

TOWN OF BOURNE

Town Hall
24 Perry Ave
Buzzards Bay, MA 02532

Pre-Disaster Hazard Mitigation Plan

Prepared for the Federal Emergency Management Agency
to comply with the DMA Act of 2000

October 21, 2004

Adopted October 26, 2004

Coordinated and written by the Local Emergency Planning Committee under the
direction of the Office of the Town Planner

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SECTION 1: INTRODUCTION

1.1 Hazard Mitigation

In the context of natural disasters, ***hazard mitigation*** is commonly defined as any sustained action that permanently reduces or eliminates long-term risk to people, property, and resources from natural hazards and their effects.

In the context of this Local Pre-Disaster Mitigation (PDM Plan ***hazard*** refers to an extreme natural event that poses a risk to people, infrastructure, or resources. ***Risk*** can be defined as “hazard; danger; peril; exposure to loss, injury, or destruction” or “the possibility of suffering harm or loss.” The Town’s hazard risk assessment determines which areas of Town may be affected by a natural hazard, how likely it is that a given hazard may occur, and how intense that hazard might be.

Vulnerability can be defined as “susceptibility to injury or attack.” Vulnerability indicates what is likely to be damaged by the identified hazards and how severe the damage might be. For example, if an area is determined to be at risk of flooding, vulnerability estimates could include potential residential property losses, impacts to the tax base and damages to public infrastructure in that area.

Hazard mitigation planning is the process that the Local Pre-Disaster Mitigation Community Planning Team (MHCPT) underwent to analyze our Town’s risk from natural hazards, to coordinate available resources, and to develop a strategy to implement actions to eliminate risk.

1.2 Plan Purpose and Benefits

The purpose of this plan is to fulfill the federal regulations for the *Disaster Mitigation Act of 2000 (DMA 2000)*, Section 322 (a-d). All cities and towns are required to adopt local multiple-hazard mitigation plan in order to remain eligible for the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant funds (available after a disaster is declared) and to be eligible for other federal hazard mitigation funds.

The Town of Bourne chose to participate in the Regional Pre-Disaster Mitigation planning initiative as coordinated by the Cape Cod Commission (Commission). The Commission convened a regional Multi-Hazard Community Planning Team to advise on the regional Pre-Disaster Mitigation Plan (PDM) and to provide planning assistance to local communities in development of local PDM plans.

1.3 Planning Process

On May 27, 2003, the Board of Selectmen established the Disaster Hazard Mitigation (PDM) Committee consisting of the existing Local Emergency Management Planning Committee (LEPC) as well as the Town Planner, Town Engineer and the Building Inspector. Planning Team Members are listed in Table 1.

As part of the planning process, the Town Planner participated in the Regional PDM planning process and also served as a liaison for the local PDM committee.

The local PDM committee nine (9) meetings in conjunction with the LEPC. A draft plan was presented at a public hearing held on October 18, 2004, that was advertised in local newspapers and posted in Town Hall. Additionally, the draft document was presented to the Board of Selectmen on October 5, 2004 during a public meeting and posted on the Town's website for a (21) twenty-one day comment period. Public comment was reviewed, considered, and incorporated into the plan. The final draft was presented to the Board of Selectmen on October 26, 2004 at a public meeting, for their review and comment.

Table 1: Local Hazard Disaster Mitigation Committee

Department Affiliation		Name
1.	Board of Health Agent	Cynthia A. Coffin
2.	Local Cable Television Representative	Richard Anderson
3.	Chief of Fire Department	Charles W. Klueber
4.	Chief of Police	John A. Ford
5.	Community Group	John R. Elwood
6.	Community Representative	Greg Dadak
7.	Director of the LEPC	Joel E. Gould
8.	Department of Natural Resource Director	George Weinert
9.	Department of Public Works	Rickie Tellier
10.	Emergency Medical Service Representative	Martin Greene
11.	Environmental (Conservation Agent)	Heidi Marsella
12.	Hospital Representative	Carol Kibner
13.	Integrated Solid Waste Management Rep.	Brent Goins
14.	Sewer Department Representative	George Tribou
15.	Media	Christine Ferullo
16.	Media	Paul Gately
17.	State Elected Official	Jeffrey Davis Perry
18.	NSTAR	Jeffrey Luce
19.	Owners & Operators	Scott Barr
20.	Owners & Operators	George Eldridge
21.	Owners & Operators	William Norman
22.	Transportation Representative	Sue Alma
23.	Town Engineer	Micheal Lietzel
24.	Local Elected Official	Linda Zuern
25.	Department of Public Works	George Sala
26.	Building Inspector	Roger Laporte
27.	Town Planner	Coreen V. Moore

1.4 Existing Town Plans Goals that Support Hazard Mitigation

While hazard mitigation is not specifically mentioned in the three following plans, components of such an approach are indicated.

- Draft Local Comprehensive Plan
- Open Space and Recreation Plan
- Comprehensive Emergency Management Plan

In the Open Space Plan - Section 9 one of the goals of the Five Year Action Plan is to revise Flood Plain zoning to minimize damage to barrier beaches, coastal banks and dunes. Additionally, included in the draft Local Comprehensive Plan Coastal Resources element it states that "... flood damage has historically placed the greatest limits on the productive use of Bourne's coastal resources", therefore a policy has been recommended

to continue to monitor use of and enforce regulations related to waterfront fueling facilities, sewage pumpout stations, stormdrains and septic disposal systems. Also develop a Flood Hazard Management Plan and identify necessary actions to address the effects of severe storms projected sea-level rise and sand migration.

The Comprehensive Emergency Management (CEM) Plan in the past has had the heaviest emphasis in on preparedness and response to risks such as man-caused emergencies and natural disasters. However, the Bourne Emergency Management Office has been charged with the responsibility to develop and implement CEM and more recently, in addition to Preparedness and Response, equal emphasis is now placed on Mitigation and Recovery phases of CEM.

1.5 Community Goal(s) for Hazard Mitigation

1. Reduce the loss of life, property, infrastructure and the impacts on environmental and cultural resources in the Town from natural disasters.
2. Coordinate our local hazard mitigation planning and activities with those of Barnstable County and neighboring towns.
3. Seek and take advantage of funding opportunities to implement the Pre-Disaster Mitigation Plan.
4. Mitigate potential financial losses incurred by municipal, residential and commercial establishments due to disaster.
5. Develop and distribute hazard awareness information and conduct and educational programs for the public.

SECTION 2: HAZARD ANALYSIS AND RISK ASSESSMENT

2.1 Community Description

The Town of Bourne known as the “Gateway to Cape Cod” is located in southeastern Massachusetts, wholly in Barnstable County. It is approximately 61 miles southeast of the city of Boston and is bordered by the Town of Plymouth to the north, Cape Cod Bay to the northeast, Town of Sandwich to the east, Buzzards Bay and the Town of Wareham to the west, and the Town of Falmouth to the south.

This medium-sized rural community bisected by the Cape Cod Canal occupies an area off 52.82 square miles including 40.90 square miles of land, which also includes 15 square miles of the Massachusetts Military Reservation and the National Cemetery.

According to the National Climatic Data Center (Hyannis Station), the average temperature in January is 28.4 degrees, 70.4 degrees in July with an mean annual temperature of 50 degrees. The normal annual precipitation is 43.9 inches.

The coastline to the northeast is regular and unprotected. The west coast is very irregular with peninsulas, islands, inlets, and small bays. Development along the coast is mostly residential.

Table 2: Population

1990 Census	2000 Census	2003 Town Data	1990-2003 Difference	% Change	Population Projections
16,064	18,721	19,566	3,502	17.9%	2010 – 22,422* 2020 – 26,827*

* Projections taken from the Massachusetts Institute for Social and Economic Research, by Stefan, Ph.D.

Table 3: Bourne Land Use Percentages*

Use	Percentage
Open Space/Conservation	8 %
Mass. Military Reservation	43 %
Residential	22 %
Municipal/Government	13 %
Charitable	1 %
Commercial Developable	2 %
Undevelopable	1 %
Commercial/Industrial/Agr./Hort.	6 %
Residential Developable	4 %

*Areas calculations taken from the Town of Bourne GIS datalayers as maintained by the Bourne Planning Department

The terrain of the Town consists of rolling land, with elevations varying from sea level along the coast to approximately 200 feet. The highest points are found in Sagamore Highlands on the Plymouth Town line (e.g. Peaked Cliff), Bournedale Hills, and along both sides of the Cape Cod Canal between the bridges. The Cape Cod Canal, which is operated and maintained by the USACE, winds through the Town in a westerly direction and connects Cape Cod Bay with Buzzards Bay.

2.1 Historical Damage and Natural Events:

Because of Bourne's location on the ocean between Cape Cod Bay, and Buzzards Bay, it is at high risk for hurricanes and other types of severe storms which carry high winds and heavy precipitation; especially coastal storms. This, combined with the fact that over 25% of Bourne's land area is low-lying makes it also highly vulnerable to flooding. These natural disasters may result in drinking water contamination due to flooding.



In 1985, during hurricane Gloria it was hard to tell the difference between Main Street, Buzzards Bay, and the bay itself.

Although the Town has been, and will continue to be impacted by blizzards and other types of severe winter storms, local officials assign a moderate, rather than a high hazard rating to these winter storms. They have also assigned a moderate hazard rating to the power outages, which often accompany such storms.

Hurricanes/Coastal Storms: August 19, 1991 Hurricane Bob brought a storm surge of about 9 feet into the upper reaches of Buzzards Bay. Some measurements put the water

line as high as 15 feet above normal.

On October 30, 1991, another unnamed coastal storm struck Cape Cod causing extensive shoreline and property damage. Sagamore Beach area received extensive damage to dunes and jetties.

On December 11 and 12, 1992 another coastal storm struck, numerous jetties and seawalls in the beach area of Sagamore, were damaged or destroyed further threatening the erosion of Sagamore Beach area.

On March 12-14, 1993, a blizzard struck, producing significant erosion along Bourne's shoreline. The blizzard caused greater damage in other communities

Bourne is also at low risk for tornadoes.

Fire Related: A significant amount of Bourne's landmass is covered with trees and brush supporting a moderate risk rating for forest fire however is at a low risk for urban fire. Based on the history of the town and past knowledge, local officials assign a low/moderate risk for drought.

Geological: Bourne is at moderate risk for earthquake occurrence and impact.

2.2 Hazard Identification Matrix

Historically, the Town of Bourne has sustained damage from flooding, storm surge, and high winds associated with hurricanes, nor'Easters, and heavy rains. However, this plan and its mitigation strategy addresses multiple natural hazards, even those assessed with low probability. Risks that have been identified in the Hazard ID Matrix include:

- *Flood (coastal storm surge, storm tides & wave action, erosion, and sea level rise)* Flooding along the northeast coast generally results from the high tides and storm surges associated with New England nor'easter's. The west coast is subject to flooding from hurricanes. Serious flooding resulted in the town during the Hurricane of September 21, 1938, and August 31, 1954. The USACE estimated that damage from the 1954 hurricane totaled nearly three million dollars. High-water marks for the 1938 flood recorded on Buzzards Bay at the State pier, Monument Beach, and the fire station were 14.1, 14.0 and 11.7 feet, respectively. The high-water mark for the 1954 flood was 13.4 feet as recorded at the Kingman Boat Yard on Red Brook Harbor.



- *Wind (from hurricanes, coastal storms, nor'Easters)* Strong surface winds can cause a barrage of flying debris. Hurricanes are categorized by sustained winds of 74 mph to 200 mph, which can cause tremendous debris problems. These storms bring high winds resulting in heavy

precipitation and coastal flooding. The angle at which the majority of these storms make landfall is approximately 60 to 90 degrees - a storm track generally perpendicular to the coastline, worsening the storm surge in north-south oriented bays and inlets. The damage would be increased by additional populations located in and around potential hazard areas.

- *Wildfire*

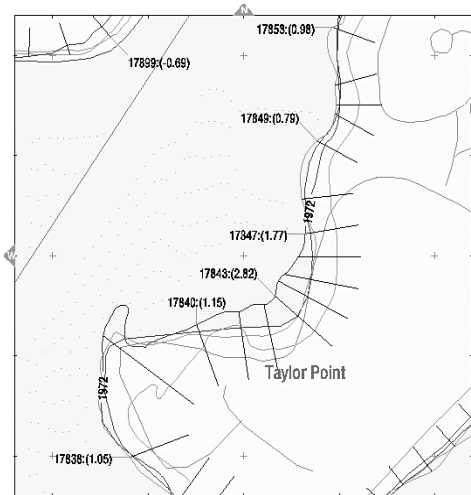
As residential areas expand into relatively untouched woodlands, people living in these neighborhoods are increasingly threatened by forest fires. Protecting structures in woodland areas from fire poses special problems, and can stretch firefighting resources to the limit.

Due to the close proximity of the Massachusetts Military Reservation and the abundant unfragmented forest habitat, Bourne is at high risk for wildfires.

- *Shoreline erosion (from shoreline change)*

Shoreline erosion has a potential to create critical impacts along coastline areas. During major storm events material is transported by waves and currents and deposited at various areas. Both erosion and accretion occur along the shoreline and site-specific shoreline change data needs to be analyzed for planning purposes.

The cases of shoreline change, particularly erosion are both natural and human related. The primary natural causes of erosion are relative sea-level rise, which is, approximately one vertical foot every 100 years and coastal storms.



Sample shoreline erosion map from MA Coastal Zone Management Shoreline Change

Table 4: Hazard Identification Matrix

<u>Natural Hazard</u>	<u>Likelihood of Occurrence</u> 0 = unlikely 1 = Possible 2 = Likely 3 = Highly likely	<u>Location</u> 1 = Small area 2 = Medium area 3 = Large area	<u>Impacts</u> 1 = Limited 2 = Significant 3 = Critical 4 = Catastrophic	<u>Hazard Index</u>
Flood	3	3	3	9
Wind Related:				
• Hurricane	3	3	3	9
• Coastal Storms	3	2	3	8
• Winter Storms	2	3	3	8
Fire Related:				
• Drought	1	3	2	6
• Wildfires	2	3	2	7
• Urban Fires	1	1	1	3

• Shoreline Erosion	3	3	3	9
Shoreline Erosion	3	3	3	9
Geologic Hazards				
• Associated Landslides of Coastal Banks	2	2	2	6
• Earthquakes	0	3	1	4
Tornadoes	0	1	1	2

Rating System

When rating frequency, location, and magnitude/severity (impacts), all locations where damage may occur were considered collectively. Each natural hazard has only one associated number. Therefore, this exercise enabled the Team to conclude which hazards ranked from most likely and damaging to least likely and damaging. The hazard ranking was determined by adding the rating scores for location, frequency and magnitude/severity according to the following key:

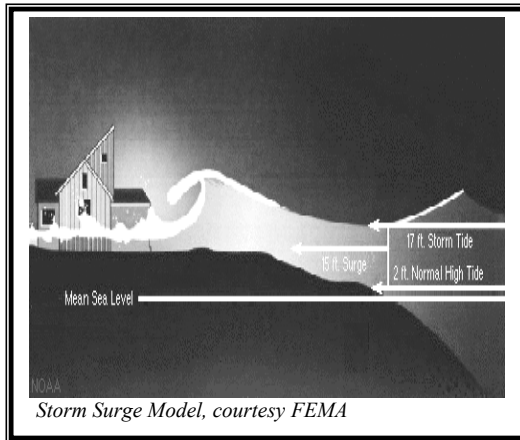
- **Likelihood of Occurrence:**
 - 0 = unlikely (less than 1% probability in the next 100 years)
 - 1 = possible (between 1 - 10% probability in the next year; or at least one chance in next 100 years)
 - 2 = likely (between 10-100% probability in the next year; or at least one chance in next 10 years)
 - 3 = highly likely (Near 100% probability in the next year)
- **Location:**
 - 1 = small
 - 2 = medium
 - 3 = large (affecting a significant portion of town during one event)
- **Impacts**
 - 1 = limited (injuries and/or illnesses are treatable with first aid; minor "quality of life" loss; shutdown of critical facilities and services for 24 hours or less; property severely damaged < 10%)
 - 2 = significant (injuries and/or illness do not result in permanent disability; shutdown of several critical facilities for more than one week; property severely damaged < 25% and > 10%)
 - 3 = critical (injuries and/or illnesses result in permanent disability; complete shutdown of critical facilities for at least two weeks; property severely damaged < 50%, > 25%)
 - 4 = catastrophic (multiple deaths; complete shutdown of facilities for 30 days or more; property severely damaged > 5)

2.3 Hazard Mapping

- Critical Facilities & Infrastructure Map IV
- Wildfire Hazard Area - Weldon Park Subdivision Map V
- Risk and Vulnerability Assessment – This map depicts the locations of critical facilities and infrastructure, extent of “A” and “V” flood zones, Sea, Lake and Overland Surges from Hurricane zones.
- Hazard Risk Map I – Historical occurrences of tornadoes, earthquakes, landslides and shoreline change are noted on this map.
- Hazard Risk Map II – This map indicates average annual snowfall amounts and tracks of hurricanes.

- Hazard Risk Map III – Local areas of wildfire risk and the wildland/urban interface are mapped and relationships with residential and commercial developed areas.

SECTION 3: VULNERABILITY ASSESSMENT



To establish a planning baseline, the Planning Team used the “Risk and Vulnerability Assessment (RVA) Map” (Appendix Map I) generated by the Cape Cod Commission to review locations of critical facilities and infrastructure in the context of Hazard Mitigation Planning. During review and discussion forty-six (46) critical facilities were identified with nineteen (19) facilities located within a Special Flood Hazard Area (SFHA) and/or Sea, Lake, and Overland Surge from Hurricanes (SLOSH) areas.

3.1 Bourne’s Critical Facilities

Table 5: Critical Facilities and Infrastructure:

ID #	FACILITY NAME	LOC #	STREET	FACILITY TYPE	SLOSH* Y/N	SFHA** Y/N
1	Barnstable County Correctional Facility	6000	Sheriff's Place	B	No	No
2	Barlow's Boat Yard	18	Wings Neck Rd	L	Yes	Yes
3	Bourne High School	75	Waterhouse Rd	G	No	No
4	Bourne Manor Extended Care	146	Macarthur Blvd	H	No	No
5	Bourne Elementary & Middle Schools	70	Trowbridge Rd	G	No	No
6	Bourne Marina	1	Academy Dr	L	Yes	Yes
7	Bourne/Sandwich Head Start	90	Adams St	I	No	No
8	Bridgeview School	885	Sandwich Rd	G	No	No
10	Cape Cod Nursing & Rehab	27	Lewis Point Rd	H	Yes	Yes
11	Cataumet Grammar School	1200	County Rd	G	No	No
12	Cataumet Preschool & Child Care	1224	Route 28a	I	No	No
13	Community Building & COA	239	Main St	J	No	No
14	Cranberry Day Care	23	Old Bridge Rd	I	Yes	Yes
15	DPW/Landfill	201	Macarthur Blvd	D	No	No
16	Ella F. Hoxie School	30	Williston Rd	G	No	No
17	Fire Station (Headquarters)	130	Main St	B	Yes	Yes
18	Gallo Ice Arena	231	Sandwich Rd	A	No	No
19	Historic Archives	30	Keene St	D	No	No
20	Jonathan Bourne Library	19	Sandwich Rd	D	No	No
21	Kids World of Buzzards Bay	165	Main St	I	Yes	Yes
22	Kingman Marina	1	Shipyard Lane	L	Yes	Yes
23	Mass Maritime Academy	101	Academy Dr	G	Yes	Yes
24	Monument Beach Fire Station	2	Thomas Philbrick Rd	B	No	No

25	Monument Beach Marina	24	Emmons Rd	L	Yes	Yes
26	Otis Memorial Elementary School	5800	Curtis Blvd (MMR)	G	No	No
27	Parker's Marina		Red Brook Harbor Rd	L	Yes	Yes
28	Pocasset Fire Station	311	Barlows Landing Rd	B	No	No
29	Pocasset Marina		Shore Rd	L	Yes	Yes
30	Police Station/ Emerg. Operations Center	175	Main St	A,B	Yes	Yes
32	School Administration Bldg.	36	Sandwich Rd	D,F	No	No
33	National Marine Life Center		Main Street	K	No	Yes
34	Town Hall	24	Perry Ave	B	No	Yes
35	Upper Cape Reg. Voc. School	220	Sandwich Rd	A,G	No	No
36	Waldorf School of Cape Cod	85	Cotuit Rd	G	No	No
37	Bourne Health Care Walk-in	1	Trowbridge Rd	C	Yes	No
39	Sewer Pump Station (Fire Station)	130	Main Street	E	No	Yes
40	Pocasset Assisted Living		County Road	C	No	No
41	Gosnold Rehabilitation Center	1140	Route 28A	C	No	No
42	Thorne Clinic		County Road - off	C	No	No
43	Bourne Bridge		Route 28	E	Yes	No
44	Sagamore Bridge		Route 6	E	No	No
45	Railroad Bridge		Off Main Street	E	Yes	No
46	Sewer Pump Station (Hideaway Village)		Head of the Bay Road	E	Yes	Yes

Critical Facilities and Infrastructure Key:

- | | |
|---|---|
| A Emergency Facilities/Shelters | G Schools |
| B Public Safety Facilities | H Nursing Homes/Elderly Housing |
| C Hospitals/ Acute Care Facilities | I Group Day Care Facilities |
| D Town Government Facilities | J Senior/Youth/Recreation Centers |
| E Infrastructure | K Designated Emergency Animal Shelters/Hospitals |
| F Hazardous Material Facilities | L Marinas/Boat Yards |

* **SLOSH** = Sea, Lake, & overland surges from hurricanes

** **SFHA** = Special Flood Hazards Area as designated on the Flood Insurance Rate Map (FIRM)

Of the nineteen- (19) facilities located within the high hazard areas eight (8) are town owned, one (1), is state owned, two (2) federally owned, and eight (8) privately owned. It should be noted that the Police Station and the Fire Department Headquarters are located within the 100-year floodplain as designated by the Flood Insurance Rate Map (FIRM). In a 100-year storm event these two key facilities would be compromised and inundated with water.

3.2 Vulnerability Analysis

The Team used the RVA map identifying critical facilities to review potential vulnerabilities during the natural hazard events identified and described in Section 2: Hazard and Risk Assessment. To clearly and efficiently evaluate all of the potential natural hazards, the location and extent of possible specific areas were identified. The following chart was developed that grouped potential hazards identified cause and effects of each hazard and areas susceptible to damage.

Table 6: Descriptive Location Chart

NATURAL HAZARD	CAUSE & EFFECT	LOCATION
FLOOD	<p>Natural Inundation in the floodplain (caused by coastal storms; winter storms; nor'easters; hurricanes)</p> <ul style="list-style-type: none"> Coastal Flooding Episodic Erosion River Flooding Pond Flooding Infrastructure Failure <p>Infrastructure Failure (caused by coastal storms; winter storms; nor'easters; hurricanes; ice/snow melt)</p> <ul style="list-style-type: none"> Bridge Failure Storm Drain Failure Culvert Failure Dam Failure Dike Failure 	<p>Areas of Coastal Flooding</p> <ul style="list-style-type: none"> Main Street (west) Cranberry Day Care MMA Monument Beach, Pocasset, Bourne Marina's <p>Areas of River Flooding</p> <ul style="list-style-type: none"> Pocasset Fire Station Pocasset Marina Barlows Boat Yard <p>Areas of Episodic Erosion</p> <ul style="list-style-type: none"> Sagamore Beach (The Strand) Wings Neck Bassetts Island Mashnee Island Scraggy Neck Toby Island <p>Deficient Infrastructure</p> <ul style="list-style-type: none"> Bourne Bridge Sagamore Bridge Foundry Pond Dam Salt Marsh Lane Culvert Railroad Bridge
WIND	<p>Hurricanes</p> <p>Nor'easters</p> <p>Tornadoes</p> <p>Roofs Blowing Off</p> <p>Trees Downed</p>	<p>Roof Damage</p> <ul style="list-style-type: none"> Town Hall Bourne High School Pebbles Elem. School Middle School Coady School Library Town wide <p>Trees Downed - Locations proximal to wind activity:</p> <ul style="list-style-type: none"> Town wide
FIRE	<p>Drought</p> <p>Wildfire</p> <p>Lightening Strikes</p> <p>Wildfire</p>	<p>Wildfire Developed land / forested area interfaces:</p> <ul style="list-style-type: none"> Weldon Park Town Forest Scraggy Neck (center) Bournedale Open Space Parcels Development adj. to MMR
GEOLOGIC	<p>Earthquakes</p> <p>Landslides</p> <p>Sink Holes</p>	<p>Structural Damage - Locations proximal to seismic activity: According to Regional Hazard Risk Map II geologic activities have not been recorded.</p> <p>Loss of Land</p> <p>Wave Inundation</p>
OTHER	<p>Snow & Ice Accumulation</p> <p>Chronic Erosion</p> <p>Sea Level Rise</p> <p>Sediment Deposition</p>	<p>Street Flooding/ Impassable Roads</p> <ul style="list-style-type: none"> Main Street Scraggy Neck Rd Academy Dr. Old Dam Road Wings Neck Rd Emmons Rd Shore Rd Mashnee Rd <p>Structural damage</p> <ul style="list-style-type: none"> Docks, piers town wide

3.3 Shelter Adequacy Analysis

The best indicator is that type of event that would most likely result in large-scale evacuation would be a severe hurricane. The following tables attempt to show the impacts of a full-scale evacuation during a severe hazard event. Table 7 depicts the existing shelter facilities and capacities; Table 8 estimates the vulnerable population.

Table 7: Public Shelter Facilities Capacities

Name / Address	Flood Potential	Generator	Food Service Capabilities? Y/N	Handicap Accessible? Y/N	Capacity @20 sq. ft / person
A) Bourne Veteran's Memorial Community Center 239 Main St	Yes	Y	Y	Y	300
B) Bourne High School 75 Waterhouse Rd	None	N	Y	Y	1,000

C) Upper Cape Cod Regional Technical School 220 Sandwich Rd	None	Y	Y	Y	1,000
D) Bourne Middle School 77 Waterhouse Rd.	None	Y	Y	Y	1,000
Total Capacity					3,300

Table 8: Vulnerable and Evacuating Populations

Population						
Population				Vulnerable Population**		
Census	Permanent	Seasonal	Total	Permanent	Seasonal	Total
1990	16,064	13,936*	30,000*	-	-	-
2000	18,721	21,279*	40,000*	4,135	4,700***	8,835
*Information from Town Report FY 1990 and FY 2000 **Information derived from the GIS layers as maintained by the Bourne Planning Dept. 4,303 residential units were found within flood zone hazard areas. Using the 2000 Census, an average household size of 2.6 was used minus 3.9% vacancy rate. ***This number was derived using the same ratio as permanent to seasonal for the total population. However, seasonal residents would likely have other options of evacuation than to utilize public shelters, i.e. returning to permanent residence.						

3.4 Dam Hazards

The 2004 Massachusetts State Hazard Mitigation Plan includes a map of dam locations and their ranking for severity of the downstream damage that could occur should it fail. Based on the hazard-ranking Bourne has one dam at Foundry Pond currently owned by the Herring Run Corporation ranked as a significant hazard. A significant hazard is defined as dams that are located where failure or mis-operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads, or cause interruption of use or service of relatively important facilities.

3.5 Repetitive Loss Properties

Statistics on repetitive loss properties and claims made under the National Flood Insurance Program (NFIP) record past and multiple occurrences of damage and should be considered indicators of where flooding is likely to occur and cause damage again. Such information was obviously valuable during this PDM planning process.

Specific property information is confidential, but within the Town of Bourne there have been fourteen (14) properties that meet FEMA's definition of repetitive loss through December of 2002. Eleven of the properties are single family homes; two are condominiums; and one is a multi family dwelling. Twelve of the properties made two claims and two of the properties made three claims. The repetitive loss property owners were paid a total of \$496,482.00 in losses due to building damage.

As of December 31, 2002 there were 1,081 flood insurance policies in effect in Bourne, with a total value of \$162,171,100.00 and the written premium in-force amount was \$893,553.00. Through December 31, 2002, 415 total losses were reported, with 77 of those being closed without payment. The remaining 338 losses were paid a total of \$4,997,478.00.

Table 9: Repetitive Flood Losses (current through Dec. 2002)

Information provided by MEMA 1/14/04; 2003 data not yet available

VILLAGE	LOSSES	PAID	TYPE	FLOOD ZONE
1. Buzzards Bay	2	\$10,980.45	Single Family	VE
2. Pocasset	3	\$33,530.98	Condo	A10
3. Pocasset	2	\$22,257.87	Single Family	V16
4. Bourne	2	\$30,808.29	Condo	AE
5. Pocasset	2	\$28,720.91	Single Family	AE
6. Gray Gables	2	\$40,215.93	Single Family	AE
7. Pocasset	2	\$5,638.41	Single Family	AE
8. Pocasset	2	\$24,210.73	2-4 Family	V16
9. Pocasset	2	\$48,058.15	Single Family	VE
10. Buzzards Bay	2	\$63,061.33	Single Family	A09
11. Gary Gables	2	\$36,783.59	Single Family	AE
12. Bourne	2	\$42,362.39	Single Family	V16
13. Pocasset	3	\$44,791.54	Single Family	V16
14. Cataumet	2	\$65,062.28	Single Family	A13

3.6 Wildfire Hazard Areas

The local PDM committee looked at the Hazard Risk Map III (Attached hereto as Appendix 3) to help them understand the areas that are at greatest risk of wildfire. The Cape Cod Commission, through the Regional PDM planning process, developed this map as part of the County's Plan. Parameters used include the Wildfire Risk category of unfragmented forest habitat greater than 40 acres and salt marsh areas greater than 3 acres. The map also identifies wildland/urban interface areas that include areas adjacent to residential and commercial development, electrical transmission line and rail right-of-ways, and major transportation infrastructure that may represent an elevated risk. Bourne's Hazard Risk Map III located local critical facilities in relation to the wildfire risk area and it was determined that none are located in wildfire hazard areas.

Understanding that the Town is at risk of wildfire, in the fall of 2003 Bourne, led by Fire Chief Charles Klueber, submitted six projects for funding under the Cape Cod Cooperative Extension's Wildfire Assessment and Preparedness Program. Project funding was available to study, evaluate, and develop management plans on town-owned parcels of land that pose a wildfire risk. Those parcels, from least to most important, are:

1. Weldon Park, Sagamore, off Scenic Highway
2. Nightengale Pond Estates, off Scenic Highway
3. Town Forest, from Tara Terrace to Spinnaker La. Pocasset
4. Chamber Rock Road, off Bournedale Road
5. Sandwich Road Development Areas
6. Scraggy Neck, center of the Island Cataumet

During fiscal year 2004, County funding was available for the Weldon Park Subdivision Area. A map of this parcel has been generated showing its location and the development that abuts it (see Map 5, attached hereto in Appendix II). The Town will continue to apply for this and other funding as available to continue this needed work on the remaining and other parcels. See Action Item 15 of the mitigation strategy in Section 5 of this plan.

3.7 Tidally Restricted Salt Marshes

The Buzzard Bay Project National Estuary Program Atlas of Tidally Restricted Salt Marshes identified 74 sites in the Town of Bourne that are considered tidally restricted. This is an indicator of a location where culverts are not properly sized to accommodate natural tidal flow, or such infrastructure is broken, collapsed, or otherwise unable to function properly.

The locations of these tidal restrictions are important to hazard mitigation planning because they indicate where flooding can occur during a storm event. The tidal restrictions constrain the natural flow of tidal waters; as a result, these locations are subject to flooding when tidal waters “back up” on one side of the culvert, overflowing channel banks. All of these locations should be considered for infrastructure resizing and/or repair/replacement to eliminate their potential for causing flooding.¹ There are of course salt marsh and other wetland impacts (either positive or negative) that will result from such work that must be factored into the permitting and construction of these infrastructure improvement projects.

SECTION 4: EXISTING LOCAL HAZARD MITIGATION PROGRAMS, PROJECTS & ACTIVITIES

As part of the development of the hazard mitigation plan a matrix assessing existing plans, programs and policies that Bourne has in place that incorporate hazard mitigation or other protective measures has been included below.

Table 10: Existing Protection Matrix

Existing Protection	Description	Area Covered	Enforcement and/or Effectiveness
Flood Plain Zoning – Section 3100 Lowlands	Floodplain Compliance Regulations	As designated by the Flood Insurance Rate Map (FIRM) for the Town of Bourne, Community # 255210 (Zones A's & V's)	Building Inspector & Conservation Commission also includes comprehensive staff routing slip
Local Wetlands Protection Bylaw	Regulates development within wetland resource areas including Special Flood Hazard Areas	Wetland Resource Areas	Conservation Commission
Beach Maintenance Program	Raking and cleaning beaches of debris	Town Beaches	Department of Public Works
Comprehensive Management Emergency Plan	Provides a framework wherein the community can plan and perform respective emergency functions during a disaster or emergency situation on the local, state or national level.	Town wide	Local Emergency Planning Committee
Subdivision	Requires utilities to be	Residential and Commercial	Planning Board

¹ In 2003, *Cape Cod Project Impact* funded the replacement of a tidally restrictive culvert under Foster Road in Sandwich, Massachusetts. This culvert was determined to be non-functioning, which, in addition to the implications on maintaining healthy upstream saltmarsh, had direct implications for floodwaters to remain over portions of the road for an unacceptably long period of time. This site was identified in the *Cape Cod Atlas of Tidally Restricted Salt Marshes* as site SA-8.

Regulations	placed underground, drainage designed using a 25 year frequency	Districts	
Site Plan Review	25 year frequency for drainage design	Commercial Districts	Planning Board
Wildfire Assessment & Preparedness Program	County grant program to reduce wildfires		Barnstable County Cooperative Extension Service, Fire Department Dept of Natural Resources & Conservation Commission
Dock Regulations	Prohibits new construction of docks in velocity zones and encourages conversion of permanent docks to seasonal in the 100 year floodplain	100 Year Floodplain Areas as designated by FIRM	Conservation Commission
National Flood Insurance Program (NFIP)	Federally backed flood insurance available to homeowners, renters & businesses	100 Year Floodplain Areas as designated by FIRM	FEMA / Building Inspector
Building Permits	Building Code Enforcement		Building Inspector

SECTION 5: MITIGATION STRATEGY ACTION PLAN

This section outlines Bourne's overall strategy to reduce our community's vulnerability to the effects of natural hazards. It has been separated into the following two distinct sections:

Mitigation Objectives – these are designed to support and correspond directly with the Community Goals (see Section 1).

Mitigation Actions – these are specific measures to be undertaken by the Town in order to achieve identified objectives. Each action identifies the objective it is intended to achieve, includes some general background information justifying the proposed action, and provides measures to assure successful and timely implementation.

Also important to note is that each Mitigation Objective and Mitigation Action is designed to be performance-based, making it easier for the Town of Bourne to measure the Plan's progress over time and during the Plan's future evaluations.

It is expected that while the *Community Goals* established in Section I may remain the same for an extended period of time, the objectives and actions included in this *Mitigation Strategy* will be updated and /or revised through regular enhancements to this Plan.

5.1 Mitigation Objectives

The following objectives have been formulated to support and to correspond directly with the Community Goals in Section 1.5. These objectives have been developed also to provide measurable short-term milestones to the Local Emergency Planning Committee and the Town.

- **Goal #1:** Reduce the loss of life, property, infrastructure, and environmental and cultural resources in the Town from natural disasters.
 - 1a. Preserve the natural and beneficial functions of the Town's floodplain, wetlands, beaches and dunes through continued support of natural

resource protection policies and by discouraging growth in environmentally sensitive areas.

- 1b. Enhance the Town's capability to conduct hazard risk assessments, demonstrate funding needs, and track mitigation activities throughout town (whether directly as part of this plan, or indirectly through the normal course of business).
- **Goal #2:** Coordinate local hazard mitigation planning and activities with those of Barnstable County and neighboring towns.
 - 2a. Ensure that current emergency services are adequate to protect public health and safety. Ensure coordination with neighboring towns and County emergency services.
- **Goal #3:** Seek and take advantage of funding opportunities to implement the Pre-Disaster Mitigation Plan.
 - 3a. Maximize available hazard mitigation grant programs to protect the Town's most vulnerable populations and structures.
- **Goal #4:** Mitigate potential financial losses incurred by municipal, residential and commercial establishments due to disaster.
 - 4a. Ensure that all critical facilities are protected from the effects of natural hazards to the maximum extent possible.
 - 4b. Ensure that new construction within high hazard areas are completed using wind-resistant design techniques that will limit damage caused by high winds and reduce the amount of wind-borne debris.
 - 4c. Decrease the number of FEMA-identified "repetitive loss properties" from 14 currently to 10 by the year 2010.
- **Goal #5:** Develop hazard awareness information and conduct educational programs for the public.
 - 5a. Increase the level of knowledge and awareness for Town residents on the hazards that are potential threats to the area.
 - 5b. Educate property owners on the affordable, individual mitigation and preparedness measures that can be taken before the next hazard event.

5.2 Mitigation Actions

In formulating this Mitigation Strategy, a wide range of activities were considered in order to help achieve the goals of the community and to lessen the vulnerability of the Town of Bourne to the effects of natural hazards. In general, all of these activities fall into one of the following broad categories of mitigation techniques.

Mitigation Techniques

1. Prevention

Preventative activities are intended to keep hazard problems from getting worse. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements

have not been substantial. Examples of preventative activities include:

- Planning and Zoning
- Open space preservation
- Floodplain regulations
- Stormwater management
- Drainage system maintenance
- Capital improvements programming
- Shoreline/ riverine / fault zone setbacks

2. Property Protection

Property protection measures protect existing structures by modifying the building to withstand hazardous events, or removing structures from hazardous locations.

Examples include:

- Acquisition
- Relocation
- Building elevation
- Critical facilities protection
- Installing shutters for wind protection
- Safe rooms
- Insurance
- Retrofitting (i.e., windproofing, floodproofing, etc.)

3. Natural Resource Protection

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their mitigative functions. Such areas include floodplains, wetlands and dunes. Parks, recreation or conservation agencies and organizations often implement these measures. Examples include:

- Floodplain protection
- Beach and dune preservation
- Riparian buffers
- Fire resistant landscaping
- Fuel Breaks
- Slope stabilization
- Habitat preservation
- Erosion and sediment control wetland preservation and restoration

4. Structural Projects

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Reservoirs
- Levees/dikes/floodwalls/seawalls
- Diversions/Detention/Retention
- Channel modification
- Beach nourishment
- Storm sewers

5. Emergency Services

Although not typically considered a "mitigation technique," emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- Warning systems ("Reverse 911")
- Evacuation planning and management
- Sandbagging for flood protection

6. Public Information and Awareness

Public Information and awareness activities are used to advise residents, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- Outreach projects
- Hazard map information
- Library materials
- Hazard expositions
- Speaker series/demonstration events
- Real estate disclosure
- School children education

5.3 Prioritization of Action Items

Actions that will be undertaken to implement effective hazard mitigation in high risk areas in the Town of Bourne are consistent with the State and County approach of using both non-structural and structural projects, and to use a *non-structural* hazard mitigation approach before undertaking a *structural* approach.

- A ***non-structural*** hazard mitigation approach is a strategy that does not change the natural hazard, but involves preventative actions that improve infrastructure to reduce the damages, or improve coordination of resources.
- A ***structural*** hazard mitigation approach involves strategies that inhibit a natural hazard, such as a sea wall or dam.

5.4 Action Items

It is important to note that these mitigation actions are short-term, specific measures to be undertaken by Bourne. It is expected that this component of the PDHMP will be the most dynamic; it will be used as the primary indicator to measure the Plan's progress over time and will be routinely updated and/or revised through future planning efforts.

<u>ACTION ITEM #1</u>	Increase protection of the floodplain by enhancing floodplain management activities within the Town.
Hazard designed to mitigate:	Flood
General background of item:	Review existing floodplain controls in a multi-hazard context and strengthen/clarify requirement for substantial reconstruction definition
Responsibility:	Building Inspector, Planning Board, Conservation Commission
Potential funding source(s):	Operating Budget
Priority:	High
Time frame for implementation:	2006
<u>ACTION ITEM #2</u>	Become a participant in the National Flood Insurance Program (NFIP) Community Rating System (CR5) program through enhanced floodplain management activities. Explore opportunities to join with Barnstable County as a whole.
Hazard designed to mitigate:	Flood
General background of item:	The NFIP CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood

	losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance
Responsibility:	Selectmen, Town Planner, Building Inspector, Conservation Commission
Potential funding source(s):	Operating Budget, Grants
Priority:	High
Time frame for implementation:	2007
<u>ACTION ITEM #3</u>	Advertise and promote the availability of flood insurance to Town property owners by direct mail at least once a year.
Hazard designed to mitigate:	Flood
General background of item:	NFIP flood insurance policies protect property owners by offering affordable rates for protecting both structures and contents.
Responsibility:	Town Planner, Building Inspector, Local Emergency Planning Committee
Potential funding source(s):	Operating Budget
Priority:	Moderate
Time frame for implementation:	Begin by 2007, ongoing
<u>ACTION ITEM #4</u>	Use the Town's Geographic Information System (GIS) to maintain current building and parcel data for the purposes of conducting more detailed hazard risk assessments and for tracking permitting / land use analysis.
Hazard designed to mitigate:	All
General background of item:	A fully developed GIS system will greatly enhance the Town's technical capability to collect, manage, analyze and display spatially-referenced data to further hazard mitigation goals.
Responsibility:	Town Planner, Assessing Department
Potential funding source(s):	Operating Budget, Grants
Priority:	Moderate
Time frame for implementation:	Ongoing
<u>ACTION ITEM #5</u>	Collect educational materials on preparedness/mitigation measures for individual property owners, for display and distribution at Town Hall, Community Building, Library and Council on Aging offices.
Hazard designed to mitigate:	All
General background of item:	FEMA, the Massachusetts Emergency Management Agency (MEMA), the National Weather Service and other agencies can provide information brochures and pamphlets on property protection measures at no cost to local governments.
Responsibility:	Building Inspector, Town Planner, Local Emergency Planning Committee
Potential funding source(s):	Operating Budget
Priority:	High
Time frame for implementation:	2006
<u>ACTION ITEM #6</u>	Continue to acquire and preserve parcels of land subject to repetitive flooding from willing and voluntary property owners.
Hazard designed to mitigate:	Flood, Erosion, Sea Level Rise
General background of item:	Land acquisition is an effective mitigation technique to permanently eliminate the potential for damages from future flood events. Bourne has

	successfully used Land Bank funds to acquire flood prone parcels of land in the past from voluntary and willing property owners
Responsibility:	Town Meeting, Selectmen, Town Planner, Natural Resources, Conservation Commission
Potential funding source(s):	Land Bank, Grants and Donations
Priority:	High
Time frame for implementation:	Ongoing
<u>ACTION ITEM #7</u>	Conduct a thorough evaluation of the Town's most at-risk locations identified in the Vulnerability Analysis, and evaluate the potential mitigation techniques for protecting each location to the maximum extent possible.
Hazard designed to mitigate:	All
General background of item:	A thorough evaluation of potential mitigation opportunities for Bourne's identified critical locations must still be completed. An inventory/database on critical facilities should be created and maintained by the Town. This inventory should include information on the risk to each location, and should also document any cost-effective mitigation techniques to consider when funding becomes available
Responsibility:	DPW, Natural Resources, BOH, Building Inspector, Town Planner, Conservation Commission
Potential funding source(s):	Town Meeting, Grants
Priority:	Moderate
Time frame for implementation:	2006
<u>ACTION ITEM #8</u>	Monitor the Town's emergency response service to identify needs or shortfalls in terms of personnel, equipment or required resources.
Hazard designed to mitigate:	All
General background of item:	Any identified needs or shortfalls should become documented and result in specific recommendations to the Selectmen for emergency service enhancements.
Responsibility:	Police Chief, Fire Chief, Health Agent, Local Emergency Planning Committee
Potential funding source(s):	Operating Budget
Priority:	High
Time frame for implementation:	Ongoing
<u>ACTION ITEM #9</u>	Revise the Town's Flood Plain Zoning Bylaw to incorporate cumulative substantial damage or improvement requirements.
Hazard designed to mitigate:	Flood, Erosion, Sea Level Rise
General background of item:	Bourne's Zoning Bylaws currently limits the definition of "substantial improvement" to onetime damage repairs or improvements. Communities can reduce flood damage by counting improvement and repair projects cumulatively, so that buildings will be brought into compliance with flood protection standards earlier in their life cycle. This will require the Town to maintain permit history so when cumulative repairs or improvements equal 50% of the building value, the building must be brought up to current codes for floodplain development.

Responsibility:	Town Planner, Building Inspector, Planning Board
Potential funding source(s):	Operating Budget, Grants
Priority:	Moderate
Time frame for implementation:	2006
<u>ACTION ITEM #10</u>	Develop an educational flyer targeting NFIP policyholders on the Increased Costs of Compliance (ICC) coverage, to be disseminated following a flood event that results in substantial damage determinations by the Town.
Hazard designed to mitigate:	Flood
General background of item:	Increased Cost of Compliance (ICC) under the NFIP provides for the payment of a claim to help pay for the cost to comply with State or community floodplain management laws or ordinances from a flood event in which a building has been declared substantially damaged. When an insured building is damaged by a flood and the State or community declares the building to be substantially damaged, ICC will help pay for the cost to elevate, flood proof, demolish or relocate the building up to \$20,000. This coverage is in addition to the building coverage for the repair of actual physical damages from the flood.
Responsibility:	Building Inspector, Local Emergency Planning Committee
Potential funding source(s):	Operating Budget; Grants
Priority:	Moderate
Time frame for implementation:	2008
<u>ACTION ITEM #11</u>	Incorporate the inspection and management of hazardous trees/limbs into the Town's routine monitoring process.
Hazard designed to mitigate:	Wind, Snow & Ice
General background of item:	A significant amount of property damage during high wind events results from tree failure. Trees that fall into utility lines have additional serious consequences such as causing power outages, surges, fires and other damage. The Town's ability to recognize and prevent hazardous tree conditions (through inspection, pruning or removal) is the best defense against problems and costly damages resulting from tree failure. Specifically, trees located on Town properties which pose immediate threats to property, utility lines and other critical facilities should be addressed.
Responsibility:	DPW, Fire Department
Potential funding source(s):	Operating Budget, Grants
Priority:	Moderate
Time frame for implementation:	Ongoing
<u>ACTION ITEM #12</u>	Augment the enforcement of the State Building Code and related Town Bylaws by encouraging wind- resistant design techniques for new residential construction and reconstruction during the Town's permitting process.
Hazard designed to mitigate:	Wind
General background of item:	Although the State Building Code requires certain building practices for wind loss reduction, experts agree that structures built to exceed high

	wind provisions have a much greater chance of surviving violent windstorms. Additional techniques include adding protection for windows (i.e., shutters), anchoring door frames with multiple hinges, stiffening garage doors with additional bracing, reinforcing masonry chimneys with vertical steel, and strengthening connections between walls and the roof with hurricane straps and ties. These techniques should be promoted to building contractors and homebuyers by the Town for all new residential construction, to the maximum extent possible during the building permit process.
Responsibility:	Building Inspector, Planning Board
Potential funding source(s):	Operating Budget
Priority:	High
Time frame for implementation:	Ongoing
<u>ACTION ITEM #13</u>	On an annual basis, contact all owners of FEMA identified repetitive loss properties and inform the owners of the assistance available through the federal Flood Mitigation Assistance (FMA) program, in addition to other flood protection measures.
Hazard designed to mitigate:	Flood
General background of item:	Bourne's listing of FEMA-identified repetitive loss properties is maintained and regularly updated by the Building Inspector. Each of these properties are targeted by FEMA and the State of Massachusetts for Flood Mitigation Assistance (FMA) funding, which will fund up to 75% of a mitigation project to eliminate future flood risk (usually through elevation or acquisition or relocation). FMA funds are awarded on an annual basis by the Massachusetts Division of Emergency Management. Eligible property owners should be contacted every year to promote the availability of the FMA funding and to determine their level of interest in applying for the program.
Responsibility:	Building Inspector, Town Planner, Local Emergency Planning Committee
Potential funding source(s):	Operating Budget
Priority:	Moderate
Time frame for implementation:	2008
<u>ACTION ITEM #14</u>	Annually host a public hazards & mitigation display for the residents of Bourne, in combination with the Scallop festival or another appropriate community event.
Hazard designed to mitigate:	All
General background of item:	A hazard display for Town residents should be added to an established community event drawing large crowds. The display should be geared toward educating them on the hazards which threaten Bourne and the mitigation and preparedness measures available to protect them. Educational displays/handouts should be provided such as Flood Insurance Rate Maps, storm surge inundation maps, FEMA publications, hurricane tracking charts, safety tips, etc.
Responsibility:	Town Planner, Building Inspector, Local Emergency Planning

	Committee
Potential funding source(s):	Operating Budget, Grants
Priority:	Moderate
Time frame for implementation:	2007
<u>ACTION ITEM #15</u>	Participate in Barnstable County's Cooperative Extension Service's grant program for wildfire fuel reduction programs.
Hazard designed to mitigate:	Wildfire
General background of item:	The Town owned parcels of conservation and recreation lands are potential sources of wildfires in areas with proximity to residentially developed areas. The Town has submitted grant proposals for 6 areas: See Section 3.6
Responsibility:	Natural Resources Department, Fire Department
Potential funding source(s):	Barnstable County
Priority:	Moderate
Time frame for implementation:	Ongoing
<u>ACTION ITEM #16</u>	Regular maintenance dredging of harbors
Hazard designed to mitigate:	Erosion, Sea Level Rise
General background of item:	In order to protect economic and recreational interests by keeping this vital waterway connection with Cape Cod Bay viable for navigation purposes.
Responsibility:	Shore and Harbor, Engineering Department, Natural Resources Dept.
Potential funding source(s):	Grants, Capital Funding
Priority:	High
Time frame for implementation:	2005
<u>ACTION ITEM #17</u>	Continue to participate in marsh restoration project that improves tidal flushing.
Hazard designed to mitigate:	Flood, Fire, Erosion, Sea Level Rise
General background of item:	Several tidally influence water bodies in Bourne are physically restricted in their ability to exchange water freely during tidal cycles. Reducing or removing these restrictions provide hazard mitigation benefits including increased flood storage capacity and reduced wildfire fuel potential from invasive species growth (i.e., phragmites) resulting from limited flushing.
Responsibility:	Conservation
Potential funding source(s):	Grants
Priority:	High
Time frame for implementation:	Ongoing
<u>ACTION ITEM #18</u>	Develop a map indicating hazard sensitive parcels acquired by Bourne
Hazard designed to mitigate:	All
General background of item:	A graphical depiction of past land acquisitions that further hazard mitigation principles does not exist.
Responsibility:	Town Planner
Potential funding source(s):	Operating Budget, Grants

Priority:	High
Time frame for implementation:	2006
<u>ACTION ITEM #19</u>	Conduct a quantification of potential losses by estimating potential losses at varying degrees of storm surge, wind, and stormwater hazard severity, as well as specific impacts on critical facilities for the PDHMP five (5) year update.
Hazard designed to mitigate:	All
General background of item:	Due to data processing limitations, this analysis could not be conducted for this plan. As the Town's Geographic Information System (GIS) capabilities expand, these estimates will be calculated. With the development of a building footprint GIS "layer", the estimation of potential losses at varying degrees of storm surge, wind, and stormwater hazard severity, as well as specific impacts on critical facilities will be evaluated
Responsibility:	Town Planner
Potential funding source(s):	Operating Budget
Priority:	High
Time frame for implementation:	2009

SECTION 6: ADOPTION, IMPLEMENTATION, & MONITORING

6.1 Process

Two duly noticed Public Hearings were held by the PDM team on October 5, 2004 and October 18, 2004. Public comment received was considered and incorporated into the plan as appropriate.

The final Pre-Disaster Hazard Mitigation (PDM) Plan was adopted by the Bourne Board of Selectmen on October 26, 2004.

The PDM Plan will be implemented through the delegation of assignments by the Board of Selectmen through the Town Administrator, and as specified within this Plan. In *Section 5: Mitigation Strategy*, mitigation actions are listed and assigned specific implementation measures which include the assignment of responsibilities to Town departments/committees and/or specific Town staff, along with the establishment of a targeted completion date for each proposed mitigation action. When applicable, potential funding sources were also listed.

It will be the responsibility of the Town Administrator, as he/she sees fit, to ensure that these actions are ultimately carried out no later than the target completion dates unless reasonable circumstances prevent their implementation (i.e., lack of funding availability). Otherwise, the completion of each proposed mitigation action has been determined feasible within the timeframe allowed.

6.2 Funding Sources

Although all mitigation techniques will likely save money by avoiding losses, many projects are costly to implement. The Town of Bourne will continue to seek outside funding assistance for mitigation projects in both the pre- and post-disaster environment.

6.3 Monitoring and Reporting

Periodic monitoring and reporting of PDM Plan is required to ensure that the goals and objectives for Bourne are kept current and that local mitigation efforts are being carried out. The Plan has therefore been designed to be user-friendly in terms of monitoring implementation and preparing regular progress reports.

6.4 Annual Reporting Procedures

The PDM Plan shall be reviewed annually, by the Planning Team, or as situations dictate such as following a disaster declaration. Each year, the Town Administrator will assign responsibility for conducting this annual review to a specific department or individual. This department or individual will ensure the following:

1. The Board of Selectmen and the Town Administrator will receive an annual report and/or presentation on the implementation status of the PDM Plan. This report will include, at a minimum, a completed, printed version of the Mitigation Action Plan (MAP) indicating the implementation status of each identified action.
2. The report will also include an evaluation of the effectiveness and appropriateness of the mitigation actions proposed in the Plan.
3. The report will recommend, as appropriate, any required changes or amendments to the Plan. If the Board of Selectmen determines that the recommendations warrant modification to the PDM Plan, the Board may initiate a Plan Amendment as described below.

6.5 Revisions and Updates

Periodic revisions and updates to the PDM Plan are required to ensure that the hazard mitigation goals and objectives for Bourne are kept current. More importantly, revisions may be necessary to ensure that the Plan is in full compliance with Federal regulations and State statutes. This portion of the Plan outlines the procedures for completing such revisions and updates.

Five (5) Year Plan Review - The PDM Plan should be reviewed every five (5) years to determine if there have been any significant changes in Town that would affect the

Action Plan. Increased development, increased exposure to certain hazards, the development of new mitigation capabilities or techniques, and changes to Federal, State or County legislation are examples of changes that may affect the condition of the PDM Plan.

Disaster Declaration - Following a disaster declaration, the PDM Plan will need to be revised to reflect on lessons learned or to address specific circumstances arising out of the disaster.

Selectmen Determination - If the Board of Selectmen determines that the recommendations warrant modification to the PDM Plan, the Board may either initiate a Plan Amendment as described below or, if conditions justify, may direct the Town Administrator to undertake a complete update of the Plan.

6.6 Plan Amendments

An amendment to the Plan should be initiated only by the Board of Selectmen, either at its own initiative or upon the recommendation of the Town Administrator, Town Planner, Town Emergency Manager, or some other person or agency. Upon initiation of an amendment to the Plan, Bourne will forward information on the proposed amendment to all interested parties including, but not limited to, all affected Town departments, residents and businesses. Information will also be forwarded to Barnstable County (Cape Cod Commission) and the Massachusetts Emergency Management Agency. This information will be sent out in order to seek input on the proposed Plan amendment for not less than a forty-five (45) day review and comment period.

At the end of the comment period, the proposed amendment and all review comments will be forwarded to the Town Administrator (or his/her designee) for consideration. If no comments are received from the reviewing parties within the specified review period, such will be noted accordingly. The Town Administrator (or his/her designee) will review the proposed amendment along with the comments received from other parties, and submit a recommendation to the Board of Selectmen within sixty (60) days.

Appendices

1. Critical Facilities & Infrastructure Map IV
2. Wildfire Hazard Area - Weldon Park Map V
3. Regional Hazard Risk Map III
4. Regional Hazard Risk Map II
5. Regional Hazard Risk Map I
6. Risk & Vulnerability Assessment Map VI