increased cost of single-family homes will increase the demand for rental housing, and therefore increase rental costs In turn, increased rental housing costs will increase the percentage of North Carolinians who are homeless

Another adverse impact of over-regulation relates to the ability of local governments to provide basic governmental services needed by home owners The sparse development allowed in the over-regulated areas will significantly increase the costs and therefore the tax money necessary to provide basic services such as roads, water, sewer, garbage pick-up, etc to homes in the areas

Restrictions on "Critical" and "Protected" Areas

There is no technical or scientific basis for establishing the boundary of the critical area at one mile and the boundary of the protected area at five miles These two boundaries established in the Rules are purely arbitrary The boundary of the "critical" area should be no more than 1/2 mile as originally proposed The boundary of the "protected" area should be established on a case-by-case basis and only after a credible, watershed-specific technical study is performed to determine whether the boundary should be greater than 1/2 mile, and, if so, what the protected area should be in these locations

Density Restrictions

The Rules specify that compliance with the density restrictions must be on a project-by-project basis. Requiring new development to meet the density requirements on a project-by-project basis is unnecessarily restrictive It is more important that development within the watershed as a whole meets the density requirements Lands such as State and federal parks and forests which will remain undevelopable should be used as a "density offset", thus allowing the developable portions of the watershed to be more highly developed This would provide the same necessary level of protection to the water supply and allow productive use of the developable land This is especially important for many western counties that have extensive public trust land holdings which return little or nothing to the local economy

Equity

To achieve the goal of protecting our water supplies across North Carolina, all sources of degradation of these water supplies should be controlled in proportion to their impact on our surface water supplies Moreover, the State's scarce resources for protecting our water supplies should be used in a way that will yield the most benefit from the regulations The

December 1990 rules do not require agricultural runoff controls, but only encourage them although a significant portion of the degradation of our water supplies is caused by agricultural runoff To be successful, water supply watershed management plans should require mandatory controls on pollution from whatever source- septic tank, point source pollution, pesticides, fertilizer, etc , and address all problems in proportion to their severity

High Water Quality

Because the Rules specify progressively more stringent control requirements and restrictions as the classifications move from WS-IV to WS-III to WS-II and, finally, to WS-I, there is a common belief that the quality of the water also improves This is totally incorrect The water quality of WS-IV is as high as it is for WS-I. The water of all of the waters classified as water supplies will be suitable for public water-supply purposes Likewise, because a body of water is proposed to be classified WS-II does not mean that it has better water than a body of water proposed to be classified as WS-III In fact, the proposed classifications in many cases are arbitrary and ignore areas capable of being developed for the benefit of communities and their residents

Grandfather Clause

The grandfather clause is ambiguous and is being interpreted by the State to mean that any project that does not already have a building permit must comply with the new rules The Rules even require that existing development comply with the Rules "to the maximum extent practicable " The Rules should be revised to exempt all projects underway (for which significant expenditures have been made, whether or not a building permit has been issued), all projects platted, and areas zoned as of January 1, 1994

Economic Factors

No new discharges other than domestic wastewater will be allowed, thus effectively barring new industry and the expansion of existing industry The Rules will have a "chilling" effect on the State's ability to attract new industry and on the confidence of lenders and investors

Existing but uncompleted projects with upfront infrastructure costs may be shut down or foreclosed With the decreased ratio of buildings to land, many such projects will no longer be financially possible Industrial complexes and employers will be drastically reduced or eliminated

New or expanded essential services such as roads, airports, hospitals, (and even churches and day-care facilities) will be stopped or significantly reduced The Rules specifically state that even construction of new roads in critical areas should be avoided

The Rules, by decreasing tax revenue to local governments, will result in a decrease in services provided by most municipalities and counties Additionally, the tax burden on existing businesses and to consumers outside the watershed areas will increase

Summary

The water supply watershed protection Rules proposed by the Environmental Management Commission go far beyond the "minimal requirements" authorized by the North Carolina General Assembly to protect the surface water supplies of our State The Commission should, and must, amend the proposed Rules so that the restrictions imposed are the minimum necessary to ensure safe drinking water supplies for all North Carolinians.

GUARANTEED TUNE-UP
AUTOMOTIVE SERVICE CENTER

GUARANTEED TUNE UP

5745-B N TRYON STREET
CHARLOTTE NC 28213
(704) 596-5557

Citizens Hearing OCT 14, 1991
10/14/91

TO MAYOR SUE MYRICK
& CITY COUNCIL

FROM CHARLES M'SWEENEY
AREA MANAGER
GUARANTEED TUNE UP

SUBJECT HARASSMENT AND DISCRIMINATORY PRACTICES
OF ZONING ENFORCEMENT OFFICERS

I, CHARLES M'SWEENEY, RESIDING AT 8014 MARIN DR CHARLOTTE, N C 28215 I AM EMPLOYED AT GUARANTEED TUNE UP AND SERVE AS AREA MANAGER I, PERSONALLY AM RESPONSIBLE FOR ALL THE OPERATIONS AT GUARANTEED TUNE UP'S BOTH LOCATIONS THIS STORY BEGINS IN MARCH 1988 WHEN WE OPENED OUR FIRST STORE AT 5745 B N TRYON ST CHARLOTTE WE WERE READY TO INSTALL OUR NEW SIGN WHEN WE WERE INFORMED OF THE NEW SIGN ORDINANCE ALLOWING ONLY A 100 SQUARE FOOT SIGN. WE HAD TO PUT OUR BRAND NEW $5,000 SIGN INTO STORAGE AND PURCHASE ANOTHER SIGN. ALSO AT OUR LOCATION WAS A MEINEKE MUFFLER SHOP WHICH SHARED THE BUILDING WITH US THEY HAD ALREADY INSTALLED A 100 SQUARE FOOT SIGN ON A POLE 1 YEAR PRIOR TO THE NEW LAW. WE WERE NOT ALLOWED TO PUT OUR SIGN ON A POLE ABOUT 5 MONTHS LATER WE OPENED A SECOND STORE ON INDEPENDENCE BLV THE OWNER OF OUR COMPANY, CHARLES N PORTER PERSONALLY SPENT $60,000 ON RENOVATING THIS BUILDING WE INSTALLED THE $5,000 SIGN THAT WAS PUT INTO STORAGE PREVIOUSLY, AT THE SECOND LOCATON SIX MONTHS LATER WE MOVED FROM OUR INDEPEDENCE LOCATION TO OUR S BLV LOCATION DUE TO VARIOUS REASONS UPON OPENING THIS STORE WE THEN INSTALLED THE SAME $5,000 SIGN AT THIS NEW LOCATION WE WERE VISITED BY THE ZONING INSPECTOR, R L LODDELL AND HE INFORMED US ABOUT VARIOUS SIGN LAWS AND TOLD US WE COULD NOT USE THE MARQUEE UNDER OUR SIGN WHICH HAS BEEN THERE FOR 10 YEARS

GUARANTEED TUNE-UP
AUTOMOTIVE SERVICE CENTER

GUARANTEED
TUNE UP

5745-B N TRYON STREET
CHARLOTTE NC 28213
(704) 596-5557

WE WERE ALSO TOLD THAT OUR 100 SQ FT SIGN WAS AT ITS ALLOWABLE LIMITS I GAVE MY WORD THAT I WOULD NOT USE THE MARQUEE AND KEPT MY WORD FOR OVER A YEAR WHEN MEINEKE MUFFLER MOVED OUT FROM THE N TRYON LOCATION WE THEN HIRED CONCO SIGNS TO MOVE THE LARGE 100 FT SIGN FROM S BLV AND MOVE IT TO OUR N TRYON LOCATION. WE THEN PURCHASED A SMALLER SIGN FOR S BLV SINCE WE HAD A SMALLER SIGN INSTALLED WE STARTED USING THE MARQUEE THE INSPECTOR FOR THE N TRYON LOCATION RECEIVED A COMPLAINT FROM OUR NEW TENANT ABOUT OUR TAKING OVER THE USE OF THE POLE THAT MEINEKE MUFFLER HAD LEFT. THERE WAS AVERBAL AGREEMENT BETWEEN THE OWNER OF MEINEKE MUFFLER AND THE OWNER OF GUARANTEED TUNE UP THAT WE COULD TAKE OVER THIS POLE IT WAS ALSO OUR UNDERSTANDING THAT THE POLE FELL UNDER A GRANDFATHER CLAUSE WE THEN HIRED AN ATTORNEY AND WENT TO A HEARING AT THE ZONING BUILDING AND WON AN EXTENSION THROUGH 1996 THIS COST US ANOTHER $3,000 SO TO DATE WE HAVE SPENT OVER $6,000 TRYING TO PLEASE THE ZONING LAWS THIS PAST FRIDAY, OCT 11, 1991, WE WERE REVISITED BY THE SAME INSPECTOR WHO TOLD US OUR MARQUEE WAS NOW TOO LARGE FOR OUR SIGN AND WOULD HAVE TO EITHER REDUCED THE SIZE OR HAVE PERMANENT LETTERS INSTALLED WE PREFER THE MARQUEE SO AS TO SHOW SPECIALS WE ARE HAVING I VISITED NEARBY NEIGHBORS WITH MARQUEES LARGER THAN GUARANTEED TUNE UP'S AND IN DEFINATE VIOLATION OF THE ZONING LAW AND THEY TOLD ME THEY HAD NOT BEEN VISITED BY ANY ZONING OFFICERS GUARANTEED TUNE UP ALONE WAS SIGHTED FOR SUCH A SMALL INFRACTION OF THE LAW I HAVE RECENTLY BEEN INFORMED THAT THE CITY IS CONCENTRATING ON THE REMOVAL OF FLAGS AND BANNERS FROM BUSINESSES DUE TO THE OVERUSE BY REALTORS WHO OWN APTS AND CONDOS

GUARANTEED TUNE-UP
6 MONTHS/6,000 MILES
AUTOMOTIVE SERVICE CENTER

GUARANTEED
TUNE UP

5745-B N TRYON STREET
CHARLOTTE, NC 28213
(704) 596-5557

SO BECAUSE OF A FEW VIOLATIONS THE WHOLE BUSINESS COMMUNITY MUST SUFFER SIX TO EIGHT MONTHS AGO I WAS TOLD THAT BANNERS AND FLAGS WITHOUT WRITING ON THEM WE PERMISSABLE NOW WE ARE TOLD TO TAKE THEM DOWN. I AM TIRED OF INCONSISTENCIES BETWEEN INSPECTORS AND WOULD APPRECIATE AN INVESTIGATION INTO THIS MATTER

Charles T. McSweeney

CHARLES T MCSWEENEY

MECKLENBURG COUNTY

Office of the County Manager

August 30, 1991

M E M O R A N D U M:

To: Gerald G. Fox
County Manager

From: Wanda P. Towler WT
Assistant County Manager

Subject: Proposed State Watershed Rules and Classifications

Staff provides the following comments regarding the proposed State watershed rules and classifications. These comments are presented after discussion by staff representing County Engineering, Planning, CMUD, County Attorney, and Environmental Protection. These comments are directed solely at the proposed State rules and classifications and do not represent staff opinion on the consultant's proposed plan or the content of any final local watershed protection program.

Comments

1. Existing uses, 15A NCAC 2B.0104(s) - The definition of "existing development" appears to say that all land within a designated water supply watershed which is zoned as of a certain date will be treated as existing development for the purposes of compliance with the regulations. Since all land within Mecklenburg County is covered by zoning, such land would only be "...required to comply with these rules to the maximum extent practicable." It would seem that this is an unintended result and that the language of that paragraph should be rewritten as follows:

> (s) Existing development, as defined for the purposes of these Rules, means projects for which a certificate of compliance has been issued, projects for which a building permit has been issued, property which has been subdivided by a recorded instrument, or projects which have obtained vested rights pursuant to G.S. 153S-344.1 or G.S.160A-385.1, as of the date of adoption of the amendment incorporating this subpart into the Rules.

600 East Fourth Street • P O Box 31787 • Charlotte, North Carolina 28231 • (704) 336 2472

Existing development is required to comply with these Rules to the maximum extent practicable. Redevelopment is allowed, although the requirements of these Rules shall be complied with to the maximum extent practicable.

In addition, the application of such standards should be tied to the effective date of the regulations and not the end of the public hearing process as presently proposed.

2. Critical area, 15A NCAC 2B.0202(14) - Staff supports the proposed definition of 1 mile from the normal pool elevation. Less dense development in this sensitive area provides an adequate and necessary margin of safety to prevent high concentrations of non-point source pollution from entering community and metropolitan drinking water supplies.

3. Classification of non-NC water supplies (discussed on pp 16,17 of the hearing notice package) - Staff's understanding is that the State proposes not to classify reservoirs or rivers as water supplies if they are not used by N.C. residents even though they might be used downstream in S.C. or Tennessee. This is not a technical issue but a moral one. In most cases, watershed protection will require a long-term cooperative multi-jurisdictional effort to achieve and insure a clean raw water supply. We expect our friends in Virginia not to foul our common rivers and streams. As we are dependent on our upstream neighbors to not pollute our drinking water, so are our downstream neighbors dependent on us. As good neighbors, N.C. should classify all drinking water supplies as such, regardless of the state in which the user resides.

4. Classifications
   - Lake Norman - Staff accepts WS-IV as proposed.
   - Lake Wylie - Staff accepts WS-IV as proposed .
   - Mountain Island Lake - Staff proposes that the Gar Creek watershed be classified as a WS-II. Staff accepts the main channel, McDowell and Johnson Cove classification as WS-IV as proposed.

   Rationale: Gar Creek feeds directly into Mountain Island Lake just upstream of the CMUD water intakes. It is important that this watershed receive maximum State protection. A WS-II classification allows only low density controls, is consistent with the consultant's recommended plan and provides adequate protection from non-point source pollution. Additionally, the entire Gar Creek watershed is totally within the jurisdiction of Mecklenburg County.

A State classification of WS-IV for McDowell Cove, Johnson Cove, and the main channel does not provide protection in the entire local watershed (i.e. it is limited to five miles), is not consistent with the consultant's recommended plan, nor does it provide protection necessary to meet the Board's policy statement of February 1990. However, as a practical matter, staff recognizes that any higher classification would require exceptions to the proposed rules. For example, as proposed, a WS-III classification does not allow any new domestic wastewater discharges in the critical area or any industrial discharges in the entire watershed. An exception for McDowell Wastewater Treatment Plant would have to granted by the State. A WS-III classification would also require consensus of all affected jurisdictions (Gaston County, Lincoln County, Cornelius and Huntersville). Therefore while staff accepts the State's proposed WS-IV as a floor, the classification and associated conditions do not represent staff opinion for a final local watershed protection plan.

<u>Recommendation</u>

Staff recommends that the Board forward these comments to the North Carolina Environment Management Commission prior to September 30, 1991.

Depending on the direction chosen by the Environmental Management Commission and the Board of County Commissioners, the staff will develop regulatory alternatives to provide Mecklenburg County with a wide range of options to protect the water quality of the Catawba River.

WPT:jpb

cc: John M. Barry, Ph.D., Director, Environmental Protection
Don Willard, Environmental Protection
Marvin Bethune, County Attorney
Joe Stowe, CMUD
Jim Farrell, CMUD
Martin Cramton, Planning Commission
Walter Fields, Planning Commission
Bobbie Shield, Engineering
Cary Saul, Engineering

1991 PROPOSED AMENDMENTS TO THE WATER SUPPLY WATERSHED PROTECTION RULES TO BE EFFECTIVE IN 1992

Classification		Dischargers	Land Use Description	Allowable Density W/O Stormwater, Low Den Opt	Allowable Density W/Stormwater, High Den Opt	Required Control with High Den. Opt	Non-residen Development	Sludge Appl	Landfills
WS-I	Watershed	None	Undeveloped	N/A	N/A	N/A	N/A	N/A	N/A
WS-II	Critical area	Only existing discharges qualifying for General Permit (0127)	Predominantly undeveloped	1du/2ac or 6% built upon	Not Allowed	N/A	No new industrial	No new sites	No new landfills
	Watershed			1du/2ac or 6% built upon	Allowed - as added protection	N/A	10% of the watershed, max. 70% built-upon	Allowed	No new discharging landfills
WS-III	Critical area	No new	Low to mod developed	1du/2ac or 6% built upon	6-30% built upon area	Control the 1" storm	No new industrial	No new sites	No new landfills
	Watershed	Domestic & non-process		1du/1ac or 12% built upon	12-50% built upon area	Control the 1" storm	10% of the watershed max. 70% built-upon	Allowed	No new discharging landfills
WS-IV	Critical area	Domestic no new ind	Moderate to highly devel	1du/1ac or 12% built upon	12-30% built upon area	Control the 1" storm	Allowed	No new sites	No new landfills
	Protected area	Domestic & industrial		2du/1ac or 24% built upon	24-70% built upon area	Control the 1" storm	Allowed	Allowed	Allowed

NOTE
- N/A - Not Applicable
- Local ordinances and nonpoint source management plan required in water supply watersheds and protected areas
- Critical area is 1 mile and draining to water supplies from the normal pool elevation of reservoirs, or 1 mile and draining to a river intake
- Protected area is 5 miles and draining to water supplies from the normal pool elevation of reservoirs, or 10 miles upstream of and draining to a river intake
- Municipal with pretreatment program (2H 0904) is considered industrial discharge
- Discharges qualifying for a General Permit pursuant to 2H 0127 will also be allowed in all areas of WS-III and WS-IV watersheds along with the allowed discharges noted in the table Also, new swimming pool filter backwashes are allowed in WS-II watersheds
- Buffers will be maintained around all perennial waters (solid blue lines on USGS 7 5 topo map) with a minimum width of 100 feet It is recommended that the first 25 feet of the buffer remain as natural vegetation
- Groundwater remediation discharges may be allowed wh o other practicable alternative exists
- Local governments will assume ultimate responsibilit r operation and maintenance of stormwater controls

1991 PROPOSED AMENDMENTS TO THE
WATER SUPPLY WATERSHED PROTECTION RU
TO BE EFFECTIVE IN 1992

Classification		Hazardous Materials	Cluster	Sewer Lines	Agriculture BMPs	Forestry BMPs	Trans BMPs
WS-I	Watershed	N/A	N/A	N/A	Required #	Required *	Required +
WS-II	Critical area	Inventory spill/failure	Allow	Allow	Required #	Required *	Required +
	Watershed	Inventory, spill/failure	Allow	Allow	Required #	Required *	Required +
WS-III	Critical area	Inventory, spill/failure	Allow	Allow	Required #	Required *	Required +
	Watershed	Inventory, spill/failure	Allow	Allow	Required #	Required *	Required +
WS-IV	Critical area	Inventory, spill/failure	Allow	Allow	Required #	Required *	Required +
	Protected area	Inventory, spill/failure	Allow	Allow	Required #	Required *	Required +

NOTE # Agricultural activities must implement provisions of the Food Security Act of 1985 and the Food, Agriculture Conservation and Trade Act of 1990. In WS-I watersheds and critical areas of WS-II, WS-III and WS-IV areas, agricultural activities must maintain a 10 foot vegetated buffer or equivalent control and animal operations > 100 animal units must use BMPs as determined by the Soil and Water Conservation Commission

* Silviculture activities must implement the provisions of the Forest Practices Guidelines Related to Water Quality (15A NCAC 1I 0101- 0209)

\+ The Department of Transportation must use BMPs as described in their document, "Water Supply Watershed Best Management Practices"

AT ISSUE:

RAW WATER

QUALITY CONTROLS

MOUNTAIN ISLAND LAKE

AREA AFFECTED:

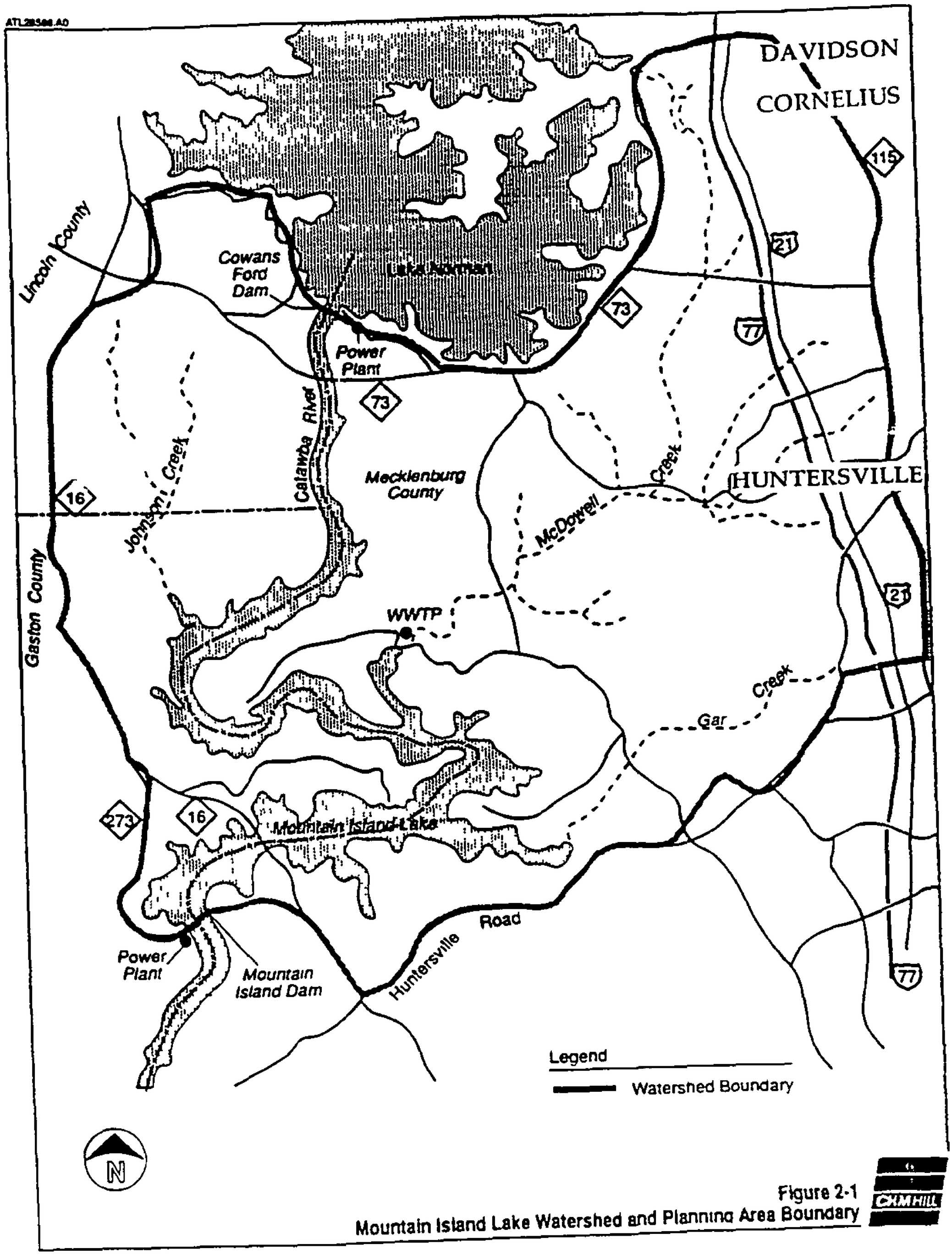


Figure 2-1
Mountain Island Lake Watershed and Planning Area Boundary

THE STUDY PROCESS:

1 YEAR STUDY BY CONSULTANT TO ACHIEVE "NO FURTHER DEGRADATION" IN MOUTAIN ISLAND

Mountain Island Lake Watershed Protection Study

Mecklenburg County
Department of Environmental Protection

CH2M HILL

May 1991

THE CONTROL PROBLEM:

1) "THE UMBRELLA EFFECT"

- 97% OF MTN. ISLAND WATER COMES FROM UPSTREAM OR GASTON AND LINCOLN COUNTIES
  (ONLY 3% IS MECKLENBURG)

2) "THE MOVING TARGET"

- STATE STANDARDS NOT YET SET

ECONOMIC IMPACT = WHY CHAMBER INTERESTED

1) 20% OF REMAINING UNDEVELOPED RESIDENTIAL LAND

2) JOB CENTERS INCLUDE DAVIDSON, CORNELIUS, HUNTERSVILLE, I-77 NORTH JOB CORRIDOR, NEW HIGHWAY 16, NEW MCDOWELL TREATMENT PLANT BASIN

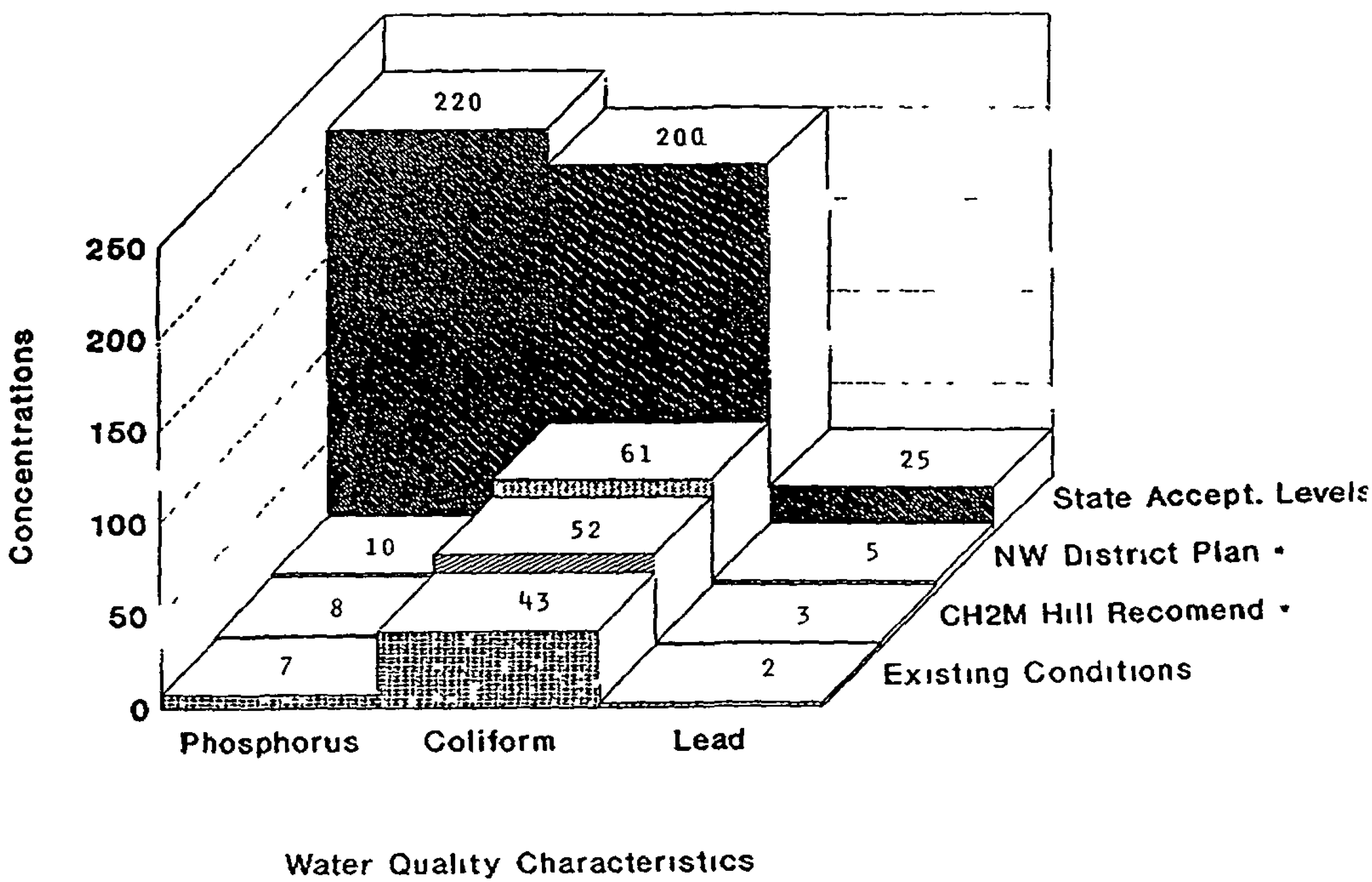
3) UNBALANCED GROWTH (SCHOOLS, ROADS, ETC.)

CONSULTANT RECOMMENDATION:

"WS 2 / 3" LAND USE CONTROLS

- 2 ACRES PER WATERFRONT LOT
- ONE ACRE PER INTERIOR LOT
- LIMIT NON-RESIDENTIAL TO 10%

CONSULTANT'S PLAN HAS LITTLE EFFECT ON RAW WATER QUALITY



COST/BENEFIT NOT FAVORABLE

- NW DIST PLAN WOULD ADD EST.

  $600 MILLION TO TAX BASE IN NEXT

  20 YEARS = $3.6 MM/YR IN TAX

  REVENUE

RECOMMENDATIONS

1) EXAMINE CMUD TREATMENT CAPABILITIES & COSTS (RAW WATER VS DRINKING WATER)

2) EVALUATE STATE STANDARDS (DUE BY YEAR END) BEFORE WRITING LOCAL ORDINANCES

3) EVALUATE OTHER ENGINEERING / TECHNICAL APPROACHES

Charlotte Chamber VENTURES

Volume 20, Number 7 May 31, 199

Promoting quality economic growth and advocating business interests

Mt. Island water quality in question

Will limiting land use around three percent of Charlotte's water supply truly protect the quality of our drinking water? A recent study before the Mecklenburg County Commission suggest the answer is yes, but many people disagree.

The area in question is the Mountain Island Lake basin, 67 square miles of water between Lake Norman and Lake Wylie, which encompasses 20 percent of the remaining undeveloped residential land in Mecklenburg County

Jim Teat, McGuire Properties, is chairing a special Chamber task force to monitor the situation He said, "This is not an issue of environmental protection versus economic development, because quality of life and job growth go hand in hand Instead the issue is whether or not the consultant's recommendation give us the cleanest water at the best cost benefit ratio "

Water-Continued on page 3

Water-Continued from page 1 . . .

The study was commissioned to comply with a new state law that requires protection plans for all waterways which provide drinking water to counties and cities. The Chamber supports its basic goal—to maintain a vibrant regional economy through protecting Mountain Island Lake, which provides abundant clean water for drinking, fire protection, industrial uses and recreation

Yet 97 percent of Charlotte's water comes from upstream (Gaston and Lincoln Counties) The proposed plan would limit development within one mile of the lake to 1 house per two acres, and one house per acre within five miles of the lake

According to Teat, "The concept of balanced growth, as endorsed by our community, is at risk The job centers of Davidson, Huntersville, Cornelius, and the I-77 corridor have already been earmarked for growth These areas will bring an estimated total of $600 million to the tax base within the next 20 years, or $3 6 million each year "

The task force has recommended several options to maintain the integrity of the basin, other than limiting land use. They are. 1) Examine alternative Charlotte Mecklenburg Utilities Department treatment costs and capabilities, 2) Search for engineering and technical solutions, such as relying on structural BMPs to control pollutant introduction into the water supply, and 3) Evaluate state standards before writing local ordinances (a move the County Commission has already chosen to endorse)

The next chapter of this story will be unfolding in August, when the state holds public hearings on its water quality standards. Although the County Commission faces a December deadline for developing a water protection plan, it will probably not take definitive action until the state solidifies its requirements In the meantime, the Chamber will continue to monitor the issue For more information, call 378-1314

MINORITY REPORT

Regarding

DRAFT OF FINAL STUDY FOR

MOUNTAIN ISLAND LAKE

WATERSHED PROTECTION PLAN

DRAFTED BY CH2M HILL

DATED APRIL 1991

May 3, 1991

MINORITY REPORT RECOMMENDATIONS

As members of the Mountain Island Watershed Protection Technical Advisory Committee who want to protect our water supply and have voted not to support the recommended plan prepared by CH2M Hill, and for this reason we feel a responsibility to advise the Board of the reasons for our minority position and request your consideration of an alternative plan.

1. The consultant's recommended plan results from a too narrowly articulated policy from a previous County Commission which is as follows:

   POLICY STATEMENT: *"Mecklenburg County shall protect and preserve the water and related resources of the Mountain Island Lake watershed for the benefit of current and future residents of the region. Mecklenburg County shall establish a watershed management program for the primary purpose of providing for high quality, safe and abundant drinking water. In addition, the program shall provide for the enhancement of natural resources, recreation and economic development while promoting intergovernmental cooperation. The program shall be established to meet the Federal Clean Water Act as amended in 1987, North Carolina House Bill 156 "Watershed Management Act" ratified June 23, 1989 and North Carolina Administrative Code governing water supplies. The program development approach is outlined in the following goals:"*

   Specific goals were also established to help develop the watershed protection policy. These goals include one that deals with anti-degradation and another addressing economic development, as identified below:

   Goal 1 - Water Quality - design and establish a watershed management program which prevents further degradation of water quality and effects improvements to meet current and future water quality standards

   Goal 2 - Economic Development - to maintain a vibrant regional economy through protecting Mountain Island Lake as a valuable economic resource which provides abundant clean water for drinking, fire protection, industrial uses, and recreation.

   The water quality goal has resulted in recommendations which far exceed the State's standards for watershed protection criteria and requirements for safe public recreation and drinking water supply.

2. The charge to the consultant disregarded the critically important fact that we have two very valuable resources in the Mountain Island Lake Watershed - the water and the land. The present and future land value and useability of this unique 40,000 acre land resource for present and future land owners and County residents as a place to live, work and play has been substantially impacted by the study recommendations.

3 The consultant's own report (p 5-1) admits that *"the predicted water quality impacts on the lake from the four development scenarios (studied) are not significant."* Their own data shows clearly that the land uses and housing densities allowed under the N.W. District Plan (and allowable under a WS-IV water classification which is the most appropriate and likely under proposed State guidelines) would result in no significant further degradation of the lake water quality than would the consultant's recommended plan, even without the use of structural BMP's. (See attached graph.)

4. Best Management Practices (BMPs), tools to filter runoff from existing and new development, to achieve desired levels of water quality do not receive fair treatment in the report. The consultant's own report documents the effectiveness of BMPs but recommends low density development as the only tool to achieve water quality. Further the County Engineering Department recently announced a storm water management program in which it proposed to construct major storm water impoundments around the County, one reason being to control the quality of storm water runoff. (See attached article)

5. Many sources for drinking water in North Carolina are small self contained water watersheds. However, the Mountain Island Watershed only represents 3% of the entire watershed and Mecklenburg County contributes less than 2% runoff to the watershed. Further, agriculture has been proven the largest contributor to pollution in a typical watershed and urbanization is one of the smallest. The consultants discussed these factors but they are not reflected in their recommendations.

6 By permitting only 1 dwelling unit per 2 acres in the critical area and 1 dwelling unit per acre in the protected area, the consultant's plan would cause an underutilization of public investment in utilities and roads in the northern part of the County and eliminate the economic viability of future commercial, industrial and residential growth in the area. This would be a tremendous disservice to the County as a whole and is totally contrary to the goal of balanced growth as set forth in the 2005 Plan and the N.W and North District Plans

7. A significant percentage of the soils in the study are unsuited for septic tanks. (See attached map). In the large lot scenairo, the consultant assumes that septic tanks will be used to provide sewer. If the property owner's land does not perc, it will not be financially feasible for them to pay for the extension of public sewer to serve their individual lot.

8. Another result of the consultant's plan would be to significantly decrease the availability of developable land for affordable housing and hence decrease the future supply of affordable housing in the County. Since the land supply for affordable housing continues to dwindle in Mecklenburg County, this housing will have to be built in adjoining counties.

9. Adoption of the proposed plan would effectively result in a massive down-zoning and consequent devaluation of land. There would be a multimillion dollar reduction in the land value creating the necessity for reductions of property owners assessed values commensurate with market value. The creation of an approach to watershed protection which places the biggest burden of lost or diminished land value on the shoulders of just the watershed land owners is inequitable. In addition, diminished land value and tax revenue in the watershed will cause all Mecklenburg citizens to pay more taxes to make up the shortfall

10 Because the consultant's recommendation is not scientifically supported even by its own data as being necessary to serve an overriding public health and safety purpose, it would amount to an unjustified taking of landowner value without compensation.

11. The study does not give credit to the positive impact on the Mountain Island and other watersheds of recently adopted and pending new environmental regulations (State watershed rules, EPA-NPDES storm water rules, revised sediment and erosion control regulation, N.C. Environmental Policy Act, Wetlands Regulations, NPDES point source regulations and the County's current floodway/storm water control program and the proposed City and County storm water utility) all of which contribute to the protection of the Catawba River Basin

12. The original justification for the urgency in adopting a watershed protection plan was based on the horror stories about other municipalities whose drinking water supplies had become contaminated by spills of toxic chemicals The consultant fails to recommend a more formalized response to emergency spills and to the educational needs of the area for watershed protection practices in the home and workplace

For these reasons we respectfully request the Board of County Commissioners adopt a more balanced goals statement for the Mountain Island Lake Watershed Protection Plan as follows:

> *"Formulate a plan which preserves the values of both the land resource and the water resource in the Mountain Island Lake watershed by allowing the area to be developed residentially, commercially and industrially in keeping with the appropriate District Plans subject to the regulations in the State's Watershed Protection Plan assuming a class WS-IV watershed".*

With such a reformulated goal in mind, the County Commission should then ask staff from appropriate governmental departments and agencies such as CMUD, County Engineering, Planning, Department of Environmental Protection, Tax Assessor and others to provide the Board with cost versus benefit impact analysis of the CH2M Hill plan and our recommended plan (WS-IV), both of which are summarized in the attached table.

Comments	North & Northwest Plans Based on District Plans	WS-IV *Moderate to Highly Developed*	CH2M Hill Recommended Plan *Predominately Undeveloped and Low to Moderate Developed*
Critical Area	1 DU/AC (12% built upon) 5% Parkland 20% Parkland near Gar Creek	Without BMPs 1 DU/AC 12% built upon With BMPs 12-30% built upon	1 DU/2 AC 6% built upon (clustering allowed) 16% Parkland
Protected Areas	2 DU/AC (Gar Creek) 67% @ 3 DU/AC (25% built 10% @ 4 DU/AC (30% built) 11% @ 5 DU/AC (40% built) 12% Office/Commercial (78% built)	Without BMPs 2 DU/AC With BMPs 24-70% built	1 DU/2 AC (Gar Creek) 1 DU/1 AC (rest of watershed)

Each department or agency should evaluate the affects of the two alternative plans on

1. CMUD's ability to provide safe drinking water for the community

2. Utilization of the community's current investment and proposed near term investment in roads, utilities, and other public infrastructure in the area.

3. Present and future individual property values as well as the present and future overall sales and property tax revenues of the Study area.

4. Future business expansion and job growth in the I-77 corridor and elsewhere in the area.

5. The community's stated goal for balanced growth which is to direct development toward less developed geographic areas of the County.

6. On land value of property owners in the Study area.

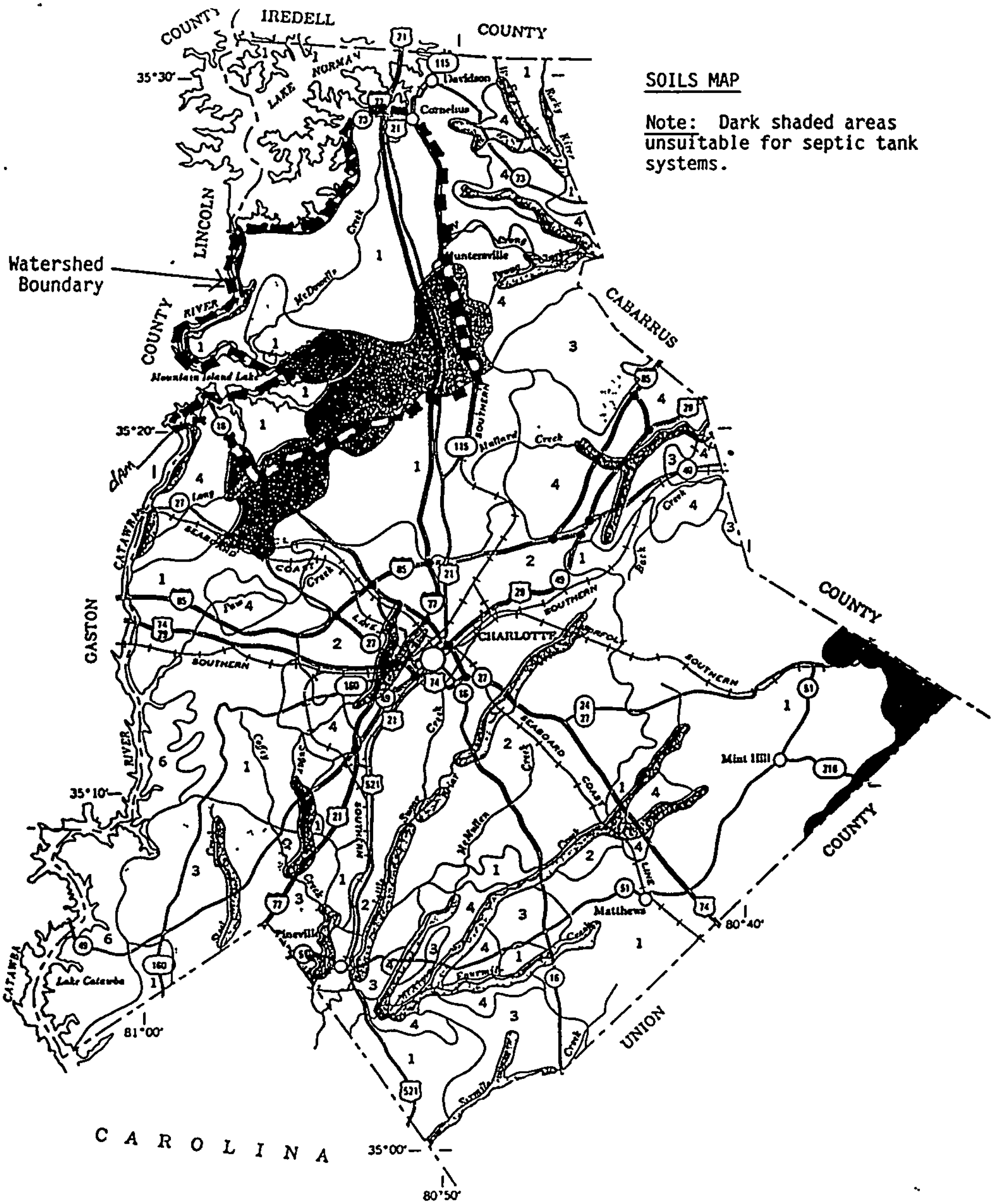
7. On jobs and tax revenue resulting from new construction targeted for the area.

This report is presented by:

Dale Stewart, HBA Representative

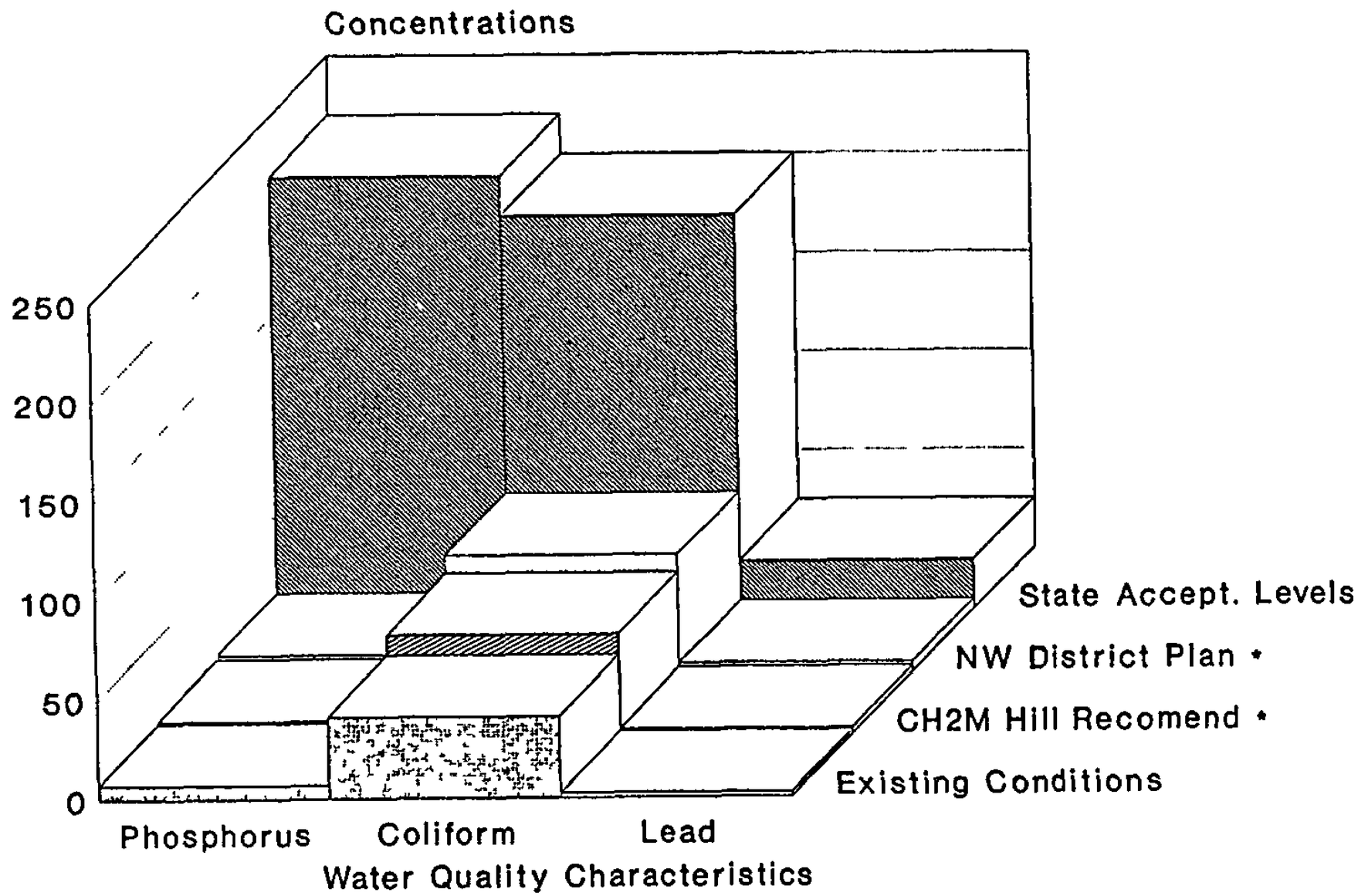
Steve Schreiner, HBA Representative

Robert B. Dienst, Citizen


SOILS MAP
Note: Dark shaded areas unsuitable for septic tank systems.
Watershed Boundary
IREDELL COUNTY
LINCOLN COUNTY
CABARRUS COUNTY
GASTON COUNTY
UNION COUNTY
CAROLINA
LAKE NORMAN
Mountain Island Lake
Lake Catawba
CHARLOTTE
Mint Hill
Matthews
Pineville
Cornelius
Davidson
Huntersville
35°30'
35°20'
35°10'
35°00'
81°00'
80°50'
80°40'
dam

MOUNTAIN ISLAND LAKE WATERSHED

Comparison of State Standards and Development Alternatives w/o BMPs



Data - CH2M Hill
Graph - Minority Report

* WS-IV alt. will fall between CH2M Hill and NW Dist. Plan

County to take bids on 14 lakes to ease flooding, improve water

By GAIL SMITH
Staff Writer

By May, Mecklenburg County will ask companies for bids to design the first of several new lakes that will help alleviate flooding and improve water quality

The county will start by building 14 lakes and renovating existing ones with $5 million from a voter approved bond issue Construction starts within 18 months

First on the list are four creek basins in the west, northwest or southwest — Steele, Colley, Paw and Long creeks Also under study are the McDowell Creek basin in the northwest and Mallard Creek in the northeast

Building lakes in the six basins will take some time

"We re probably talking about the next five to six years" said Fred Gore field services division manager for the county engineering department

In addition to flood control, the lakes will help improve water quality and provide recreation areas and lakeside homes for birds and animals Lakes act as giant filters, trapping pollutants before they run into water supplies

"Ultimately most of these (creeks) go into the Catawba River, which is a water supply for any number of people" Gore said

Mecklenburg draws its drinking water from Mountain Island Lake, fed by the Catawba Other communities along the river depend on it for water, too

The McDowell Creek basin is part of the Mountain Island Lake watershed The McDowell plan is on hold until the county adopts a watershed protection plan, which is still under study The plan may restrict development to prevent additional storm water runoff

The McDowell basin — and the five others under study — are part of the county's plan for storm water control The county chose to go with the six basins first because they are in less developed areas

"We specifically went to those areas first so we could be proactive and put controls in place before development occurred and it could be a problem," Gore said

In the Mallard Creek basin — at 40 3 square miles the largest of the six basins — consultants are working on a pilot project

By June, they expect to finish a small area of the basin — just a square mile — but an important one That's because the county's consulting firm is putting information about that area into a computer and a geographic information system called GIS

Gore

Everything will be translated into a computer picture — including drain pipes roads driveways parking lots and buildings Those informational pictures will help engineers decide where flood problems can occur, and where lakes should be built

If data on the whole basin is entered into the GIS program, engineers could call up the Mallard Creek map, zero in on a specific intersection and get a picture that shows where drain pipes are, how big they are and their condition

"It will be an amazing thing when it's done," Gore said

The 1 square mile pilot project includes the Wexford subdivision in the UNC Charlotte area

"It's a good example of how the county is becoming developed, because about half of that 1 square mile area is fairly dense residential and the other half is pasturefield, woods and undeveloped areas and they're side by side," Gore said

The project will help officials estimate how long it will take to get the rest of the basins on the GIS system Depending on the location a basin could have from 100 to 1,000 drainage pipes or culverts in a 1 square mile area

"We can work out the bugs with the system on a smaller scale, before we get that massive amount of data in there," Gore said

Mecklenburg County storm water masterplan

Steele Creek Basin
14 3 square miles in southwest Mecklenburg, six new lakes.

Coffey Creek Basin
10 4 square miles in west Mecklenburg, seven new lakes, six existing lakes

Paw Creek Basin
13.1 square miles in northwest; eight new lakes, two existing lakes

Long Creek Basin
33 7 square miles in northwest, an estimated 12 to 15 new lakes

McDowell Creek Basin
28 3 square miles in northwest, uncertain because of the pending Mountain Island Lake watershed protection plan.

Mallard Creek Basin
40 3 square miles in northeast, uncertain because study is still under way, but at least 15 new lakes likely

DRAFT

MOUNTAIN ISLAND LAKE WATERSHED PROTECTION STUDY

Prepared for

MECKLENBURG COUNTY
DEPARTMENT OF ENVIORNMENTAL PROTECTION

DRAFT

Prepared by

CH2M HILL, INC.
Charlotte, North Carolina

April 1991
ATL28586 A0 09

/89 FORM 389

MOUNTAIN ISLAND LAKE WATERSHED PROTECTION STUDY

		Page
1	Introduction	1-1
	Background	1-2
	Project Approach	1-2
	Policy and Goals Statement	1-2
2	Review and Analysis of Existing Conditions	2-1
	Watershed Description	2-1
	Water Quality Description	2-4
3	Development of a Watershed Management Model	3-1
	Watershed Flow Yield Estimates	3-1
	Watershed Flow Pollutant Distribution	3-5
	Future Development Simulation	3-6
4	Prediction and Evaluation of Future Land Use Effects on Water Quality	4-1
	Selection of Best Management Practices	4-1
	North Carolina Water Supply Protection Rules	4-4
	Effects of Future Land Uses on Water Quality	4-7
	Procedures	4-10
	Results	4-10
	Observations	4-19
5	Conclusions and Recommendations	5-1
	Evaluation of WS-II/WS-III/Northwest/Northern District Plan Combination	5-2
	Conclusions	5-4
	Technical Advisory Committee Discussion	5-11
	Recommendations	5-11

DRAFT

Page

Tables

2-1	Mountain Island Lake Watershed Soil Distribution	2-3
2-2	Mountain Island Lake Watershed Land Use Distribution	2-4
2-3	Existing Water Quality Conditions	2-5
3-1	Guidelines for Estimating CN Values for Application of Yield Curves to Mountain Island Lake Watershed	3-4
3-2	Water Quality Characteristics for Long Creek Watershed	3-5
3-3	Mountain Island Lake Pollutant Load Summary	3-7
4-1	Typical Urban Runoff Pollutant Reduction Efficiencies For Selected Control Alternatives	4-2
4-2	Summary of Water Supply Watershed Protection Rules	4-5
4-3	Mountain Island Lake Watershed Land Use Alternatives	4-9
5-1	Mountain Island Lake Watershed Land Use Alternatives	5-3

DRAFT

/89 FORM 389

MOUNTAIN ISLAND LAKE WATERSHED PROTECTION STUDY

		Page
Figures		
2-1	Mountain Island Lake Watershed and Planning Area Boundary	2-2
3-1	Watershed Yield Curves for Soil Type B	3-3
4-0	Mountain Island Lake Critical and Protected Areas	4-6
4-1	Predicted Whole Lake Total Phosphorus Annual Ambient Concentrations (ug/l)	4-11
4-2	Predicted Whole Lake Total Lead Annual Ambient Concentrations (ug/l)	4-12
4-3	Predicted Whole Lake Fecal Coliform Maximum Concentrations (mpn/100 ml)	4-13
4-4	Predicted Gar Cove Total Phosphorus Annual Ambient Concentrations (ug/l)	4-14
4-5	Predicted Gar Cove Total Lead Annual Ambient Concentrations (ug/l)	4-15
4-6	Predicted Gar Cove Fecal Coliform Maximum Concentrations (mpn/100 ml)	4-16
4-7	Northwest/Northern District Land Use Scenario	4-17
4-8	WS-II/WS-III Land Use Scenario	4-18
5-1	Predicted Whole Lake Total Phosphorus Annual Ambient Concentrations (ug/l)	5-5
5-2	Predicted Whole Lake Total Lead Annual Ambient Concentrations (ug/l)	5-2
5-3	Predicted Whole Lake Fecal Coliform Maximum Concentrations (mpn/100 ml)	5-3

DRAFT

Page

Figures (Cont'd)

5-4 Predicted Gar Cove Total Phosphorus Annual Ambient Concentrations (ug/l) 5-8

5-5 Predicted Gar Cove Total Lead Annual Ambient Concentration (ug/l) 5-9

5-6 Predicted Gar Cove Fecal Coliform Maximum Concentrations Maximum Concentrations (mpn/100 ml) 5-10

5-7 Watershed Recommended Plan 5-12

Appendixes

A Existing Conditions TM, June 4, 1990

B Watershed Protection Control Alternatives TM, August 8, 1990

C Evaluation of Future Land Use Scenarios TM, July 7, 1990

Mountain Island Lake Loading and Land Impact Analysis TM, September 28, 1990

Mountain Island Lake and Gar Creek Land Pollutant Load and Receiving Water Impacts Analysis TM, December 18, 1990

Mountain Island Lake Watershed Recommended Plan TM, February 7, 1991

DRAFT

8/89 FORM 389

no problems now ?!

so it will have to meet current drinking water quality standards, so that sets a long term target for controls.

Section 1
INTRODUCTION

BACKGROUND

Mountain Island Lake, a reservoir that was formed by damming the Catawba River, is an increasingly important regional water supply source for south-central North Carolina. It currently provides abundant, accessible, economical, and clean drinking water to Mecklenburg County and the City of Mount Holly and is expected to supply the City of Gastonia in the future. The lake also serves many other uses, including body contact recreation, fish and wildlife habitat, boating, sport fishing, thermal cooling, and domestic wastewater assimilation. Protection of this resource for current and future generations is a critical concern of Mecklenburg County and led to the initiation of the Mountain Island Lake Watershed Protection Program.

additional WQ standards because of additional uses.

Mountain Island Lake has a drainage area of 1,860 square miles. It is narrow, 20 to 30 feet deep in the main stem, and has many rocky points near the shore. The upstream boundary of Mountain Island Lake is the outlet of Lake Norman at Cowan's Ford Dam. Lake Norman's drainage area is 1,793 square miles, leaving about 67 square miles of watershed directly draining to Mountain Island Lake. However, Lake Norman's extensive watershed is outside the political jurisdiction of Mecklenburg County and therefore is outside the study area. In addition, Lake Norman is an efficient sink for many pollutants in the Mountain Island Lake watershed. The major emphasis of the program, therefore, is on controlling water quality degradation resulting from the watershed draining directly to Mountain Island Lake.

but what about its WQ impacts on the MIL system?

which is only 1/28 or only 3% of the overall drainage area!

In addition to releases from Lake Norman, inflow to Mountain Island Lake occurs through (1) surface runoff from three tributaries and adjacent land and (2) effluent from a wastewater treatment plant (WWTP). Outflow sources include raw water diversions for Mecklenburg County and Mount Holly, lake surface evaporation, shallow groundwater percolation, and outflow through Mountain Island Dam.

ok, but what is the mix? any agricultural?

The watershed of the lake is largely undeveloped and consists of low-density residential areas, however, the area, as part of the rapidly expanding Charlotte metropolitan area, faces increasing pressure from development interests. Additional pressures in the basin include initiatives to widen a state road and develop a major intersection as an enterprise/business zone.

This report summarizes the Mountain Island Lake Watershed Protection Study. The following sections include discussions of the goals for the study, existing conditions, prediction of water quality effects resulting from potential changes in land use, new

.04
1860) 67.000
4 40

8/89 FORM 389

state watershed protection regulations, management strategies and costs, and watershed protection recommendations. More detailed information is available in the technical memorandums (TMs) included in the appendixes

PROJECT APPROACH

The project approach was designed to help the County develop watershed protection strategies which may include planning, management, and technical methods for protecting the watershed. Ten basic tasks were identified to focus the work of the project

Task 1	-	Develop Work Plan and Policy Statement
Task 2	-	Conduct Project Meetings
Task 3	-	Collect and Analyze Data
Task 4	-	Evaluate Existing Conditions
Task 5	-	Evaluate Future Land Use Scenarios
Task 6	-	Identify Watershed Protection Control Alternatives
Task 7	-	Evaluate Watershed Protection Control Alternatives
Task 8	-	Evaluate Regulatory, Financial, and Institutional Requirements
Task 9	-	Prepare Final Report
Task 10	-	Advise County and Planning Staff in Preparing New or Revised Ordinance

POLICY AND GOALS STATEMENT

At the beginning of the alternatives analysis process, the Mecklenburg County Board of Commissioners established the policy and goals for the watershed protection program. The Policy and Goals Statement outlined the primary goals and objectives of the study and provided guidelines for the procedures to be followed in selecting a watershed protection alternative. The statement is reproduced here to show the foundation on which the recommended watershed protection program is based.

POLICY STATEMENT: "Mecklenburg County shall protect and preserve the water and related resources of the Mountain Island Lake watershed for the benefit of current and future residents of the region. Mecklenburg County shall establish a watershed management program for the primary purpose of providing for high quality, safe and abundant drinking water. In addition, the program shall provide for the enhancement of natural resources, recreation and economic development while promoting intergovernmental cooperation. The program shall be established to meet the Federal Clean Water Act as amended in 1987, North Carolina House Bill 156

1/89 FORM 389

"Watershed Management Act" ratified June 23, 1989 and North Carolina Administrative Code governing water supplies The program development approach is outlined in the following goals:

1. **Water Quality:** Design and establish a watershed management program which prevents further degradation of water quality and effects improvements to meet current and future water quality standards.

2. **Water Supply:** To ensure that local governments have an adequate and economical water supply to provide for future growth and sufficient influence to assure the needed supply

3 **Public Health/Safety:** To protect the users of Mountain Island Lake from exposure to waterborne disease or toxic substances resulting from foreseeable uses of the lake and its watershed.

4. **Water Supply Reclassification:** To assess the impact, desirability and feasibility of State water supply reclassification as part of the recommended watershed management program.

5. **Environmental System Resources (vegetation, wildlife):** To establish a monitoring system for the flora and fauna of the Mountain Island Lake watershed to measure the effectiveness of the implemented watershed management program.

6. **Development/Growth/Land Use:** To ensure that any development in the protected watershed is consistent with BOTH local land use policies AND the watershed management program.

7. **Economic Development:** To maintain a vibrant regional economy through protecting Mountain Island Lake as a valuable economic resource which provides abundant clean water for drinking, fire protection, industrial uses and recreation.

8. **Intergovernmental Cooperation:** To involve all local governments (i.e. Gaston and Lincoln Counties and the cities of Gastonia and Mt. Holly) in program development to insure that the outcome is a viable watershed management program.

9. **Citizen Participation:** To ensure public involvement in the development of the watershed management program by creating a Technical Advisory Committee to the Board, representative of persons affected by the Program

10 **Stormwater/Erosion/Flood Control:** To coordinate the program with current County-wide stormwater management/erosion/flood control studies to ensure compatibility and water quality maintenance

11. **Recreational:** To preserve Mountain Island Lake for recreational uses which do not degrade water quality and as a wildlife habitat providing opportunity for a natural outdoor experience.

12. **Maintenance:** To establish a plan to provide for the long-term maintenance of the watershed management program."

DRAFT

/89 FORM 389

Section 2
REVIEW AND ANALYSIS OF EXISTING CONDITIONS

One of the first major tasks for the watershed protection program was to establish existing conditions within the lake and the adjacent watershed as a baseline for projecting and comparing future conditions. The importance of the task is apparent, as changes in any inflow, outflow, or water quality characteristics of the lake could impact one or more of its many uses. A TM was published on June 4, 1990 to document the information collected and analysis performed toward that purpose. A copy of the TM is included in Appendix A. Do need this.

WATERSHED DESCRIPTION

Figure 2-1 depicts Mountain Island Lake and its watershed, which was defined as the area draining to the lake below Lake Norman and above Mountain Island Dam, as represented on 1:24,000 topographic maps from the U.S. Geological Survey (USGS). The land adjacent to the lake is gently rolling, and the drainage boundaries consist mainly of major roads. The overall watershed boundary represents the limits of the current study area encompassed by the watershed protection program; this area totals about 68.07 square miles, of which the surface area of the lake accounts for about 5.05 square miles (U.S. EPA, 1975) and the watershed about 63.02 square miles.

Three major tributaries drain into the Catawba River at Mountain Island Lake: Johnson Creek, McDowell Creek, and Gar Creek. Other sources of inflow to the lake include discharges from Lake Norman through Cowans Ford Dam, runoff from two adjacent tributary land, effluent from the WWTP on McDowell Creek, and direct rainfall. Lake outflows include raw water diversions for Mecklenburg County and the City of Mount Holly, lake surface evaporation, and discharges to the Catawba River through Mountain Island Dam. Although all sources are potentially important, the vast majority of lake inflows and outflows are accounted for by discharges from Cowans Ford Dam and Mountain Island Dam, respectively.

Local watershed hydrology is influenced to a great extent by the type and distribution of soils. Soil series within the planning area were identified from detailed soil surveys and general soil maps obtained from the Soil Conservation Service (SCS) for Mecklenburg, Lincoln, and Gaston Counties. Each soil series was then placed in one of four SCS hydrologic soil groups--A, B, C, and D--that correspond to decreasing water transmission/infiltration rates (i.e., group A soils have the lowest runoff potential and group D soils the highest). Soil group C was further divided into C1 and C2 soils based on erosion potential (higher for C2).

/89 FORM 389

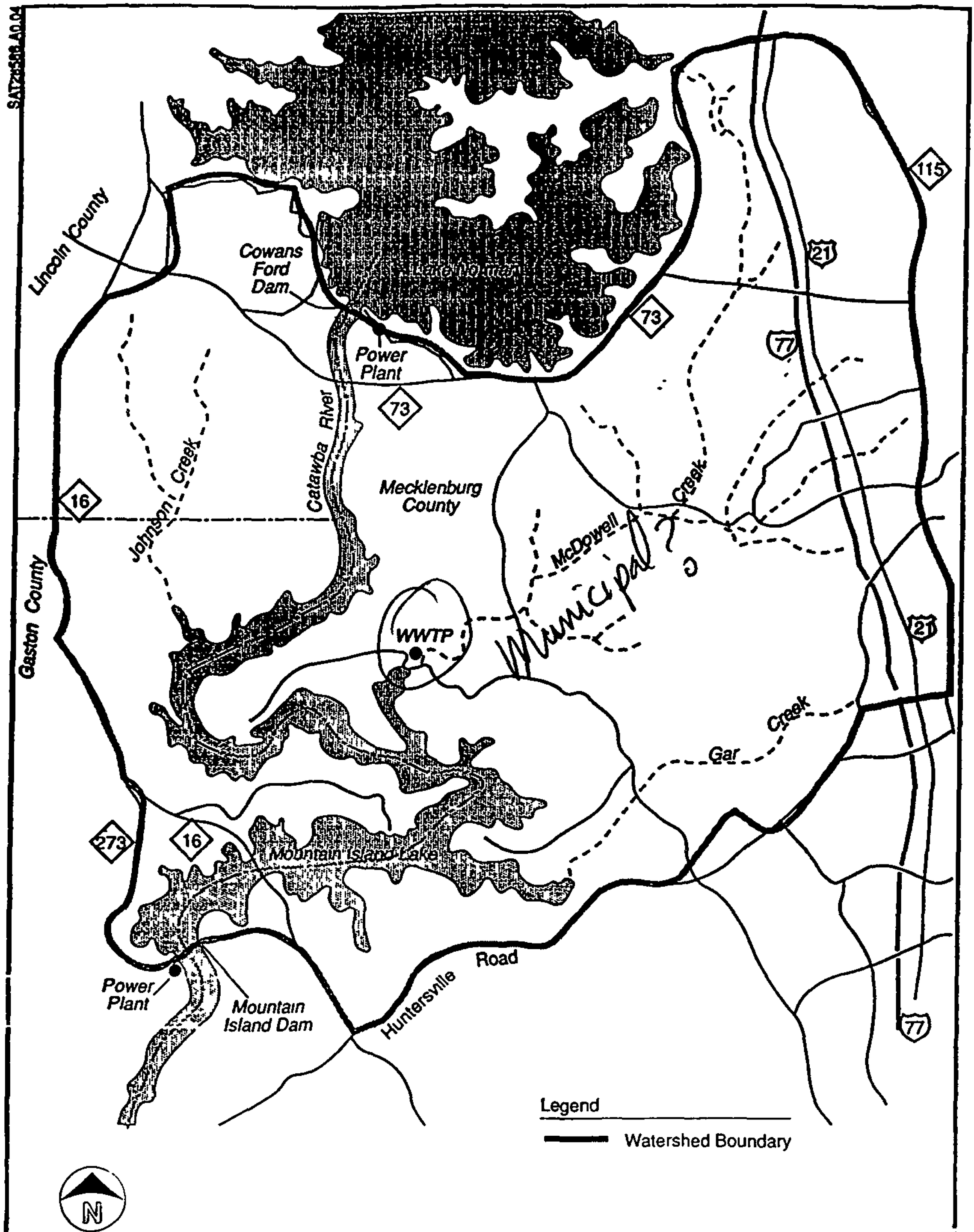


FIGURE 2-1.
Mountain Island Lake Watershed and Planning Area Boundary.

The acreage associated with each group is shown in Table 2-1 for each of the main tributary subbasins within the watershed as well as the total study area; the percent of total area represented by each soil group is also shown Hydrologic soil group B accounts for the largest portion of study area soils (nearly 60 percent). The rest of the soils belong mainly to groups C1 and C2, and the high erosion potential soils in group C2 are found over nearly 24 percent of the study area. There are no group A soils within the study area and very few group D soils

Table 2-1
MOUNTAIN ISLAND LAKE WATERSHED SOIL DISTRIBUTION

Hydrologic Soil Group	Area (acres) Johnson Creek	McDowell Creek	Gar Creek	Adjacent Land	Total	Percent of Total Area
B	2,302	11,374	1,697	8,198	23,571	58.4
C1	1,885	1,783	158	2,255	6,081	15.1
C2	191	5,059	2,102	2,254	9,606	23.8
D	58	342	16	254	670	1.7
Other	2	33	29	338	402	1.0
Subbasin Total (acres)	4,438	18,591	4,002	13,299	40,330	100.0
Subbasin Total (sq miles)	6.93	29 05	6.25	20.78	63 02	
Percent of Total Area	11.0	46 1	9.9	33 0	100 0	

good soils

high erosion potential - find out if these soils have agriculture on them!

DRAFT

An additional point relevant to watershed soils is the shallowness of the pervious components of the profile. Throughout the watershed, restrictive layers of clay or bedrock are generally found at depths of less than 5 feet. This condition would be expected to enhance the contribution of infiltrated water to lake inflows, as deep percolation would be essentially nonexistent. good for WQ of the lake, lots of water infiltrat.

so this watershed currently sheds alot of rainfall via runoff.

Another critical factor in characterizing existing conditions and evaluating the impacts of future development is land use. The categories of land uses currently found within the Mountain Island Lake watershed include commercial/industrial, low density residential (a minimum of about 1 acre per dwelling), high density residential, forested land, and open land. The last category encompasses open fields, pastures, cultivated fields, other

189 FORM 389

why lump agriculture in with other things? what is it?

agricultural land, and power and pipeline rights-of-way. The watershed area associated with each land use is shown in Table 2-2.

Table 2-2
MOUNTAIN ISLAND LAKE WATERSHED LAND USE DISTRIBUTION

Hydrologic Soil Group	Area (acres) Johnson Creek	McDowell Creek	Gar Creek	Adjacent Land	Total	Percent of Total Area
Forested Land	3,159	9,138	2,457	7,506	22,260	55.2
Open Land	669	7,642	978	4,524	13,813	34.2
Low Density Residential	610	1,229	534	1,027	3,400	8.4
High Density Residential	0	367	34	0	401	1.0
Commercial/ Industrial	0	215	0	242	457	1.2
Total	4,438	18,591	4,003	13,299	40,331	100.0

only 10% so urbanized.

DRAFT

WATER QUALITY DESCRIPTION

Many information sources were consulted in reviewing and analyzing existing conditions, and the most recent data applicable to locations within or adjacent to the Mountain Island Lake watershed were used as much as possible. When necessary, local data were supplemented with regional and national information. In addition, computer modeling was used to enhance the understanding of local watershed hydrology and to estimate average annual watershed yields.

Several agencies conduct water quality monitoring programs at various stations in Mountain Island Lake. Measurements from several observation stations were available for the following water quality parameters: dissolved oxygen (DO), biochemical oxygen demand (BOD), pH, turbidity, alkalinity, hardness, total phosphorus, total lead, and fecal coliform. No stations reported on all the parameters at all times of the year. The values and dates for the available measurements were entered into a computer spreadsheet for each observation station, and monthly and annual mean values were calculated for each parameter at each location The result was a water quality summary table for each station The data in these tables allow a fairly complete lakewide analysis of several parameters, including DO, total phosphorus, and turbidity

8/89 FORM 389

In general, Mountain Island Lake exhibits excellent water quality, as demonstrated by a high DO content and low levels of phosphorus, turbidity, fecal coliform, and lead. The existing water quality conditions for the lake are shown in Table 2-3. Information on biological communities supports this characterization, these communities are generally representative of a mesotrophic Piedmont lake system. The fish community is a mix of endemic species and introduced gamefish typical of a relatively clean Piedmont lake.

Table 2-3
EXISTING WATER QUALITY CONDITIONS
MOUNTAIN ISLAND LAKE - ALL STATIONS

Parameters	Units	Applicable NC Criterion	Overall Average	Extreme Monthly Value
DO	mg/l	4 - 5*	8	4.8*
Turbidity	NTU	25	14	51
F. Coliforms	#/100 ml	200	17	197
Lead	ug/l	25	<DL	2
Temperature	Celcius	32	18	30
Hardness	mg/l	100	12	15
pH	--	6 - 9	7	6 - 10

*Except for bottom waters.

cool!

DRAFT

MUST have separate info., detailed info, for Lake Norman input to be even remotely accurate or credible. where is it?

yes, this is good quality

8/89 FORM 389

Section 3
DEVELOPMENT OF A WATERSHED MANAGEMENT MODEL

The major objective of the project was to predict and assess the impact of pollutant loads on Mountain Island Lake associated with various development alternatives. A model to predict watershed yields and associated pollutant concentrations resulting from the development scenarios was created. A detailed discussion of the model development is presented in the Existing Conditions TM in Appendix A. I need this.

WATERSHED FLOW YIELD ESTIMATES

The importance of soils and land uses to understanding the hydrologic system of the Mountain Island Lake watershed is related to their effect on inflows to the lake. This is manifested by the amount of surface runoff and subsurface flow to the lake attributable to precipitation as it encounters various combinations of soils and land use. Yields from these nonpoint inflow sources can be estimated by comparing soil and land use characteristics to reliable, long-term flow data for tributary systems of the watershed.

Streamflow records were not available for the tributaries to Mountain Island Lake but were available for Long Creek, which lies adjacent to the study area and should, therefore, exhibit similar hydrologic conditions. An analysis of Long Creek data generated input for a hydrologic simulation model that produced yield curves applicable to the study area.

Get Jim to critique CREAMS for this study

The continuous hydrologic simulation component of CREAMS (a field-scale model for Chemicals, Runoff, and Erosion from Agricultural Management Systems) was used to develop yield curves from the Long Creek data that could be applied to the Mountain Island Lake watershed. CREAMS, developed by the U.S. Agricultural Research Service for the SCS (1984), uses daily rainfall data and soil profile characteristics to compute a long-term continuous water budget for the modeled watershed. Daily rainfall is divided into surface runoff and soil infiltration components, soil moisture is divided into evapotranspiration and deep infiltration. For the Mountain Island Lake watershed, deep infiltration equates to interflow/baseflow in the local soil profile, where decreasing permeability with depth essentially precludes deep infiltration.

The CREAMS model was used to generate a 3-year sequence of surface runoff and interflow/baseflow Input to the model included the daily rainfall array for 1983 through 1985 for Charlotte Airport, the soil characteristics for each hydrologic soil

39 FORM 389

group within the Long Creek watershed, and the various land use/soil type combinations occurring within the watershed. Land use and soil group data were generated by a Geographic Information System (GIS) data base. Representative SCS curve number (CN) values were calculated for each land use/soil group combination based on published SCS guidance.

which ones?

Model parameters were varied until the simulated total annual watershed yield agreed with the measured yield at the stream gaging station and the split between surface runoff and interflow/baseflow agreed with the observed 60/40 percent distribution. This process continued until the model was calibrated.

Simulations were run with varying CN values to evaluate the effect of changes in land use on watershed yields. The hydrologic simulation, produces curves that define annual watershed yield as a function of the land use for each soil group, as shown in Figure 3-1 for soil type B. Three curves are presented in the figure; one each for the surface runoff and interflow/baseflow components and one for the total yield.

The yield curves illustrate an important trend. As the degree of development (CN value) increases and less rainwater is able to enter the soil matrix, the interflow/baseflow component of watershed yield decreases significantly and surface runoff increases. The result is greater pollutant transport potential and higher total watershed yields, although the latter increase is less than might be expected because of the importance of interflow/baseflow to local streamflow.

To apply the yield curves to the Mountain Island Lake watershed, land use/soil group combinations were developed from the GIS data base for each subbasin within the study area. CN values were assigned to each combination using the guidelines in Table 3-1, which includes base values (taken from SCS guidance) representative of the major land cover classifications (forested, open, and impervious) and calculated values obtained by applying an impervious fraction to forested and open land. The values shown in Table 3-1 are application-specific and, like the watershed yield curves, are appropriate only for evaluation of the Mountain Island Lake watershed; that is, the CN values given in Table 3-1 were used to derive the yield curves and must be used when applying the curves.

8/89 FORM 389

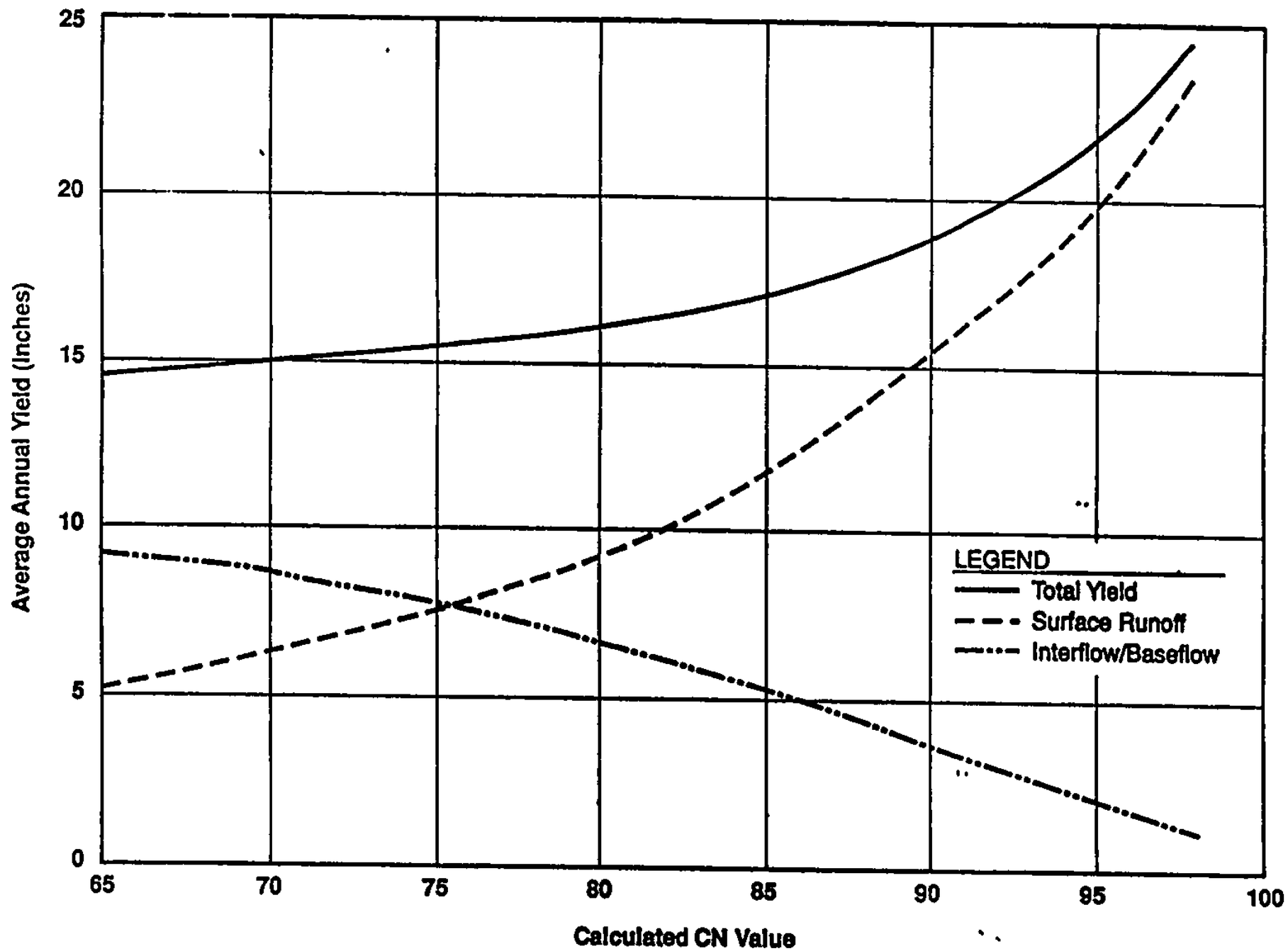


FIGURE 3-1.
Watershed Yield Curves for Soil Type B.

CH2MHILL

TABLE 3-1
GUIDELINES FOR ESTIMATING CN VALUES FOR APPLICATION OF YIELD CURVES TO MOUNTAIN ISLAND LAKE WATERSHED

1. Base Values		CN Value by Soil Type		
Land Cover		B	C	D
Forested		66	78	83
Open		79	86	89
Impervious		98	98	98

2. Composite Values for Low-Density Residential Land Use on Forested Lands				
Development Density	Imperv. (%)	CN Value by Soil Type		
		B	C	D
1 house/5 acres	4	67	79	84
2 houses/5 acres	7	68	79	84
1 house/acre	12	70	80	85

3. Composite Values for All Development on Open Land				
Land Use	Imperv. (%)	CN Value by Soil Type		
		B	C	D
Residential				
1 house/5 acres	4	80	86	89
2 houses/5 acres	7	80	87	90
1 house/acre	12	81	87	90
2 houses/acre	19	83	88	91
5 houses/acre	40	87	91	93
Industrial	70	92	94	95
Commercial/ Business	85	95	96	97

DRAFT

Application of the calculated CN values for the study area to the yield curves produced estimates of average annual flow yields for each subbasin under existing conditions. All the subbasins demonstrate similar average total yields of 15.0 to 15.4 inches per year, about 34 percent of the total rainfall. Of the total yield, approximately 45 percent is interflow/baseflow; higher than for the Long Creek watershed because the study area is less developed.

3/89 FORM 389

WATERSHED FLOW POLLUTANT DISTRIBUTION

To gain some insight into the distribution of pollutants between the components of watershed flow, water quality data were obtained for the same gaging station that provided streamflow records for Long Creek. Water quality monitoring began in January 1985 by the State of North Carolina and has been conducted monthly since then, the data are available through the U.S. EPA's STORET water quality data base.

So there is no observed storm runoff quality data.

The portions of annual streamflow attributable to surface runoff (60 percent) and interflow/baseflow (40 percent) were previously estimated. On many days when both water quality samples and flow measurements were taken at the gaging station, the only streamflow component observed was interflow/baseflow. Therefore, water quality characteristics for that component were computed directly from the data. The long-term flow-weighted average concentration of each water quality constituent, the interflow/baseflow concentration of that constituent, and the long-term split between interflow/baseflow and surface runoff were then used directly to estimate the constituent concentration for surface runoff. The results of the joint streamflow/water quality data analysis are presented in Table 3-2.

this is pure bullshit! talk about throwing your answer and then fudging the system to help you predict your answer!

TABLE 3-2
WATER QUALITY CHARACTERISTICS FOR LONG CREEK WATERSHED

Parameter	Value	
	Surface Runoff	Interflow/Baseflow
BOD, mg/l	2.3	1.0
pH	6.7	7.2
Turbidity, NTU	150	11
Total phosphorus, mg/l	0.25	0.17
Alkalinity, mg/l	14	64
Hardness as $CaCO_3$, mg/l	30	67
Fecal coliform, MPN/100 ml	3,000	140

The values reported in Table 3-2 support the conclusion that the water quality of surface runoff is substantially different from that of the filtered interflow/baseflow. The BOD concentration in surface runoff is more than twice as high as in the interflow/baseflow component, while turbidity and fecal coliform are more than an order of magnitude greater. Surface runoff is also slightly more acidic than the interflow/baseflow, and phosphorus concentrations are higher

there is no way this is accurate!

8/89 FORM 389

The water quality characteristics of the two components of watershed flow are critical to the development of a watershed protection program, as increases in development will increase surface runoff and its associated pollutants and will reduce interflow/ baseflow

FUTURE DEVELOPMENT SIMULATION

Existing conditions of the watershed were established and yield curves were developed based on soil type and land use. Also, pollutant concentrations for surface runoff and interflow/baseflow streamflow components were established for BOD, total phosphorus, pH, turbidity, alkalinity, hardness, and fecal coliform. The remaining task was to use this information to compute loading rates to the lake and to predict associated lake water quality response to various future development scenarios.

Table 3-1 was used to establish CNs for a proposed development density scenario. Yield curves, such as that shown on Figure 3-1, were then be used to determine the surface runoff and interflow/baseflow yields associated with each development density. If pollutant concentrations were known, annual pollutant loading rates could be estimated.

Concentrations of pollutants, as well as the increase in concentrations associated with increasing development, were determined by using regression equations based on results of the National Urban Runoff Program (NURP). NURP was developed as a result of the Clean Water Act of 1977 to assess the nature and causes of urban runoff and its effects on surface water and groundwater. The USGS and the U.S. EPA, in cooperation with state and local governments, conducted the program to collect and analyze storm rainfall, runoff, and water quality data in numerous cities throughout the U.S.

Driver et al. (1988) developed four sets of linear regression models for estimating storm runoff constituent loads, storm runoff volumes, storm runoff mean concentrations of constituents, and mean seasonal constituent loads from physical, land use, and climatic characteristics of urban watersheds in the U.S. The regression equations, based on NURP data, use the following parameters to predict concentrations of various pollutants: total storm rainfall; drainage area, percent of impervious, industrial, commercial, residential, and non-urban area; mean annual rainfall; mean January temperature; and the 2-year, 24-hour rainfall intensity. With this method, loads increase as a functin of hydrology and as a functin of increasing concentrations associated with develoment. These regression equations were used to predict mean pollutant concentrations in each subbasin. Table 3-3 shows pollutant load summaries calculated from pollutant concentrations that increase with development

this whole line of thinking is so very bogus that it's ridiculous — NO, you don't do it this way. You take your current mix of LU's and predict, or measure the current quality. Then you

8/89 FORM 389

Table 3-3
Mountain Island Lake Pollutant Load Summary
Concentrations Varied With Increasing Development

Pollutant	Existing Conditions (No Growth)			Low-Density Development				High-Density Development			
	Surface Runoff Conc	Base Flow Component Conc.	Watershed Load (pounds/year)	Surface Runoff Conc.	Base Flow Component Conc.	Watershed Load (pounds/year*)	*Factor Increase*	Surface Runoff Conc.	Base Flow Component Conc.	Watershed Load (pounds/year*)	*Factor Increase*
BOD(mg/l)	2.3	1	2.41E+05	5.3	1	5.94E+05	2.46	8.5	1	1.07E+06	4.44
TP(mg/l)	0.25	0.17	3.01E+04	0.28	0.17	3.70E+04	1.23	0.42	0.17	5.74E+04	1.91
FC(mpn/100 ml)	3000	140	1.09E+15	3000	140	1.43E+15	1.31	3000	140	1.67E+15	1.53
SS(mg/l)	240	-	1.86E+07	250	-	2.57E+07	1.38	410	-	4.95E+07	2.66
Pb/(ug/l	230	-	1.78E+04	310		3.18E+04	1.79	400		4.83E+04	2.71
ALK(mg/l)	14	64	5.13E+06	14	64	4.55E+06	0.89	14	64	4.21E+06	0.82
HARD(mg/l)	30	67	6.55E+06	30	67	6.33E+06	0.97	30	67	6.26E+06	0.96
COD(mg/l)	30		2.32E+06	31		3.18E+06	1.37	41		4.95E+06	2.13
Zn(ug/l)	120		9.29E+03	100		1.03E+04	1.11	110		1.33E+04	1.43
TN(mg/l)	0.89		6.89E+04	0.93	-	9.53E+04	1.39	0.96		1.16E+05	1.68
Cu(ug/l)	14		1.08E+03	14	-	1.44E+03	1.33	20		2.41E+03	2.23

Table gives proposed mini-all of the land uses - and do the same thing. - that you see: loads, from the total way

1. the total all uses

2. the percent's by each use. did was

then development loads only

Here what look at

to only

Well sure, it demonstrates help

at increasing sure as increasing development to show increasing loads. But

an going that's obvious. now

loads urban area is

the total mix, and

10% of increase by a factor of

it's still only 2.9 of

the total pollutant load to the lake!!!

1 WECK/01861

Section 4
PREDICTION AND EVALUATION OF FUTURE LAND USE EFFECTS ON WATER QUALITY

it hasn't done all the existing uses yet, to see what % development is

The watershed management model was used to predict pollutant concentrations from potential future land uses within the watershed. Empirical models were then used to predict water quality impacts on Mountain Island Lake for three categories of degradation: nutrient, bacteriological, and toxicant. Specific pollutants were selected to represent the degree of degradation resulting in each category. The selected constituents were: total phosphorus and total nitrogen, representing nutrients, fecal coliform, representing bacteria, and lead, representing toxicants. The analysis also applied removal efficiencies for selected structural Best Management Practices (BMPs) to the generated pollutant loads to assess their mitigating effects. Based on this analysis water quality impacts on Mountain Island Lake resulting from nonpoint runoff from various watershed development scenarios were compared.

SELECTION OF BEST MANAGEMENT PRACTICES

During the late 1970s a series of structural BMPs were developed to mitigate the adverse impact on receiving water quality water resulting from urbanization within their watersheds. BMPs are designed to reduce pollutant concentrations during storms and thereby improve the quantity of stormwater runoff delivered to receiving waters.

The Watershed Protection Control Alternatives TM dated August 8, 1990 (Appendix B) included descriptions and schematics of grassed swales, filter strips, porous pavement, infiltration basins, infiltration trenches, wet ponds, extended detention ponds, and water quality inlets, along with discussions of their advantages, disadvantages, and applicability. Table 4-1 shows the pollutant reduction efficiencies assumed for each BMP based on literature values.

need this.

DRAFT

/89 FORM 389

Table 4-1
TYPICAL URBAN RUNOFF POLLUTANT REDUCTION EFFICIENCIES FOR SELECTED CONTROL ALTERNATIVES

	Removal Efficiency %				
CONTROL ALTERNATIVE	**Suspended Solids**	**Total Phosphorus**	**Total Nitrogen**	**Copper**	**Fecal Coliform**
Wet Ponds					
-- 0.5 % Surface Area (1)	80-85	50-55	35-40	35-40	95
-- 1.0% Surface Area (1)	90-95	60-65	40-45	40-45	99
Dry Detention Ponds	60-70	10	20	30-35	90
Filter Strips	40	15	15	30	na
Grass Swales	40	15	15	30	na
Infiltration Devices (2)	50-95	75	50-75	50-95	75-95
Water Quality Inlets	20	negligible	negligible	negligible	negligible

1. Surface area of pond as percentage of drainage area served.

2. Infiltration devices include: infiltration basins, infiltration trenches, and porous pavement. These devices effectively capture all surface runoff intercepted. A portion of the infiltrated surface runoff becomes interflow/baseflow.

The infiltration BMPs, which include porous pavement, infiltration basins (dry detention ponds), and infiltration trenches would not be practical because of the low infiltration rates of the soils present in the watershed. Therefore, they were not considered as mitigation measures in the analysis of potential future land use impacts on water quality. Also, water quality inlets have such a low removal efficiency that they were not included in the analysis. The BMPs that appear most appropriate include wet ponds, including extended detention ponds, grassed swales, and natural buffers (filter strips).

Often wet ponds are applied on a regional basis rather than a site-specific basis. These ponds, referred to as regional ponds, have construction, operation, and maintenance cost advantages over numerous site-specific wet ponds. Because of their size, siting regional ponds is often difficult, particularly with regard to minimizing impacts on wetlands

/89 FORM 389

too high - we need to counter this with real numbers. How many projects might be built in the next 10-15 years? How many were built in the last 10 yrs?

The estimated construction cost for wet ponds is $1,000 to $2,000 per acre served, with an annual operation and maintenance (O&M) cost of 3-5 percent of the base construction cost of the wet ponds. These costs are based on estimating methodology presented in "Controlling Urban Runoff A Practical Manual For Planning and Designing Urban BMPs" prepared by the Metropolitan Washington Council of Government in 1987 (MWCOG, 1987). Assuming that a regional pond can serve a drainage area of 200 acres and that the entire 40,000-acre watershed at build-out is served by regional ponds, 200 ponds would be required. If the entire watershed were served by onsite wet ponds, then 2,000 ponds would be required. Probably many less than 200 regional ponds can be sited in the watershed, therefore onsite ponds would be a necessary BMP for much of the watershed. At build-out, the total cost of constructing regional onsite ponds could approach $80 million in 1991 dollars, with an annual O&M cost as high as $4 million.

Grassed swales and filter strips can be included in a development as a design feature. Construction costs for a grass swale range from $5 to $9 per linear foot (MWCOG, 1987). The cost of establishing filter strips is relatively low, particularly if existing vegetation is incorporated into the design as filter strips.

The construction of BMPs is generally the responsibility of the developer, with O&M the responsibility of the development owner -- as in the case of an office park or neighborhood association for a subdivision. In some cases, a government body may take responsibility for developing and administering BMP design standards and O&M of BMPs. Administering a program involving design review, inspection, operation, and maintenance of BMPs for a watershed will have a program cost the magnitude of which will depend on the level of services provided.

yes, but its also an illegal taking of private property?!

Land use controls generally involve neither the capital cost nor the risk associated with structural BMPs. For example, there is no cost of constructing or maintaining BMPs associated with land use controls, whereas the cost of BMPs can be substantial, as previously discussed. The major disadvantage of land use controls are the potential tax base reductions. no small matter, except to people who own nothing like these guys!

High density development relying upon BMPs to control pollutant introduction into water supply sources generates considerably more stormwater pollutant loadings than a watershed relying upon land use controls. The data base on removal efficiency of structural BMPs is relatively small. Thus there is some uncertainty about their effectiveness, which introduces a level of risk in relying on BMPs for watershed protection. Undeveloped land, particularly land that is predominantly in forest, produces considerably less stormwater pollution than urbanizing land.

A watershed protection program which relies strictly on BMPs is essentially irreversible. As urbanization takes place, land values escalate and there is increased pressure on further development This pressure generally results in more dense

4-3 but is this "some uncertainty" worth the severe economic impacts? the Co. Commissioners must be shown this!

8/89 FORM 389

This is clearly many take thinking by pointed headed bureaucrats and their consultants who have no practical appreciation for business, economic development, or private property rights.

development, hence the production of larger quantities of pollutants which have to be treated by the BMPs. If the BMPs do not effectively remove the increasing quantities of pollution from the urbanized watershed as a result of inadequate maintenance or some other reason, there is little opportunity to impose land use controls at that point. On the other hand, a more conservative approach relying on land use controls in the beginning and then careful implementation of BMPs on a case-by-case basis would allow planners to benefit from improvements in BMP technology resulting from an increase in their effectiveness data base.

NORTH CAROLINA WATER SUPPLY PROTECTION RULES

In December 1990 the North Carolina Environmental Management Commission (EMC) adopted minimum watershed protection rules for all water supplies in the state. Table 4-2 summarizes these rules. House Bill (HB) 156 (Water Supply Watershed Protection Act) required the adoption of these rules by January 1, 1991 and called for existing surface-water supplies to be classified according to the adopted rules by January 1, 1992. In addition the act called for local governments with jurisdiction in water supply watersheds to adopt local watershed protection programs and ordinances at least as stringent as the State rules by July 1, 1992.

The rules require establishment of a critical area of at least one mile around all intake locations and reservoirs where intakes are located. Local governments may extend this critical area beyond the one-mile minimum as they judge appropriate. The protected area of a WS-IV water supply is the land extending 5 miles from and draining to water supply reservoirs (measured from normal pool elevation) or 10 miles from and draining to a river or stream intake. The watershed ridge line is the outer boundary of the protected area in those cases where the 5- or 10-mile boundary extends beyond the ridge line. The size of the protected area of a WS-IV water supply are minimum requirements and local governments may extend these boundaries as appropriate. For WS-I, II, and III water supplies, the entire watershed is within the protected area. A buffer size of at least 100 feet for all perennial waters in water supply critical, protected, and watershed areas is also required by the new rules. The buffer is to be measured landward from the normal pool elevation of impoundments and from the banks of free-flowing streams or rivers. The preferred practice will be to maintain natural areas within the buffer; the revised rules allow for natural or vegetative cover. Natural rather than planted vegetative cover should be maintained in at least the first 25 feet of the buffer area directly adjacent to the surface waters. The location of the critical and protected areas within the Mountain Island Lake Watershed is shown in Figure 4-0.

who says?! that was supposed to be the way watersheds were classified!!

A few non-conforming activities within a watershed will not prohibit a watershed from obtaining a higher classification. The rules state that ~~minor non-~~conforming existing activities will be ~~reviewed~~ to assess their impacts. If these impacts are found to be insignificant they would not preclude a higher classification. The rules establish

how? This should be shown?! I'll be we can show more pollution from the WWTP than the 10% urban land in the watershed!

/89 FORM 389

TABLE 4-2

SUMMARY OF PROPOSED WATER SUPPLY WATERSHED PROTECTION RULES

Proposed Classification		Dischargers	Land Use Description	Allowable Density W/O Stormwater, Low Den. Opt	Allowable Density W/Stormwater, High Den. Opt	Required Control with High Den Opt	Non-residen Development	Sludge Appl.	Landfills	Hazardous Materials
WS I	Watershed	None	Uninhabited undeveloped	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WS II	Critical area	Only existing discharges qualifying for General Permit (.0127)	Predominantly undeveloped	1du/2ac 6% built upon	Not Allowed	N/A	No new industrial	No new sites	No new landfills	Inventory, spill/failure
	Watershed			1du/2ac 6% built upon	Allowed - as added protection	N/A	10% of the watershed, max 70% built-upon	Allowed	No new discharging landfills	Inventory, spill/failure
WS III	Critical area	No new	Low to mod. developed	1du/2ac 6% built upon	6-30% built upon area	Control the 1" storm	No new industrial	No new sites	No new landfills	Inventory, spill/failure
	Watershed	Domestic & non-process		1du/1ac 12% built upon	12-30% built upon area	Control the 1" storm	10% of the watershed, max. 70% built-upon	Allowed	No new discharging landfills	Inventory, spill/failure
WS IV	Critical area	Domestic no new ind.	Moderate to highly devel.	1du/1ac 12% built upon	12-30% built upon area	Control the 1" storm	Allowed	No new sites	No new landfills	Inventory, spill/failure
	Protected area	Domestic & industrial		2du/1ac 24% built upon	24-70% built upon area	Control the 1" storm	Allowed	Allowed	Allowed	Inventory, spill/failure

Note
- Local ordinances and nonpoint source management plan required in water supply watersheds and protected areas.
- Critical area is 1 mile and draining to water supplies from the normal pool elevation of reservoirs, or 1 mile and draining to a river intake.
- Proposed protected area is approximately 5 miles and draining to water supplies from the normal pool elevation of reservoirs, or 10 miles and draining to a river intake.
- Municipal with pretreatment program (2H .0904) is considered industrial discharge
- Discharges qualifying for a General Permit pursuant to 2H .0127 will also be allowed in all areas of WS-III and WS-IV watersheds along with the allowed discharges noted in the table. Also, new swimming pool filter backwashes are allowed pursuant to 2H .0131 are allowed in WS-II watersheds.
- Buffers will be maintained around all perennial waters (solid blue lines on USGS 7.5 topo map) with a minimum with a minimum width of 100 feet. It is recommended that the first 25 feet of the buffer remain as natural vegetation.
- Groundwater remediation discharges may be allowed when no other practicable alternative exists.
- Local governments will assume ultimate responsibility for operation and maintenance of stormwater controls.

SUMMARY OF PROPOSED WATER SUPPLY WATERSHED PROTECTION RULES (Continued)

Proposed Classification		Cluster	Sewer Lines	Agriculture BMPs	Forestry BMPs	Trans. BMPs
WS-I	Watershed	N/A	N/A	Required if ACSP funds available	Required *	Recommended
WS-II	Critical area	Allow	Allow	Encouraged	Required *	Recommended
	Watershed	Allow	Allow	Encouraged	Required *	Recommended
WS-III	Critical area	Allow	Allow	Encouraged	Required *	Recommended
	Watershed	Allow	Allow	Encouraged	Required *	Recommended
WS-IV	Critical area	Allow	Allow	Encouraged	Required *	Recommended
	Protected area	Allow	Allow	Encouraged	Required *	Recommended

* as per 1J .0101-.0209

what bullshit! you can have 80% of your area (or 55% or so as you have here) that produces far higher TSS nutrient and Ag. Chemical loads to the lake — far more than 10% urban land ever would! and the law only "encourages" them to consider thinking about some form of storm pollution control! Bullshit.

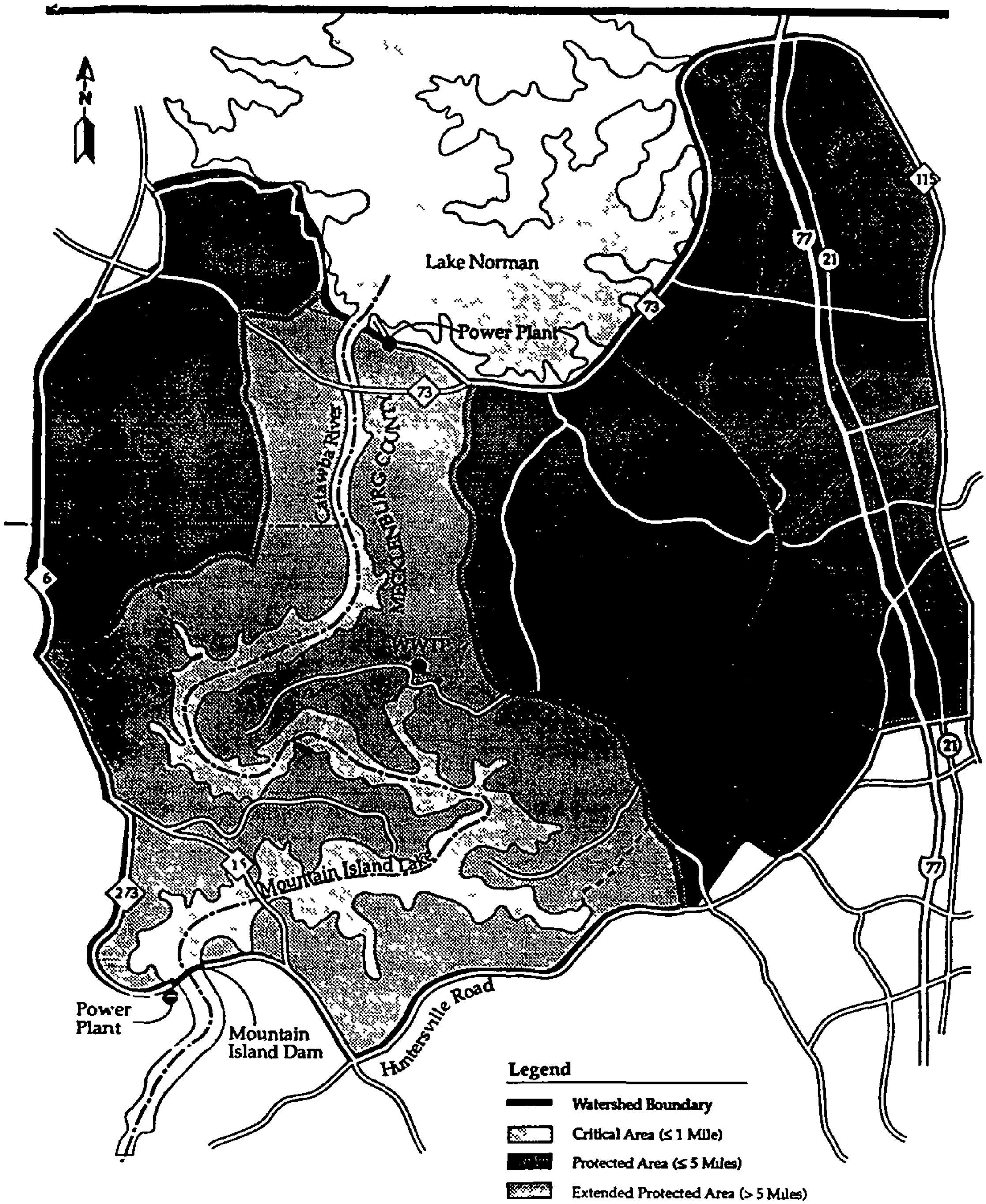


Figure 4-0
Mountain Island Lake Critical and Protected Area According to WS IV Water Supply Classification

CH2MHILL

ATL28586.A0

minimum requirements that must be met but local governments have the option of adopting and enforcing more stringent controls. The rules also allow sewer lines throughout WS-II, WS-III, and WS-IV watersheds.

The rules allow clustering in all areas of WS-II, WS-III, and WS-IV watersheds, including the critical area. Clustered development would be placed in the upper portion of the project away from surface waters to provide some protection from stormwater runoff impacts on water quality due to these developed areas. The remaining portion of the clustered project must remain in a vegetative or natural state.

The rules address the use of higher water supply (WS) classifications to protect lower classified WS waters so that this additional protection could be provided in any areas of a watershed, not just in critical areas Where multiple jurisdictions are involved, all local governments must be involved and willing to support the request before it will be considered by the EMC.

EFFECTS OF FUTURE LAND USE ON WATER QUALITY

Impacts on water quality from pollutant loads for five land use scenarios within the watershed were calculated and compared. The analysis also applied removal efficiencies for the BMPs (wet ponds, grass swales, and filter strips) judged most appropriate for use in the Mountain Island Lake watershed. A detailed description of this analysis is contained in TMs prepared on July 7, 1990, September 28, 1990, December 18, 1990, and February 7, 1991. These TMs are included in Appendix C.

The analysis was performed for one no-growth alternative (referred to as "existing conditions") and four land use/development density alternatives: low density development, high density development, Northwest/Northern plan, and WS-II/WS-III combination. The watershed was subdivided into three site-specific zones: buffer, critical, and protected, based on each area's potential for contributing nonpoint source pollution to the lake. The proposed distribution of future land uses within the critical and protected areas of the watershed is unique for each alternative. Therefore, the watershed yields and constituent runoff concentrations for each future land use alternative vary slightly. Also specific to each alternative is the strategy for controlling nonpoint source runoff through BMPs.

The analysis assumed a 100- to 200-foot buffer zone and a 1-mile critical area around the lake. The 1-mile area is hydrologic (i.e., the hydrologic travel distance from the point of rainfall deposition to the lake is 1 mile or less). The receiving water analysis is performed for the lake as a whole. Gar Creek Cove is examined separately because of its proximity to the Charlotte-Mecklenburg Utility District (CMUD) water supply intake. The analysis also applied BMP removal efficiencies to the generated pollutant loads to assess the mitigating effects of the BMPs

'89 FORM 389

This is incredible, absolutely incredible — they are only looking at various densities of urbanization and they're saying that higher urbanization gives higher loads.

The five alternatives (described below) represent different land use and impervious area options. The four development alternatives are summarized in Table 4-3. Each alternative assumes that existing development will remain and open/forested land will be developed according to a prescribed plan.

GREAT!

EXISTING CONDITIONS (NO-GROWTH SCENARIO)

Someone paid for this? and this has absolutely nothing to do with the

Orthophotoquad and topographic maps were used to ascertain existing land uses and development densities. The composite impervious area for existing conditions in the watershed was found to be 8 percent. The existing conditions alternative is considered because it represents a no-growth scenario.

total load to the lake, from all land uses and the

LOW DENSITY DEVELOPMENT

This alternative is based on the proposed North Carolina WS-IV water supply watershed protection classification, which assumes low density development with no structural BMPs. Development density would be 1 house/acre in the critical area and 2 houses/acre in the protected area. The composite impervious area for this alternative would be 16 percent. BMPs would consist of filter strips and grassed swales.

supply Lake (Lake Norman) of course higher densities of urban land use will cause higher loads. And of course they will be only dealing with 3/10's of 1 percent of the total area!!

HIGH DENSITY DEVELOPMENT

This alternative is based on the proposed WS-IV classification, which assumes high density development that would be served by structural BMPs (i.e., wet ponds). Future development would consist of 4 houses/acre in the critical area and a 9-to-1 mix of residential (at 4 houses/acre) and industrial development in the protected area. The composite impervious area would be 32 percent. BMPs would consist of wet ponds.

NORTHWEST/NORTHERN PLAN

This alternative is based on the Charlotte-Mecklenburg Planning Commission's Northwest District Plan, dated December 12, 1989, and on preliminary information on the Northern District Plan. The plan calls for a development density of 1 house/acre in the critical area, except for 5 percent of the area, which would be parkland. In the Gar Creek watershed, 20 percent of the critical area would be parkland. The Gar Creek protected area would be developed under the high-density protected area plan described above. The rest of the watershed protected area in Mecklenburg County would be developed as follows: 67 percent at 3 houses/acre, 10 percent at 4 houses/acre, 12 percent office and commercial, and 11 percent at 5 houses/acre (multi-family). Lincoln and Gaston Counties would be developed according to the proposed WS-IV classification using the low density alternative. BMPs would consist of filter strips and grassed swales in the critical areas, wet ponds in the McDowell

magnitude of higher — but we're

In order to be credible, they must consider the non-impervious pollution loads — otherwise what are they really trying to do? Only address 0.3% of the contributing area to Mountain Isl. Lake?!

DRAFT

8/89 FORM 339

Table 4-3
Mountain Island Lake Watershed
Land Use Alternatives

	Low Density	High Density	Northwest Plan	WSII/WSIII Combination
Comments	Proposed WS-IV low-density alternative	Proposed WS-IV high-density alternative	Based on Charlotte/Mecklenburg Planning Commission Northwest District Plan	Proposed WS II/WS III conceptual requirements
Buffers	100-200 feet	100-200 feet	100-200 feet	100-200 feet
Critical Area	Residential development only 1 DU/ac (12% impervious)	Residential development only 4 DU/ac (30% impervious)	1 DU/ac 5% parkland 20% parkland in Gar Creek subwatershed	Residential development only 1 DU/2ac
Protected Area	2 DU/ac (19% impervious)	9:1 ratio of residential @ 4 DU/ac (30% impervious) and commercial (70% impervious)	Same as high density alternative in Gar Creek subwatershed Lincoln/Gaston Counties developed @ 2 DU/ac Rest of watershed developed at 67% @ 3 DU/ac 10% @ 4 DU/ac 11% @ 5 DU/ac 12% office and commercial	1 DU/2ac in Gar Creek subwatershed residential only (WSII) 9:1 ratio of residential @ 2 DU/ac and commercial @ 30% impervious in all other Mecklenburg County protected areas. 1 DU/ac residential in Gaston & Lincoln County protected area
BMPs	Grassed swales/filter strips throughout	Wet ponds throughout	Filter strips/grassed swales in critical area and Johnson Creek subwatershed protected area Wet ponds in all other areas.	Grassed swales/filter strips in critical areas Gar Creek subwatershed and Lincoln & Gaston County protected areas. Wet ponds in other Mecklenburg County protected areas.
Overall Impervious Area	16%	32%	27%	15%

NOTE: DU = Dwelling unit

DRAFT

Creek, Gar Creek, and adjacent land protected areas, and filter strips and grassed swales in the Johnson Creek protected area. Figure 4-7 is a schematic of the watershed showing locations of development densities.

WS-II/WS-III

so what? based on what? any economic development consideration or interest

This alternative was formulated by CH2M HILL and is based on the recently adopted North Carolina WS-II/WS-III water supply watershed protection classifications. The formulation of this alternative was based on the premise that, although Mountain Island Lake will probably be classified as WS-IV according to the proposed state guidelines, several of the tributaries and associated watersheds may be given the more stringent WS-III or WS-II classification. Figure 4-8 shows this alternative.

Under this plan, all critical areas would be developed at 1 house/2 acres, since the WS-II and WS-III low density option requirements are the same. The McDowell Creek protected area, as well as the protected area north of McDowell Creek and east of Mountain Island Lake, would be developed at 2 houses/acre, which is the high density alternative under the WS-III classification. The Johnson Creek protected area, as well as the protected area north of Johnson Creek and west of the lake, would be developed at 1 house/acre. The Gar Creek protected areas would be developed at 1 house/2 acres, as required by the WS-II classification. BMPs for this alternative would consist of filter strips and grassed swales in the critical and protected areas of Gar Creek, Johnson Creek, and adjacent lands. Wet ponds would be established in the McDowell Creek protected area.

from what? only those loads, or the total including, for example, agriculture?

PROCEDURES

For each of the alternatives described above, pollutant loads and receiving water impacts were calculated. Empirical removal rates for selected BMPs were applied to the pollutant loading difference between existing and alternative conditions. Receiving water impacts were then calculated with and without BMPs in order to assess the effectiveness of the BMPs. The procedures used in the analysis are described in the December 18, 1990 TM included in Appendix C.

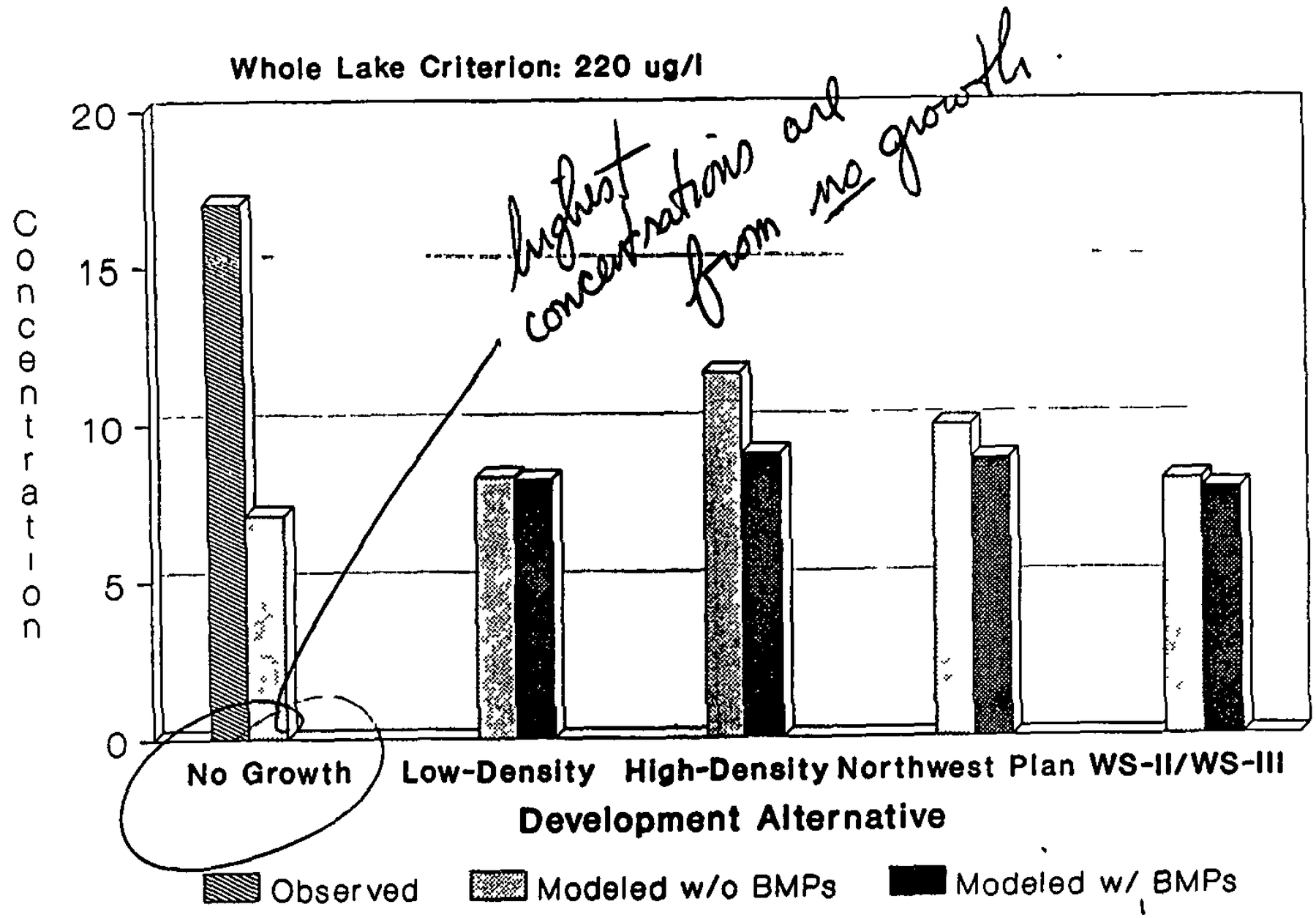
I need this.

RESULTS

Results of the analysis for each alternative are presented in Figures 4-1 through 4-6. Each receiving water concentration was calculated with and without the mitigating effects of BMPs. The receiving water criterion is indicated on each figure. The total phosphorus (TP) criterion is based on the state chlorophyll a standard of 40 ug/l. Because both nitrogen and phosphorus contribute to the quantity of chlorophyll a in a water body, the phosphorus criterion was taken as that concentration that would result in an ambient water chlorophyll a concentration of 40 ug/l, assuming a standard

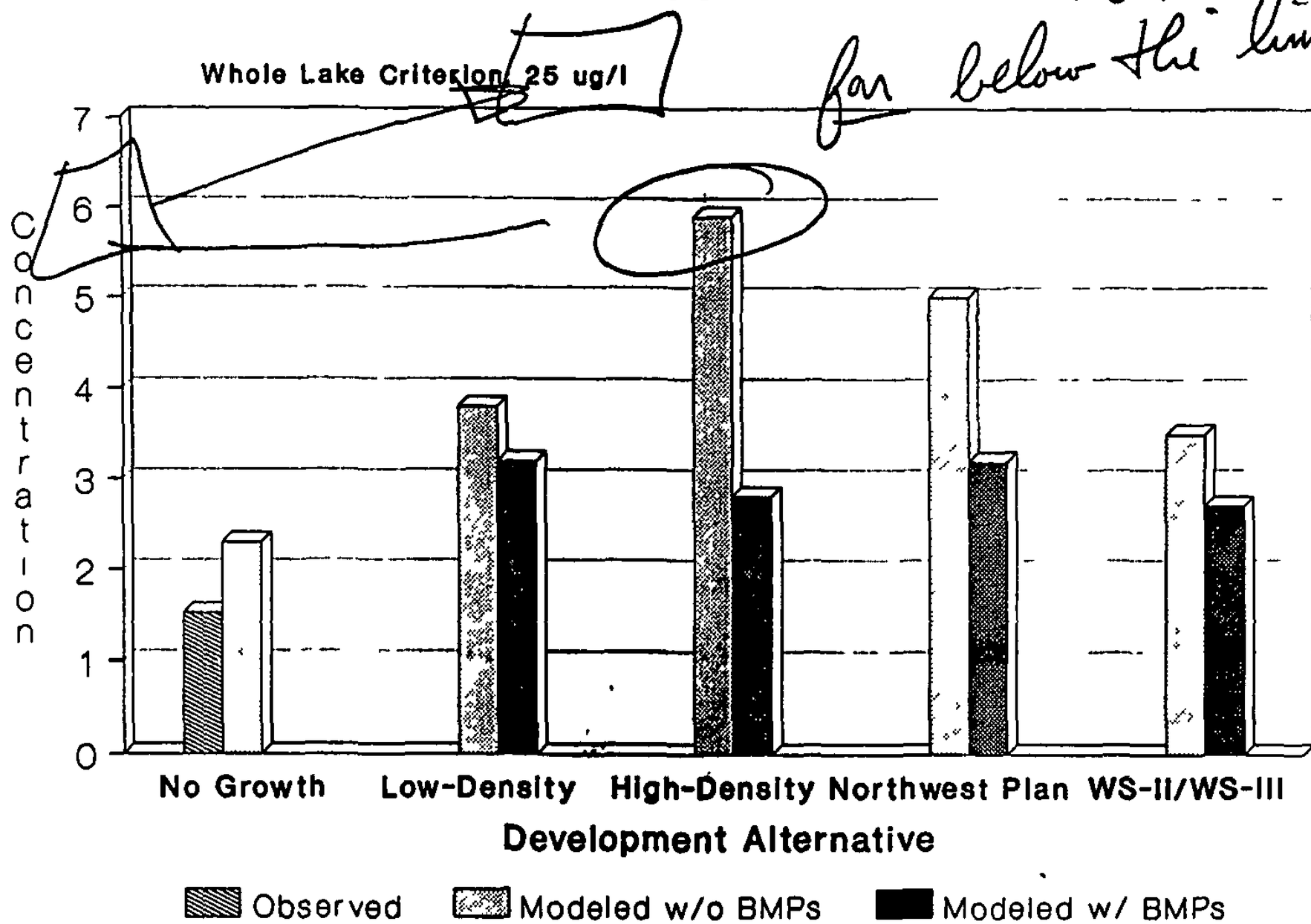
/89 FORM 389

FIGURE 4.1 - PREDICTED WHOLE LAKE TP ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Reckhow, 1988

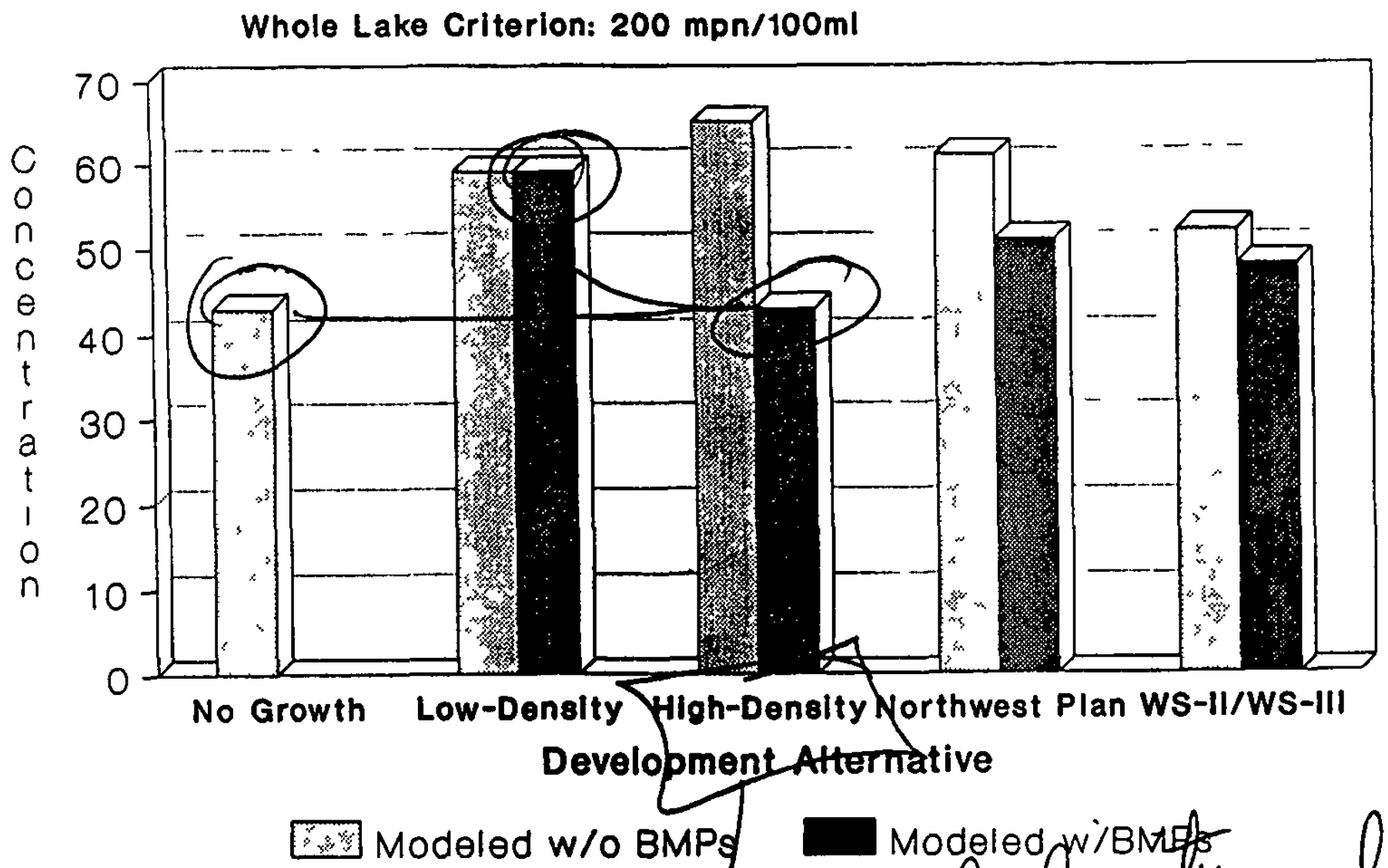
FIGURE 4.2-PREDICTED WHOLE LAKE TOTAL Pb ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Mass Balance

FIGURE 4.3 - PREDICTED WHOLE LAKE FC MAXIMUM CONCENTRATIONS (mpn/100ml)

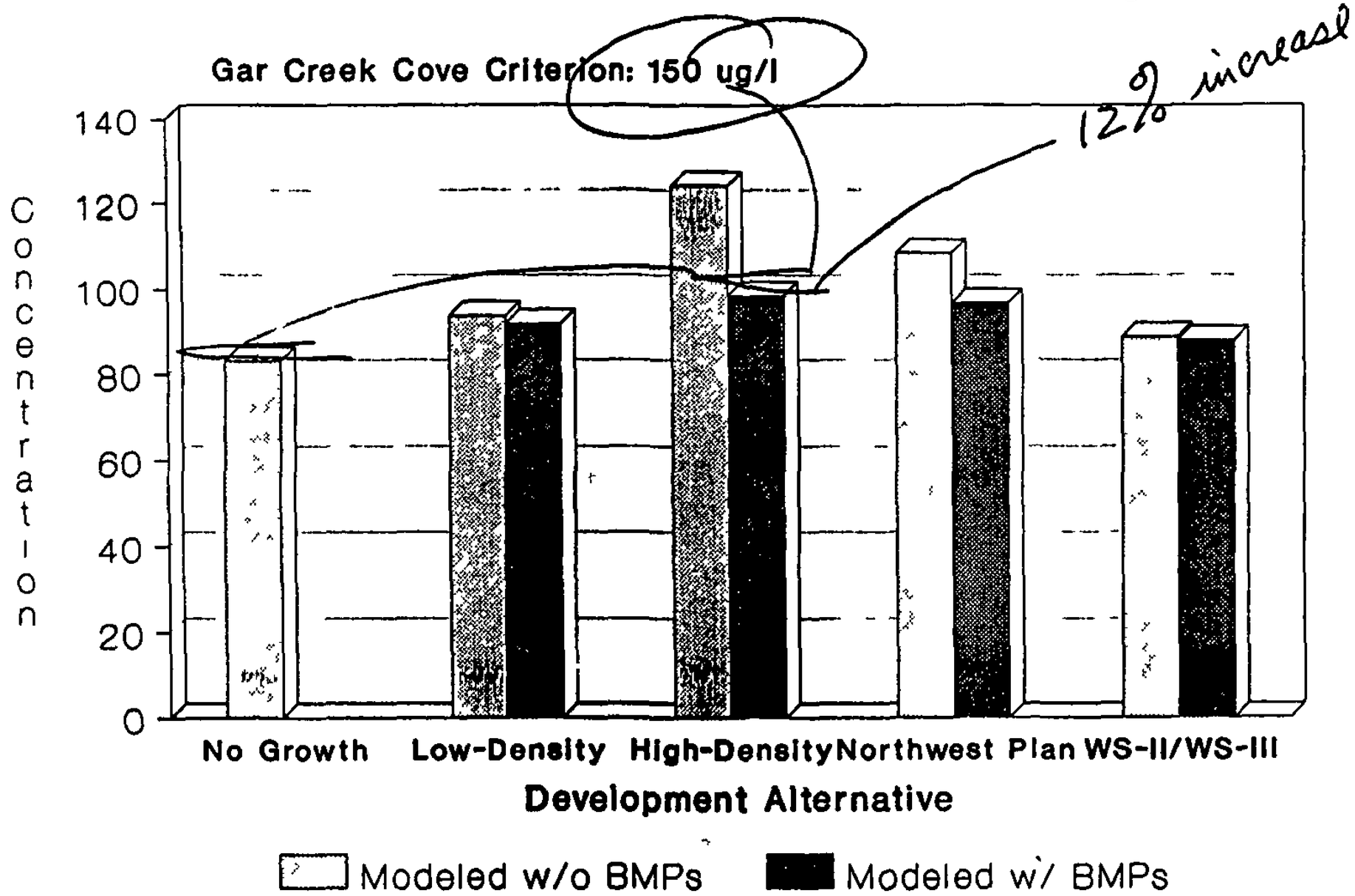
3 Month Storm Event



High density is the best, equal to no growth

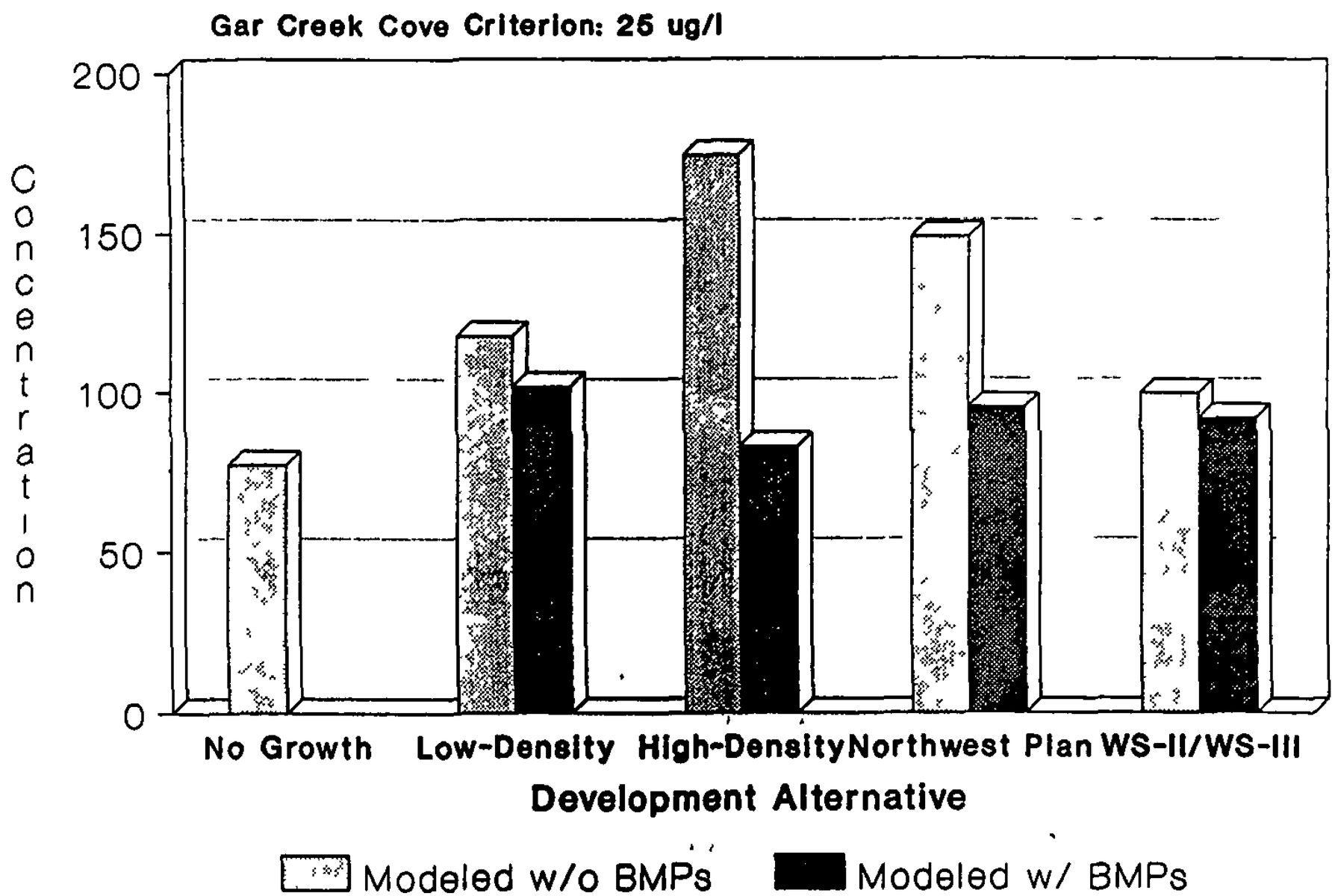
Lake Model Exponential Decay Function
Observed Values 0 - 9700 (mpn/100ml)

FIGURE 4.4 - PREDICTED GAR COVE TP ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Reckhow, 1988
No Observed Values

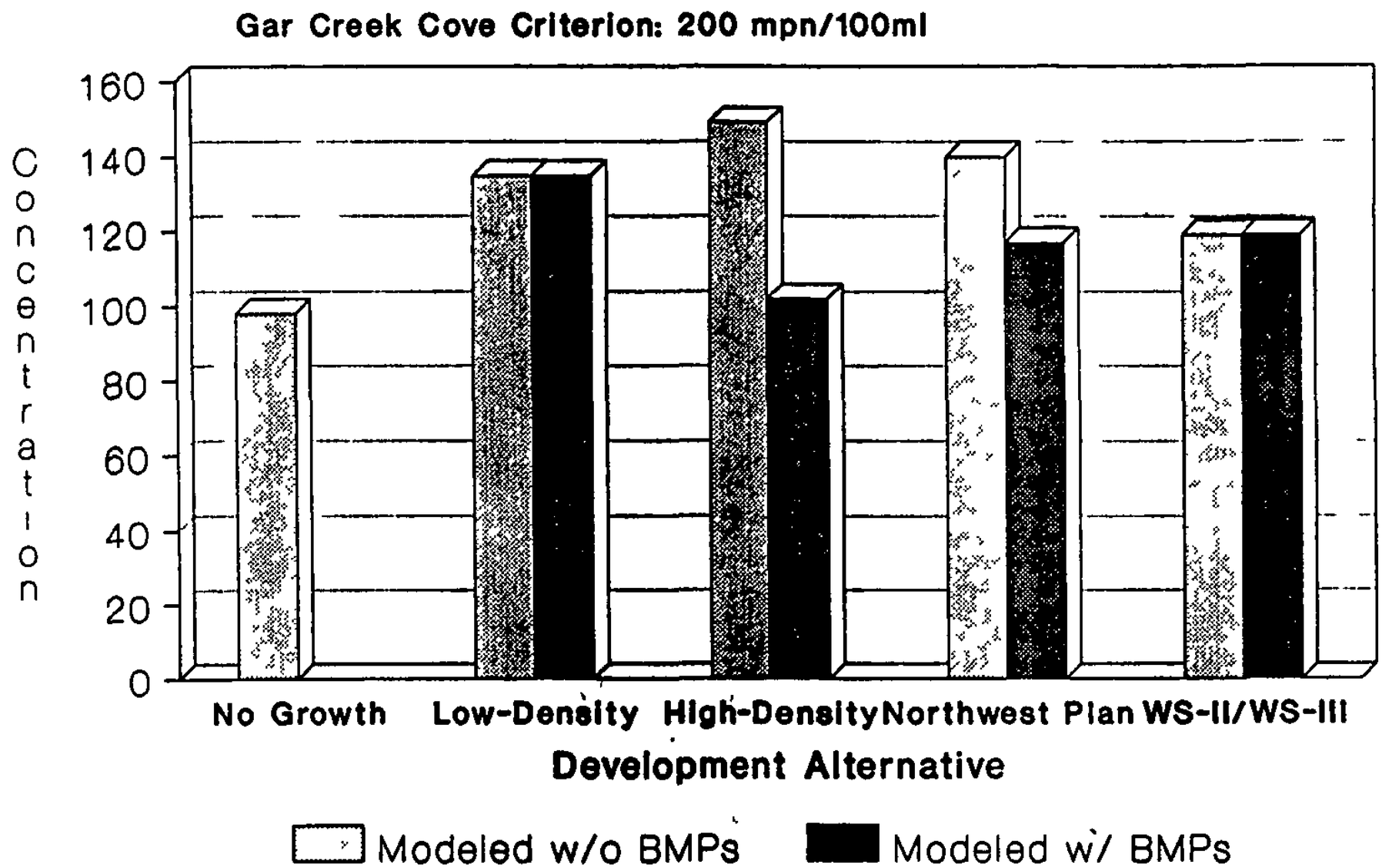
FIGURE 4.5 - PREDICTED GAR COVE TOTAL Pb ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Mass Balance (assumes no in-system losses)
No Observed Values
Note Modeled values to be used for comparison purposes only

FIGURE 4.6 - PREDICTED GAR COVE FC MAXIMUM CONCENTRATIONS (mpn/100ml)

3 Month Storm Event



Lake Model Exponential Decay Function
No Observed Values

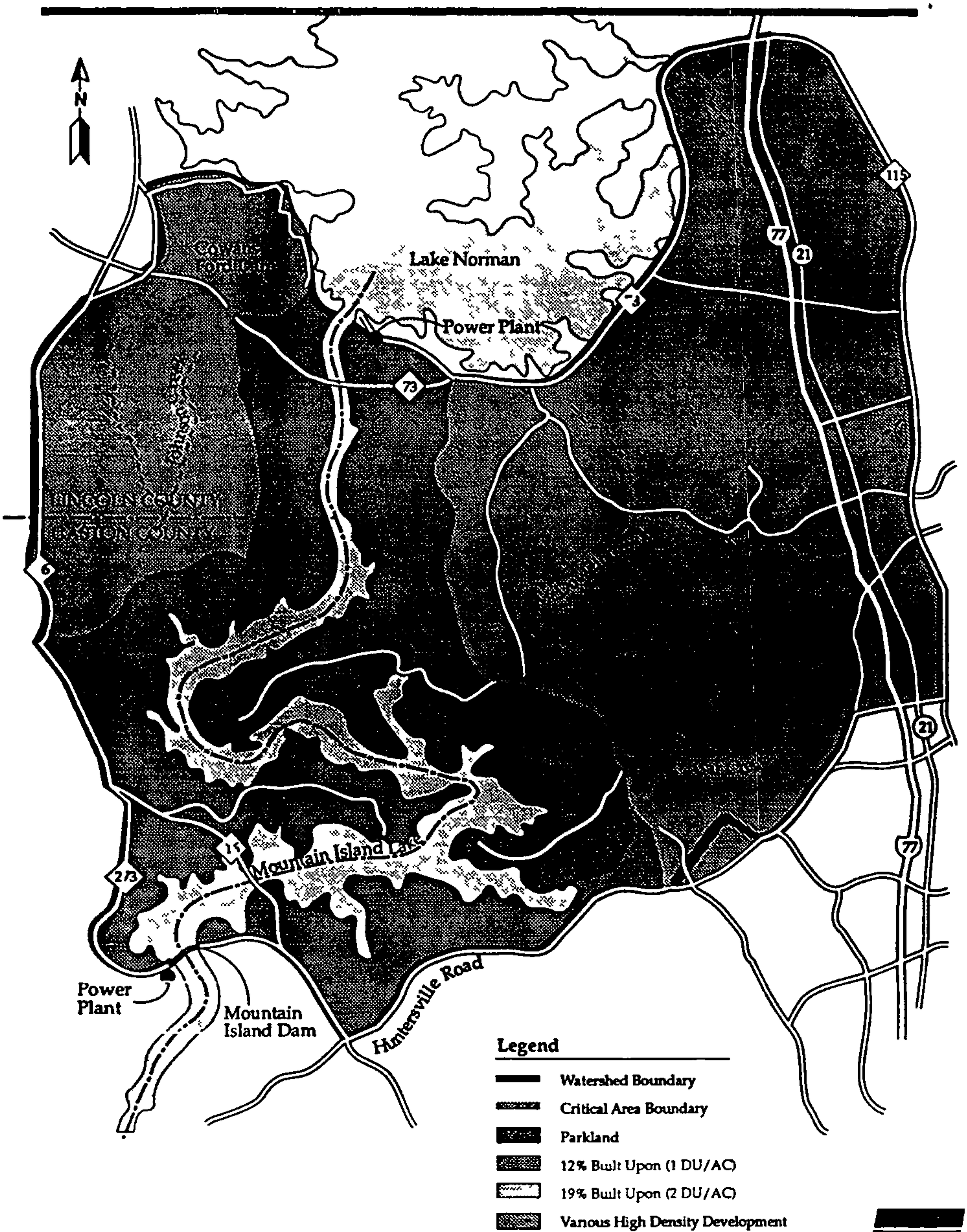


Figure 4-7
Northwest/Northern District Land Use Scenario

CH2M HILL

ATL28586.A0

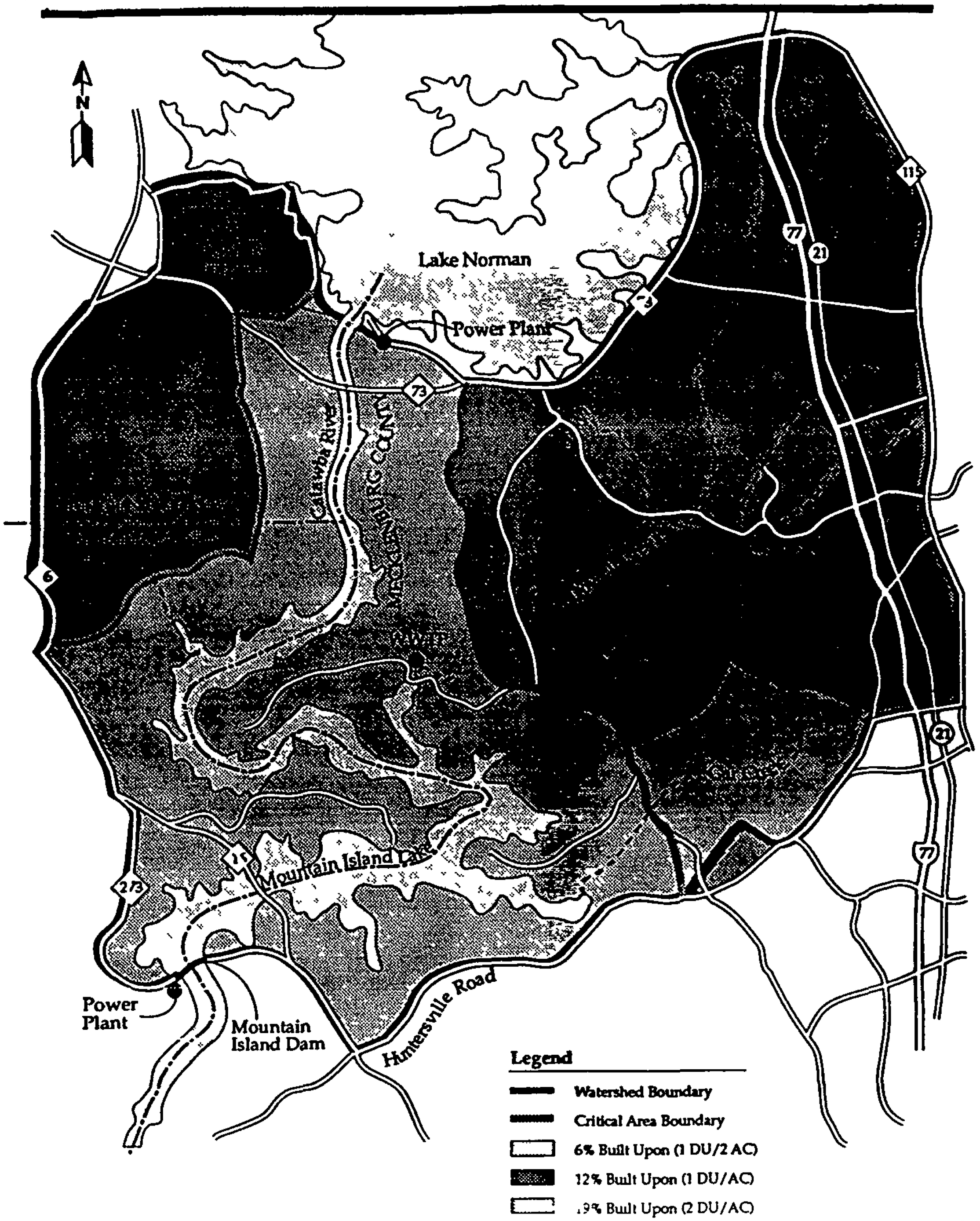


Figure 4-8
WSII/WSIII Land Use Scenario

CH2M HILL

ATL28S86.A0

nitrogen-to-phosphorus ratio of 3.6:1 The TP criterion is different for the "whole lake" analysis and the Gar Creek Cove analysis because receiving water residence time is a factor in the equation The lead (Pb) and fecal coliform (FC) criteria are based on state standards.

Figures 4-1 and 4-4 depict whole lake and Gar Creek Cove annual ambient TP concentrations. Figures 4-2 and 4-5 show annual ambient total Pb concentrations for the whole lake and Gar Creek Cove. Figures 4-3 and 4-6 show FC maximum concentrations following a storm event with a 3-month recurrence interval in the whole lake and Gar Creek Cove.

when it doesn't go their way they call it insignificant!

OBSERVATIONS

Several observations are apparent based on the results discussed earlier:

1. Figure 4-1 shows the observed average of TP in the whole lake to be higher than that predicted for the alternatives. This variability relative to the receiving water criterion is insignificant and may be a result of analytical variability at low TP levels. Also, values reported as less than the detention limit were averaged as the detection limit which provides an artificially high observed value. It is important to interpret results based on the relative difference between concentrations realized under the alternatives, rather than on the difference between modeled and observed results for existing conditions.

why?

2. Figure 4-2 shows the observed value of Pb to be approximately 25 percent less than the modeled value for existing conditions. This is plausible considering that the value measured in the water column is strictly the total component, whereas the modeled results represent total Pb, including both the dissolved portion and any recoverable lead adsorbed to solids. Relative total Pb values for the alternatives are somewhat high compared to the observed value for the reason stated above, in addition to the nature of the NURP study on which the prediction equations are based. NURP data were acquired from highly urbanized areas, which tend to generate higher concentrations of metals in runoff. Also, these data were acquired during the late 1970s and early 1980s, when the use of leaded gasoline was much more prevalent than it is today or will be in the future.

3. The observed range reported for FC in the whole lake is zero to 9,700 MPN/100 ml. This is because FC concentrations are highly variable. Here again, it is important to note the relative changes in concentration between alternatives Also it is important to interpret the modeled

no way!

'89 FORM 389

so throw it all out. No one "models" fecal coliforms! it's bullshit

results as geometric means of a sample of maximum FC measurements because order-of-magnitude outliers will occur.

4 Gar Creek Cove shows greater receiving water impacts than the whole lake This is to be expected considering the relative size of Gar Creek Cove in comparison with the high flow-through characteristic of Mountain Island Lake as a whole.

5. For all three pollutants in both the whole lake and Gar Creek Cove analyses, the high density alternative with BMPs results in pollutant concentrations relatively similar to or lower than those of the other alternatives. This is primarily due to the relatively high efficiency of wet ponds (the single selected structural BMP for the high density alternative) in removing pollutants It must be stressed, however, that wet ponds involve high physical and maintenance costs, as well as an opportunity cost for the inundated lands. In addition, wet ponds (particularly regional ponds) may be somewhat difficult to implement because of environmental concerns relative to wetlands. These factors should be considered in comparing results for the high density alternative with wet ponds implemented as BMPs and the other alternatives employing non-structural BMPs.

4 * and it would be much higher relatively

this is rediculous. Here what they're doing

DRAFT

But they're not even mentioning this fact!

Before After

LEAD, For example

urban area 0.3% of total

other, including Agriculture 99.7% of total

8/89 FORM 389

Section 5
CONCLUSIONS AND RECOMMENDATIONS

no, only future urban land use effects, or 0.3% of the total!

During the prediction and evaluation of future land use effects on water quality, five land use scenarios were evaluated. Three categories of degradation were investigated. nutrients, bacteriological, and toxicant. Specific pollutants were selected to represent the degree of degradation resulting in each category. The analyses revealed that the concentrations of the three constituents were lower for the no-growth (or existing land use) scenario than for the other four evaluated. As expected, the highest concentrations were predicted for the high density scenario, followed by the Northwest/North District Plan scenario. The WS-II/WS-III scenario resulted in predicted concentrations lower than those of the low density scenario and approaching those of the no-growth scenario.

Performing the analysis assuming BMP removal efficiencies resulted in a lowering of predicted concentrations for each pollutant within Mountain Island Lake for the four land use scenarios.

private industry pays for this, by the way, what about the other 99.7% of the pollution load?!

Relying on structural BMPs to protect Mountain Island Lake's many uses will be costly. At build-out, the construction cost for structural BMPs in 1991 dollars could approach $80 million, with an annual operating maintenance cost as high as $4 million. The only efficient and effective way of managing a BMP program of that magnitude would be through local governments. However, institutional arrangements for funding and managing BMP programs in Mecklenburg, Gaston, and Lincoln Counties have not been made.

no way! let's show what it would really be.

The policy and goals statement adopted by the Mecklenburg and Gaston County Boards of Commissioners calls for the establishment of a watershed management program which would prevent further degradation of water quality within Mountain Island Lake. Although the predicted water quality impacts on the lake from the four development scenarios are not significant, the WS-II/WS-III scenario has the least severe impacts. Even with application of BMPs, the water quality impacts are still greater than what is predicted for the no-growth (existing land use) scenarios.

to who?

Relying on BMPs to protect Mountain Island Lake would pose additional risk and cost. Relying strictly on land use controls would preclude implementation of the Northwest/North District Plans within Mecklenburg County and may result in potential tax base reductions. Developing a watershed protection program which combines land use controls with BMPs appears to be a logical way to proceed. Therefore, CH2M HILL elected to examine another development scenario that combined the WS-II/WS-III scenario, which had the least severe water quality impacts, with certain aspects of the Northwest/North District Plan This scenario emphasized reliance on land use controls within the critical area and protected area

Here's the real conclusion — even with a severely biased analysis, no significance could be attributed to urban development pollution impacts.

89 FORM 389

How could a responsible professional come to this conclusion?

Northwest/North District Plan with BMPs in the extended protected area within Mecklenburg County

EVALUATION OF WS-II/WS-III/NORTHWEST/NORTH DISTRICT PLAN COMBINATION

The "combination" land use scenario includes development of the entire Mountain Island Lake watershed critical area, excluding parks and buffers, at a density of 1 development unit per 2 acres (1 du/2 ac), which equates to approximately 6 percent built upon. BMPs would include nonstructural stormwater controls, such as grassed swales and filter strips. As indicated in previous TMs, the Gar Creek subwatershed has been determined to be the most sensitive to pollutant loads; in this scenario, therefore, it would be developed at 6 percent built upon, with nonstructural stormwater controls. The Gar Creek subwatershed could therefore be classified as WS-II.

All protected areas in the Mountain Island Lake watershed would be developed at 1 du/ac, or 12 percent built upon. BMPs in the protected area would include nonstructural controls, i.e., grassed swales and filter strips.

The extended protected area, located entirely in the McDowell Creek subwatershed, would be the most highly developed portion of the Mountain Island Lake watershed under the combination scenario. Development in the extended protected area would conform to the tentative plans for the North/Northwest District Plan. BMPs would include structural stormwater controls, i.e., wet ponds, to mitigate nonpoint source pollution. They could be applied on a regional or project basis (depending on siting constraints); regional ponds have the advantage of providing control of both new and existing development. The densities for non-developed areas would have the following distribution:

Development	% Area	% Built Upon
Parkland	1	-
3 du/ac	47	25
4 du/ac	26	30
5 du/ac	21	40
C/I		78

These densities, weighted according to their encompassing areas, along with existing development result in an aggregate built-upon area of 30 percent. This is also the maximum allowed under the high density option of the EMC's WS-II requirements. Table 5-1 summarizes characteristics of the combination scenario as well as two land

8/89 FORM 389

Table 5-1
Mountain Island Lake Watershed
Land Use Alternatives

Comments	Northwest Plan Based on Charlotte/Mecklenburg Co. Planning Commission Northwest District Plan	WSII/WSIII Combination Based on adopted WS-II/WS-III conceptual requirements	Combination Plan Combination of Alternatives
Buffers	100 feet	100 feet	100 feet
Critical Area	1du/ac (12% bu) 5% parkland 20% parkland in Gar Creek subwatershed	Residential development only 1du/2ac (6% bu)	6% Built Upon Clustering Allowed
Protected Area	Same as high density alternative in Gar Creek subwatershed Lincoln/Gaston Counties developed @ 2du/ac Rest of watershed developed at 67% @ 3du/ac (25% bu) 10% @ 4du/ac (30% bu) 11% @ 5du/ac (40% bu) 12% office and commercial (78% bu)	1du/2ac in Gar Creek subwatershed, residential only (WSII). 9:1 ratio of residential @ 2du/ac and commercial @ 30% impervious in all other Mecklenburg County protected areas. 1du/ac residential in Gaston and Lincoln County protected areas.	Protected 6% BU Gar Creek Subwatershed 12 BU in Rest of Protected Area Extended Protected 30% BU Overall 1% Parkland 47% @ 3du/ac (25% bu) 26% @ 4du/ac (30% bu) 21% @ 5du/ac (40% bu) 5% Commercial/ Industrial (78% bu)
BMPs	Filter strips/grassed swales in critical area and Johnson Creek subwatershed protected area. Wet ponds in all other areas.	Grassed swales/filter strips in critical areas. Gar Creek subwatershed, and Lincoln and Gaston County protected areas. Wet ponds in other Mecklenburg County protected areas.	Grassed swales/filter strips in critical area Wet ponds in Mecklenburg County extended protected area Grassed swales in Gaston and Lincoln County protected areas.
Overall Impervious Area	27%	13%	15%

NOTE. du = Dwelling Unit; BU = built upon area

use scenarios (Northwest/North District Plan and WS-II/WS-III) analyzed previously and discussed in the TM entitled "Mountain Island Lake and Gar Creek Cove Pollutant Load and Receiving Water Impact Analysis," dated December 18, 1990.

CONCLUSIONS

Pollutant loads and receiving water impacts associated with the combination scenario were calculated by the same methods followed for land use scenarios analyzed earlier. The results of the analysis are presented in Figures 5-1 through 5-6. The results of two scenarios previously analyzed, the Northwest/North District Plan and WS-II/WS-III, are also presented for comparison. A detailed discussion is included in the TM dated February 7, 1991 included in Appendix C.

Predicted water quality results do not differ substantially from the WS-II/WS-III alternative or the no-growth scenario analyzed and presented in a previous TM. Predicted water quality concentrations are less for the "combination" scenario than the Northwest/North District Plan scenario with and without BMPs. However, for each land use scenario evaluated, the predicted concentrations of the specific pollutants selected to represent the degree of degradation were lower than the minimum state criterion for that pollutant within Mountain Island Lake. The combination scenario does recognize that Gar Creek is the most sensitive cove to pollutant loads and has the highest potential to adversely impact the CMUD water intake; consequently, the scenario prescribes minimal development in this subwatershed.

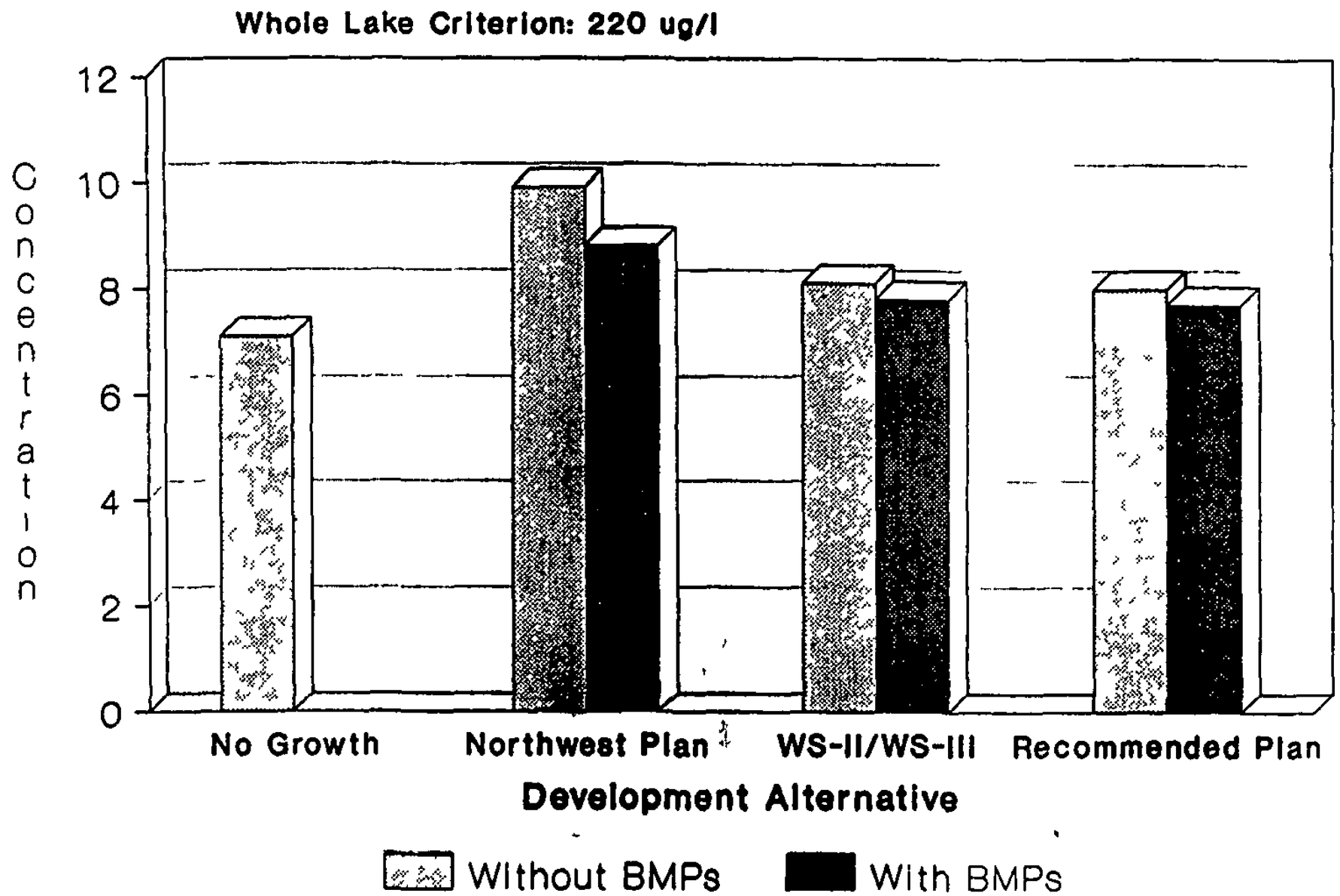
Implementation of the combination scenario would exceed minimum state requirements for a Class IV watershed, would allow higher classifications for tributary areas within the watershed planning area, would conform to the Planning Commission's Northwest/North Plan for the McDowell Creek extended protected area, and would come close to achieving the stated goal of preventing further degradation of water quality in Mountain Island Lake.

An additional benefit of land use controls combined with BMP implementation is that the overall risk of degradation due to single-impact occurrences, such as tanker truck spills, would be reduced as a result of lower traffic volumes. The increase in impervious area associated with urbanization typically results in increased flooding, erosion, and habitat destruction. By limiting the overall amount of impervious area in the watershed, the combination scenario would reduce impacts related to increased storm peak flows. In addition, the use of wet ponds, although not specifically designed to control storm peaks, would offer some protection.

this is so ridiculous a statement that it doesn't warrant a reasonable response! let's jump on this type of stupidity.

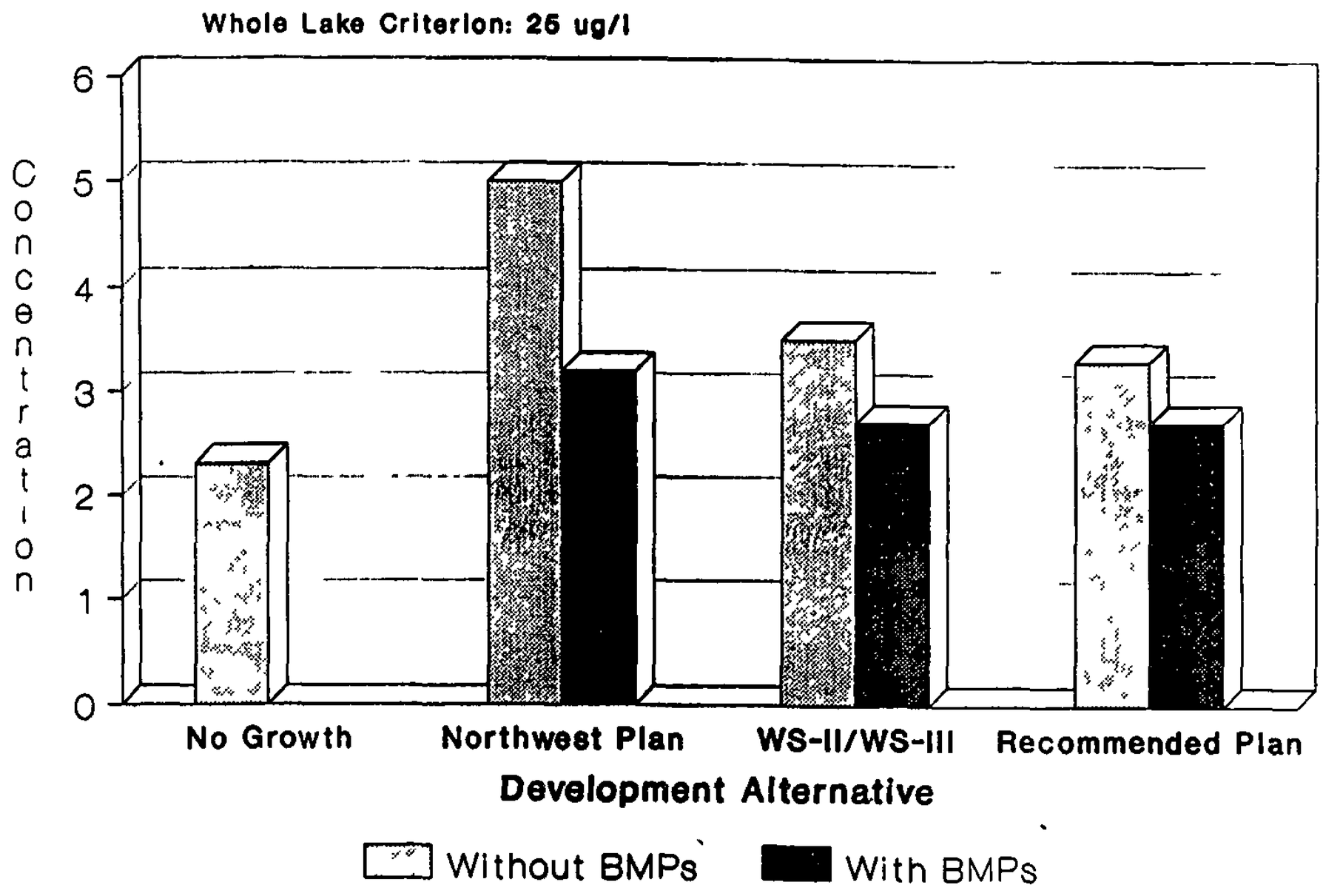
11/89 FOHM 389

FIGURE 5.1 - PREDICTED WHOLE LAKE TP ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Reckhow, 1988

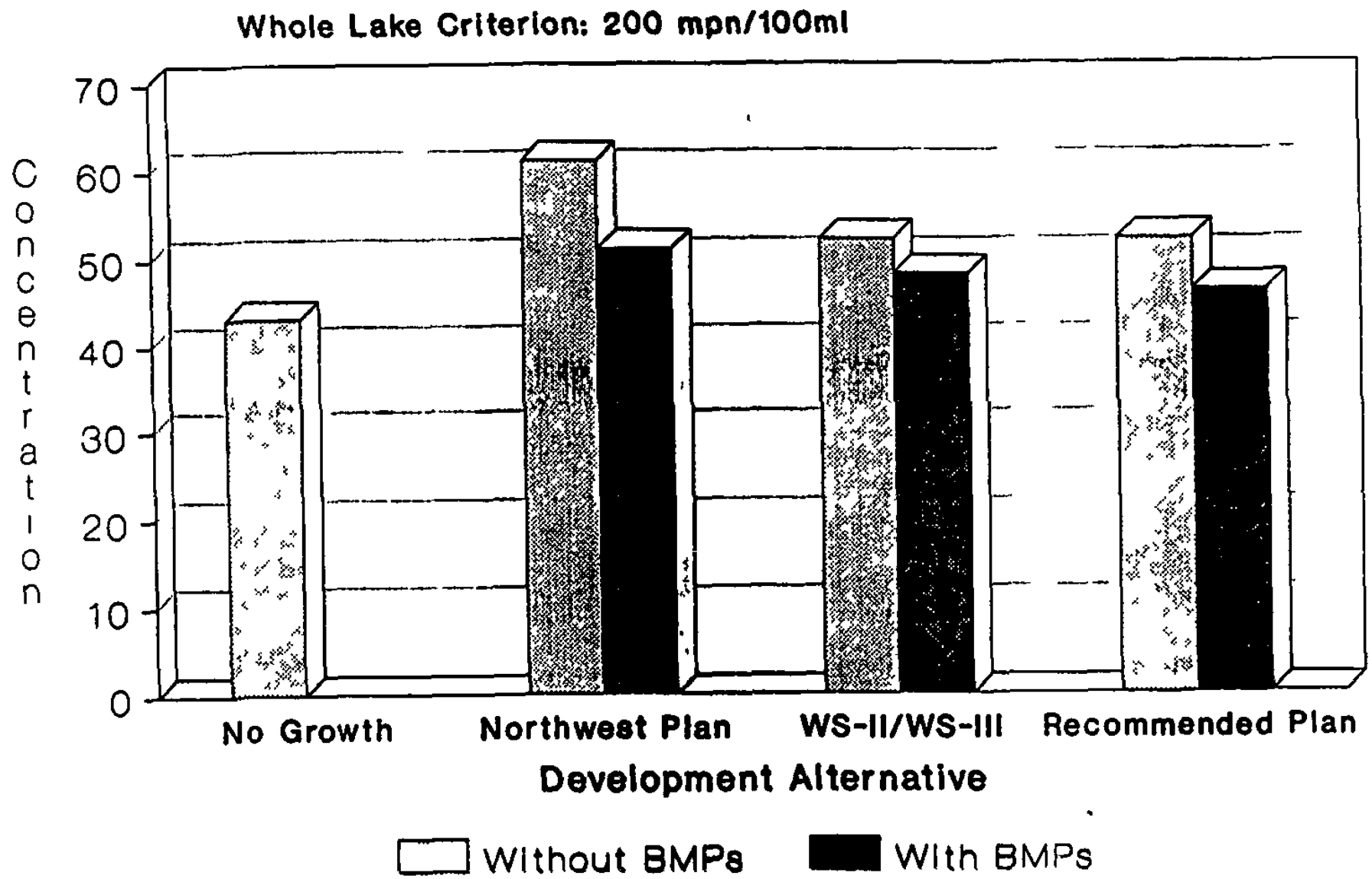
FIGURE 5.2-PREDICTED WHOLE LAKE TOTAL Pb ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Mass Balance

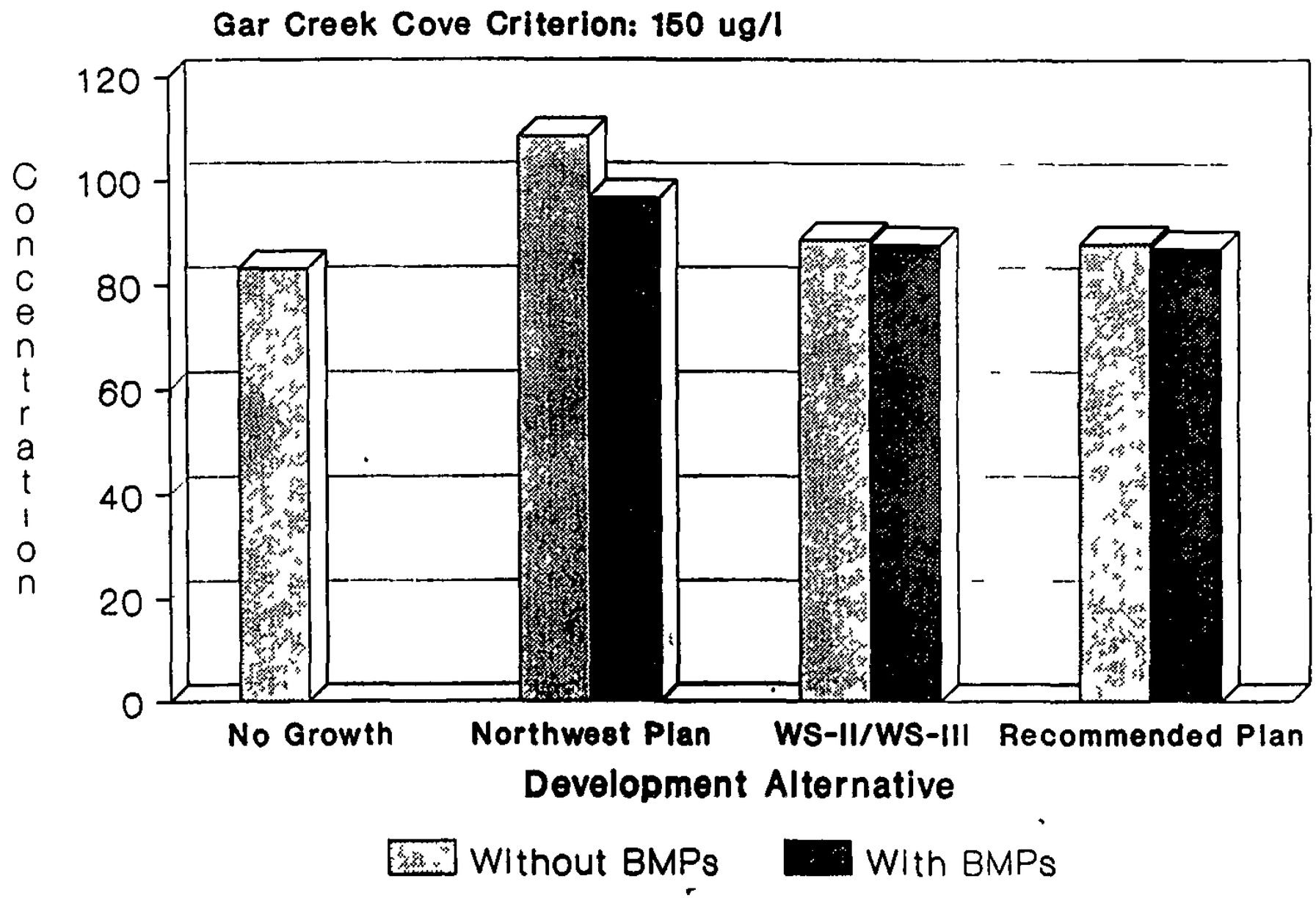
FIGURE 5.3 - PREDICTED WHOLE LAKE FC MAXIMUM CONCENTRATIONS (mpn/100ml)

3 Month Storm Event



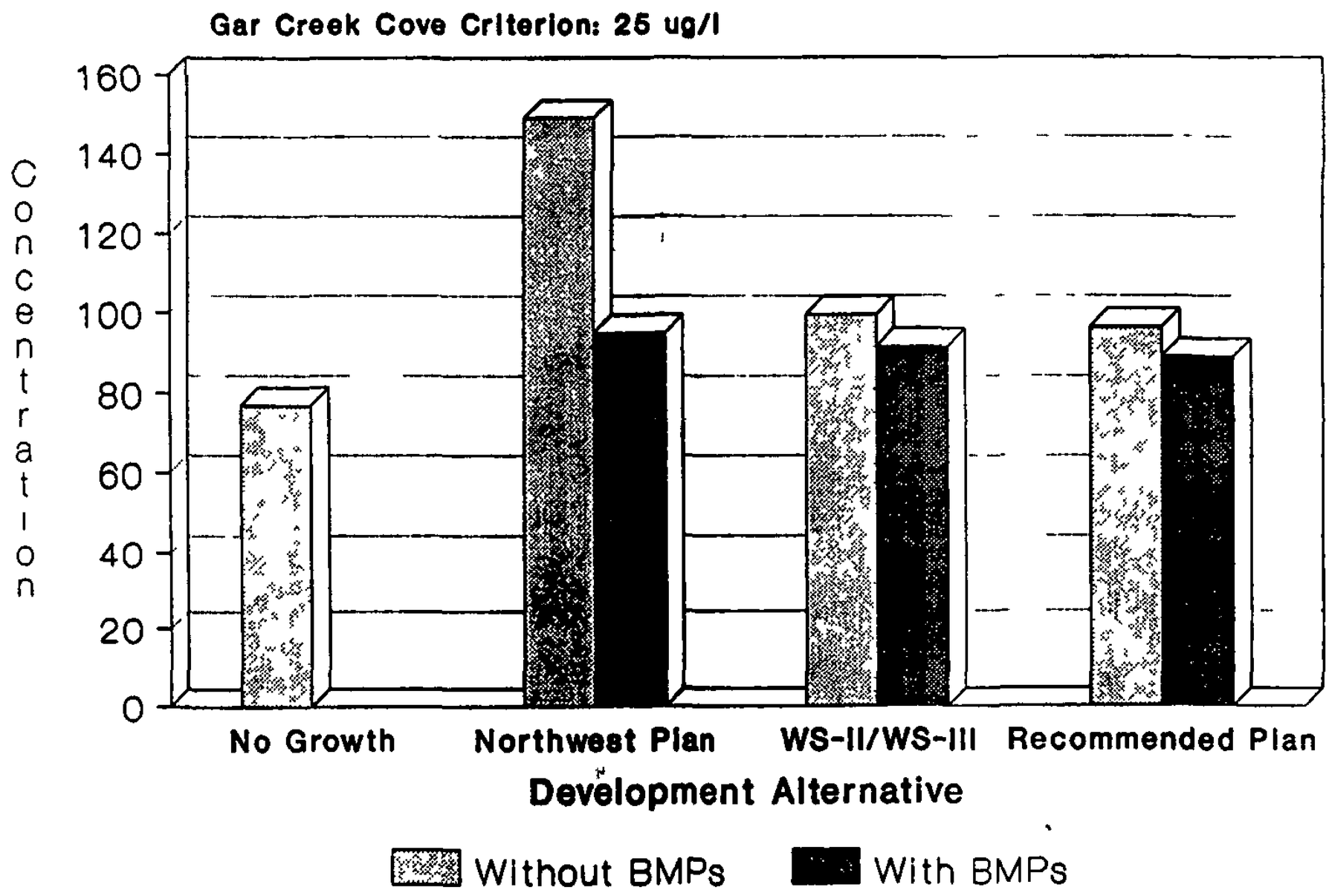
Lake Model Exponential Decay Function

FIGURE 5.4 - PREDICTED GAR COVE TP ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Reckhow, 1988

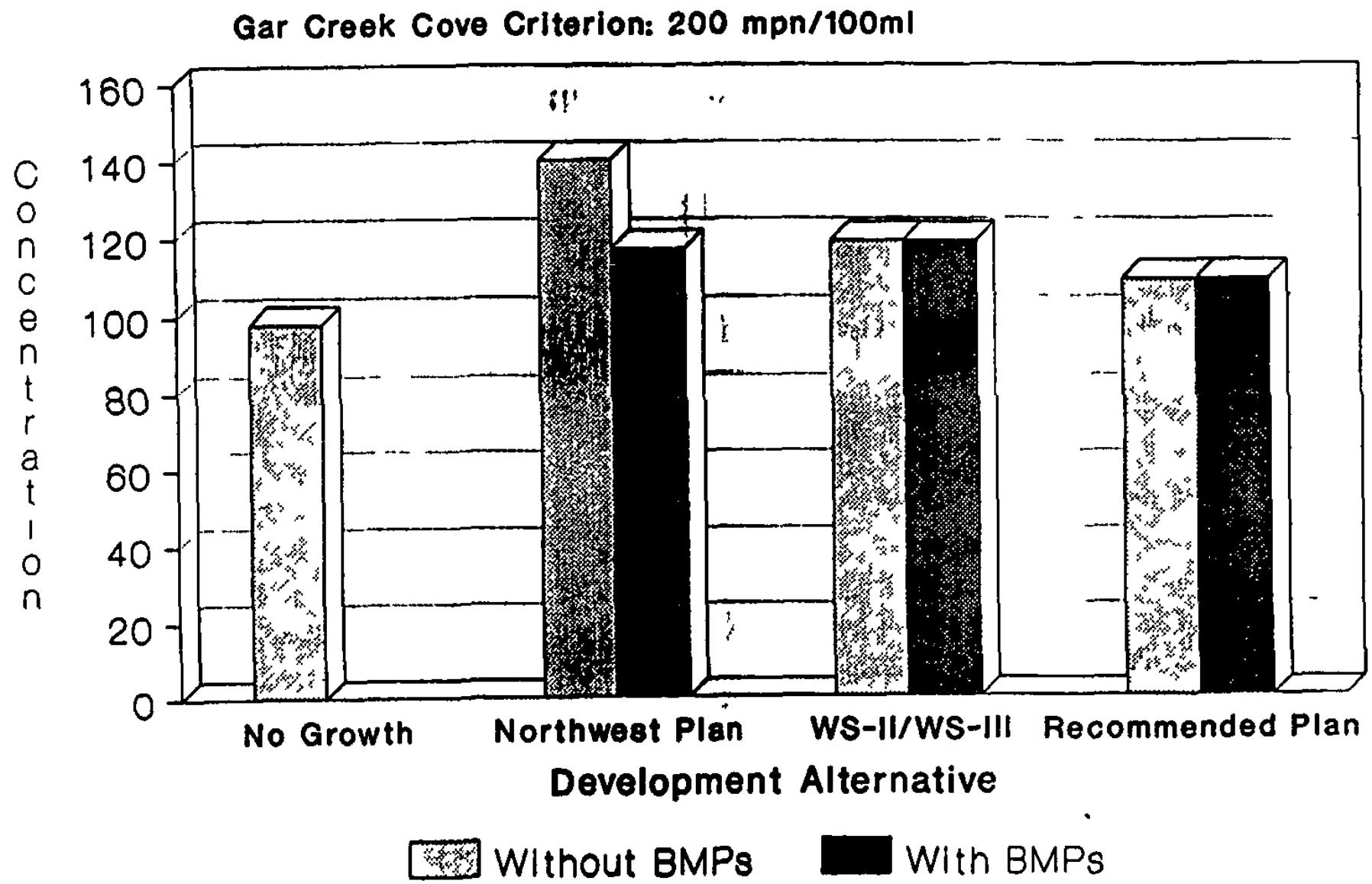
FIGURE 5.5 - PREDICTED GAR COVE TOTAL Pb ANNUAL AMBIENT CONCENTRATIONS (ug/l)



Lake Model Mass Balance (assumes no in-system losses)
No Observed Values
Note Modeled values to be used for comparison purposes only

FIGURE 5.6 - PREDICTED GAR COVE FC MAXIMUM CONCENTRATIONS (mpn/100ml)

3 Month Storm Event



Lake Model Exponential Decay Function

TECHNICAL ADVISORY COMMITTEE DISCUSSION

Throughout the course of the study, CH2M HILL met on a monthly basis with a Technical Advisory Committee (TAC) to brief them on study progress and receive guidance regarding aspects of the watershed protection program. The TAC was charged with recommending a specific watershed management program for Mountain Island Lake to the Mecklenburg County Board of Commissioners.

why, find out the basis for this - if it's this study then it's no wonder!

During meetings with the TAC in January and February of 1991, CH2M HILL received comments regarding the watershed protection program focus. In both meetings the majority of the committee favored a watershed protection program with primary reliance on land use controls rather than BMPs. The majority of the TAC was concerned about the cost and risk of relying on BMPs to achieve the goal of no further degradation of Mountain Island Lake. A minority of the TAC favored more dense development within the watershed and reliance on BMPs to control pollutant runoff. The preferences of the minority were based on the analyses which predicted no significant degradation of Mountain Island Lake when BMPs were used.

but degradation will continue, with or without any new development

RECOMMENDATIONS

The watershed draining into Mountain Island Lake is predominantly rural, with approximately 55 percent of the 40,000 acres covered by forest. Because of the relatively undeveloped nature of the watershed (coupled with the fact that over half of this acreage is still in forest) the lake receives relatively low concentrations of pollutants from runoff. Increased development, however, will generate larger concentrations of pollutants which have the potential of reaching the lake and degrading the water quality. This study evaluated the potential water quality impacts on the lake resulting from pollutant concentrations produced under five land use scenarios. Each of these evaluations was made with and without BMPs. The combination scenario, which includes aspects of the WS-II/WS-III and Northwest/North District Plan scenarios, would be the most effective in meeting the stated goal of preventing further degradation of water quality in Mountain Island Lake and is recommended for implementation. Figure 5-7 is a schematic of the watershed with the development plan superimposed upon it.

relatively, yes, but remember that urban areas are only 0.3% of the total drainage area.

Let's find out who these members were and support them technically and politically

not really!

The recommended plan, following the mandates of Mecklenburg County's policy statement and consistent with EMC's water supply watershed protection rules, subdivides the watershed into three zones (*critical, protected, extended protected*) according to their proximity to the reservoir and their corresponding risk of contributing nonpoint source pollution. The *critical area* extends from the normal pool elevation of the reservoir either 1 hydrologic mile or to the ridge line of the watershed, whichever is nearer The *protected area* is adjacent to and extends upstream of the critical area 4 hydrologic miles or to the ridge line of the watershed,

* this study is actually reckless in saying that degradation will only occur because of new development. What happens if (or when) they stop new development and things still get worse?

/89 FORM 389

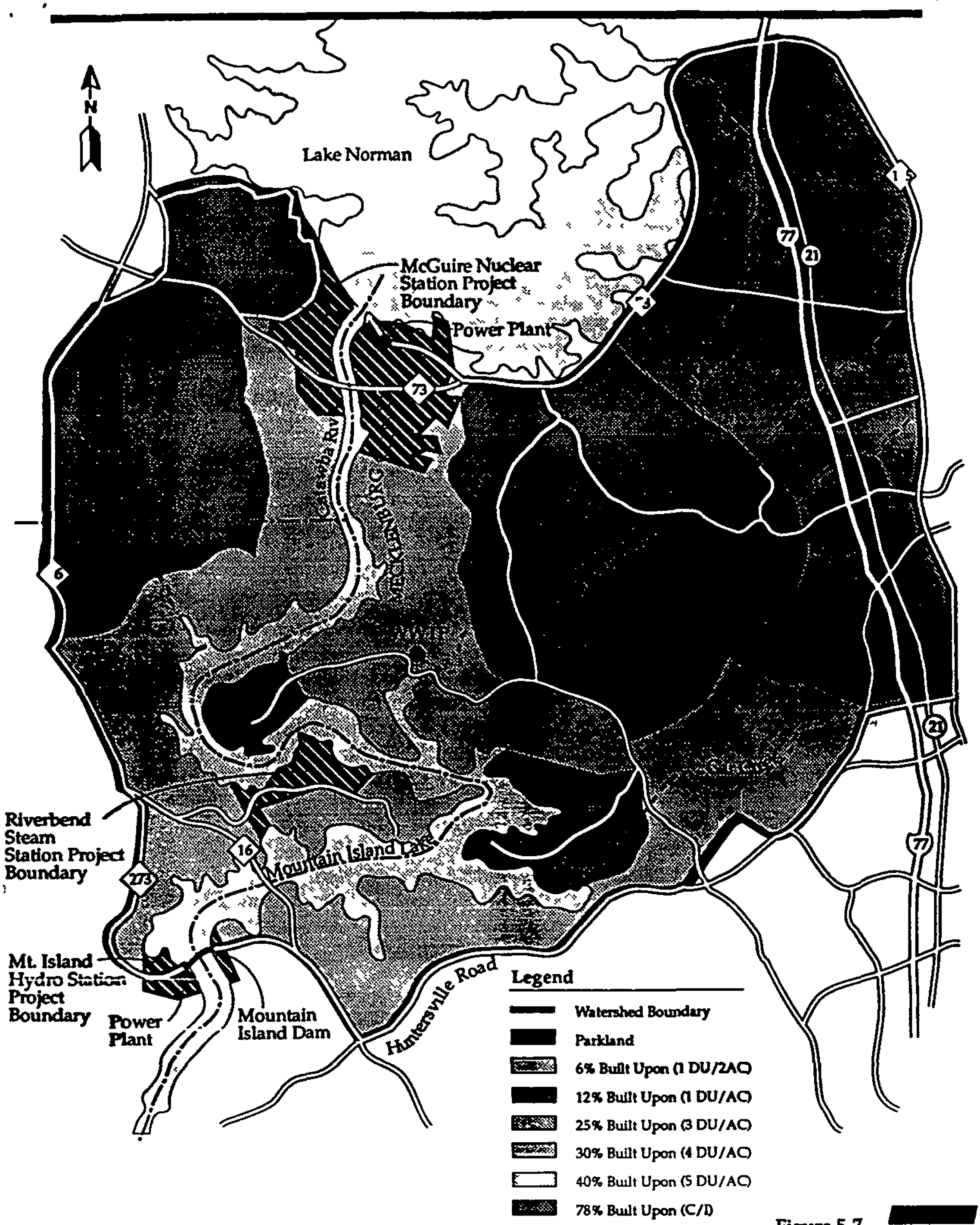


Figure 5-7
Mountain Island Lake
Watershed Recommended Plan

Note: C/I = Commercial/Industrial

ATL28506.A0

this is incredible, a major without ment or technical support they seriously affect economic growth.

whichever is nearer. Any watershed area upstream of the protected area (greater than 5 hydrologic miles from the normal pool elevation of the reservoir) is being recommended as an *extended protected area*. Although this area is not required to be included in a watershed protection plan under the Class WS-IV minimum requirements of the EMC, it is included in the recommended plan because: (1) the entire planning area below Lake Norman can influence water quality in Mountain Island Lake, (2) this area includes a significant amount of existing development; and (3) this area has major transportation corridors and is likely to undergo significant urbanization; and 4) by including the extended protected area it may qualify for a WS-III classification.

An additional recommendation is that throughout the watershed, all land extending 100 feet from the normal elevation of perennial waters be designated a buffer zone. This recommendation is based on the EMC's rules. The buffer zone would consist of a natural (at least 25 feet landward) or vegetative cover through which runoff flows in a diffuse manner without becoming channelized. Buffers provide for infiltration of runoff and thereby filter out pollutants.

Stormwater runoff and nonpoint source pollution from the 22,260 acres of forest within the watershed is less per acre than for other land use types. Maintaining as much of that forest as possible will help control pollutant introduction into Mountain Island Lake. The recommended buffer program will help maintain the forest. Other options would be to expanding the parks system, promote clustered development, and developing a tree ordinance for the watershed.

watch out for this only it has been and elsewhere to seriously stop development

The recommended plan includes goals for the amount of development (built upon area) for each of the zones in the watershed. These goals were developed based on the water quality analysis of the land use alternatives, the adopted water classification rules, and the County's policy statement. The recommended plan will allow tributary areas to qualify for either a WS-II (Gar Creek subwatershed) or WS-III (remainder of the watershed) classification. It has been assumed that the lake itself will ultimately be classified as WS-IV because of activity in the watershed upstream of Cowan's Ford Dam (Lake Norman watershed).

The EMC's water supply watershed protection rules require that stormwater controls or BMPs be implemented concurrently with any development greater than a low density limit (which is dependent on the water classification). The recommended plan includes provisions for BMPs throughout the watershed, although non-structural controls, including grassed swales, filter strips, and stream buffers, are recommended throughout the extended protected area on either a site (commercial) or regional (residential) basis consistent with EMC rules.

The watershed protection rules also specify that clustering is allowed on a project-by-project basis in all areas of WS-II WS-III, and WS-IV watersheds, including the

/89 FORM 389

critical areas. Clustered development is to be placed in the upper portion of the project, away from surface waters, to provide some protection from stormwater runoff impacts on water quality resulting from this developed area. The remaining portion of the area must remain in a vegetative or natural state. The recommended plan will also allow clustering as long as the overall percent built upon area achieves the goal for the applicable zone. In addition, the recommended plan will allow clustering to go beyond a project basis or allow higher development to be offset by dedicated parkland or other natural land area. Therefore, clustering may be implemented provided the overall percent built upon area is consistent with the specifications in the recommended plan.

During discussions with the TAC, concern was expressed regarding how the watershed protection program would affect existing development in the critical and protected area. Since the plan is based on a maximum limit of 6 percent and 12 percent of the land in the critical and protected areas respectively being built upon, existing developments such as Duke Power's facilities in those areas could continue with their development plans but with the addition of site specific structural BMPs as long as the maximum built upon limits are maintained.

Crescent land?

While the recommended plan is designed to conform to the EMC's water supply watershed protection criteria, it also considers the tentative land use plans developed by the Charlotte-Mecklenburg County Planning Commission's Northern and Northwest District Plans. These plans focus on establishing balanced urban growth patterns that accommodate quality employment concentrations, commercial development, and various housing options while maintaining parkland and greenways in the landscape.

DRAFT

In summary the recommended plan includes the following features:

- Density limits of 1 du/2 ac would be established within the critical area in Mecklenburg, Gaston, and Lincoln Counties with a limit of 6 percent of land built upon.

- Density limits of 1 DU/1 AC would be established within the protected area in Mecklenburg, Gaston, and Lincoln Counties with a limit of 12 percent of land built upon.

- Existing developments within the critical and protected areas could continue with development plans with the addition of structural BMPs.

retrofit for current development?

- The extended protected area in Mecklenburg County would be developed in conformance with the Northwest and Northern District Plans with the addition of structural BMPs.

39 FORM 389

- Clustered development would be encouraged as a means of limiting the percentage of land built upon.

- Throughout the watershed all land extending 100 feet from the normal elevation of perennial waters would be designated a buffer zone to be maintained in a natural or vegetative state.

- Efforts should be made to maintain the forest within the watershed through land acquisition, clustered development, and tree ordinances.

watch out!

no wet ponds?

- The BMPs recommended for the critical and protected area include grassed swales, filter strips, and stream buffers.

this is next.

- The BMPs recommended for the extended protected area in Mecklenburg County include grassed swales, filter strips, stream buffers, site specific wet ponds, and regional wet ponds.

not proven to be correct.

- Because of its sensitivity to pollutant loads, the Gar Creek subwatershed would be developed at a density of 1 du/2 ac.

but industry will pay for the risk. who pays for the risk imposed by new agricultural chemicals?

RECOMMENDED PLAN DISCUSSION

High density development in the critical and protected area of the watershed relying on structural BMPs to control pollutant introduction into the water supply source would generate considerably more stormwater pollution loadings than the recommended plan. The BMP's would be designed to capture and remove pollutants from the stormwater, however, the data base on removal efficiency of structural BMPs is relatively small. Thus, there is some uncertainty about their effectiveness, which introduces a level of risk in relying solely on BMPs to protect the water quality of Mountain Island Lake from stormwater runoff particularly in the critical area and to a lesser extent the further you get from the lake. The recommended plan emphasizes density controls to protect water quality in Mountain Island Lake from development within the critical and protected areas. The extended protected area which is entirely within Mecklenburg County, includes utilization of structural BMPs with development densities proposed in the Northwest/North District Plans. This extended protected area encompasses about 25 percent of the Mountain Island Lake local watershed. At build out conditions, if structural BMPs were used in the critical area and protected area upwards of 2,000 wet ponds would be operational. The cost of constructing these ponds could approach $80 million in 1991 dollars with an annual operation and maintenance cost of around $4 million. The structural BMP cost for the recommended plan would be considerably below those figures because structural BMPs would be used only in the extended protected areas within Mecklenburg County

but it exists, and they even resent it!

FORM 389

A major disadvantage of land use controls are the potential tax base reductions In comparing land use controls and higher density development with structural BMPs, Mecklenburg County may want to compare potential tax base reductions with the additional costs of providing County services to more dense development.

A watershed protection program which relies strictly on BMPs is irreversible. As urbanization takes place, the land values escalate and there is increased pressure on further development. This pressure generally results in more dense development--hence the production of larger quantities of pollutants which have to be treated by the BMPs. If the BMPs do not effectively remove the increasing quantities of pollutants from the urbanized watershed as a result of inadequate maintenance or some other reason, there is little opportunity to impose land use controls at that point. On the other hand, the recommended plan presents a more conservative approach It relies on land use controls for those areas close to the lake contained in the critical and protected areas while relying on BMPs for the extended protected area, which is the area currently undergoing more intense growth within the watershed. The recommended plan will ensure maintaining water quality within Mountain Island Lake while providing planners the opportunity to develop the institutional capability to implement and fund a structural BMP program as well as evaluate their effectiveness in removing pollutants. In the future as the BMP administration and funding program matures and improvements in BMP technology develop, planners may want to increase development densities on a case-by-case basis within the protected area of the watershed by utilizing BMPs. At that time there will be a means of funding and administering the BMP program, and more information on their effectiveness will be available.

DRAFT

3/89 FORM 389

DRAFT

CIVIL ENGINEERING DIVISION

THE EDGe GROUP

Presented to:

Mecklenburg County
Department of Engineering

MOUNTAIN ISLAND LAKE WATERSHED BEST MANAGEMENT PRACTICES FEASIBILITY STUDY

Presented by:

ENGINEERING, DESIGN & GEOSCIENCES GROUP, INC.
3325 PERIMETER HILL DRIVE
NASHVILLE, TENNESSEE 37211
(615) 331-3520

An ERC International Company

January 23, 1989

INTRODUCTION

Acknowledgement

This study was performed in a very short time frame and required the assistance of a large number of persons. Assistance and data were received from EPA staff, state officials, administrators of successful water quality control programs across the country, local county staff, Duke Power, universities, other consultants and the development community. We wish to acknowledge the superb level of cooperation and assistance and thank each person for their efforts.

General

The purpose of this study is to make an assessment of the feasibility and relative effectiveness of "engineering devices" (more generally known as Best Management Practices - BMPs) for reduction and control of pollutant loadings from site runoff. We investigated the amount of flexibility provided by the use of combinations of BMPs and density requirements both under the proposed Mountain Island Lake Watershed Management Plan (MILWMP) and for other alternatives. In addition, we briefly assessed available data on Mountain Island Lake water quality and the larger question of the various factors that must be considered when implementing a management plan like that proposed.

Report Organization

This report is organized into three sections: (1) a Summary Overview (this section) which pulls essential information out of the appendices to develop a clear and concise statement of indings; (2) a Recommendations section which describes two alternate courses of action along with other supporting recommendations; and, (3) an Appendix section which gives detailed information under various headings. We have decided to forgo a one or two page executive summary, not wishing to lure busy readers into a perfunctory consideration of such an important issue. The appendices are as follows:

A Exisiting Water Quality In Mountain Island Lake
B Watershed Pollutant Loads
C Best Management Practices
D Example BMP Applications
E Description Of A Typical BMP Program
F Water Quality Act of 1987
G Key Unresolved Issues
H References

OVERVIEW REPORT

Appendix A - Water Quality In Mountain Island Lake

General

Figure 1 presents a map (taken from the proposed Mountain Island Lake Watershed Management plan) depicting the study area with the maximum, medium and minimum protection areas as identified by the Mecklenburg County Department of Environmental Protection (MCDEP) included.

Water quality entering Mountain Island Lake from Lake Norman is generally good and is completely mixed prior to entering the main body of the lake six miles downstream from Cowans Ford Dam. Water quality at the Charlotte intake is also good and, according to Charlotte-Mecklenburg Utility District (CMUD), can be treated easily by conventional methods.

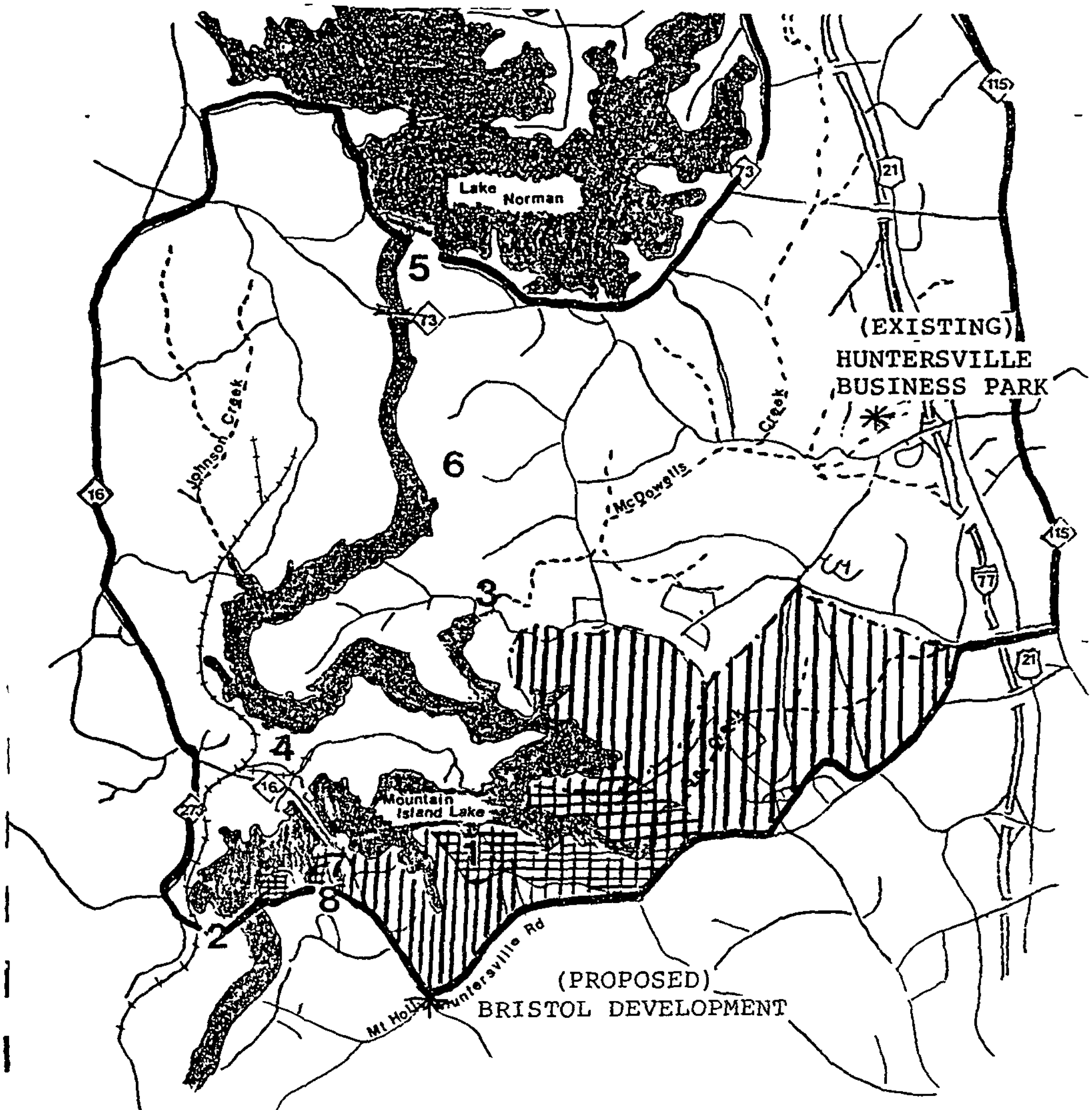
Flow In The Lake

The drainage area of the Catawba River above Mountain Island Lake dam is 1856 square miles. Based on Mecklenburg Engineering staff figures the local drainage area into Mountain Island Lake is about 80 square miles. This comprises only about 4% of the total area contributing flow to Mountain Island Lake. Of the local area the Mecklenburg County portion is about 76%, the Gaston County portion is about 15% and the Lincoln County portion is about 9%. Noting that average rainfall in the Catawba River headwaters are normally more than in the Mecklenburg County area, the actual runoff contribution from the contiguous drainage area is estimated to be about 2.4% (personal communication, Duke Power).

Retention times in Mountain Island Lake are very short, particularly when Cowans Ford is generating power; which it does each day, morning and evening. This causes flushing of the lake on a regular basis. The theoretical mean retention time for the lake is 11 days based on mean inflow. This is not reflective of the actual flow regime since travel times of flow to move the length of the lake when Cowans Ford is operating range from 6.3 to 10.6 hours. This must be compared to a typical eutrophication retention time requirement of about 2 weeks (MWCOG, 1987).

An attempt was made to predict the relative flow contributions from the various tributaries to Mountain Island Lake and Lake Norman. The total runoff from a 2-yr, 10-yr and 100-yr 24 hour duration storm are: 2762, 7893, and 14,208 acre feet respectively. If it is assumed that Cowans Ford operates for five hours per day (Duke Power, 1979), the inflow volume during a 24 hour period for 1, 2, 3, and 4 units operating would be 28,700, 57,400, 76,500 and 114,800 acre feet respectively.

Figure 1 MOUNTAIN ISLAND LAKE WATERSHED



Key: 1 - Charlotte-Mecklenburg Water Intake 2 - Mount Holly Water Intake
3 - McDowell Creek Wastewater Treatment Plant 4 - Riverbend Steam Plant
5 - Duke Power Mcguire Nuclear Station 6 - Proposed Stevens Road Landfill
7 - Proposed Elbert Realty Wastewater Treatment Plant 8 - Proposed Mattox Development
Streams (-------) Watershed Boundary (———) Maximum Protection Area (#######)
Medium Protection Area (||||||||)

Therefore, it can be seen that the relative inflow volumes from the tributaries, even under unusual storm circumstances are an order of magnitude less than the inflow from Lake Norman. Since Mecklenburg County comprises about 76% of the local drainage area we can assume it would have control over that percent of the local pollutant input.

Lake Water Quality

There are many sources of urban pollution including: atmospheric fallout, transportation residue, particulate accumulation, urban litter, chemical usage, fertilizers and pesticides, microorganisms, unpermitted point sources, construction activities and streambank degradation. Each can be expected to have some impact, however minor, on Mountain Island Lake. Impacts of these pollutants include: oxygen depletion, nutrient over-enrichment, toxics contamination, microorganism contamination, sediment accumulation and its related effects, biological degradation and altered hydrology.

The main sources of possible pollution to Mountain Island Lake are probably the wastewater treatment plant discharging to McDowell Creek Cove, erosional materials entering the lake from construction activities and the McGuire nuclear plant. The wastewater input may have led to several fecal coliform violations in 1987, although input from the McDowells Creek cove can be assumed to be mixed and diluted well upstream from the water intakes.

Conclusions

The conclusion can be drawn: Lake Norman water quality controls the general water quality in Mountain Island Lake. Flushing of the lake takes place regularly. Most of the flow moving through Mountain Island Lake is along the old stream channel. Therefore, in isolated coves it can be expected that the tributary flowing into that cove controls water quality in that cove only.

Based on our assessment of available data, we feel detailed analysis of the relative impacts of the tributaries cannot be made. We recommend that a data collection program be initiated to assess the actual interaction of Lake Norman and the tributaries. Details of this program are given in Appendix A.

Appendix B - Watershed Pollutant Loads

Purpose

Our purpose in this section of the report is to estimate the pollutant loadings from: (1) various landuses types and (2) total loadings for three alternative landuse schemes for protection areas. The three watershed development conditions compared are:

(1) existing conditions, (2) ultimate development conditions under the proposed Planning Commission Northwest District Plan and, (3) ultimate development conditions under the proposed Watershed Management Plan. Alternative one sets a baseline; alternative two sets a worst case scenario; while alternative three gives information and sets targets and performance criteria under the watershed management plan.

Table 1 gives landuse definitions used in this report. "Rural Residential" corresponds to the density requirements in the maximum protection area. "Low Residential" corresponds to the density requirement in the medium protection area without sanitary sewer connections. "Medium Residential" corresponds to the maximum allowable density, with sewer connection, in the medium protection area.

TABLE 1. LAND USE DEFINITIONS

Land Use	% Imp	Description
Wooded	1	Wooded land
Pasture	1	Meadow, pasture, or open land
Crops	1	Agriculture, row crops
Rural Res	6	Sgl Fam, 1 dwl / 2+ ac
Low Res	12	Sgl Fam, 1 dwl / ac
Med Res	30	Sgl Fam, 2+ dwl / ac; Duplex
High Res	60	Multi-Family, Apartment / townhouse
Commercial	75	Light commercial with landscaping
Industrial	90	Light manufacturing, warehousing

To estimate pollutant loadings a simple method was chosen which was developed by the Metropolitan Council of Governments (1987) from data collected nationwide and in the DC area under the National Urban Runoff Program (NURP). The pollutants addressed in herein were chosen to be typical constituents from urban and rural runoff.

Table 2 presents annual per acre washoff loadings for the various landuse types. These loadings are the basis to compare the impacts of various landuse schemes in the medium and maximum protection areas. Using this information a per acre loading of pollutants was developed. Figure 2 presents the contributing areas and a breakdown of Gar Creek into sub-basins.

All landuses for the three alternatives were digitized and a weighting scheme developed. From this weighting total pollutant loadings and loadings on a per acre basis could be developed. Table 3 represents the results of the per acre analysis. Landuse alternative three (Watershed Management Plan) takes into account the various measures proposed to abate pollution while alternative two (the Northwest District Plan) uses no controls whatsoever. Both alternatives two and three assume maximum allowable development and take into account development that already exists.

Figure 2 GAR CREEK AND MOUTAIN ISLAND LAKE

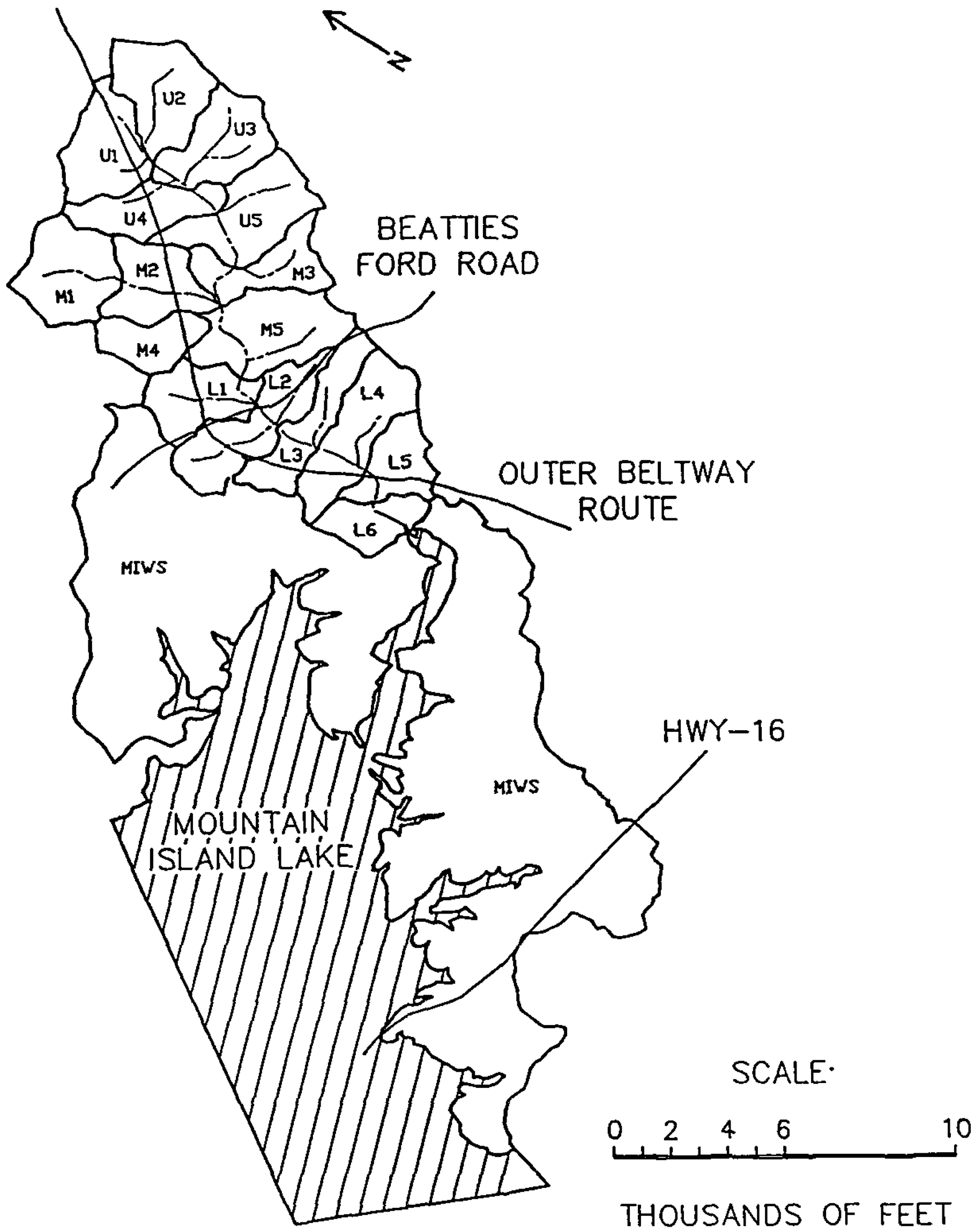


TABLE 2. ANNUAL PER ACRE LOADINGS DEVELOPED IN PIEDMONT REGION

Land Use	Washoff Load (pounds) TSS	TP	TN	BOD	COD	TPb	TCu	TZn
Wooded	10.5	0.08	0.44	1.02	27.68	.002	.004	.003
Pasture	5.3	0.05	0.41	1.02	7.24	.004	.009	.008
Crops	5.3	0.05	0.41	1.02	7.24	.004	.009	.008
Rural Res	25.2	0.25	1.95	4.88	34.8	.018	.036	.046
Low Res	38.3	0.39	2.96	7.41	52.8	.027	.055	.070
Med Res	77.5	0.78	6.01	15.01	106.9	.054	.111	.141
High Res	142.9	1.44	11.08	27.69	197.2	.100	.205	.260
Commercial	175.5	1.77	13.61	34.01	242.2	.122	.252	.320
Industrial	219.1	2.21	16.98	42.46	302.3	.153	.314	.399

Table 3. PER ACRE WASHOFF LOAD SUMMARY

Landuse Alternative	Annual Washoff Load (pounds) TSS	TP	TN	BOD	COD	TPb	TCu	TZn
1. EXISTING	28.20	0.21	1.45	3.45	39.69	.011	.029	.022
2. NW DIST PLAN	51.66	0.52	3.95	9.87	69.23	.036	.092	.072
% INCR	83%	148%	172%	186%	74%	227%	217%	227%
3. WATERSHED MGMT PLAN	35.64	0.35	2.71	6.76	47.12	.024	.063	.049
% INCR	26%	67%	87%	96%	19%	118%	117%	123%
% OVER MGMT PLAN	45%	49%	46%	46%	47%	50%	46%	47%

From Table 3 we can see that there is increase in pollutant loadings under both cases. Those for the Northwest District Plan are about 46% higher than for the proposed watershed management plan.

Appendix C - Best Management Practices

Purpose

The purpose of this section is: (1) to determine the capability of Best Management Practices (BMPs) in removing pollutant loadings from various landuses and what BMPs would be necessary to reduce the loadings from a more dense landuse to that mandated under the proposed Watershed Management Plan in the protection areas.

Best Management Practices

Best Management Practices are defined as a collection of both structural and non-structural practices which have varying effectiveness in the removal or reduction of pollutant washoff loading. BMPs have one main goal: source control. Non-structural BMPs are such things as ordinance control, household waste disposal systems, street sweeping and catch basin cleaning practices, density limitations, etc. The proposed Watershed Management Plan is itself a non-structural BMP.

Structural BMPs (called "engineering devices" in the Mecklenburg County context) include such things as vegetative buffers, devices to control a certain portion of the runoff (say the first half inch), grassed swales, etc. Most of the requirements in the proposed Watershed Management Plan are actually structural BMPs. For example, the requirement in the medium and minimum protection areas to control the first half inch of runoff will require numerous detention or retention ponds (conservative estimates place the number at over 1000) which will have to be built, maintained and inspected.

The structural BMPs most applicable to the climate and soil combination in Mecklenburg County include: vegetative filter strips, grassed swales, wet ponds, extended detention ponds, first flush controls, infiltration trenches, dry wells and oil and grease baffles. Detailed information on each of these BMPs is given in Appendix C. Information on non-structural BMPs as part of a comprehensive program and cost information are given in appendix E.

BMP Effectiveness

Table 4 presents a matrix of percent reductions required for any type of pollutant for a given percent imperviousness to reduce the load to make it equivalent to another percent imperviousness. Thus, for example, to reduce an area with a planned percent imperviousness of 80 to make its loading equivalent to the 30 percent impervious loading a pollution loading reduction of 69 percent would be necessary. The 30 percent line includes the requirement to control the first half inch of runoff.

TABLE 4. PERCENT POLLUTANT LOAD REDUCTION REQUIRED

	Percent Imperviousness						
Protection Area	6	12	30	45	60	80	95
Maximum	0	34	67	77	82	87	89
Medium (12%)	0	0	51	65	73	80	83
Medium (30%)	0	0	0	47	59	69	75

These percent reductions are then the target. If a denser development, say two units per acre (12% imperviousness), were considered for the maximum protection area (6% imperviousness) the target reduction in loading would be 34 percent. The next step is to determine what reduction in loading is provided by different applicable BMPs.

Table 5 presents removal effectiveness for each pollutant for each BMP for several different design types along with code letters. This table assumes medium values of removal effectiveness thus building in a ten percent safety factor. Tables 6, 7 and 8 show what different combinations of BMPs would reduce the pollutant loading equal to or greater than the required amount.

Conclusions

The conclusion is clear: BMPs are able to reduce the expected pollutant loading from almost any type of development to that required under the proposed Watershed Management Plan. There may be some types of development, such as heavy industry, that should not be allowed in certain areas due to hazardous waste or industrial effluent.

TABLE 5. BMP EFFECTIVENESS AT REMOVING IDENTIFIED POLLUTANTS

			Percent Removal of Indicated Pollutant (±10%)							
BMP	Code	Design Criteria	TSS	TP	TN	BOD	COD	TPb	TCu	TZn
Extended Detention	ED1	(first flush, 6-12 hr)	70	50	30	50	50	70	70	70
Extended Detention	ED2	(1 inch, 24 hr)	90	70	50	50	50	70	70	70
Extended Detention	ED3	(1 in, 24 hr, marsh plants)	90	80	70	70	70	70	70	70
Wet Pond	WP1	(pool vol = 2.5 X 2-yr runoff)	70	50	30	30	30	70	70	70
Wet Pond	WP2	(pool vol = 4.0 X 2-yr runoff)	90	70	50	50	50	70	70	70
First Flush Basin	FF1	(first flush = 1st 0.5 in)	65	40	30	50	50	65	65	65
First Flush Basin	FF2	(first flush = 2-yr runoff)	75	50	40	60	60	75	75	75
First Flush Basin	FF3	(2-yr, liquid to sand filter)	90	80	75	75	75	80	80	80
First Flush Basin	FF4	(2-yr, liquid to WWTP)	90	90	90	90	90	90	90	90
Filter Strips	FS1	(20 foot wide grassed)	30	10	10	10	10	30	30	30
Filter Strips	FS2	(100 foot wide wooded)	90	50	50	70	70	90	90	90
Grassed Swales	GS1	(slope = 5%, no check dams)	10	10	10	10	10	10	10	10
Grassed Swales	GS2	(slope (5%, with check dams)	30	30	30	30	30	10	10	10
Infiltration Trench	PXS	(Partial exfiltration, 2-yr)	75	45	45	60	60	75	75	75
Infiltration Trench	IT1	(1 inch per impervious acre)	90	50	50	70	70	90	90	90
Infiltration Trench	IT2	(all runoff up to 2-yr event)	90	70	70	90	90	90	90	90
Dry Well	DW1	(rooftop runoff, 1st 0.5 inch)	60	50	50	70	70	70	70	70

But, if it is assumed that BMPs can be properly installed and maintained (an assumption implicit in the proposed watershed management plan), severe restrictions in development based solely on stormwater runoff generated pollution increase are, in our opinion, not warranted. This is particularly true when the required change in degree of development is not great. We do not recommend attempting more than a 75 percent reduction in pollutant loading through the use of any BMP combination.

Appendix D - Example BMP Applications

Purpose

In order to illustrate the use of BMPs in actual site designs, three proposed designs were chosen. Two are located in the medium protection area and one in the minimum protection area.

Maximum Protection Area

We anticipate that any development in the maximum protection area would not be different in kind from that proposed under the plan. In the maximum protection area an average pollutant increase of about 35 percent would be anticipated if densities were allowed to increase to, for example, 12 percent (one dwelling unit per acre). However, the buffer requirement is already sufficient to provide a high degree of removal (almost 100 percent) of those pollutants which would be most directly increased through a greater density. Allowing a density increase from 1/2 to 1 dwelling unit per acre along the lake would make development economically feasible. If this is not acceptable then land acquisition for park use should be explored in the area adjacent to the water intake.

Medium and Minimum Protection Areas

Details of the sites and the BMPs are given in Appendix D. Site one will be used to illustrate the procedure here. It is a 50 acre multi-family development with an estimated imperviousness of 60 percent. Four different BMP designs were developed, each capable of reducing the pollutant runoff from the site to that required for the medium protection area. The type of BMP used to reduce the runoff from this site would be the same as that BMP which would be chosen under the proposed Watershed Management Plan to control the first half inch of runoff. Only the size of the facility is different, being roughly half the size required for the 60 percent impervious site.

Conclusions

The buffer BMPs required for the maximum protection area are already the maximum feasible (and in some cases infeasible) for that area. A slight increase in allowable percent imperviousness

will have little additional affect on pollutant loadings reaching the lake. If this is not acceptable land acquisition might be explored.

In the medium and minimum protection areas combinations of BMPs will adequately reduce pollutant runoff, meeting the targets required by the proposed Watershed Management Plan, and, make more cost effective use of land while retaining aesthetics.

APPENDIX E - TYPICAL BMP APPLICATION PROGRAM

Introduction

A number of stormwater quality programs exist across the country. This appendix highlights some of them.

Other Programs

Several common threads run through all of them. They all involve comprehensive planning. They all were developed to meet specific local conditions. They all were developed with broad backing of politicians, the public, and the staff. Most stressed regional BMPs over local BMPs. And most assumed at least some of the responsibility for maintenance, especially if public lands contributed to the runoff.

Maintenance

Maintenance costs vary widely from place to place. Specific data should be generated for Charlotte based on performance of similar tasks (mowing, drainage infrastructure repair, etc.). Maintenance estimating equations are supplied.

A Charlotte-Mecklenburg County Program

The responsibility for various phases of a program which could be instituted for Charlotte-Mecklenburg County could parallel those services currently being provided. However, a recent study reviewing the current stormwater management program indicated that one of the biggest obstacles in the way of an efficient program was a cumbersome and diffuse institutional setup. Overlap between county and city functions and gaps in jurisdiction hamper an effective program. We recommend a single entity be responsible for stormwater quality and quantity which receives staff input from various areas but administers and enforces the program itself.

APPENDIX F - WATER QUALITY ACT OF 1987

Introduction

The EPA regulations implementing the Water Quality Act of 1987 require a wide range of activities for Charlotte-Mecklenburg

County. These requirements have great impact on the decision about how to control development in the Mountain Island Lake watershed.

Act Requirements

The basic requirements are that illicit connections (ie. illegal polluters) be identified and disconnected, and that Charlotte-Mecklenburg County control the runoff of pollution from stormwater to the "maximum extent practicable" (MEP).

Charlotte-Mecklenburg County must file Part 1 of the application by February 4th, 1990; Part 2 by February 4th, 1991 and be in compliance by February 4th, 1995.

Impacts

What this means in actual terms is that Charlotte-Mecklenburg County will need to apply for an NPDES permit to discharge stormwater. Our best estimate of the main requirements to bring Charlotte-Mecklenburg County into compliance with the expected provisions of the permit will be:

- a stormwater quality and quantity management program
- demonstrated ability to finance a stormwater program
- demonstrated legal ability to enforce regulations
- estimates of pollution from all areas of the urban area
- representative sampling of low flow and high flow water quality
- proposed controls for stormwater pollution abatement
- an assessment of the overall effectiveness of the program

Conclusions

These regulations will, in effect, force Charlotte-Mecklenburg County to assume responsrbility for management of a stormwater quality control program. Therefore, the additional cost and effort which might be required to inspect, enforce or maintain a program in the Mountain Island Lake Watershed should be put in perspective: Charlotte-Mecklenburg County will need to inspect, enforce or maintain in the whole urbanized area by 1995.

APPENDIX G - KEY UNRESOLVED ISSUES

Introduction

In order to arrive at the right answers the right questions need to be asked. The central question we have been requested to answer can be stated as: "is it possible to limit the off-site delivery of key pollutants by stormwater runoff to a level commensurate with the Mountain Island Lake development density limitations and other site design requirements through the use of 'engineering devices'?" The short answer to that question is a

qualified 'yes'. The qualifications are given in various places in this report. However, we feel that there are questions that have not been asked that are just as, or more, important than the one above. These questions relate to key unresolved issues which we feel must be recognized and considered. We have narrowed these issues down to three fundamentals with some related concerns. Appendix G details these issues and asks a large number of questions related to each one.

Issues

ISSUE 1. What measurable water quality goals or standards must be achieved, where must they be achieved and why?
Before it is possible to assess the extent of the impacts of development in the area around the lake— it is necessary to establish specific water quality goals and standards to attain or maintain. Most of the literature and information on water supply watershed management is aimed at a watershed on which the water supply depends solely. Mountain Island Lake is a unique situation in that the local drainage area comprises only a small percentage of the total drainage area flowing into Mountain Island Lake via the Catawba River. Therefore it appears important for planners to assess the bigger picture of pollution, dilution and dispersion within the lake prior to implementing a watershed management plan which may be overly restrictive or not restrictive enough.

It is not possible to determine "best" solutions without first setting goals and targets and assessing ability and willingness to carry out a recommended solution. This is not to say the recommended controls are too restrictive. They may not be. But, at present, no one can say. Therefore, in our opinion, it seems somewhat premature to mandate an ordinance that will affect the development of the northern portion of Mecklenburg County prior to finding or developing at least partial answers to a number of questions provided in Appendix G.

These questions relate to defining an intended use of the lake and setting specific standards for that use. Then questions concerning the actual impacts of tributaries and lake Norman must be answered. Having answered these technically based questions a larger issue must be faced:

ISSUE 2. How should a watershed management plan be developed that fully recognizes the broader context of comprehensive landuse planning, economic development and property use such as to maximize net benefits from the use of the land areas in question and the lake without compromising essential water quality goals and standards?

The primary goal on which commitment and consensus must be reached is the assurance of a high quality water supply. By design, the Mountain Island Lake Management Plan is narrowly focused on this goal. While this is the foundational goal (all

can agree that there is an urgent need to maintain an acceptable level of water quality), it is by no means the only goal. Multiple and, perhaps, conflicting objectives for the use of the area may exist. This is always the case in an urbanizing area.

The state recognizes this situation for urban watersheds and is possibly considering an urban water supply classification similar to the "WS" classifications now in existence.

Most of the risks in attempting to implement a management plan which is not restrictive enough are obvious. One of the risks of attempting to attain, what might be perceived, as an unreasonable or premature restriction of landuse is a political, popular or administrative reaction wherein water quality is subsumed in other needs or objectives. This is especially true if there is reason to believe that subsequent data collection and analysis may prove the plan too restrictive.

ISSUE 3. What responsibility and involvement should Mecklenburg County and/or Charlotte have in maintaining water quality in the lake and in regulating surface runoff quality?

For better or worse, we are entering a new era of water quality regulation. The impact of the forthcoming EPA NPDES permitting regulations for stormwater runoff will be great. They may dictate the type of control Charlotte or Mecklenburg County will exert on landuse and drainage design in the future. The management of stormwater quality will require the dedication of assets beyond those now assigned to the drainage system.

The regional (versus on-site) control of urban stormwater runoff quality has many advantages including: reduction in total maintenance and capital costs for the basin, increased landuse opportunities, more effective pollutant and flood peak control, increased recreational or multi-objective use opportunities and a better ability to retrofit existing facilities for pollution control. Studies have shown that on-site detention ponds (as required under the proposed plan) quickly fall into disrepair even with an inspection program.

Regional control of stormwater quality would necessarily fall mostly under the purview of public staff. Thus there are some tradeoffs. The county would assume maintenance responsibility for the facilities. There would also be a need for planning, design, financing, and construction in advance of development. Some hard questions need to be asked and studied related to costs, responsibilities, organization, etc.

RECOMMENDATIONS

Introduction

The previous section provides an overview of the various findings of this study. The decisions made on the use of the Mountain Island Lake Watershed will have impact into the distant future on the character of the northern portion of the county, revenue generation, quality of life, water supply, and possible litigation. It is imperative that the decision on how best to utilize Mountain Island Lake Watershed be based on a comprehensive assessment of available data and, possibly, the collection of additional data targeted to answer the specific questions addressed in Appendix H.

General Assessment of the Current Plan

The current plan is generally a reflection of the state's guidelines for obtaining a surface water classification. In that respect, with minor departures, it is faithful to its charge. However, in our opinion, based on our findings, the Watershed Management plan as currently proposed is both premature and incomplete. It is premature because of "process" flaws and incomplete because of "program" flaws. This is not the fault of the plan but of the planning process. Based on discussions with various staff personnel and input from the January 19th public hearing, we feel that the plan might be viewed as the final statement on what should be done with watershed. In fact, it is only one very important staff input to, what should be, a much larger consideration.

We feel a decision based solely on the plan is premature because it appears that the plan was developed, in a sense, in a vacuum without going through the typical and necessary watershed management planning and coordination steps:

1. Analyze and fully understand the problem and all implications; both technical and institutional.

2. Establish specific and quantifiable goals and set specific direction through consensus building, cost effectiveness studies and negotiation.

3. Develop workable technical guidelines and controls.

4. Determine implementation steps, procedures, and timing.

5. Monitor and evaluate program effectiveness.

This was not a case of subterfuge. The Department of Environmental Protection are very dedicated and competent. MCDEP was charged with writing a plan that look narrowly at physical environmental considerations. This they did. However, based on input from a variety of county staff elements and local

officials, little apparent attempt was made to evaluate how this plan impacts the bigger picture. Unless this "bigger picture" step is taken the result will be unsatisfactory in a number of quarters where whole hearted support is vital.

We feel that the plan is incomplete in that it mandates the blanket use of certain BMPs but provides no wording and criteria to insure that they are properly designed and no administrative structure to insure that they are properly maintained. Implementation of this plan, over time, has the possibility of reliance on literally hundreds of wet detention ponds that are ineffective though lack of enforced maintenance, a monitoring system that cannot accurately assess performance, an ordinance without teeth, an engineering community without technical guidance, possibly increased flooding problems, and undefined and diffuse county staff responsibility when the inevitable corrective actions need to be taken.

Many of the provisions of the plan are very good. But certain rigid provisions of the plan may lead to equal problems. The proposed plan mandates the use of septic tanks, grassed swales, and vegetated buffer strips. Septic tank requirements are often an indirect method to maintain density restrictions. Based on conversations with state officials, this appears to be the case here. Discussions with county officials and local engineers indicate that septic tanks will often fail due to the poor percolation capability of the soil. Septic tanks are required close to the lake, where they can do the most damage. The requirement to sewer those locations where problems occur is probably not workable in practice. Who knows, a priori, where these tanks will fail? Who will pay for a sewer to every seventh house?

Grassed swales are not effective when velocities reach 3 feet per second or flows exceed 5 cfs. It can be shown that, in these cases, curb and gutter combined with a wet pond provides superior pollutant removal results where feasible. Vegetated buffer strips, unless carefully designed, invariably "short circuit" and become ineffective. This is especially true where no provision is made for grading approaches or providing flow spreading devices.

Alternatives

The County Commission faces a range of alternatives that can be thought of as forming a continuum extending from the extremes of "do nothing to control development" to "adopt a plan more restrictive than the proposed Watershed Management Plan". From our assessment of the available data and county situation we feel that one of two recommended intermediate courses of action should be taken. Each of these major courses of action has advantages and disadvantages; but both of them are based on consideration of important factors impacting the final decision.

Certain other recommendations will apply to both of the alternates. These follow a brief discussion of the two recommended alternatives. We prefer the second alternative for reasons discussed below.

Alternative Recommendation One - Modify the Proposed Watershed Management Ordinance To Allow Greater Flexibility in Meeting Pollution Reduction Standards Through The Use of Performance, Rather Than Design, Based Criteria.

The proposed Watershed Management Plan already mandates the use of BMPs to control the first half inch of runoff in the medium and minimum protection areas as well as other measures. Therefore, this recommendation is an extension of that idea to allow some specified greater level of flexibility in meeting performance based criteria for pollutant loading.

Performance criteria set a pollution loading target but do not rigidly mandate how that target is to be met. Rather guidelines and controls are set that fall within the limits of the County stormwater management program. This report establishes, in a preliminary way, the performance criteria mandated by the Management Plan and thus target performances to be met by any proposed development.

Criteria in the modified plan should set limitations on certain types of development (especially in the maximum protection area) and reasonable imperviousness (perhaps a 75 percent required reduction in loadings). But the main thrust of the criteria should be the establishment of pollutant based performance criteria wherein a landowner/developer could retain some measure of flexibility in how he would meet these criteria. This would more directly address the goal of pollutant reduction.

It is our opinion, for example, there will be cases in development of an area where curb and gutter combined with wet ponds would provide pollutant removal efficiency superior to grassed swales, or where wet ponds would be superior to buffer strips.

The major objections to this type of recommendation are: (1) increased involvement required by County staff, (2) the possibility of BMP failure due to poor maintenance, and (3) fear of allowing too much flexibility.

If proactive control of environmental pollution is a priority in Mecklenburg County (and it is) then training and involvement of many of the County departments is unavoidable. County staff will be forced to be involved under the EPA NPDES permitting requirement. Even under the proposed plan, with several thousand small half-inch control ponds expected, the County staff will be

involved. It is better to plan County involvement on the front end than attempt to correct a problem after it has grown overwhelmingly.

There is no extensive data on failure of BMPs. This is good and bad news. Few have been tested over their design life. Few have failed. One leading program (Bellevue, WA, personal communication) found the most important factors leading to effectiveness of a particular BMP were design and construction, with maintenance being secondary. Both the proposed plan and this recommendation rely on BMPs. Both will require a monitoring and inspection program to be effective in reducing pollution runoff.

The idea that "case-by-case" exceptions to preset criteria can be made is already allowed by the State of North Carolina for WS-II classifications (NCDNRCD 1987). This option was omitted from the Watershed management Plan. Reinstatement of this option will require County staff to be able to review BMP plans knowledgeably. This will require training. Charlotte was one of the leaders in North Carolina in passing a detention ordinance which set performance, not design, criteria. An education process took place in the community among the engineers. It must happen again under either plan. It will be forced by EPA regulations. We recommend that allowing innovation, flexibility and an ability to take advantage of new methods and information as they become available be built into the plan on the front end.

Alternative Recommendation Two - Develop a Moratorium Ordinance Or Regulation To Be In Effect Until A More Comprehensive Planning And Analysis Process Can Be Completed.

A negotiated moratorium on development can be declared which has the purpose of controlling the impact of development until a more comprehensive study of the situation can be undertaken. The moratorium could take the form of a temporary ordinance controlling development within all or only the maximum and medium protection areas.

Such a temporary ordinance has been used successfully and commonly in similar situations (Burby, et al 1981) and constitutes a legally defensible exercise of the police power if deemed directly related to the problem at hand and equitable.

The ordinance can take the form of the modified plan suggested in alternative one or a more strict format. It should make adequate allowance for property owners who have, in good faith, invested in development and are to a certain point in the planning and development process. It could control or freeze other developments which are not as far along in the development process. It might mandate performance criteria in removal of pollutants to or below the targets suggested by the proposed Watershed Management plan.

This alternative has several advantages:

1. It allows reasonable development while a logical and comprehensive planning process proceeds.

2. It allows time for development of staff procedures, ordinances, financing and definition of responsibilities necessary to carry out any type of Watershed Management Plan.

3. It allows time to determine the impact of the EPA regulations so that these impacts can be meshed with the Watershed Management Plan.

4. It keeps the "window of opportunity" open for both environmentalists and property owners and thus is equitable.

5. It allows the development of more comprehensive technical data upon which better technical decisions can be made.

We recommend that the Planning Commission would be the logical County entity to pursue a comprehensive plan with the Environmental Protection Commission having major input.

Other Recommendations

Regardless of which alternative is adopted several actions must, in our opinion, be taken to help insure the success of the stormwater quality plan for Mountain Island Lake watershed.

Further Definition and Study of the Problem

Neither effective data nor the ability to predict the impacts of land development are not available. We recommend the development of a comprehensive data collection program aimed at defining the actual impacts of the tributary flows on Mountain Island Lake. It should coordinate all parties now collecting data and be designed to collect data during first flush as well as low flow periods. Details of this recommendation are given in Appendix A.

Define An Administrative program

At present, responsibility for the various aspects of stormwater quality management and basin planning are diffused throughout many county staff functions and in different offices. We recommend that a special task force be appointed or other means be used to study the various staff responsibilities and to make specific recommendations on how a plan could be set up and administered. The study should include financing, legal authority, administrative procedures and responsibilities, training needs, etc.

Provide Technical Guidance

When technical guidance is made immediately available designers will use it. Technical guidance which meshes with the desires of the County and the physical limitations of the Piedmont Region should be developed and provided to local engineers and developers.

Begin EPA Regulations Process

The EPA regulations will become effective shortly. Any activities related to stormwater quality will be impacted. The process of NPDES permitting should be defined for the Charlotte-Mecklenburg area and begun.

Seek Funding

There are possibilities for funding from both the state and federal governments. Specific efforts should be made to investigate these sources and secure outside funding. A specific study should be made on funding needs for proposed programs and local funding sources.

REBIC
MINUTES
AUGUST 22, 1991

The meeting began at 4:30 p.m. in the conference room of the Charlotte Association of Realtors, 1356 East Morehead Street, Charlotte, North Carolina.

Present were· Allen Tate, Steve Schreiner, Jim Teat, Dale Stewart, Ken Szymanski, Dick Lester, Danny Watts, Neal Broome, Doug Boone, John Crosland, Jone Coates.

CALL TO ORDER

Allen Tate, Chairman, called the meeting to order and welcome all to the special meeting to discuss the Watershed issue.

REBIC RESOLUTION

We are coming down to the end of four and one-half years of working with the Zoning Rewrite Task Force. This has been a massive undertaking. It is now ready for adoption by the City Council and County Commissioners before the end of this year. A summation of REBIC'S position on the rewrite was distributed for discussion. Upon approval of our position a final paper will be prepared and signed by each association president and then mailed to the elected officials and other interested parties. Discussion was held. Allen Tate reminded that at the last REBIC meeting a full report was given on the zoning ordinance and it was agreed that REBIC should have a summation of its position and this is where we are today. •

Doug Boone moved that we adopt this resolution. We still have problems with the ordinance and the objective in passing this resolution is to get the Council and Commissioners to commit to a comprehensive review in two years. Danny Watts seconded the motion. Discussion was held. Doug pointed out that we decided long ago that it was not politically practical to go back to the old ordinance and there was never the opportunity to abandon the ordinance rewrite and stay with the old one. Regarding single family standards we gained ground but otherwise there were losses. The motion was voted on and passed unanimously. (Position paper made a part of these minutes.)

WATERSHED UPDATE

Steve Schreiner, Jim Teat and Dale Stewart were on hand to inform REBIC on the watershed issue. Steve Schreiner advised that we are talking about a land use ordinance and not a watershed protection ordinance. People at the public hearings are beginning to realize this and what the State is trying to do from a land use situation rather than water quality. The ground that would be regulated by this watershed ordinance is 26% of the total ground in North Carolina 50% of the Piedmont is effected and 39% of Mecklenburg County. Details of the restriction were discussed.

Development could be restricted to one residential structure to a one acre lot in the critical area of the watershed. A sewer system would be cost prohibited and soil samples in Mecklenburg County show that about 40% of the soil in the area is not conducive for the use of septic tanks. Therefore, no development could occur on much of the land. The set backs on the water are 100' and the ordinance recommends that 25 feet of this be natural. This puts a barrier to the water. This is not only for developers but would mean no access areas on the lake. There can be no structures inside the set back and this means the buffer cannot be punched through to get to the water...no boat docks...nothing. Persons building a homes on the water would not be able to build any structure on the water's edge in order to use the lake and the natural buffer could not be removed for a better view of the water.

Pertinent information was distributed. A chart indicating the various watershed classifications and there restrictions and allowances was discussed.

Jim Teat pointed out that statewide between October 31, 1991 and 1993 or 1994 (depending upon the size of the town, property owners are on hold. A one acre lot can be developed under existing ordinance, but regarding growth in the community nothing can be done. The State has moved the deadline back to 1994 for municipalities to adopt their regulations. He questioned that in in essence does this mean that a moratorium has been place on this area's development until we know what rules we will be judged by. Allen Tate furthered pointed out that the law enacted says that we can't have a regulation that is less restrictive in the State and until the State adopts this how will we know we are meeting the law. This conclusion needs further study to determine if the moratorium assumption is correct.

Dale Stewart discussed the Calender of Regulations passed this summer by the legislation:

July 1992 The Environmental Management Commission (EMC) has to have rules and reclassifications in effect. This is a legal deadline.

July 1993 Cities greater than 5,000 have to have local watershed ordinances.

October 1993 Cities less than 5,000 have to have local watershed ordinances.

January 1994 Counties must have watershed ordinances.

The Watershed Taskforce was encouraged to keep REBIC up to date on this matter and to advise us when action is needed by our group.

THE MEETING WAS ADJOURNED.

WESTON

BMP/design	Suspended Sediment	Total Phosphorus	Total Nitrogen	Oxygen Demand	Trace Metals	Bacteria	Overall Removal Capability
Extended Detention Pond							
Design 1	◕	◔	◔	◔	◑	⊗	Moderate
Design 2	●	◑	◔	◑	◕	⊗	Moderate
Design 3	●	◕	◑	◑	◕	⊗	High
Wet Pond							
Design 4	◕	◑	◔	◔	◔	⊗	Moderate
Design 5	◕	◑	◔	◔	◕	⊗	Moderate
Design 6	●	◕	◑	◑	◕	⊗	High
Infiltration Trench							
Design 7	◕	◑	◑	◕	◕	◕	Moderate
Design 8	●	◑	◑	◕	●	◕	High
Design 9	●	◕	◕	●	●	●	High
Infiltration Basin							
Design 7	◕	◑	◑	◕	◑	◕	Moderate
Design 8	●	◑	◑	◕	●	◕	High
Design 9	●	◕	◕	●	●	●	High
Porous Pavement							
Design 7	◑	◕	◑	◕	◑	◕	Moderate
Design 8	●	◕	◕	◕	●	●	High
Design 9	●	◕	◕	●	●	●	High
Water Quality Inlet							
Design 10	○	⊗	⊗	⊗	⊗	⊗	Low
Filter Strip							
Design 11	◔	○	○	○	◔	⊗	Low
Design 12	●	◑	◑	◕	●	⊗	Moderate
Grassed Swale							
Design 13	○	○	○	○	○	⊗	Low
Design 14	◔	◔	◔	◔	○	⊗	Low

Key:

- ○ 0 to 20% Removal
- ◔ 20 to 40% Removal
- ◑ 40 to 60% Removal
- ◕ 60 to 80% Removal
- ● 80 to 100% Removal
- ⊗ Insufficient Knowledge

Design 1 First flush runoff volume detained for 6-12 hours
Design 2 Runoff volume produced by 1 0 inch, detained 24 hours
Design 3 As in Design 2, but with shallow marsh in bottom stage
Design 4 Permanent pool equal to 0 5 inch storage per impervious acre
Design 5 Permanent pool equal to 2 5 (Vr), where Vr=mean storm runoff
Design 6 Permanent pool equal to 4 0 (Vr), approx 2 weeks retention
Design 7 Facility exfiltrates first flush 0 5 runoff/imper acre
Design 8 Facility exfiltrates one inch runoff volume per imper acre
Design 9 Facility exfiltrates all runoff up to the 2 year design storm
Design 10 400 cubic feet wet storage per impervious acre
Design 11 20 foot wide turf strip
Design 12 100 foot wide forested strip with level spreader
Design 13 High slope swales with no check dams
Design 14 Low gradient swales with check dams

Source Metropolitan Washington Council of Governments, Urban BMP Design Manual 1986

273-1983b

FIGURE 2 COMPARATIVE POLLUTANT REMOVAL OF URBAN BMP DESIGNS

In order to put this information further into perspective, these two zoning cases for the Island Pointe Development (i.e., the current zoning for the area and CRESCENT's proposed rezoning) would generally produce roughly the same amount of stormwater pollution to Lake Wylie, absent any management or control.

The proposed rezoning plan for Island Pointe does result in slightly higher NPS pollution loads than that for a hypothetical one acre zoning plan. However, the highest percentage difference in annual NPS pollution loads for these two zoning cases (i.e., one acre density vs. that proposed for Island Pointe) is under 5 percent. This is for "uncontrolled" conditions in both cases, i.e., without the use of stormwater pollution control facilities or systems. Despite the fact that current regulations for the county or the state do not require that stormwater pollution management be provided for development projects, CRESCENT is committed to providing NPS management using "state of the art" environmental management and protection systems for Island Pointe. CRESCENT commits to the development of a stormwater pollution control design plan for Island Pointe that will not only achieve this 5 percent reduction in post-development stormwater pollution loadings, but will also provide sitewide control of the one inch storm using BMP's. Therefore, CRESCENT's commitment to NPS pollution control will result in a far greater reduction in stormwater pollutants to Lake Wylie than would result from a one acre density zoning for this site.

STORMWATER CONTROL (BMP) TECHNOLOGIES

Urbanization of an area will cause an increase in nonpoint source pollutant loads. This does not necessarily mean that there must be an associated impact to nearby waterbodies, however. Research and design applications over the last decade have resulted in the development of numerous types of engineering alternatives, commonly referred to as Best Management Practices, or BMPs, to address this problem.

Each BMP has both unique capabilities and potential limitations with respect to its application for a given project. It is the job of the land planner and engineer to apply the appropriate BMP, based on the physical constraints of the site as well as the objectives and