CAPE COD COMMISSION

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DATE: SEPTEMBER 20, 2007

TO: JOHN KLIMM, TOWN MANAGER
MARK ELLS, SUPERINTENDENT, DEPT OF PUBLIC WORKS

FROM: CAPE COD COMMISSION

RE: DEVELOPMENT OF REGIONAL IMPACT
CAPE COD COMMISSION ACT, SECTIONS 12 & 13

APPLICANT: TOWN OF BARNSTABLE
MAIN STREET
HYANNIS, MA 02601

PROPERTY OWNER: TOWN OF BARNSTABLE, MASSACHUSETTS

COMMISSION PROJECT# EOEA#6553/ BARNSTABLE WASTEWATER FACILITIES PLAN

PROJECT LOCATION: WATER POLLUTION CONTROL FACILITY
BEARSES WAY, HYANNIS, MA

DECISION OF THE CAPE COD COMMISSION

SUMMARY

The Cape Cod Commission (Commission) hereby approves, with conditions the application of the Town of Barnstable as a Development of Regional Impact (DRI) pursuant to Sections 12 and 13 of the Cape Cod Commission Act (Act), c.716 of the Acts of 1989, as amended, for the proposed Wastewater Facilities Plan. The decision is rendered pursuant to a vote of the Commission on September 20, 2007.

The Final Plan/DRI provides a proposed strategy for connecting areas of concern (AOCs) in the eastern portion of Town, identified in a 1993 Needs Assessment Report, to the municipal sewer system and addresses longstanding performance and disposal issues at the Hyannis Water Pollution Control Facility (WPCF). This Final Plan/DRI is the culmination of 13 years effort to provide a way forward to address immediate and long-term wastewater management needs at the WPCF and the portion of the Town of Barnstable that utilizes the WPCF. The development of the Final Plan included extensive coordination among and efforts by town officials, their consultants, regional, state and federal experts. Given the time to complete this effort all parties demonstrated flexibility to: include new information, incorporate evolving technologies and address regulatory changes along the way. The Final Plan/DRI provides solutions to the Town's immediate wastewater concerns, and provides the framework to address future needs, resource protection and restoration goals through the implementation of the Town's proposed Nutrient Management Program and Adaptive Management Plan.

PROJECT DESCRIPTION

The Final Plan/DRI provides a comprehensive 20-year strategy for wastewater treatment and disposal issues in the eastern portion of the Town of Barnstable. The planning period design year is 2014, which is 20 years after the project formally began in 1994.

The Barnstable Water Pollution Control Facility (WPCF) was initially sited and began operation in 1935 to serve downtown Hyannis. In 1979, the Facility was upgraded to secondary treatment with a design capacity of 4.2 million gallons per day (MGD). In the mid-1980s, prior to widespread sewering, it was discovered that treated effluent discharge causes water table mounding beneath the site that could have impacts to low lying properties and would spread the flow of effluent-altered groundwater to other water resources, such as nearby freshwater ponds and public drinking water supply wells. To address these concerns, the Town limited the wastewater discharge volume to 2.7 MGD for peak flow as a precaution and began its Wastewater Facility Planning process in 1987.

The Wastewater Facility Planning process included a number of steps that were coordinated through MEPA and Cape Cod Commission review and involved active discussion among all

parties. The first phase, the identification of wastewater needs, included: 1) review of land use and demographics, including wastewater projections and areas with wastewater problems, 2) development of a sub-regional groundwater model to help evaluate potential impacts of discharge from the WPCF, 3) development of town goals for wastewater treatment, and 4) potential upgrades in the WPCF and the sewer collection system. This first phase identified 24 Areas of Concern (AOCs) with wastewater issues to be addressed and was produced in December 1993.

The second phase of the Wastewater Facility Planning process, the alternatives screening analysis, which was produced in February 1996, identified four additional AOCs and reviewed potential solutions to address the issues for the AOCs.

During the course of developing the first two phases, a number of additional wastewater issues were identified that required attention. These were addressed mostly through Notices of Project Change between 1996 and 2006 and included:

- a review of wastewater issues at Cape Cod Community College,
- an initial evaluation of nitrogen loading within the watershed to the Three Bay estuary system,
- a pilot evaluation of wastewater injection wells,
- a review of potential satellite wastewater disposal locations at different locations throughout the town,
- upgrades of pump stations and sewer lines,
- upgrades of WPCF components, and
- changes in the process to await findings from the Massachusetts Estuaries Project.

Throughout these phases and subsequent efforts, the town coordinated with Commission and state staff. This coordination has also, in some cases, led to Commission staff providing technical assistance to assist the town with addressing issues. For example, the town utilized the County-sponsored US Geological Survey groundwater-modeling project to evaluate the potential impacts from a variety of discharge volumes at the 6.9-acre McManus site. This technical assistance combined with other technical efforts led to an approved discharge capacity of 0.5 MGD by the EOEA Secretary in his 2006 Certificate. The Certificate also allowed a plan to install force mains and sewers beneath the new Route 132 upgrade to connect the new site into the effluent discharge system.

The 2007 Final Wastewater Facilities Plan utilizes the insights from these past efforts and proposes a series of actions for moving forward. The water level issues at the WPCF are addressed through an assessment of groundwater level conditions at the WPCF. This assessment reviews water level data that has been collected over the past 15 years and concludes that the initial assessment, which constrained the site discharge to 2.7 MGD, overestimated the effect of the facility's discharge on water table levels. The FEIR proposes an adaptive management approach that would allow the discharge of up to 4.2 MGD of treated effluent at the WPCF

through a water level monitoring program that contains contingencies to alter discharge locations, including use of the approved 6.9-acre site, if monitoring identifies concerns. This proposed Adaptive Management Plan includes actions to monitor changes in water table levels from increasing treated-water recharge at the WPCF and identifies potential mitigation strategies from impacts should they occur in the future.

The Final Plan/DRI also proposes to provide sewering to 10 (ten) AOCs in the eastern portion of Town, that includes: 3 wellhead protection areas near and downgradient of the WPCF, areas near Lake Wequaquet, Long Pond, Red Lilly Pond, Long Beach Road, Stewart's Creek, Hall's Creek, and the Community College. The Plan acknowledges that sewering these areas will require consideration of regulatory changes, design issues, and public input. The plan also proposes a number of improvements at the WPCF are also recommended to increase the treatment capacity to 4.2 MGD and better treat sludge management. The Plan also acknowledges that the Town faces some additional wastewater-related issues for addressing nutrient loading to surface waters, both estuaries and freshwater ponds. The Plan includes a work plan for the Nutrient Management Plan that will actively address the assessment, screening and selection of wastewater alternatives to address the protection and/or remediation of these resources.

PROCEDURAL HISTORY

The Wastewater Facility Plan project has undergone regulatory review pursuant to section 11.26(7)(h)(6) of the Massachusetts Environmental Policy Act (MEPA) regulations beginning when the Secretary of Environmental Affairs scoped a Certificate on the initial Environmental Notification Form (ENF) in 1987. The Town filed a Notice of Project Change (NPC) in 1996 and opted to exercise a joint MEPA regulatory review with the Cape Cod Commission. The Town completed its Final Environmental Impact Report in March of 2007 and the Secretary, in his Certificate dated May 18, 2007, found that the Town's project adequately and properly compiles with MEPA and its implementing regulations. Over the last 13 years the Commission has received and reviewed 7 major MEPA submittals from the Town of Barnstable as indicated in the Table below. For each submittal, the document was reviewed, staff comments were prepared, some involving significant technical data and resource analysis, a joint public hearing was held, and Commission subcommittee comments were sent to the MEPA Office.

	Submittal	Public Hearing	Comment Letter
Environmental Notification Form (ENF)	Sept 1987	prior to Cape Cod Commission	
Notice of Project Change (NPC) 1st	March 1996	April 10, 1996	April 12, 1996
Notice of Project Change (NPC) 2nd	May 2003	***	June 12, 2003
Notice of Project Change (NPC) 3rd	Feb 2005	none	March 15, 2005
Notice of Project Change (NPC) 4th	Oct 2005	Nov 29, 2005	Dec 12, 2005
Notice of Project Change (NPC) 5th	Oct 2005	Nov 29, 2005	Dec 12, 2005

Draft Wastewater Facilities Plan (DEIR)	Nov 2006	Nov 12, 2006	Dec 12, 2006
Final Wastewater Facilities Plan, (FEIR)	March 2007	May 2, 2007	May 3, 2007

The content of each submittal is summarized below.

- 1987: Initial ENF Filing: To prepare a Sewer Master Plan
- 1996: 1st Notice of Project Change: To expand scope to include a Comprehensive Wastewater Facility Plan, setting the 2014 planning period and requiring three Phases of study including the Needs Assessment, Screening of Alternatives and the Draft and Final Plans.
- 2003: 2nd Notice of Project Change: To proceed with improvements to the Wastewater Facility Plan and defer wastewater alternative analysis for watersheds to nitrogen sensitive embayments until the Massachusetts Estuary Project establishes appropriate nitrogen loading limits.
- 2005: 3rd Notice of Project Change: To proceed with improvements of the Water Pollution Control Facility to increase its treatment capacity from 2.7 to 4.2 million gallons per day.
- 2006 4th Notice of Project Change: To allow additional improvements at the WPCF, install a force main along Route 132 to connect Cape Cod Community College to the WPCF, install two sewer extensions in Hyannis, and to develop sand filter beds with a capacity of 0.5 MGD at the 6.9-acre site adjacent to the McManus site located adjacent to Exit 6 on Route 6 north of the Hyannis Golf Course.
- 2006 5th Notice of Project Change: To allow the construction of a Main Street Pump facility and the limited replacement of force mains within Hyannis.
- 2007 Draft and Final Wastewater Facilities Plan: Described above on page 2.

MATERIALS SUBMITTED FOR THE RECORD

Chrono-logical #	**From the Applicant** Title	Date
1	Groundwater and Water Resource Protection Plan SEA Consultants	9/1/1985
2	Map of Zone 2 Recharge Area for Exisiting Water Supply Wells	3/2/1989
3	Update of Townwide Zones of Contribution of Public Supply Wells	9/1/1989
4	Hydrogeological and Water Quality Investigation on BWC Wells	3/1/1991
5	Report on Prolonged Pumping Test and Zone 2 Delineation at Test Well Site 8-90	11/1/1991
5a	Memo of Understanding between Mass Environmental Policy Act and the Cape Cod Commission	11/25/91
6	Technical Memorandum Three Dimensional Flow Model Construction and Calibration Town of Barnstable	1/22/1992

7	Map of Observed Water Table	6/1/1992
8	"Letter to Thomas Cambareri from Scott Potter, Geraghy & Miller re: Response to November 10th Letter to Mark Ells from Mr. E. Eichner "	10/4/1992
9	Request for Statement of Qualifications to Perform a Wastewater Facilities Planning Study Town of Barnstable DPW	10/7/1992
10	Three Dimensional Flow model Construction and Calibration	10/22/1992
11	"Letter to Robert Cady from Thomas Mullen, Town of Barnstable re: Wastewater Facilities Plan DEP/BMF Project No. 20-1016-01 Groundwater Modeling and Related Services"	10/27/1992
12	"Letter to Thomas Cambareri from Mark Ells, Town of Barnstable re: Wastewater Facilities Plan DEP/BMF Project No. 20-1016-01"	11/9/1992
13	"Letter to Thomas Cambareri from Gisella M. Spreizer, Geraghy & Miller re: Ground-Water Flow Model Reports for Bourne and Sandwich, Ma"	4/1/1993
14	Letter to Robert Cady from Mark Ells. Town of Barnstable re: Wastewater Facilities Plan DEP/BMF Project No. 20-1016-01	4/7/1993
15	Groundwater Protection Overlay Districts	8/19/1993
16	Groundwater Conditions	9/1/1993
17	"ENF Well Supply Facility 5, Barnstable Fire District Water Department"	9/3/1993
18	"Map of Water Table of Wastewater Treatment Facility, Town of Barnstable"	9/13/1993
19	"Wastewater Facilities Plan Phase 1, Needs Assessment Report"	11/1/1993
20	"Wastewaters Facilities Plan Phase 1, Needs Assessment Report Town of Barnstable, "	11/1/1993
21	1994 Annual Report on BWC to Water Management Program Department of Environmental Protection	1/1/1995
22	Q & A about water quality in our town of Barnstable	10/19/1995
23	Town of Barns. Notice of Chg. EOEA #6553 Sewer Area 5 Project	3/13/1996
24	"Town of Barnstable, Comment Letter on EIR CCC#EIR96005/EOEA #6553"	4/9/1996
24a	Extension Agreement	4/12/96
25	Summary of Prioritized Sites for Evaluation in Phase III Modified Table 8-8	4/26/1996
26	Wastewater Facilities Plan DEP/BMF Project no. 20-1016-01 Revised Table 8-9	5/16/1996
27	"Wastewater Facilities Plan, Notice of Project Change EOEA #6553"	5/17/1996
28	Town of BWWFP Alternative Discharge Siting Effluent Mitigation Alternatives DEP/BMF Project No. 20-1016-1 Robert Cady	10/16/1996
29	Town of BWWFP Status of Area of Concern Evaluation DEP/BMF Project No. 20-1016-01 Robert Cady	10/17/1996
30	Progress Meeting Wastewater Facilities Plan Phase III Barnstable MA	10/23/1996
31	FAX: re Agenda for Barnstable Progress Meeting of 2/12/97	2/10/1997
32	"Town of Barns. Area 5 Sewer Project EOEA #6553 Town Wide	9/15/1997

	Wastewater Facilities Plan, EIR, Notice of Project Change"	
33	Effluent Mitigation Alternatives Draft Summary	12/17/1997
33a	Extension Agreement	1/26/98
34	"Wastewater Facilities Plan, Cape Cod Commission March 18, 1998"	3/18/1998
35	"Wastewater Facilities Plan, Effluent Mitigation Options March 27, 1998"	3/27/1998
36	Fax with a meeting agenda 2/12/97 and Letter to Ron Lyberger re: Frequency and volume of effluent to be mitigated from the Hyannis WPCF	4/2/1998
37	"FAX: Draft Work Plan, Additional effluent mitigation evaluation Wastewater facilities report, Town of Barnstable"	6/15/1998
38	"Wastewater Facilities Plan, Effluent Mitigation Options April 8, 1998"	7/8/1998
39	Effluent Mitigation Screening and Evaluating of Potential Injection Well Sites - DRAFT	10/15/1998
40	"Minutes from 10/6/98 Meeting with DEP Wastewater Facilities Plan, Effluent Mitigation Alternatives"	10/20/1998
41	Draft Matrix of site evaluation for modeling of effluent disposal sites	11/13/1998
42	FAX re: Comments to Lake Wequaquet Protective Association re: Wastewater Facilities Plan progress	1/20/1999
43	Memo: Effluent Mitigation Alternatives	3/18/1999
44	Water Quality & Habitat Health of the Three Bays Estuarine System	10/1/2000
	Extension Agreement	1/29/01
45	Nutrient Management Planning Project- Project Scope	8/14/2001
46	Req.to add Norris St. to Cert.of Proj. Chg.	3/12/2002
	Extension Agreement	7/4/02
47	Attach. A Scope-Services-Compl. Of WWFP & EIR	3/19/2003
48	Meeting Agenda for Wastewater Facilities Plan	4/8/2003
49	Town of Barns. Notice of Chg.	5/12/2003
50	"Map, Figure 1 Town of Barnstable MA Effluent Mitigation Investigation benchmark Evaluation"	7/14/2003
51	"Lake Wequaquet, Long Pond and Cape Cod Community College Sewer Extension"	9/1/2003
52	Meeting Handouts on Local Comprehensive Plan Wastewater Facilities Plan/EIR including 2 maps of Wastewater Areas of Concern	3/29/2004
53	Notice of Project Change full report to EOEA for construction of interim improvements to the Hyannis WPCF	1/28/2005
54	"Town of Barnstable, Wastewater Capital Improvement Projects Program Schedule"	10/5/2005
55	"Town of Barnstable, Wastewater Facilities Plan, Summary of Environmental Review Process, Previous Evaluations and Reports, Related Town Wastewater Projects"	10/5/2005
56	Proposed Model Runs for Town of Barnstable	10/12/2005
57	Document Outline for Notice of Project Change for Proposed Approval and Implementation of an Effluent Force Main in the Route 132 ROW and	10/12/2005

	Effluent Discharge at the McManus Site	
58	"Effluent Mitigation Evaluations, Wastewater Facilities Plan and USGS Evaluations Model Review Meeting"	10/12/2005
59	Memo re: Outline for proposed Notice of Project Change for Phase I Waiver	10/12/2005
60	Nitrogen Loading Calculations for Barnstable Harbor	10/21/2005
61	"Notice of Project Change full report to EOEA for construction of interim improvements to the Hyannis WPCF, effluent discharge facility as well as three sewer extensions"	11/15/2005
62	"Wastewater Facilities Planning Study, NOPC Document, Town of Barnstable Volume 1 of 4"	11/15/2005
63	"Wastewater Facilities Planning Study, NOPC Document, Town of Barnstable Volume 2 of 4"	11/15/2005
64	"Wastewater Facilities Planning Study, NOPC Document, Town of Barnstable Volume 3 of 4"	11/15/2005
65	"Wastewater Facilities Planning Study, NOPC Document, Town of Barnstable Volume 4 of 4"	11/15/2005
66	"Letter to Stephen Prichard EOEA from Mark Ells, Barnstable DPW re: NOPC Barnstable Fire District Water Issues"	12/9/2005
67	"Draft Report on Infiltration Loading Tests to McManus Site Town of Barnstable, MA"	7/5/2006
68	"Draft Wastewater Facilities Plan And Draft Environmental Impact report and Notice of Project Change, Town of Barnstable Volume 1 of 4"	9/6/2006
69	"Draft Wastewater Facilities Plan And Draft Environmental Impact report and Notice of Project Change, Town of Barnstable Volume 2 of 4"	9/6/2006
70	"Draft Wastewater Facilities Plan And Draft Environmental Impact report and Notice of Project Change, Town of Barnstable Volume 3 of 4"	9/6/2006
71	"Draft Wastewater Facilities Plan And Draft Environmental Impact report and Notice of Project Change, Town of Barnstable Volume 4 of 4"	9/6/2006
72	"Letter to Stephen Prichard EOEA from Mark Ells, Barnstable DPW re: submitting DEIR and NPC"	10/16/2006
73	"Final Wastewater Facilities Plan and Final Environmental Impact Report Town of Barnstable, Volume 1 of 4"	3/7/2007
74	"Final Wastewater Facilities Plan and Final Environmental Impact Report Town of Barnstable, Volume 2 of 4"	3/7/2007
75	"Final Wastewater Facilities Plan and Final Environmental Impact Report Town of Barnstable, Volume 3 of 4"	3/7/2007
76	"Final Wastewater Facilities Plan and Final Environmental Impact Report Town of Barnstable, Volume 4 of 4"	3/7/2007
77	Plan of Study for Nutrient Management Program	11/1/2007

Chrono Logical #	**From State, Local and Public** Title	Date
1	"Letter from Cotuit Fire District, John Anderson to Trudy Coxes re Town of Barnstable Notice of Project Change EIR"	4/5/1996
2	"EOEA #6553 Notice of Project Change for Town of Barnstable Wastewater Facilities Plan, Barnstable"	4/11/1996
3	"Letter to Trudy Cox from Glenn Hass, MADEP, RE Barnstable Notice of Project Change Wastewater Mgmt Plan"	4/16/1996
4	MEPA Certificate on Notice of Project Change Wastewater Facilities Plan Area 5 Sewer Project	4/24/1996
5	"Letter to Mark Ells from Glenn Hass MADEP, re: Barnstable Wastewater Management Plan Site Screening- Phase III"	5/24/1996
6	Reclaimed Water Use The Massachusetts Approach	8/1/1996
7	MEPA Certificate on Notice of Project Change Wastewater Facilities Plan Area 5 Sewer Project	10/23/1997
8	MEPA Certificate on Notice of Project Change Wastewater Facilities Plan Area 5 Sewer Project	5/10/2002
9	MEPA Certificate on Notice of Project Change Wastewater Facilities Plan Area 5 Sewer Project	6/23/2003
10	MEPA Certificate on Notice of Project Change Wastewater Facilities Plan Area 5 Sewer Project	5/25/2005
11	Memo to Tom Cambareri from Brian Howes SMAST Technical Director MEP re Barnstable Wastewater Effluent Discharge McManus Site and Barnstable Marshes	11/11/2005
12	"CZM Memo to Robert Golledge from Susan Snow Cotter, Director CZM re EOEA #6554 Wastewater Facilities Plan Draft Environmental Impact Report and Notice of Project Change."	11/20/2006
13	"Letter to Secretary Golledge, from Johnathan Hobill MADEP re Barnstable NPC/DEIR Review"	12/1/2006
14	"Letter to MEPA Office from Robert Lawton, Town of Yarmouth re Draft Wastewater Facilities Plan"	12/16/2006
15	MEPA Certificate on Draft Wastewater Facilities Plan Area 5 Sewer Project	12/22/06
16	MEPA Certificate on Final Wastewater Facilities Plan Area 5 Sewer Project	5/18/07
17	Letter Keith Davidson	4/15/96
16	Letter V. Gale Klun	4/30/07

Chrono logical #	**From the Cape Cod Commission** Title	Date
1	"Town of Barnstable, Notice of Project Change Wastewater Facilities Plan-Environmental Impact Report Area 5 Sewer Project, EOEA #6553, CCC #EIR96005"	3/25/1996
2	Staff Report Town of Barnstable Wastewater Facilities Plan EOEA #6553	4/4/1996
3	"Letter Re: ""Re-evaluation of potential discharge sites for the Hyannis pollution and control facility"""	5/21/1996
4	Letter to Barnstable DPW Town of Barnstable Wastewater Facilities Plan Notice of Project Change	6/24/1996
5	Letter to EOEA re Barnstable Wastewater Facilities Plan CCC DRI Review #EIR96005 EOEA #6553	10/14/1997
6	"Development of Regional Impact Cape Cod Commission Act, Sections 12 and 13"	4/10/2003
7	"Fax Re: ""Conditions letter on Town of Barnstable NOPC"""	6/12/2003
8	"Town of Barnstable, Notice of Project Change Area 5 Sewers/Wastewater Facilities Plan/EIR EOEA #6553"	6/12/2003
9	Cape Cod Commission Comments on Barnstable CWMP DEIR	6/12/2003
10	"Town of Barnstable, Draft Wastewater Facilities Plan, Draft Environmental Impact Report, and Notice of Project Change (EOEA #6553)"	6/12/2003
11	"letter to EOEA Town of Barnstable Notice of Project Change, Area 5 Sewers/ Wastewater Facilities Plan/EIR"	6/12/2003
12	MEPA Meeting	10/5/2005
13	Subcommittee Meeting Handout notes	11/17/2005
14	Subcommittee notes	11/17/2005
15	Letter to EOEA Notice of Project Change, Area 5 Sewers/WWFP/EIR	12/12/2005
16	Staff Report	11/14/06
17	Hearing Notice and Minutes	11/14/06
18	Meeting Notice and Comment Letter on Draft EIR	11/21/06
19	Hearing Notice and Minutes	5/2/07
20	Comment Letter on Final EIR	5/3/07
21	Hearing Notice	6/28/07
22		
23	Draft Staff Report on Groundwater Monitoring Modifications and Implementation of an Adaptive Management Plan for the Effluent Recharge at the Hyannis WPCF Site	7/20/2007
24	Staff Report re Town of Barnstable Final Wastewater Facilities Plan, DRI	7/20/2007
25	Hearing Notice and Minutes	7/25/07
26	"Staff Report re: Town of Barnstable final Wastewater Facilities Plan, DRI"	7/25/2007

Chrono Logic #	**Technical Information** Title	Date
1	Hydrogeology And Hydrochemistry of a Sewage Effluent Plume in the Barnstable Outwash of the Cape Cod Aquifer, Master Thesis by Tom Cambareri	11/12/86
2	Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project	6/1/2003
3	Meeting Minutes of USGS Groundwater Model Project with Cape Cod Commission	4/27/04
4	Enhancing Wastewater management on Cape Cod: Planning and Legal Tools	7/1/2004
5	Barnstable model Request	10/13/04
6	Barnstable Request for USGS Groundwater model runs S&W to Tom Cambareri	11/13/04
7	Effluent Disposal and reuse planning guidance document and Case Study Report, Stearns and Wheler	1/1/2005
14	Barnstable model Request	10/12/05
15	Figure showing flux to receptors at various loading rates BarnsSite B_flux.pdf	11/04/05
16	Figure showing particle cross section from Site B: BarnSiteBxs_fig.pdf	11/05/05
17	Barnstable Request for USGS Groundwater model runs S&W to Tom Cambareri	11/12/05
8	Barnstable Model Results: Barnstable Scenario: A	04/21/06
9	Barnstable Model Results: Barnstable Scenario: B and C	04/21/06
10	Barnstable Model Results: Barnstable Scenario: E and F	04/21/06
	Barnstable Model Results: Barnstable Scenario: D	05/27/06
11	Barnstable Model Results: Barnstable Scenario: G	05/27/06
12	Barnstable Model Results: Barnstable Scenario: F	05/27/06
13	Barnstable Model Results: Barnstable Scenario: H and I	06/23/06
18	Barnstable Model Results: Barnstable Scenario: new_5_27_ScenG	06/23/06
19	Barnstable Model Results 4.2 + 3.7 MGD	12/11/06
20	Spreadsheet of Water Quality Data from Monitoring Wells around the Water Pollution Control Facility 1990 to 2007	8/1/2007
21	Spreadsheet of Water Table Elevations from monitoring wells around the WPCF 1990 to 2007	8/1/2007

TO	FROM	EMAIL SUBJECT	DATE
Brian Dudley	Mark Giordano	Barnstable Facilities Plan	3/21/2003
Mark Ells & others	Mark Giordano	Public Notice Wastewater Facilities Planning	5/28/2003
Tom Cambareri	Mark Giordano	USGS modeling of Eastern Barnstable	6/17/2003
Tom Cambareri	Gage Muckleroy	Town of Barnstable - Draft for Nutrient Mgmt	8/11/2003
Tom Cambareri	Gage Muckleroy	Town of Barnstable - Draft for Nutrient Mgmt	8/11/2003
Tom Cambareri	Gage Muckleroy	Town of Barnstable - Draft for Nutrient Mgmt	8/12/2003
Tom Cambareri	Don Walter	Town of Barnstable Wastewater AOCs	3/18/2004
Tom Cambareri	Don Walter	Barnstable	4/19/2004
Mark Giordano	Tom Cambareri	Discharge Scenarios	5/19/2004
B Dupont	Don Walter	Barnstable runs	5/27/2004
Nate Weeks & others	Tom Cambareri	Barnstable WPCF	9/21/2005
Nate Weeks	Tom Cambareri	Additional Barnstable USGS Modeling	10/6/2005
Nate Weeks	Tom Cambareri	Additional Barnstable USGS Modeling	10/6/2005
Nate Weeks & others	Ron Lyberger	Town of Barnstable, Notice of Project Change Outline	10/17/2005
Tom Cambareri	Don Walter	USGS modeling and CCC issues related to effluent recharge	10/17/2005
Tom Cambareri	Don Walter	Results for Barnstable	10/19/2005
Nate Weeks & others	Tom Cambareri	Barnstable with attachment for REAL	10/21/2005
Nate Weeks & others	Tom Cambareri	Barnstable with attachment for REAL	10/21/2005
Nate Weeks & others	Tom Cambareri	Barnstable	10/21/2005
Ed Eichner & others	Scott Michaud	Effluent News - The Barnstable Patriot	10/24/2005
Nate Weeks	Tom Cambareri	USGS modeling and CCC issues related to effluent recharge	10/25/2005
Brian Howes	Ed Eichner	Barns Hbr N Loading	10/26/2005
Wu Xiaotong	Tom Cambareri	Barnstable	10/27/2005
Brian Howes	Ed Eichner	Barnstable Marshes	10/31/2005
Tom Cambareri	Don Walter	Additional Barnstable results	11/3/2005
Nate Weeks	Tom Cambareri	Barnstable	11/4/2005
Nate Weeks	Tom Cambareri	Barnstable	11/4/2005
Nicholas Zavalas	Nate Weeks	Town of Barnstable, Notice of Project Change Outline	11/9/2005
Mark Giordano	Nate Weeks	Barnstable maps	11/9/2005
Tom Cambareri	Mark Giordano	Effluent Mitigation Mtg 11/10 @ 4pm Town Hall	11/10/2005
Tom Cambareri	Mark Giordano	Effluent Mitigation Mtg 11/10 @ 4pm Town Hall	11/10/2005
Mark Giordano	Tom Cambareri	Effluent Mitigation Mtg 11/10 @ 4pm Town Hall	11/10/2005
Nate Weeks & others	Tom Cambareri	Effluent Mitigation Mtg 11/10 @ 4pm Town Hall	11/10/2005
Tom Cambareri	Mark Ells	Town comments of CCC staff report	11/17/2005
Brian Dudley	Nate Weeks	Barnstable Notice of Project Change & Water Supply Issues	11/18/2005
Nicholas Zavalas	Tom Cambareri	Barnstable NOPC	1/20/2006
Nate Weeks	Tom Cambareri	Barnstable	2/17/2006
Mark Ells & others	Tom Cambareri	Barnstable Groundwater Modeling	3/6/2006

Nate Weeks & others	Tom Cambareri	Mtg w/ Barnstable to review permitting issues for relocating GW	4/6/2006
Rona Lyberger	Mark Ells	Mtg w/ Barnstable to review permitting issues for relocating GW	4/6/2006
Nate Weeks & others	Rona Lyberger	Mtg w/ Barnstable to review permitting issues for relocating GW	4/6/2006
Nate Weeks & others	Brian Dudley	Mtg w/ Barnstable to review permitting issues for relocating GW	4/6/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP	8/16/2006
Greg Smith & others	Tom Cambareri	Barnstable Draft WWFP & EIR Mtg - 9/13	8/28/2006
Mark Ells & others	Tom Cambareri	Barnstable Facilities Meeting	9/8/2006
Greg Smith	Tom Cambareri	Barnstable Facilities MEPE Mtg in Boston	9/11/2006
Robert Butterw	Tom Cambareri	Barnstable Draft WWFP & EIR Mtg - 9/13	9/11/2006
Rona Lyberger	Brian Dudley	Barnstable Draft WWFP & EIR Mtg - 9/13	9/11/2006
Robert Butterw	Rona Lyberger	Barnstable Draft WWFP & EIR Mtg - 9/13	9/11/2006
Nate Weeks	Robert Butterw	Barnstable Draft WWFP & EIR Mtg - 9/13	9/11/2006
Robert Butterw	Robert Butterw	Barnstable Draft WWFP & EIR Mtg - 9/13	9/12/2006
Mark Ells & others	Robert Butterw	Barnstable Draft WWFP & EIR Mtg - 9/20	9/15/2006
Mark Ells & others	Robert Butterw	Barnstable Draft WWFP & EIR Mtg - 9/20	9/18/2006
Mark Ells & others	Robert Butterw	Barnstable Draft WWFP & EIR Mtg - 9/20	9/18/2006
Bill Hall	Robert Butterw	Barnstable Draft WWFP & EIR Mtg - 9/20	9/20/2006
Robert Butterw	Bill Hall	Barnstable Draft WWFP & EIR Mtg - 9/20	9/20/2006
Tom Cambareri	Mark Ells	Wastewater Plan	11/8/2006
Tom Cambareri	Mark Ells	Barnstable CWMP Mtg	11/27/2006
Mark Ells	Tom Cambareri	Barnstable CWMP Mtg	11/27/2006
Nate Weeks	Tom Cambareri	Looking for the lost Barnstable USGS model run	11/28/2006
Tom Cambareri	Mark Ells	Barnstable CWMP Mtg	11/29/2006
Mark Ells	Tom Cambareri	Barnstable CWMP Mtg	11/29/2006
Stephanie Osta	Tom Cambareri	Mark Ells	11/29/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP DEIR	12/1/2006
Tom Cambareri	Nate Weeks	Barnstable CWMP DEIR Mon. 11/11, 10-11 am	12/1/2006
Nate Weeks	Tom Cambareri	Barnstable CWMP DEIR Mon. 11/11, 10-11 am	12/1/2006
Tom Cambareri	Nate Weeks	Barnstable CWMP DEIR Mon. 11/11, 10-11 am	12/1/2006
Nate Weeks	Tom Cambareri	Barnstable CWMP DEIR	12/1/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP DEIR	12/1/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP DEIR	12/1/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP DEIR	12/4/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP DEIR	12/4/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP DEIR	12/4/2006
Nate Weeks & others	Tom Cambareri	Barnstable USGS model output	12/7/2006
Mark Ells & others	Tom Cambareri	Need for GIS plan - Coastal Resource Area include subembayments	12/10/2006
William Doherty	Tom Cambareri	Barnstable DEIR Letter	12/11/2006
Mark Ells & others	Tom Cambareri	Pdf 4.2 and 3.7 scenario	12/11/2006
Mark Ells & others	Tom Cambareri	Barnstable CWMP DEIR	12/11/2006
Nicholas Zavalas	Tom Cambareri	Barnstable CWMP DEIR	12/12/2006

Tom Cambareri	Mark Ells	Pdf 4.2 and 3.7 scenario	12/12/2006
Mark Ells & others	Tom Cambareri	Barnstable WWFP FEIR Comments	4/30/2007
Nate Weeks & others	Tom Cambareri	Barnstable WWFP FEIR Comments	5/1/2007
Tom Cambareri	Mark Ells	Barnstable WWFP FEIR Approval	5/2/2007
Mark Ells & others	Tom Cambareri	Barnstable WWFP FEIR Approval	5/2/2007
Tom Cambareri	Nate Weeks	Mtg w/ Mark Ells on Wed. June 6, 9:30am - Barnstable WWFP	5/24/2007
Nate Weeks & others	Tom Cambareri	Barnstable WWFP FEIR Approval	5/24/2007
Mastroianni, A.	Tom Cambareri	WPCF Monitoring Well Data	6/6/2007
Nate Weeks & others	Tom Cambareri	Hyannis WPCF data 2	6/6/2007
Nate Weeks & others	Tom Cambareri	Nutrient Management Plan	6/20/2007
Nate Weeks & others	Tom Cambareri	Thursday Mtg, July 18th, 1:30 pm	7/17/2007
Mark Ells & others	Tom Cambareri	Draft Staff Report	7/19/2007
William Doherty	Tom Cambareri	Barnstable WWFP DRI final plan/DRI Staff Report	7/20/2007
Mark Ells & others	Tom Cambareri	Any Comments on Draft	7/20/2007
Tom Cambareri et al	Andrea Adams	Materials	8/02/2007
Andrea Adams	Tom Cambareri	Barnstable WWFP	8/13/2007
Nate Weeks & others	Tom Cambareri	Barnstable WWFP DRI	8/13/2007
Mark Ells & others	Tom Cambareri	WWFP Meeting Dates	8/14/2007
Mark Ells & others	Tom Cambareri	Barnstable WWFP DRI	8/22/2007
Mark Ells & others	Tom Cambareri	Maps and table for AMP	8/24/2007
Mark Ells & others	Tom Cambareri	WWFP DRI Draft Decision	8/24/2007
Tom Cambareri	Nate Weeks	WWFP DRI Draft Decision	8/27/2007
Mark Ells & others	Tom Cambareri	Barnstable WWFP DRI	8/27/2007
Mark Ells & others	Tom Cambareri	WWFP DRI Draft Decision	8/27/2007
Mark Ells & others	Tom Cambareri	Barnstable WWFP DRI	8/28/2007

TESTIMONY

Public Hearing Minutes from April 10, 1996

Mr. David Shepardson of the Massachusetts Environmental Policy Act (MEPA) Unit presented introductory remarks and explained the history of the project.

Mr. Tom Mullen, Barnstable's Department of Public Works Director, asked about the process.

Mr. Richard Prince explained the Cape Cod Commission/MEPA process.

Ms. Gay Wells presented the Cape Cod Commission staff report.

Mr. Mark Ells made a presentation on Barnstable's Wastewater Facilities Plan. He also explained the public participation program and various studies connected to the Wastewater Facilities Plan.

Mr. Ron Lyberger, from the Department of Environmental Protection BMF, stated that his department is in general concurrence with the town about major issues.

Mr. Bob Schernig, Barnstable's Planning Director, stated that there had been substantial coordination between the development of the Local Comprehensive Plan and the Wastewater Facilities Plan.

Public Hearing Minutes for November 14, 2006

Mr. Mark Ells presented the project for the Town of Barnstable. Mr. Ed Eichner, a Cape Cod Commission Water Resources Scientist, presented the staff report. Ms. Elizabeth Taylor requested Mark's response to the staff recommendations. Mr. Ells responded they had only received the report the day before so they had a limited response at this time. He noted that many of the issues that were brought up they wish to resolve. He stated that in regards to the nutrient loading issue, there would be a net reduction because of the facility's ability to treat at a higher level than the on site systems. He stated that they would like to move forward without using the McManus site, however, they would like to know the scenarios. In relation to the Growth Incentive Zone, they will show in their plan how they can accommodate growth. In regard to the cost issues, they identified the costs to the best of their ability. Currently, they recover one hundred percent of their costs through a system where customers pay for the service. He noted that they may not have all the issues resolved in their plan, however, he hopes that this will not interfere with their approval.

Ms. Taylor inquired about the McManus and the community college sites and potential mounding and change in groundwater direction. Mr. Ells responded that what they saw in the USGS modeling was showed that smaller amounts in more sites helps to minimize the impact. However, it is more cost effective to use only one site. The only sites under consideration are the Hyannis Water Pollution Facility and the McManus site. If there is a need, they will look further into other sites, including the community college and possibly some bogs. Ms. Taylor inquired about the work on the bogs. Mr. Ells stated that this is in the preliminary thought stage and not included in this plan.

Mr. Richardson stated that he is grateful for all the work that has gone into this project. He is hoping that the town is comfortable with the Commission issues and hopes that two staffs can work well together. Mr. Ells and Mr. Eichner stated that they could.

Mr. Richard Andres inquired about why the map indicated that there were two North Bay Box 4s. Mr. Ells stated that this is the recharge area to the Three Bays area that extends into Mashpee and Sandwich. Mr. Eichner noted that the Commission funded a box model of the estuary. There are two box 4s because the watershed for North Bay is split.

Public Hearing Minutes for May 2, 2007

Mr. Mark Ells presented the Barnstable Wastewater Facilities Plan that is the subject of the Final Environmental Impact Report (FEIR). Mr. Thomas Cambareri, Water Resources Program Manager of the Cape Cod Commission presented the Commission staff report and reviewed each section of the proposed comment letter with the Subcommittee.

Mr. Paul Can, a resident of the Lake Wequaquet area, spoke in favor of the sewer extension to his neighborhood.

Mr. Jay Zavala inquired about mentioning in the Commission letter that there is uncertainty regarding including the Centerville study area in the appendix of the report. Mr. Cambareri stated that he is still unclear why this is in the report. Mr. Ells stated that they were requested to place it there.

Mr. Doherty emphasized that the Lorusso site and the airport site are not considered as back up sites. Mr. Cambareri noted the back up site is a 6.9 acre parcel of land that is adjacent to the golf course and the McManus site. He also noted that the Cape Cod Community College will be connected to the sewer.

Mr. Zavala inquired the concept of purchasing properties. Mr. Ells explained that it may be more cost effective to purchase low lying properties.

Public Hearing Minutes from July 25, 2007

Mr. Cambareri summarized the Cape Cod Commission staff report.
Mr. Ells introduced Mr. Weeks, from Stearns & Wheeler, and Ms. Saad, as a consultant and Barnstable Department of Public Works staff who were working on the project. Mr. Ells described the proposed Facilities Plan.
Mr. Zavala asked if the Nutrient Management Plan (Plan) had been revised in its entirety?
Mr. Cambareri said no. He said the Plan had undergone technical modifications to incorporate work that has been accomplished since 2001. Mr. Zavala said the Subcommittee should be provided with a version of the Nutrient Management Plan that showed where it had been changed. Mr. Cambareri said the tasks of the the Plan had remained the same since the 2001 version.

Mr. Harris asked how the Town evaluated wastewater treatment facility capacity versus Town population? Mr. Ells said the Town had looked at existing failed on-site septic systems when evaluating the capacity needs. He said this had been done using Town Geographic Information Systems (GIS) capability. Mr. Ells described his points using a color-coded GIS map, and noted the Town had looked at existing and projected flows in certain areas, including a build-out analysis. He said existing and projected flows in areas of concern were used, but also noted the Town was going to begin a larger effort once additional capacity studies are completed.

Mr. Harris asked if the Town had taken into account what to do if flow loading occurs more rapidly than the 20-year projections? Mr. Ells noted facility planning had begun in 1994, and the Town had used historical data and growth trends, including growth/development spikes and lulls to make capacity and flow projections. He noted the actual numbers seen in recent years were tracking the estimated projections made in the early years of facility planning. Mr. Ells said that based on this, the Town had increased confidence in the capacity numbers. At the same time, Mr. Ells said the Town was aware of the need to re-evaluate and adjust the capacity figures and the entire Facilities Plan, and the potential need for a new review. He noted the Facilities Plan discussed areas of planned sewer expansion. He said that expansion of sewers beyond these identified areas would need a new review by the Massachusetts Environmental Policy Act unit and the Cape Cod Commission.

Mr. Richardson said he felt the information provided was complete, in particular in that it recognized and anticipated the need for periodic re-evaluation. He asked how membership on the Technical Advisory Committee determined? Mr. Ells said the Technical Advisory Committee is typically made up of Barnstable Town and Commission staff. At the same time, he noted the process was a public one, and the documents were available to members of the public. As such, Mr. Ells said the meetings of the Technical Advisory Committee were public, and anyone could attend if they wished. Mr. Zavala noted that page 4 of the Certificate from Secretary of Environmental Affairs listed the Technical Advisory Committee members.

Mr. Doherty asked if the project might need an extension of the Commission's review timeframes in order to complete required documents that were currently in draft form? Mr. Cambareri said the draft Nutrient Management Plan and other documents would need to be updated, but he felt this could be accomplished within the Commission's timeframes, and no extension was needed.

Mr. Owen Carney asked when the Barnstable Harbor nutrient management study would be completed? Mr. Cambareri said it was part of the Massachusetts Estuaries Project (MEP). He said information from the study Mr. Carney was referring to would probably be part of the next group of studies released by the MEP. Mr. Ells said the Town of Barnstable was pushing the MEP to get the Harbor nutrient management study done in the next group of reports. He suggested additional request by members of the public to the DEP would also help.

Mr. Oliver Cipollini expressed concern over nutrient management, but noted that there were many constituents in addition to nitrogen that could be deemed "nutrients." As such, he said the Wastewater Facilities Plan should clearly define what it deemed to be nutrients. He asked whether the document took into account varied soil types, and full build-out, including growth in the number of condominiums? Mr. Cipollini asked how the effluent would be monitored? Mr. Doherty noted that the Faculties Plan had a monitoring protocol. He also noted Mr. Ells' comments regarding the build-out analysis, including facility capacity, flow and population. Mr. Zavala noted that management systems typically would be in place for such a long-term effort regardless of personnel changes over that period. Mr. Richardson suggested the primary nutrients of concern related to nitrogen. Mr. Doherty concurred with Mr. Richardson, noting the key nutrient in groundwater was nitrogen.

Mr. Cambareri said the primary groundwater quality constituents or nutrients of concern were nitrogen and phosphorous. He said Barnstable County was working to implement a system to raise money and help towns work together to find solutions, but it was not intended to be a system of centralized, Cape-wide sewer infrastructure. In response to Mr. Cipollini's question about soil types, he said the studies were typically conservative, and picked worst-case soil types for nutrient management planning. He said the Facilities Plan also took account of specific soil types where appropriate.

Mr. Cipollini asked if the Town's plan would ties into the County's efforts? Mr. Doherty said yes. He also reiterated, however, that the County's efforts were not based on creation of a centralized sewer system. He also recognized that there could be many constituents deemed to be "nutrients," but noted that nitrogen and phosphorous were the two key ones in this case.

Mr. Andres asked for an explanation of the colored GIS map. Mr. Ells explained the map. He said the areas shown in orange were areas the Town intended to prioritize for sewering. He said this was based on areas that had high rates of failed on-site septic systems. He noted various data sources the Town had used to create the map. Mr. Ells said the Town came to the realization that based on the MEPA timeframe, utilization of the existing Barnstable Wastewater Treatment Plant was the best option, and that sewer should be extended to areas near in to that Plant.

Mr. Andres asked if Cape Cod Community College (College) had a public or private water supply? Mr. Ells said the College had public water flows that initially triggered the need for a Groundwater Discharge Permit. He said the Town had decided to provide sewer capacity to the College, and included it in the Facilities Plan because it had peak flows (Fall) when the Wastewater Treatment Plant was experiencing off-peak demand.

Mr. Andres expressed concern for possible failure of the wastewater transport pipes. Mr. Ells said the force mains will be constructed in a way that takes failures into account – with a

redundant design. He noted the College currently has a large on-site wastewater discharge, which will be eliminated when the flow is treated at the Wastewater Treatment Plant.

Mr. Andres asked which local water district provided water to the College? Mr. Ells said he could check Town records and provide Mr. Andres with the information.

JURISDICTION

This project comes under the jurisdiction of the Cape Cod Commission pursuant to Section 2(d)(i) of the Cape Cod Commission Enabling Regulations Governing Review of Developments of Regional Impact, which requires projects subject to regulation under MEPA to undergo DRI Review.

FINDINGS

The Commission has considered the application of the Town of Barnstable for the proposed Wastewater Facility Plan. Based upon the consideration of the application and on the information presented in the public hearings and submitted for the record, the Commission makes the following findings pursuant to Sections 12 and 13 of the Act.

General

G1. The project is the Wastewater Facilities Plan for the town of Barnstable, as described in the Final Wastewater Facilities Plan / Final Environmental Impact Report of March 2007.

G2. The proposed project is consistent with Barnstable's zoning bylaws, as it is an existing wastewater treatment facility. The project is also consistent with the town's local comprehensive plan, provides wastewater infrastructure to the Hyannis Growth Incentive Zone for years 0-5 of the planned 20-year implementation of the GIZ and is not located in a District of Critical Planning Concern.

G3. The proposed project is consistent with Massachusetts State Revolving Loan regulations to provide infrastructure to existing development and provide wastewater capacity for denser development in Growth Centers. The FEIR also acknowledges that the town will adopt growth-neutral land use policies for controlling development and redevelopment in existing residential areas that will be provided new sewer services.

G4. As described in the Final EIR, the benefits of the Wastewater Facilities Plan include: protection of public health; improvement of the water quality to in the aquifer beneath the Water Pollution Control Facility and to nearby downgradient water supply wells; and an upgrade of the treatment plant's operating capacity and treatment efficiency to provide infrastructure for planned growth and infilling. The detriments are limited to construction activities and the long time frame it requires to implement the plan.

G5. This project was reviewed for consistency with the 2002 (revised) Regional Policy Plan.

Water Resources

WR1. The project affects the following water resources areas of the Town of Barnstable as defined by the Regional Policy Plan:

- Wellhead Protection Area (MPS 2.1.1.2A)
- Potential Public Water Supply Area (2.1.1.2.F)
- Fresh Water Recharge Area (2.1.1.2.B)
- Marine Water Recharge Area (2.1.1.2 C)
- Water Quality Improvement Area (2.1.1.2.E)

WR2. Applicable water resources minimum performance standards are:

MPS 2.1.1.2.C.2.: requires that development in estuary watersheds where critical nitrogen loads are exceeded or where there are documented water quality problems in the estuary to maintain or improve existing nitrogen loading.

MPS 2.1.1.2.E.2.: allows the use of public sewage treatment facilities within Wellhead Protection Areas to remediate existing problems. Requires treatment facilities to maintain hydrologic balance in the aquifer and demonstrate that there are no negative ecological impacts to surface waters.

MPS 2.1.2.2: requires all sewage treatment facilities to be designed to achieve tertiary treatment with denitrification and meet a maximum 5-ppm total nitrogen discharge standard in the effluent or at the downgradient property line.

WR3. The location of the Water Pollution Control Facility (WPCF) was initially selected in 1935. The Facility discharges treated effluent into the Sagamore Lens of the Cape Cod Aquifer and within the Wellhead Protection Areas, referred to under state wellhead protection regulations as Zone IIs, as well as estuary watersheds to Lewis Bay, Stewarts Creek, and Halls Creek, known under the Regional Policy Plan as Marine Water Recharge Areas.

WR4. Since the initial construction of the Facility, it has undergone a significant number of improvements and expansions. Through the improvements undertaken during the course of the development of the Final Plan, nitrogen removal has been incorporated into the treatment at the Facility. As a result of these improvements, effluent total nitrogen concentrations over the last three years (April 2004 to April 2007) averaged 4.95 ppm, while effluent nitrate-nitrogen concentrations averaged 2.48 ppm. Because the average effluent total nitrogen concentration is just under 5 ppm, MPS 2.1.2.2. is met by the current treatment processes at the Hyannis WPCF.

WR5. The Regional Policy Plan (MPS 2.1.1.2.E.2) allows and encourages the use of advanced wastewater treatment to remediate water quality impaired areas, provided the hydrologic balance of the aquifer is maintained and there are no negative impacts to surface waters. The Hyannis WPCF provides better wastewater treatment than occurs within standard Title 5 septic systems, so the better treatment at the WPCF has to be balanced with the accompanying movement of water and nutrients to discharge at the WPCF, potential impacts on resources around the WPCF,

and potential impacts/benefits at resources that have had septic loads and water volumes removed by connection to the sewer system. The Town proposes to address these Sewer Resource Benefit Assessments for each Areas of Concern through the Adaptive Management Plan and Nutrient Management Program.

WR6. The Facility Plan identifies 10 Areas of Concern for sewer connections to the Hyannis WPCF. These areas will address public health issues with failing septic systems near surface water bodies and reduce nitrogen loading in Wellhead Protection Areas. The proposed 4.2 MGD of flow at the WPCF addresses these areas, as well as providing wastewater capacity for future growth in the Hyannis area, including the Growth Incentive Zone. As identified in the Facilities Plan, the Town intends to address these areas through the phased implementation of the Nutrient Management Plan.

WR7. The allocation of existing and proposed future wastewater flow rates to the WPCF are shown in the table below (Table 10-1 from the FEIR):

FLOW SOURCES	**PROJECT MAXIMUM MONTH FLOWS (MGD)**
	AT DESIGN YEAR 2014
Current and Future Flows	
Existing flows at WPCF at 1993	2.1
Infilling along existing sewers (developed and undeveloped)	0.30
Bearses Way sewer extension	0.03
Route 28 and Corporation Street sewer extension	0.01
Independence Park	0.40
AOCs in H1, H3, CE1-3	0.47
AOCs in ZOCs	0.07
Infilling along proposed AOC sewers	0.05
Bearses Way AOC (50% of area)	0.20
Cape Cod Community College	0.03
Potential Expansion and Additional Infilling	
Growth along existing sewer lines not currently sewered	0.20
Gravel pit development	0.13
North of Kidd's Hill Road	0.10
TOTAL	**4.2**

WR8. MEPA approval of the 3rd Notice of Project Change allowed the town to defer the screening of management alternatives to reduce nitrogen loading to protect and restore marine water quality embayments to the completion of the Final Wastewater Facilities Plan. The assessment, screening and ultimate management scenarios will be completed under the Nutrient Management Plan. The purpose of the Nutrient Management Plan is to provide a listing of the steps needed for nutrient management planning in Barnstable. It will develop the recommended plan to mitigate the nutrient related problems in each watershed. This plan will include the scheduled implementation steps for new facilities, management structures, local regulations, and funding requirements.

WR9. The Nutrient Management Plan consist of the following phases:

Phase I Assessment of Monitoring and Nutrient Limit Targets

Prepare Water Quality Status and Monitoring Need Report

Phase II Nutrient Management Needs Assessment

Identify Nutrient Related Area of Concern and prepare a Nutrient and Wastewater Management Needs Assessment Report

Phase III Identification and Screening of Alternative Solutions

Prepare Nutrient and Wastewater Management Alternatives Screening Report

Phase VI Detailed Evaluation and Development of the Nutrient Management Plan

Submit the NMP and a DEIR for Public and Regulatory Review

Phase V Resolution of Remaining Issues and Project

Modify DEIR and submit it for regulatory and public review

Phase VI Environmental and Public Review Process

Description of public review process that starts at the beginning of the process and proceeds throughout the whole project. It includes the creation of a Citizens Advisory Committee, a Technical Advisory Committee and the implementation of a Public Participation Program including the coordination of meetings and submittal of regulatory review forms and notices.

WR10. The Town has made significant progress on the initial assessment phase of the Nutrient Management Plan. The Town is in its fourth year of participating on the Massachusetts Estuaries Project (MEP) in coordination with the staff from the School of Marine Science and Technology (SMAST) at UMASS Dartmouth, who are also the MEP project leads. The Town has coordinated an extensive group of volunteer monitors to obtain marine water quality samples from its embayments. Results from these samples will be combined with complementary water quality monitoring, watershed delineations, and sediment sampling to developed linked hydrodynamic, watershed nitrogen loading, and water quality models for all of Barnstable's estuary systems in order to produce MEP Technical Reports for each estuary. These Technical Reports will provide the Town with nitrogen thresholds or limits, which will subsequently be adopted as Total Maximum Daily Loads through a Massachusetts Department of Environmental

Protection process. TMDLs are official regulatory targets under provisions of the federal Clean Water Act.

WR11. The Town has received MEP Technical Reports for Shoestring Bay (as part of the Popponesset Bay System shared with Mashpee and Sandwich), Three Bays, Rushy Marsh, and Centerville River. The Lewis Bay report was submitted for MassDEP review in June 2007 and should be available for public review by the end of summer. MassDEP released the final TMDL for Popponesset Bay in April 2006, while the draft TMDLs for Three Bays and Centerville River were released in January 2007 and June 2007, respectively. The Rushy Marsh report was submitted to MassDEP in December 2005 and does not have a draft TMDL yet. The Barnstable Harbor report is the only remaining MEP report that the Town needs to have a comprehensive understanding of the nutrient management requirements to protect and restore coastal water quality in the Town of Barnstable.

WR12. The Regional Policy Plan (MPS 2.1.1.2.C.2) requires that development in estuary watersheds where critical nitrogen loads are exceeded or where there are documented water quality problems in the estuary to maintain or improve existing nitrogen loading. The publicly available MEP Technical Reports for Shoestring Bay, Three Bays, and Centerville River indicate that these estuary systems are impaired by excessive nitrogen. Potential solutions to address these impairments may involve the Hyannis WPCF. The balance between the potential benefits of improved nitrogen treatment at the WPCF and potential additional nitrogen loads to resources around the WPCF are included as part of the town's proposed Nutrient Management Plan.

WR13. The release of the MEP reports and the establishment of embayment-specific Total Maximum Daily Loads by MassDEP follow a formal public participation process with comment periods and public presentations on draft reports and TMDLs. Each step of the process presents the public with an opportunity to comment on the conclusions or requirements in the documents.

WR14. The Town has also partnered with Cape Cod Commission water staff to provide a comprehensive assessment of all the existing water quality data on fresh water ponds within the Town. The Commission water staff is also preparing a detailed water quality assessment on Lake Wequaquet. This assessment is similar to a previously completed study of the Indian Ponds (Hamblin, Mystic, and Middle) done by the Commission in 2006. The work on fresh water ponds is scheduled to be completed in 2007 and will be available for inclusion in the Nutrient Management Plan.

WR15. Site selection screening, groundwater modeling and nutrient analysis of Barnstable Harbor indicate that the 6.9-acre site, located adjacent to the McManus property along Route 132, is suitable to accept effluent discharge up to 0.5 million gallons per day. This rate of recharge, as shown by the current USGS groundwater model, does not result in treated effluent flow into Lake Wequaquet or the Barnstable Fire District (BFD) wells. Furthermore intended sewering of the Lake Wequaquet AOC will remove septic wastewater from the BFD supply well

Zone of Contribution. Effluent discharge exceeding 0.5 MGD at the 6.9-acre site may result in resource impairment to Lake Wequaquet and the nearby Barnstable Fire District Wells and would require further analysis and submittals to MEPA. Subsurface characterization of the 6.9-acre site only penetrated several feet into the water table.

WR16. Analysis of over 20 years of water level measurements taken from monitoring wells around the Hyannis Water Pollution Control Facility and recent observation during high groundwater level conditions of 2006 indicate that treated wastewater effluent can be discharged at the present 82.4-acre WPCF site at a higher rate than 2.7 MGD.

WR17. The MEPA certificate on the Final Plan finds that the discharge of treated effluent at the Hyannis Water Pollution Control Facility can reasonably approach 4.2 MGD contingent upon implementation of the Adaptive Management Plan. The Adaptive Management Plan describes an ongoing monitoring of water levels in the vicinity of the WPCF and identifies contingencies should unacceptable impacts of a higher discharge rate be identified. The Adaptive Management Plan contingencies include precluding further increases in discharge at the WPCF and use of off-site discharge locations such as the 6.9-acre site adjacent to the McManus property.

WR18. The baseline water level and water quality-monitoring program at the WPCF was established under a 1979 Groundwater Discharge Permit issued by the forerunner of MassDEP, the Department of Environmental Quality Engineering. Town officials have met with Commission staff to form a Technical Advisory Group and provided over 18 years of monitoring data to Commission water staff for review. Staff's compilation, review and interpretation of the monitoring data has led to a number of recommendations to expand the Adaptive Management Plan, into an Adaptive Management and Monitoring Plan (AMMP). These recommendations, which have been discussed and accepted by Town staff, should lead to an updated water level and water quality monitoring program that provides monitoring of the regional groundwater divide and provides for regular review of the data. The specific AMMP recommendations include:

1) automated water table monitoring with the use of data loggers,
2) the installation of a number of additional monitoring wells,
3) quarterly update of a master water quality spreadsheet/database,
4) monthly update of a water level data spreadsheet/database and
5) the compilation and submittal to the Commission of an annual report that also includes water quality data from public water supplies, ponds and streams.

WR19. The Adaptive Management and Monitoring Plan consists of the following components:

Introduction and Objectives
Technical Advisory Group
Initial Review and Preliminary Staff Review and Recommendations
1) Groundwater Quality

a. Map of Monitoring Wells
b. Table of Monitoring Wells/Resources showing frequency

2) Water Levels
a. Table showing Monitoring Wells for water level monitoring and frequency

3) Adaptive Management Action Plan

WR20. Construction of sand-filter beds at the 6.9-acre site, located adjacent to the McManus property along Route 132, is estimated at $7.9 million. The implementation of the Adaptive Management and Monitoring Plan is designed to maximize the use of the rapid sand filter beds at the existing WPCF site, while avoiding any potential negative impacts to the resources and facilities around the WPCF. The 6.9 acre site will be used only if 4.2 MGD planned under the Final Plan cannot be discharged at the WPCF.

WR21. Groundwater modeling completed under a County-sponsored United States Geological Survey project indicates that increased recharge of treated effluent at the Hyannis Water Pollution Control Facility will enlarge the area of groundwater flow from the WPCF to effect additional receptors including the Mary Dunn Wells and Mill Creek to the east and the Craigville wells and Centerville River to the west. The Town has proposed to conduct analysis under the Nutrient Management Plan to evaluate the benefits of potential sewage collection and wastewater treatment to all resource areas potentially effected by increased WPCF discharge.

WR22. Recent research on Cape Cod and across the nation is focusing on emerging contaminants of concern in wastewater such as pharmaceuticals and personal care products. Additional information on potential presence of these compounds in the treated water effluent being discharged into the Wellhead Protection Areas is of interest to the town for present conditions and for future conditions as the increased discharge potentially impacts additional water resources.

WR23. The Massachusetts Department of Environmental Protection is in the process of revising it regulations for required disinfection of wastewater discharges within Zone II wellhead protection areas. Owing to the natural filtering conditions at the WPFC site, pathogens have not been identified as a concern to any of the downgradient public water supplies. The Commission supports the town's position that it should defer a decision to commit funds, estimated at $8.5 million, to include extra filtration and ultraviolet disinfection to address proposed MassDEP disinfection regulations.

WR24. Construction costs associated with the implementation of the Town's Wastewater Facility Plan are estimated at $203 million once the plan is fully implemented over a period of years. As described in the FEIR, the average household cost for the WWFP improvements and sewer expansion is $28,800.

CONCLUSION

Based on the findings above, the Cape Cod Commission hereby concludes the following:

- The probable benefits of the project outweigh the probable detriments as described in the Findings G4.
- The Wastewater Facilities Plan, as proposed, is consistent with the Commission's Regional Policy Plan (RPP) as described in Finding WR1 and Barnstable's Local Comprehensive Plan.
- The project is consistent with local zoning and development bylaws as described in Finding G1.
- The project is not located in a District of Critical Planning Concern.

The Commission hereby approves the application of the Town of Barnstable for the proposed Wastewater Facilities Plan as a Development of Regional Impact, provided the following conditions are met:

CONDITIONS

General

G1. This DRI decision is valid for 7 years. Local development permits may be issued pursuant hereto for a period of 7 years from the date of the written decision. The proposed project shall be constructed and implemented as described in the "Final Wastewater Facilities Plan" of March 2007.

G2. The applicant shall obtain all relevant state and local permits, as applicable, for the proposed project. The Town shall obtain a preliminary Certificate of Compliance from the Commission which states that conditions WR 1 through 7 of this decision have been met within 5 years of the of approval of the decision of the Cape Cod Commission on September 20, 2007.

G3. No development work, as the term "development" is defined in the Act, shall be undertaken until all appeal periods have elapsed or, if such an appeal has been filed, until all judicial proceedings have been completed.

G4. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this decision.

G5. The Nutrient Management Plan (Exhibit A) and the Adaptive Management and Monitoring Plan (Exhibit B) are attached to and incorporated into this decision by reference.

Water Resources

WR1. The town shall adopt the updated scope of the Nutrient Management Plan (Exhibit A). Any proposed changes to the Plan will be submitted Commission for review and approval.

WR2. The Nutrient Management Plan includes a proposed process for regulatory review including a joint MEPA/DRI review process starting with the submittal of an Environmental Notification Form. The town shall submit a preliminary schedule of the Plan's regulatory review to the Commission within two years of the date of this DRI decision.

WR3. As recommended and implemented through the Nutrient Management Plan, the town shall compare resource benefits with impacts of expanding sewer areas in order to provide additional definition, support, and prioritization for the sewering of each area. Adoption of the Nutrient Management Plan, completion of the required analyses, and implementation of steps to achieve hydrologic balance in the aquifer and demonstrate that there are no negative ecological impacts to surface waters will partially meet MPS 2.1.1.2.E.2. These Sewer Resource Benefit Assessments for each Areas of Concern shall be submitted for Cape Cod Commission review and approval prior to the preliminary sewer design report for each AOC.

WR4. The town shall adopt an expanded Adaptive Management and Monitoring Plan (Exhibit B) to monitor both water levels and water quality in the vicinity of the WPCF. The town shall implement recommendations for installing additional monitoring wells under the AMMP within one year of the date of this decision. Adoption of the Adaptive Management and Monitoring Plan and accompanying Nutrient Management Plan, follow through on the required analyses, and implementation of the steps to meet their intent will, when combined, fulfill MPS 2.1.1.2.E.2. Any proposed changes to the Adaptive Management and Monitoring Plan shall be submitted to the Commission for review and approval.

WR5. The town shall update the monitoring data generated from the Adaptive Management and Monitoring Program on a quarterly basis and prepare an annual Water level and Water Quality Monitoring Report. This annual report shall be submitted to the Commission for review and approval at the end of each calendar year. The Town shall schedule an annual meeting of the Technical Advisory Group within one month of the annual report submittal to the Commission to discuss the report's findings and any potential recommendations for adaptive strategies or monitoring modifications.

WR6. The Adaptive Management and Monitoring Plan includes contingencies for evaluating potential options for the review of effluent discharge sites that take advantage of enhanced natural attenuation of nutrients in surface water bodies. The Town and the Commission should work together to seek opportunities for conducting a pilot project for permitting of treated effluent discharge near appropriate surface water bodies to take advantage of natural attenuation and provide opportunities for maintaining water balance.

WR7. The current Massachusetts Department of Environmental Protection Groundwater Discharge Permit for the Water Pollution Control Facility is a 1990 draft that limits flow to 2.7 million gallons per day prior to treatment improvements and 4.2 MGD post improvements. The 2007 MEPA Certificate finds that the Town may now undertake activities that will approach a wastewater flow capacity of 4.2 MGD. The Town should submit a revised GWDP application to MassDEP within one year of the date of this decision. The Town should work to incorporate recommendations for monitoring that are described in the Adaptive Management and Monitoring Plan into the groundwater discharge permit. The revised GWDP application shall be submitted to the Commission for review and approval at the time of its submittal to MassDEP.

WR8. The Town shall submit its Groundwater Discharge Permit Application for the 6.9-acre site adjacent to the McManus property to the Commission for review and approval when it moves forward to implement use of the site.

WR9. The discharge of treated effluent at the WPCF shall not exceed 4.2 million gallons per day unless approved by the Commission. Further study under the Nutrient Management Plan and the Adaptive Management and Monitoring Program will be required to support flows higher than 4.2 MGD.

WR10. The town in implementing the Adaptive Management and Monitoring Program should conduct an assessment of Pharmaceutical and Personal Care products in the WPCF effluent and evaluate appropriate technologies to treat them if it is warranted.

WR11. The town in implementing the Adaptive Management and Monitoring Program should conduct an assessment of fate and transport of pathogens in the aquifer beneath the WPCF to address MassDEP disinfection concerns.

SUMMARY

The Cape Cod Commission hereby approves with conditions the application of the town of Barnstable for the Development of Regional Impact as outlined in this decision pursuant to Sections 12 and 13 of the Act, c 716 of the Acts of 1989, as amended for the proposed Barnstable Wastewater Facility Plan.

_____ _____

Robert Jones, Commission Chair Date

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss _____, 2007

Before me, the undersigned Notary Public, personally appeared

_____, in his capacity as Chairman of the Cape Cod Commission, whose name is signed on the preceding document, and such person acknowledged to me that he signed such document voluntarily for its stated purpose. The identity of such person was proved to me through satisfactory evidence of identification, which was personal knowledge of the undersigned.

_____

Notary Public

EXHIBIT A

OF CAPE COD COMMISSION DECISION

TOWN OF BARNSTABLE
NUTRIENT MANAGEMENT PLANNING PROJECT

PROJECT SCOPE

August 27, 2007

The purpose of the Nutrient Management Planning Project Scope is to provide a listing of the steps needed for nutrient management planning in Barnstable. The implementation of the Project will result in a recommended nutrient management plan for the Town of Barnstable that will mitigate the nutrient related problems in each watershed. This plan will include the scheduled implementation steps for new facilities, management structures, local regulations, and funding requirements. The objective of the Plan is to select the most appropriate nitrogen management plan for Barnstable based on a cost effectiveness analysis, analysis of non-monetary factors, and an environmental impact analysis. Listing these tasks allows Town departments, regional and state agencies, and public interest groups to understand the Nutrient Management Planning process, and efficiently provide input to the Project.

The Nutrient Management Plan was initially scoped as part of the Notice of Project Change in 2001 by Stearns and Wheler, Inc, the town's wastewater planning consultants. The Town has made significant progress on the assessment phase of the NMP and has budgeted funds under its State Revolving Loan to implement its subsequent Phases. The July 2007 revisions to the NMP scope under Cape Cod Commission DRI review provide an important update and incorporates the results of these cooperative efforts. Barnstable is in its 4th year of participating on the Massachusetts Estuary Project (MEP). The Town has coordinated an extensive group of volunteer monitors to obtain marine water quality samples from its embayments. Results from these samples will be combined with complementary water quality monitoring, sediment sampling, hydrodynamic and water quality modeling for all of Barnstable's estuary systems in

order to produce the MEP Technical Reports. The Town continues its work with the staff from the School of Marine Science and Technology (SMAST) at UMASS Dartmouth, who are also the MEP project leads. These Technical Reports will provide the town with nitrogen thresholds or limits, which will subsequently be adopted as TMDLs through a MassDEP process. TMDLs are official regulatory targets under provisions of the federal Clean Water Act.

The Project Scope is expected to have the following main uses:

- Budgeting and scheduling tool for nutrient management planning.
- Basis for the division of growth management planning tasks within the Town of Barnstable.
- Basis for professional agreements for the specialized consulting services needed for nutrient management planning.
- Low interest loan application for the State Revolving Fund (SRF) loan program.
- Development of an environmental review document for the Project through the joint Massachusetts Environmental Protection Act (MEPA) and Cape Cod Commission Development (CCC) review process.
- Development of public education materials throughout the Project.

PHASE I –ASSESSMENT OF MONITORING AND NUTRIENT LIMIT TARGETS.

This is the first phase of nutrient management planning, and it involves the assessment of the nutrient related health of coastal embayments and fresh water ponds. It is the phase when nutrient loading targets are identified for each embayment. These targets are a measure of the nitrogen assimilative capacity Total Maximum Daily Load (TMDL) of each embayment. It is the phase when the water quality of the fresh water ponds is measured and the need for phosphorus remediation in the ponds, and their watersheds, is determined. The main tasks are listed below and significant progress has been made on them.

To date, the Town has received MEP Technical reports for Shoestring Bay (as part of the Popponesset Bay System shared with Mashpee and Sandwich), Three Bays, Rushy Marsh, and Centerville River. The Lewis Bay report was submitted for MassDEP review in June 2007 and should be available for public review by the end of summer. The Rushy Marsh report was submitted to MassDEP in December 2005 and does not have a draft TMDL yet. The final TMDL for Popponesset Bay was released by MassDEP in April 2006, while the draft TMDLs for Three Bays and Centerville River were released in January 2007 and June 2007, respectively. The Barnstable Harbor report is the only remaining MEP report that the town needs to have a comprehensive understanding of the nutrient management requirements to protect and restore coast water quality in the town of Barnstable.

The release of the MEP reports and the establishment of embayment-specific Total Maximum Daily Loads by MassDEP follows a formal public participation process. Each step of the process presents the public with an opportunity to comment on the conclusions or requirements in the documents.

The Town has also partnered with Cape Cod Commission staff to provide a comprehensive assessment of all the existing data on fresh water ponds within the town. The Commission water staff are also preparing a detailed water quality assessment on Lake Wequaquet. This assessment is similar to a previously completed study of the Indian Ponds (Hamblin, Mystic, and Middle) done by the Commission in 2006. The work on fresh water ponds is scheduled to be completed in 2007.

A. Review Current and Past Monitoring of surface waters to assess future monitoring needs.

Estuary water quality monitoring has been conducted in order to provide adequate data for the preparation of the nitrogen thresholds in the MEP Technical Reports. TMDLs include a requirement for on-going water quality, eelgrass, and benthic habitat monitoring in order to ensure compliance with the nitrogen thresholds and protection of the resources. Definitive

guidance on what constitutes appropriate TMDL-compliance monitoring is being developed through discussions among MEP staff, towns, MassDEP, and SMAST.

Freshwater pond water quality monitoring has also been completed on a pond-specific, but limited, basis. With 184 ponds in town (CC Pond and Lake Atlas, 2003), this is a much larger effort and only selected ponds have been adequately sampled. The town has participated in a number of the SMAST/Cape Cod Commission PALS Snapshots, but data is limited to approximately 30 ponds. The Town Conservation Commission-funded review of pond water quality data that will be completed by the CCC in 2007 will evaluate the available data and provide suggestions for future monitoring and based upon the available data, characterize fresh water quality problems and offer recommendations for prioritization.

With the above status in mind, these steps will be undertaken:

1. Prepare a water quality-monitoring program for estuary TMDL compliance.

    - Review TMDLs and existing data, MEP reports, and ongoing monitoring programs.
    - Discuss current status of TMDL compliance monitoring with MassDEP and SMAST staff, especially concerning timing, extent of monitoring, and public reporting requirements.
    - Prepare a sampling plan to address compliance monitoring for estuaries based on MassDEP guidance
    - Recruit volunteers to perform the monitoring.
    - Provide needed monitoring equipment.
    - Select qualified analytical laboratory to perform the analyses.

2. Monitor and establish water quality priorities in fresh water ponds.

    - Review Cape Cod Commission review of Barnstable pond water quality data and any subsequent pond monitoring data
    - Discuss and establish monitoring goals and water quality thresholds for ponds.
    - Develop sampling plan to address impaired water quality.

- Recruit volunteers to perform the monitoring.
- Provide needed monitoring equipment.
- Select qualified analytical laboratory to perform the analyses.

B. Review current monitoring of public water supplies to assess status

- Review available MassDEP monitoring data from public water supplies
- Assess potential water quality issues of concern for individual wells or collectively of the town-wide system

C. Prepare Water Quality Status and Monitoring Need Report

1. Prepare this report to document the components of this phase.

2. Submit this report for environmental and public review as discussed in Phase 6.

PHASE II – NUTRIENT MANAGEMENT NEEDS ASSESSMENT

Phase II consists of the tasks to define the nutrient management needs of the Town. Needs will be defined by identifying the Town goals for nutrient management, evaluating the existing conditions, developing projections of the future conditions, and then comparing these goals and conditions to the water quality limitations of the Town's waters.

The purpose of the nutrient management needs assessments is to evaluate and define the nutrient management needs of the Town including other potential wastewater management needs previously identified in the Town's Wastewater Facility Plan and needs identified thorough the MEP Technical Reports, TMDLs, and freshwater pond assessments.

The main tasks of this phase are listed below:

A. Review, Describe, and Summarize Existing Conditions and Town Issues.
Including:

1. Nutrient management issues discussed in Phase I.

2. Town governmental issues including:

   - Town goals and objectives affecting nutrient management.
   - Local rules and regulations.
   - Growth management policies.
   - Affordable housing initiatives.
   - Fiscal constraints.
   - Institutional constraints.

3. Available technical data including:

   - Land use information from existing reports and town GIS files.

- Build out projections from existing reports.
- Areas of Town served by public and private water supplies.
- Zone of contribution (ZOC) delineations for public water supplies.
- Soils information and area of Town with high groundwater conditions.
- Areas of Town served by on-site systems, cluster treatment systems and the Hyannis WPCF.
- Performance of existing on-site nitrogen removal systems.
- Performance of Barnstable Middle School WWTF and all other public and private cluster and packaged treatment plants.
- Hyannis WPCF performance.
- Properties with septic system failures.

4. Previous and on-going projects related to nutrient management planning including:

- Town Wastewater Facilities Planning Study
- Recent and planned upgrades to Hyannis WPCF
- Stormwater remediation projects
- No-Discharge Area designation in Town's coastal areas
- Town DCPC and GIZ nomination efforts
- Land acquisition efforts
- Pond and embayment studies discussed in Phase I Report

B. Review And Summarize Regulatory Issues Affecting Nutrient Management Planning. Including issues related to:

- Watershed delineations to coastal embayments and freshwater ponds.
- Nitrogen standards for coastal waters.
- On-site systems and the nitrogen management aspects of the Title 5 regulations.
- Ocean Sanctuaries Act and the ability to discharge treated effluent through an ocean outfall.

- Wetland regulations.
- Groundwater standards and the discharge of treated effluent to the groundwater system.
- Drinking water standards and the ability to site an effluent discharge in Cape Cod's Sole Source Aquifer.
- Regulations pertaining to usage of nitrogen fertilizers.
- Privately owned wastewater treatment facilities.
- Septic systems owned and operated by community groups
- Collection and treatment of stormwater runoff
- Wastewater treatment and discharge requirements
- Coastal Zone Management (CZM), U.S. Corps of Engineers, and FEMA requirements on modifications to and remediation of coastal water bodies

C. Evaluate Summarize And Describe Future Conditions In Town. Including:

- Nutrient loadings and limitations presented in Phase I
- Findings of previous build out analysis
- Potential redevelopment in Hyannis
- Future wastewater flows and loadings with seasonal variation
- Proposed wastewater improvements at the Hyannis WPCF and proposed sewer extensions recommended as part of the wastewater facilities plan
- Proposed affordable housing projects
- Potential new public water supplies and the creation of new ZOC areas
- No action alternative (this is the future condition of the Town if nutrient management strategies are not implemented in the future)

D. Identify Nutrient Related Areas Of Concern And Prepare A Nutrient and Wastewater Management Needs Assessment Report.

1. Identify water bodies that currently or will exceed nutrient loading thresholds, including TMDLs and targets in the future.

2. Identify public water supplies with existing or future water quality concerns

3. Summarize the existing and future conditions for these areas to facilitate the evaluation of nutrient management and where applicable, wastewater management solutions in future phases.

4. Summarize the nutrient management needs of the Town.

5. Identify data gaps and additional information needed to proceed efficiently with the project.

6. Prepare the Nutrient Management Needs Assessment Report in accordance with State guidelines for nutrient management and wastewater management reports, and guidelines for projects funded by State Revolving Fund (SRF) loans. Summarize the analysis and findings of this project phase in the Needs Assessment Report.

PHASE III- IDENTIFICATION AND SCREENING OF ALTERNATIVE SOLUTIONS AND SITES

Phase III reviews, identifies, and develops solutions which may be feasible to meet the Town's nutrient management and wastewater management needs. These solutions are then summarized and screened to retain only the most feasible. Alternative wastewater treatment sites are also identified and screened to identify the most feasible sites that will balance costs, environmental impact and public acceptance. Feasible solutions (technical as well as management) and sites are then grouped into alternative scenarios for detailed evaluation in the next phase.

The purpose of the identification and screening of alternative solutions and sites is to identify nitrogen remediation solutions and then reduce the number of solutions to the most feasible ones for detailed evaluation. The Phase III identification and screening of alternatives may be specific to a particular watershed and its TMDL.

Significant progress has been made on the technical approaches to evaluate and resolve embayment specific and site-specific issues related to proposed sites for recharge of treated effluent. These approaches are described in the Technical Report Effluent Disposal and Reuse Planning Guidance that was prepared by the town under a County Wastewater Management Grant. The MEP reports and their accompanying models and the recently-updated USGS groundwater models will allow the town to test scenarios to see if they address the TMDLs and evaluate other potential impacts, such as changes in watershed boundaries. The benefits of these tools were recently demonstrated through findings from a County-funded USGS groundwater-modeling project, which allowed the town to evaluate the impact of different discharge volumes at the proposed McManus discharge location. This evaluation was paired with an evaluation of the potential impacts on Barnstable Harbor of the associated nitrogen loads completed by the MEP staff and an evaluation of potential phosphorus loading impacts on Lake Wequaquet. The Tasks evaluating alternatives will require evaluation of the changes in watershed boundaries from existing and proposed effluent recharge sites and the determination of net nutrient loads where both sewering to reduce loads and recharge of collected wastewater effluent will occur. Such analysis will demonstrate the benefits of potential sewage collection and wastewater

treatment to the impacts from existing septic systems on specific resources (coastal waters, fresh water ponds and drinking water wells).

The tasks of this phase are listed below.

A. Identify, Review and Summarize Alternative Solutions To Meet The Town's Nutrient and Wastewater Management Needs. Investigate the groups of technologies, opportunities and alternatives, including:

- Modification to Town Zoning and land use requirements
- Stormwater mitigation opportunities
- Fertilizer mitigation opportunities
- Individual on-site wastewater nitrogen removal technologies
- Community (cluster) wastewater nitrogen removal technologies
- Centralized wastewater treatment and nitrogen removal technologies
- Centralized wastewater collection and residual management technologies
- Wastewater flow and loading reduction opportunities
- Wastewater reuse opportunities
- Solutions to encourage greater nitrogen attenuation within watersheds
- Financing scenarios
- Infrastructure management scenarios
- Potential centralized discharge sites based on past Town evaluations

B. Screen The Alternative Solutions To Identify The Most Feasible Ones For Detailed Evaluation.

1. Prepare a screening methodology for solutions that can meet the needs identified in Phase II. The methodology will include a standard set of criteria to screen the technologies.

2. Prepare a screening matrix, which provides a side-by-side comparison of the various alternatives within a group that meets the specific needs in Phase II.

3. Select the most feasible alternatives for detailed evaluation.

C. Identify And Screen Potential Sites For Nutrient Management Facilities.

Including wastewater treatment and discharge sites for cluster systems, centralized facilities and stormwater treatment and discharge sites.

1. Prepare a facilities site and screening methodology for regulatory and project review. The methodology will include a standard set of criteria to screen the sites.

2. Use the Town GIS to identify and tabulate information on potential sites.

3. Compare a screening matrix, which provides a side-by-side comparison for potential sites.

4. Visit the sites to form additional observations about the sites.

5. Meet with Land Bank representatives and other land preservation groups to explore possibilities of using preservation land for nitrogen management facilities.

6. Select the most feasible sites for detailed evaluation.

7. Identify subsurface or environmental investigations needed to demonstrate the feasibility and acceptability of particular sites for wastewater treatment and disposal facilities. Potential investigations include:

   - Wetland delineations
   - Endangered species survey
   - Archeological survey

- Test pit and percolation investigations
- Pump testing and hydraulic conductivity testing

D. Group Feasible Solutions And Sites Into Alternative Nutrient Management Scenarios.

1. Group the feasible solutions with the input of Town staff and Citizen Advisory Committee members.
2. Summarize the rational for grouping various feasible solutions into the nutrient management scenarios.

E. Prepare Nutrient and Wastewater Management Alternative Screening Report

1. Prepare this report to document the components of this phase.

2. Submit this report for environmental and public review as discussed in Phase 6.

PHASE IV – DETAILED EVALUATION AND DEVELOPMENT OF THE NUTRIENT MANAGEMENT PLAN

Phase IV provides a detailed analysis of costs and non-monetary factors for the alternative nutrient management scenarios. It also performs the environmental impact analysis for these alternative scenarios in accordance with State and Cape Cod Commission requirements. It presents the recommended nutrient management plan to mitigate the nutrient related problems in each waterbody. This plan will include the recommended implementation steps for new facilities, management structures, local regulations, and funding requirements, as well as recommended schedule for implementation.

The main tasks for this phase are listed below:

A. Additional Environmental Investigations and Modeling For Potential Nutrient Management Sites. Potential investigations include:

- Groundwater Modeling
- Nitrogen loading evaluations/comparison to estuary TMDLs and drinking water standards
- Phosphorus loading evaluations/comparison to freshwater pond thresholds
- Other drinking water contaminant evaluations
- Hydraulic surface water modeling/water balance evaluations
- Site assessments for enhanced natural nitrogen attenuation
- Wetland delineations
- Endangered species survey
- Archeological survey
- Test pit and percolation investigations
- Pump testing and hydraulic conductivity testing

B. Perform Present-Worth Evaluations Of Alternative Nutrient Management Scenarios.

1. Develop unit costs for capital and operational & maintenance (O&M) costs.

2. Develop capital costs for each alternative scenario.

3. Develop O&M costs for alternative scenario.

4. Perform a present-worth analysis to equate the capital cost and twenty years of O&M costs of each alternative scenario to a present worth cost. Compare present worth cost of the alternative scenarios to identify the most cost effective scenario. The purpose of this analysis is to develop a comparable cost for alternative scenarios that may have different cost structures. (One alternative scenario may have high capital cost but low O&M cost; while another alternative scenario could have low capital cost but high O&M cost.)

C. Perform Non-Monetary Evaluations Of The Alternative Scenarios.

1. Compare non-monetary factors of each scenario such as:

   - Anticipated public acceptance
   - Ease of implementation
   - Land area requirements
   - Energy use
   - Flexibility for changing requirements
   - Maintenance requirements and complexity of operations
   - Nutrient and other contaminant mitigation performance
   - Regulatory feasibility
   - Expected Growth

2. Develop a numerical rating system to quantify these non-monetary factors

D. Perform An Environmental Impact Analysis Of The Alternative Scenarios.

1. Perform an environmental impact analysis in accordance with the guidelines and regulatory procedures of the Cape Cod Commission and the Massachusetts Environmental Protection Act (MEPA) Office of the state.

E. Evaluate The Present-Worth Analysis With The Non-Monetary Evaluation and The Environmental Impact Analysis To Select The Most Appropriate Management Scenario.

1. Develop evaluation summaries for project team and regulatory review.

2. Select the most appropriate management scenario.

F. Develop And Present Recommended Nutrient Management Plan, and Prepare The Nutrient Management Plan And Draft Environmental Impact Report (DEIR).

1. Briefly summarize the previous evaluations and project phases.

2. Present the findings of any environmental investigations performed at the beginning of this phase.

3. Present a summary of the evaluations and analysis performed in this phase, including:

   a. Present the wastewater management recommendations including:

      i. Identify the recommended wastewater management approach for all areas of Town including:

- Areas to be served by sewers and advanced nitrogen removal at one or more new centralized wastewater treatment facility(s).
- Areas to be served by sewers and community (cluster) wastewater treatment facilities
- Areas to be served by on-site nitrogen removal systems serving individual homes or small groups of homes.
- Areas of Town that can continue to be served by Title 5 systems
- How each of these wastewater treatment technologies in these areas will address nutrient management thresholds and TMDLs.

ii. Present detailed description, O&M requirements, conceptual design, layout, design flows and loadings, and expected performance of all recommended wastewater management approaches including the following possibilities:

- Modification and expansion of the Hyannis WPCF
- New centralized treatment facility(s)
- New community (cluster) treatment facilities
- On-site nitrogen removal septic systems
- Standard Title 5 systems

iii. Present detailed description, conceptual design, design capacities, and O&M requirements of recommended effluent discharge facilities.

iv. Present detailed descriptions, conceptual design, O&M requirements and design capacities of recommended wastewater residuals management facilities including:

- Areas to be served by sewers and advanced nitrogen removal at the Hyannis WPCF

- Septage management facilities and managed pumping of septic tanks.
- Screenings, grit and biosolids management and disposal.

v. Capital and O&M costs for all recommendations.

b. Present recommendations for enhanced natural nitrogen attenuation within selected watersheds either through the restructuring of existing systems or creation of new systems.

c. Present pond remediation recommendations including:

- Prioritization of pond remediation projects.
- Detailed description of recommended remediation program, technology, and cost for each pond, including: evaluation of watershed controls, in-lake options and preferred treatment, opportunities for joint nitrogen and phosphorus removals, evaluation of potential decreased nitrogen attenuation due to better pond water quality, development of conservation commission application template for pond remediation projects, and evaluation of long term benefits of recommended remedial options.
- Capital and O&M costs for the pond remediation.

d. Present recommended institutional changes and management structures needed to operate and implement the nutrient management strategies recommended including:

- Changes in Town staffing
- Town departmental responsibility shifts
- Possible management district formation
- Possible inter-municipal agreements
- Capital and O&M costs for these management changes

e. Present fertilizer management recommendations including evaluation of the following options:

- Public education programs.
- Town regulations to monitor and control proper application of fertilizer.
- Development of specifications for approved fertilizers in town.
- Zoning changes to encourage smaller lawns and the disturbance of less natural ground cover.

f. Present stormwater management recommendations to manage and mitigate nutrient impacts from stormwater including:

- Prioritization and conceptual design of stormwater projects to mitigate impacts of stormwater discharges on estuaries and ponds.
- Zoning changes to minimize the creation of impervious surfaces and the production of stormwater.

4. Present recommended implementation schedule for implementing the management recommendations.

5. Recommend CIP budgeting needed for the implementation.

H. Submit The Nutrient Management Plan and DEIR For Regulatory and Public Reviews.

1. Prepare this report to document the components of this phase.

2. Submit this report for environmental and public review as discussed in Phase 6.

PHASE V – RESOLUTION OF REMAINING ISSUES AND PROJECT COMPLETION

This phase is needed to complete the Environmental Impact Review Process and finalize the Nutrient Management Plan. This phase includes the following tasks:

A. Resolve Remaining Issues. There maybe remaining issues to address, which will require the following tasks:

- Reinvestigate previous analyses as required
- Investigate additional alternatives and/or sites as required
- Develop additional information as required

B. Modify The DEIR To Prepare The Nutrient Management Plan and FEIR, and Submit It For Public and Regulatory Review. The DEIR will need to be modified to include any requested information to produce a FEIR. The FEIR will then be submitted to the regulatory agencies for review.

1. Prepare this report to document the components of this phase.

2. Submit this report for environmental and public review as discussed in Phase 6.

PHASE VI – ENVIRONMENTAL AND PUBLIC REVIEW PROCESS.

This phase is the creation and coordination of the environmental and public review process that proceeds throughout the whole project.

The environmental review process needs to follow the Cape Cod Commission/Massachusetts Environmental Policy Act (CCC/MEPA) Joint Review Process (CCC/MEPA, 1991) which typically uses public hearings after the submittal of each project document. The Town can also request a more formalized Joint Review Process described as "Special provisions for Major and Complicated Projects" and detailed in State Regulation 201CMR11.12. This review process requires regulatory review of each project document and can require additional review components as requested by the Town. Both environmental review processes require many regulatory meetings and public hearings to coordinate the flow of information to the various regulatory agencies.

The public review process is closely related to the environmental review process. It will contain additional items needed to properly disseminate information to the Town's community groups and to the Town Public. Proper public education is needed to ensure that the recommended plan will be approved by the Town Council and by the voters in any proposition 2_ override referendums.

The purpose of this phase is to create and coordinate an environmental and public review process which will inform project participants and the Town Public, and ensure that the recommended plan will be approved by the Town Council and Town Voters.

The main tasks of this phase are listed below:

A. Establish and Utilize a Citizens Advisory Committee. A Citizens Advisory Committee (CAC) is typically comprised of Town residents with diverse views that fairly represent all points of view. The purpose and function of the CAC include:

- Become knowledgeable about all aspects of the Project.
- Make recommendations to the Town and Town Decision Makers
- Represent members of the public that cannot attend public meetings.
- Investigate and develop recommendations on issues as they arise.

The CAC will meet periodically throughout the Project as desired by CAC members. Meeting notes will be maintained.

B. Establish and Utilize a Technical Advisory Committee. A technical Advisory Committee (TAC) is typically comprised of representatives of Town technical staff, representations from regulatory agencies, and professional staff from interested agencies. The Town has already assembled a Nutrient Management Team which is considered a TAC. The current representation of this group includes:

- Town Department of Public Works
- Town Health Department
- Town Conservation Department
- Town Planning Department
- Cape Cod Commission
- Massachusetts DEP
- Three Bays Preservation, Inc.

The TAC will meet regularly throughout he Project to be sure that technical issues are addressed. Meeting notes will be maintained.

C. Prepare and Conduct a Public Participation Program. A public participation program is needed to develop appropriate public education materials to inform the public of Project activities and findings. Public education tasks include:

- Provide public notification of all public meetings and hearings.
- Develop Project summaries before and after each major phase of the Project.

- Develop and distribute news bulletins to the press to keep project activities in the news.
- Maintain Project information dissemination booths at public libraries and other public locations. These tables will display information about the project as well as act as a distribution point for project summaries.
- Organize presentations to the Town citizen and public interest groups.
- Tape and air all CAC and public meetings on community television and/or through the town website
- Organize workshops with community groups to facilitate greater information exchange between Project team members and the public.

D. Prepare, Submit and Coordinate the Public Review of the Environmental Notification Form and Development of Regional Impact Document. The Environmental Notification Form (ENF) and Development of Regional Impact (DRI) document is the first Project Submittal of the Joint CCC/MEPA Review Process. The document briefly describes the main issues of the Project and presents a Project Scope that describes the major tasks to be accomplished by the Project. The ENF/DRI document will be based on the Plan of Study. The major tasks include:

1. Solicit comments form the regulatory agencies and other interested parties on the Plan of Study.

2. Prepare the ENF/DRI document for MEPA, CCC and public review.

3. Attend document review meetings and a public hearing.

4. Receive the MEPA Certificate and address public comments in a letter to the Secretary of the Executive Office of Environmental Affairs.

5. Modify the Plan of Study as needed to address the comments.

E. Coordinate the Public Review of the Other Project Documents

1. Coordinate the public review of the other project documents identified in previous phases including:

   - Assessment of Monitoring and Nutrient Limit Targets.
   - Nutrient Management Needs Assessment Report
   - Nutrient and Wastewater Management Alternative Screening Report
   - Nutrient Management Plan and Draft Environmental Impact Report (DEIR)
   - Nutrient Management Plan and Final Environmental Notification Report (FEIR)

2. Attend review meetings and public hearings for these documents.

3. Receive the MEPA, CCC and other comments and address them in a letter.

F. Coordinate and Attend Meeting and Public Hearings.

PHASE VII – PROJECT MANAGEMENT AND FUNDING

A. Develop and Administer State Revolving Fund Loan Applications and Agreements.

B. Develop and Administer Contract Agreements for Specialized Services.

C. Provide overall Project Management and Coordination.

EXHIBIT B
OF CAPE COD DECISION ON

Adaptive Management and Monitoring Plan for the Effluent Recharge at the Hyannis WPCF Site

August 27, 2007
Draft

An Adaptive Management and Monitoring Plan has been developed to monitor water table fluctuations and trends caused by seasonal climatic variations and recharge of treated effluent at the Water Pollution Control Facility, and water quality. The purpose of the Adaptive Management and Monitoring Plan is to: 1) distinguish between changes in water table fluctuations caused by natural sources and those caused by WPCF discharge, 2) evaluate potential changes in the location of the regional groundwater divide resulting from increased discharge, 3) provide accurate documentation on the fate and transport of recharged components through the aquifer and 4) identify procedures that will be used if groundwater reaches specific elevations (threshold elevations) in a group of sentinel wells.

Technical Advisory Group: The Adaptive Management and Monitoring Program includes the establishment of a Technical Advisory Group (TAG) to regularly review monitoring data and recommend changes to the monitoring plan. The TAG will consist of members of the Town, their consultants, Cape Cod Commission Water Resource Program staff and others on an as needed basis to include MassDEP, USGS and SMAST. The technical advisory group shall meet at least once per year to review the on-going monitoring data to discuss and recommend any modifications or changes to the proposed AMMP and then.

Initial Review: The Barnstable Department of Public Works has conducted monthly measurements at monitoring wells around the WPCF since the mid 1980s. Over 18 years of water level and water quality data were provided to Commission Water Staff. Staff conducted an initial review and compiled a summary of water level and water quality data (see Appendix 1 for summary of wells reviewed). The AMMP is grouped into two sections based on this initial review: 1) Groundwater Quality and 2) Water Levels. The initial review included those items referenced in the MEPA Certificate:

1) Summary tables and graphs of water level data at each of the monitored wells including average, median, maximum and minimum and number of readings.

2) Summary table and graphs comparing water levels at each monitoring well to effluent discharge at the WPCF, precipitation and water levels at relevant USGS index wells and present r-squared values to evaluate their relationships.

3) Summary tables and graphs of water quality data at all the wells including effluent and influent to show average, median, maximum, minimum standard deviations and number of readings.

At present, Commission staff is working with the town to develop map of monitoring well locations to compliment the details included in this AMMP. A draft map is provided as a placeholder attachment (Figure 1).

1) Groundwater Quality

The objective of the groundwater quality monitoring program is to characterize and document changes in groundwater quality downgradient of the WPCF. Changes in water quality are to be expected from changes in effluent quality and increased volume of effluent discharge (see figures in Appendix 2). Changes to be expected are improvements from better overall treatment at the WPCF and an increase of the area of groundwater affected by increased volume of discharge.

An initial evaluation has been completed by Cape Cod Commission Water Resources Staff based on 18 years worth of data supplied by the Town. Based upon this preliminary review of the data, it is clear that the network of monitored wells should be altered: several monitoring well locations for water quality should be dropped and others should be added. A preliminary characterization of the monitoring well water quality data is included in Appendix 1. From the preliminary review, it is recommended that additional well information should also be added to the database, including: distance from WPCF, well screen depth below water table, depth to water, length of water column in the well and stratigraphy surrounding the well.

Recommended changes to the monitoring program include additional wells to characterize the existing plume area and wells to monitor an increased area potentially effected by the increased volume of discharge are shown on the attached Table 1. This monitoring program would supplement, but not replace standard monitoring regularly required under the MassDEP Groundwater Discharge Permit, such as influent and effluent monitoring. Follow-up with the

town on this initial evaluation will include discussion on staff recommendations of monitoring. The TAG may also want to consider additional monitoring programs for other compounds of concern such as total nitrogen, phosphorous, caffeine, drugs, pathogens, and estrogen mimics. These compounds concern a variety of receptors; the nutrients are important for surface waters (ponds, estuaries, and streams), while the caffeine, drugs, pathogens, and estrogen mimics are concerns for public water supplies.

The TAG will also consider the establishment of water quality thresholds for various compounds. Threshold and/or contingencies for consideration include, if trends in water quality at lateral monitoring points indicate an increase in effluent altered groundwater, additional monitoring points at a further distance from the WPCF will be added.

2) Water Levels

Water level monitoring is important because of the potential of WPCF discharge to impact low-lying properties and alter groundwater flow paths and impact drinking water wells, ponds, and estuaries. Specifically, it is important to monitor water levels around the WPCF to:

1) better manage the discharge among the 49 rapid infiltration beds as volume increases,

6.9-acre site, located adjacent to the McManus property along Route 132, in preparation of its potential use as a discharge site.

Water level information from 1990 to the present was evaluated by Commission staff. The relationship between water levels and discharge is readily discernable at only a few wells in close proximity to the WPCF. These wells include PT300-SE, C-2, 92-4, and 92-16. Staff recommend that these wells be adopted as the near-field monitoring wells for water levels and that appropriate water level thresholds for these wells be identified in the AMMP for effluent discharge management and groundwater divide monitoring (Table 2).

Staff also recommends well W7 as a groundwater divide monitoring location and several others that have yet to be identified.

Staff recommends that wells W4 and BA-3 be identified as far-field water level monitoring wells to evaluate the relationship to low-lying properties that have been identified in the FEIR as a

concern. The previously established thresholds for these wells should continue to be used until Town and Commission discussion of the water level relationships is completed.

3) Adaptive Management and Monitoring Plan.

If groundwater elevations reach elevation threshold levels, the following immediate actions will be implemented depending upon the degree and frequency and/or long term changes associated with low lying property concerns and/or the regional groundwater divide:

a. Verify the groundwater rise or potential impact, including:

    1) More detailed survey and site visit to verify the GIS elevations that have been used to date.

    2) Possible correlation of groundwater rise to the WPCF recharge.

    3) Investigation of impacts from other possible water sources such as broken water mains or poor drainage.

    4) Inquiries to adjacent property owners that may be impacted as to whether groundwater is entering any basement living space or if problems have been noted with operation of their septic systems.

If the threshold elevations are exceeded and the exceedances are believed to be due to Hyannis WPCF recharge at the site, the following correction action alternative evaluations will occur:

b. Evaluate various mitigation alternatives to address the high groundwater and changes in the groundwater divide that may include the following:

    1) Drainage improvements.

    2) Well point dewatering and recharge at an appropriate and permitted location.

3) More widespread rotation of effluent recharge within the Hyannis WPCF sand filter beds.

4) Relocation of up to 0.5 MGD to the 6.9-acre site.

5) Property purchase of the affected property.

6) Evaluation, planning, approval, and implementation of additional remote effluent recharge locations.

7) Discontinuation of sewer connections to properties that want to be served by the sewer (sewer moratorium).

c. Prepare an evaluation report for submittal to MADEP and the Cape Cod Commission summarizing the evaluations and recommended actions and timetable

Figure 1. Barnstable WPCF Adaptive Management and Monitoring Plan: Map of Monitoring Well Network showing DEP GWDP wells and others.

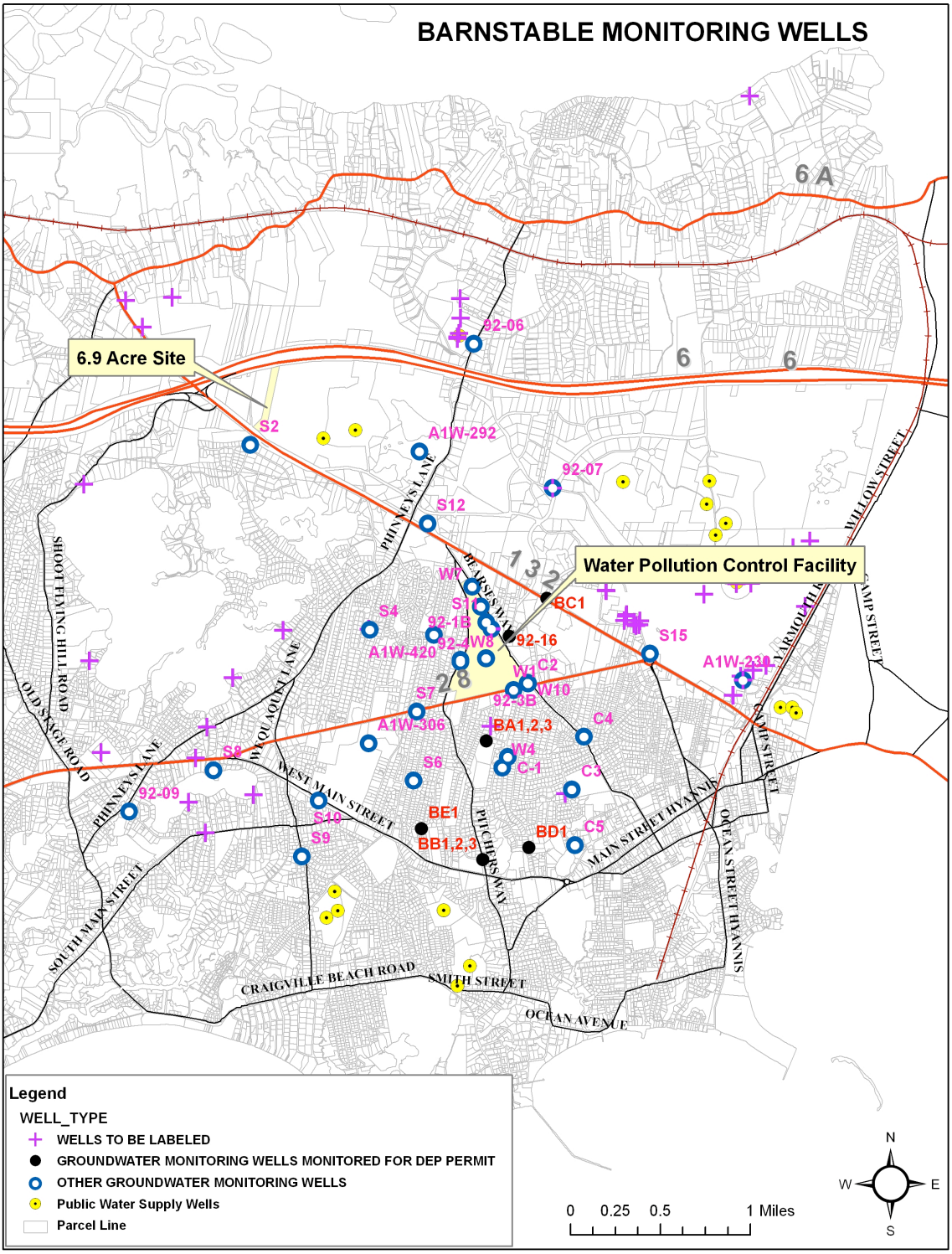


Table 1) Recommended Groundwater Quality Monitoring Plan

WELL/RESOURCE	LOCATION	DEPTH	RESOURCE	FREQUENCY
BA1	Expanded Plume	Deep	Water Supply	Quarterly
BA2	Expanded Plume	Inter	Water Supply	Quarterly
BA3	Background	Shallow	Urban Background	Can be Dropped
BB1	Expanded Plume	Deep	Water Supply	Quarterly
BB2	Background	Inter	Urban Background	Can be Dropped
BB3	Background	Shallow	Urban Background	Can be Dropped
BC	East Lateral	Inter	Water Supply	Quarterly
BD	Plume	Inter	Water Supply	Quarterly
BE	Background/W. Lateral	Inter	Urban Background	Quarterly
C1	Plume Core	Install Deep	Water Supply/SW	Quarterly
C2	Plume Core/Background	Install Deep	Water Supply/SW	Quarterly
C3	Plume Core	Install Supplement	WS/SW	Quarterly
C4	East Lateral	Install Supplement	WS/SW	Quarterly
C5	Plume Core	Deep	WS/SW	Quarterly
W7	North Upgradient	Install Supplement	Water Supply	Quarterly
AIW420	West Lateral	Install Supplement	Water Supply/SW	Quarterly
92-16	East Lateral	Install Supplement	Water Supply/SW	Quarterly
Stewards Creek	Downgradient SW	Stream flow	Surface Water	Quarterly
Duck Pond	Downgradient SW	Pond Water	Surface Water	Quarterly
4-Additional Wells	Lateral Control Points	Inter and Deep	Water Supply	Quarterly

Wells are to be measured for Water Level, Specific Conductance, Temperature, Dissolved Oxygen and sampled for Ammonia-N, Nitrate-N Total Nitrogen, Phosphorous, chloride, copper, iron, manganese, sodium, sulfate, and annually monitoring for potassium, VOC, THM.

Additional Near-field wells should be considered to characterize additional compounds of concern.

Changes to the initial 9 – “B” series wells that were part of the 1980 Groundwater Discharge Permit will need concurrence by DEP

Table 2. Recommended Water Level Monitoring Program

WELL	TYPE	OBJECTIVE	THRESHOLD (	FREQUENCY
PT300se	Near-field	Mound/Groundwater Divide	TBD	Data Logger
C2	Near-field	Mound / LLP*	33 ft	Data Logger
92-4	Near-field	Mound/ Groundwater Divide	TBD	Data Logger
W7	Near-field	Mound/ Groundwater Divide	TBD	Data Logger
92-16	Near-field	Mound / LLP/Divide	TBD	Data Logger
W4	Far Field	Mound/ LLP	26 ft	Monthly
BA3	Far-Field	Mound / LLP	TBD	Monthly

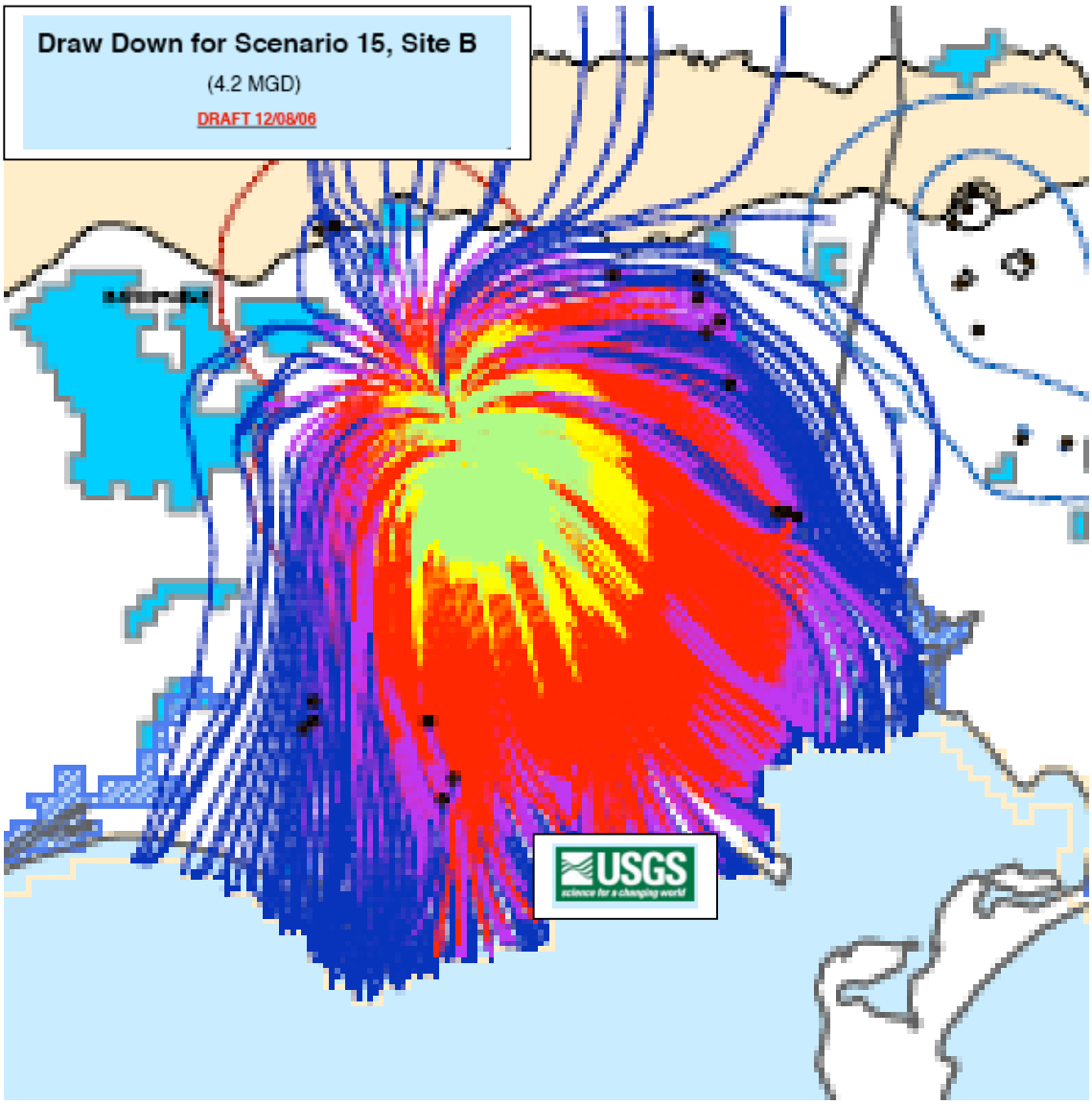
*Low Lying Property

Staff will review and finalize these selections with the Town.

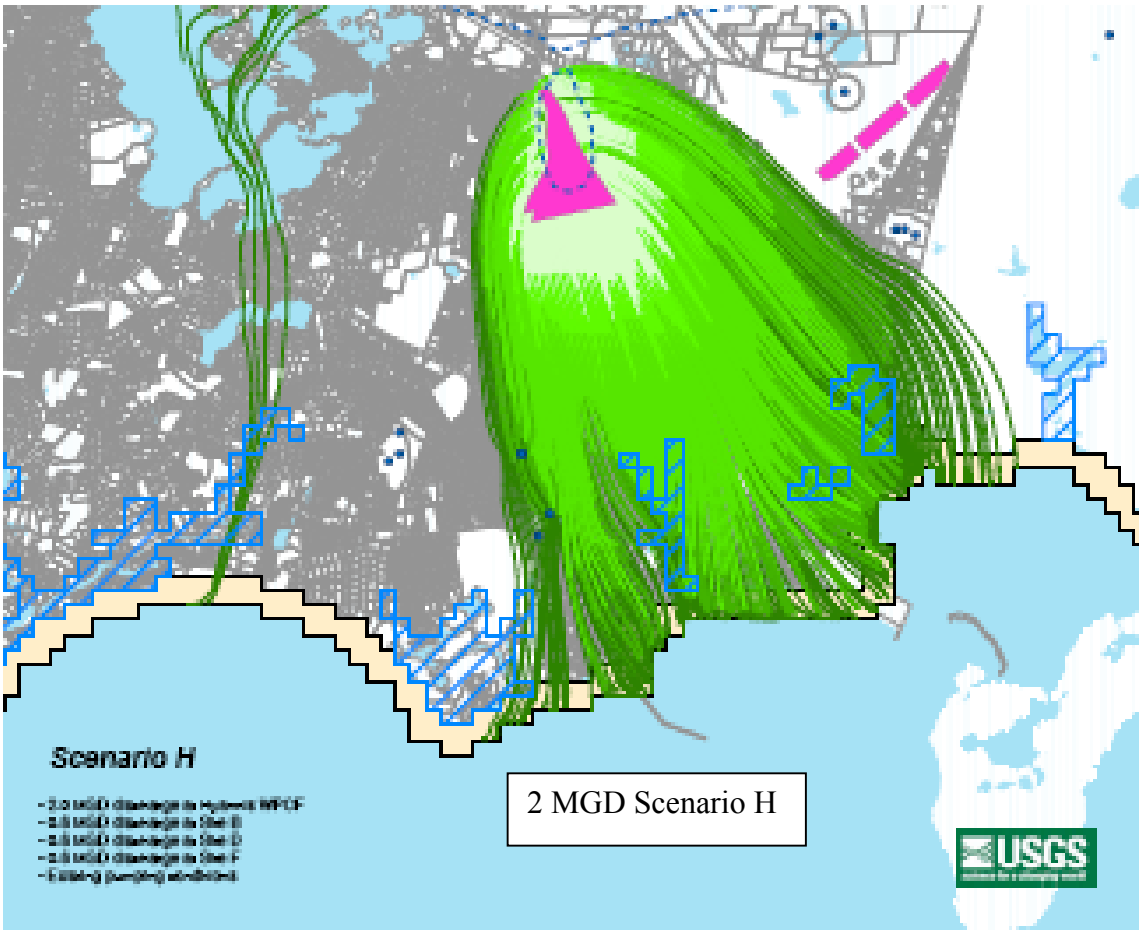
Appendix 1. Summary of Available Groundwater Quality Monitoring at the Hyannis WPCF

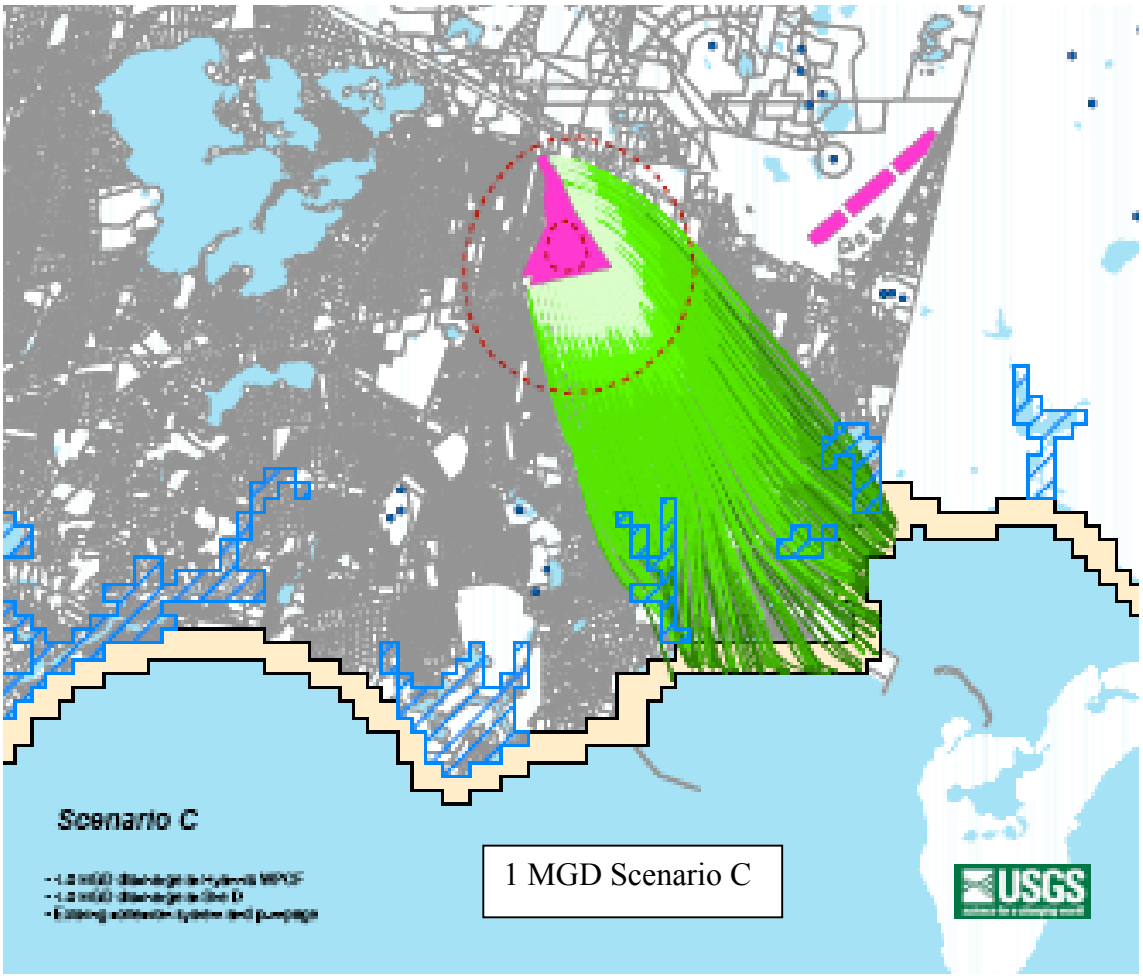
Well	Monitoring Location	Total Depth	Depth to H20	Depth of H2O	Year Installed	Period of Record	
BA-1	Plume	75	18	57	1979	1988+	Increase in Effluent plume character 1998+
BA-2	Plume	66	18	48	1979/1995	1988	Increase in Effluent plume character 1998+
BA-3	Plume	26	18	8	1979	1988+	Increase in Effluent plume character 1998+
BB-1	Plume	63	17	46	1979	1988+	Increase in Effluent plume character 2002++
BB-2	Background	43	17	26	1979	1988+	
BB-3	Background	25	17	8	1979	1988+	
BC	Background	66	31	35	1979	1988+	Run Off
BD	Plume	50	17	33	1979	1988+	Changes in oxidation state in 1995 & 2004
BE	Background	50	20	30	1979	1988+	
C1	Plume	75	12	63	1983*	1988-1993	Strong Plume Character
C2	Plume	42	11	31	1983*	1988-1997/2002-4	Run Off component
C3	Plume	58	18	40	1983	1988-1997	
C4	Plume	58	24	34	1983	1988-1997	
C5	Plume	45	6	39	1983	1988-1997	Strong Plume Character
W1	Plume	30	27	3	1978?	No data post 1994	Also Road Run Off
W4	Background	25	20	5	1978?	No data post 1994	
W5	Background	26	17	9	1978?	No data post 1994	
W7	Background	41	31	10	1978?	No data post 1994	
W8	Plume	43	33	10	1978?	No data post 1994	
W9	Background	Shallow		#VALUE!	1978?	No data post 1994	
W10	Background	Shallow		#VALUE!	1978?	No data post 1994	
92-1A	Plume	?			1992	1992,1996-1997	
92-1B	Plume	?			1992	1992,1996-1997	
92-2A	Plume	?			1992	1992,1996-1997, 2004	
92-2B	Plume	?			1992	1992,1996-1997, 2004	
92-4	Plume	?			1992	2002-2004	
92-16	Plume	?			1992	2002-2004	
PT300se	Plume	?			1992?	2004	

Appendix 2 – Selected Groundwater Particle Tracks from County Funded USGS Project



Barnstable Model Results: 4.2 + 3.7 MGD


Scenario H
2 MGD Scenario H
USGS


Scenario C
1 MGD Scenario C
USGS