COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

January 11, 2001

In the Matter of

Stuart Bornstein, Requestor

Docket No. 98-168
Determination of Applicability
Landowner: Canal Marine, Inc.
Property: 153 Freezer Road,
Map 301, Parcel 006
Barnstable

RECOMMENDED FINAL DECISION

SUMMARY

The coastal bank on the eastern side of the Site serves as a source of sediment to a coastal beach and, thus, is significant to the wetlands interests of storm damage prevention and flood control because it serves both as a vertical buffer to wave action and as a source of sediment. The coastal bank on the western side does not serve as a source of sediment to a coastal beach, coastal dune, or barrier beach and, thus, is significant to the wetlands interests of storm damage prevention and flood control only as a vertical buffer to wave action. In addition, neither Maraspin Creek nor Rendezvous Creek is a river adjacent to the Site. Consequently, there is no riverfront area on the Site.

Paul C. Wightman, Esq., Barnstable, for the petitioner.

Paul Revere, III, Esq., Centerville, for the requestor.

Shaun P. Walsh, Esq., Lakeville, for the Department.

INTRODUCTION

This is an appeal under M.G.L. c. 131, §40, the Wetlands Protection Act. The Department's Southeast Regional Office issued a Superseding Determination of Applicability (SDA) to Stuart Bornstein on December 4, 1998 concerning his property at 153 Freezer Road in Barnstable, Massachusetts (the Site).

The Site, which is on Freezer Point, is a finger-like projection connected on the south to the mainland.[1] On the eastern side of the Site, there is a coastal bank landward of a coastal beach. There is a rock revetment on the seaward facing side of the bank. On the western side of the Site, there is another coastal bank landward of a salt marsh. The property is bounded on the west by the Rendezvous Marshes, through which Rendezvous Creek flows, and on the east by the Inner Harbor[2], which is used as a marina. The Inner Harbor is dredged to keep it navigable. Adjacent to the Inner Harbor is a road known as Mill Way. The Maraspin Marshes extend to the east of Mill Way. Maraspin Creek flows through the Marshes and a culvert under the Mill Way Bridge as it travels out to Barnstable Outer Harbor. The Site is bounded by Barnstable Outer Harbor to the north.

The Department determined in the SDA that the Site contained coastal beach, coastal bank, coastal dune, salt marsh and land subject to coastal storm flowage, all resource areas protected under the Act. The Department also found that the coastal banks on the Site served as vertical buffers from storm waters, but did not serve as sediment sources to nearby coastal beaches. The Barnstable Conservation Commission appealed the SDA. The Commission disagreed with the Department's determinations that: 1) the coastal banks on the eastern and western sides of the Site do not serve as sediment sources to nearby coastal beaches; 2) Rendezvous Creek is not a river and therefore does not have an associated Riverfront Area; and 3) the mouth of Maraspin Creek, a river, is located at a point where it flows under the bridge at Mill Way immediately upgradient of the Inner Harbor; consequently, no Riverfront Area associated with Maraspin Creek extends onto the Site. The Commission asserts that the coastal

[1] See attached sketch of the Site and surrounding area.
[2] The Department and Mr. Bornstein refer to the marina area as "Barnstable Inner Harbor." The petitioner objects to that term because it is not used on any map and is not in common usage in Barnstable. I have elected to use the term "Inner Harbor", which is one of the terms in common usage identified by the petitioner.

banks on the eastern and western portions of the Site serve as sources of sediment to nearby beaches as well as vertical buffers to elevated storm waters.[3] It also argues that both Rendezvous and Maraspin Creeks are rivers with associated Riverfront Areas for their entire length adjacent to the Site.

In this decision, I conclude that the coastal bank on the eastern side of the Site serves as a source of sediment to a coastal beach and, thus, is significant to the wetlands interests of storm damage prevention and flood control because it serves both as a vertical buffer to wave action and as a source of sediment. The coastal bank on the western side does not serve as a source of sediment to a coastal beach, coastal dune, or barrier beach and, thus, is significant to the wetlands interests of storm damage prevention and flood control only as a vertical buffer to wave action. In addition, I conclude that neither Maraspin Creek nor Rendezvous Creek is a river adjacent to the Site. Consequently, there is no riverfront area on the Site.

BACKGROUND

The Order Re: Issues To Be Adjudicated attached to the Prehearing Conference Report issued on June 10, 1999, identified the disputed issues as: 1) "Is Rendezvous Creek a river?" 2) Is the mouth of Maraspin Creek (located below where the creek flows under a bridge on Mill Way immediately upgradient of Barnstable Inner Harbor) a river?" and 3) Is the coastal bank on the [Site] significant to storm damage prevention or flood control because it supplies sediment to coastal beaches ...?[4]

Following the conference, Mr. Bornstein and the Commission cross-moved for partial summary decision. At the Department's request before deciding the motions, I took a view of

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[3] Note that the Commission is not contesting the Department's determination that the coastal banks serve as vertical buffers to storm waters.

[4] The Commission had raised an issue concerning the correct elevations of mean high water and spring high water. This issue related to the Commission's objection to Mr. Bornstein's description of an area shown on the plan as

the Site on October 4, 1999. I denied the motions for partial summary decision on November 15, 1999 because I found that there were material facts in dispute. The affidavits filed by the parties brought to light an additional dispute concerning the number of coastal banks on the Site and the location of the top of the banks. I amended the issues to be adjudicated to reflect this additional area of disagreement.

I held a hearing on March 9 and 10, 2000 in Boston and on March 29, 2000 in Lakeville. The parties filed closing briefs on April 28, 2000.

DISCUSSION

a. Coastal Bank

A coastal bank is defined in the Wetlands Regulations as "the seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of a coastal beach, land subject to tidal action, or other wetland." 310 CMR 10.30 (2). Coastal banks that supply sediment to coastal beaches, coastal dunes and barrier beaches are *per se* significant to the wetlands interests of storm damage prevention and flood control. 310 CMR 10.30 (1). Coastal banks that provide a buffer to upland areas from storm waters are presumed significant to storm damage prevention and flood control. *Id.* As I noted in the Partial Summary Decision Ruling at 6-7, "[t]his distinction is important because different performance standards apply to work on a coastal bank depending upon whether it functions as a source of sediment or as a vertical buffer in serving the wetlands interests of storm damage prevention and flood control." *See* 310 CMR 10.30 (3)-(5) [source of sediment]; 310 CMR 10.30 (6)-(7) [vertical buffer.] A particular coastal bank may function as a source of sediment, as a vertical buffer, or as both. 310 CMR 10.30 (1).

"isolated black grass" that the Commission believed was salt marsh. The parties filed a stipulation on December 9, 1999 in which they agreed that this area was salt marsh. Thus, no party filed testimony on this point.

The Partial Summary Decision Ruling continued: "In addition to stating that coastal banks 'exposed to vigorous wave action serve as a major continuous source of sediment' for coastal landforms, 310 CMR 10.30 (1) states that '[t]he supply of sediment is removed from banks by wave action, and this removal takes place in response to beach and sea conditions.' 310 CMR 10.30 (1) describes generally the characteristics of each type of coastal bank and manner in which each type functions to protect the wetlands interests. *See* 310 CMR 10.21. A resource area is significant because of the way it functions to protect those interests. 'Significant means plays a role. A resource area is significant to an interest identified in the Act when it plays a role in the provision or protection, as appropriate, of that interest.' 310 CMR 10.04. Consequently, a coastal bank is significant to the interests of storm damage prevention and flood control because it plays a role in the protection of those interests by supplying sediment to coastal beaches, coastal dunes or barrier beaches, or by serving as a buffer to wave action, or both."

Witnesses

A coastal geologist testified for each party concerning the coastal bank issue. Peter Rosen, Ph.D. testified for Mr. Bornstein. He is a professor at Northeastern University and chairs the Department of Geology. He also is a partner in a consulting firm, GEO/PLAN Associates. Dr. Rosen serves on the Hingham Conservation Commission and has been a member for fifteen years. Jo Ann Muramoto, Ph.D. testified for the Commission concerning the coastal bank issue.[5] She is the Coastal and Wetlands Director at Horsley & Witten, Inc. She has over sixteen years of experience in the geological sciences, including study and research in the area of marine sedimentation processes. She also served for four years as Conservation Administrator in

[5] The Commission offered the testimony of three additional witnesses who provided a foundation for various aspects of Dr. Muramoto's testimony. Bradley Bertolo and Sarah Jackson, employed by Horsley & Whitten, conducted topographic surveys at the Site. Jeffery Weber photographed Freezer Point during the 1991 "No Name Storm" and testified to the accuracy of the photo.

Falmouth when she administered the Wetlands Protection Act. James Mahala testified for the Department. He has a Master of Science degree in Coastal Geology. He has been employed at the Department's Southeast Regional Office wetlands division since 1986. He drafted the Department's SDA.

Stipulation

At the opening of the live hearing the parties agreed to stipulate to the location and certain characteristics of the coastal banks on the property. I shall refer to these banks as the eastern and western coastal banks. The areas of agreement are depicted on a copy of the plan of record prepared by Schofield Brothers of New England, Inc. revised June 1, 1998 with the notation "Coastal Bank Stipulation" and some additional handwritten notations that depict the parties' agreement.

The parties stipulated that there is a coastal bank on the western/central portion of the Site. This feature is identified as a coastal bank on the plan. The upper portion of it, which is composed of dredged spoils deposited on the Site in the 1950s, has two sides.[6] The parties agree that the portion of this western coastal bank east of the line drawn on the plan, that is, the portion facing out directly towards Barnstable Outer Harbor, serves only as a vertical buffer and is not a source of sediment for coastal resource areas. The parties disagree about whether the portion of the western coastal bank west and south of the line, that is, where it borders the Rendezvous Marshes, serves as a source of sediment to coastal resource areas, in addition to serving as a vertical buffer.

The parties stipulated that there is a coastal bank on the eastern portion of the property facing the Inner Harbor. There is a revetment on a portion of this eastern coastal bank. The

[6] Given the orientation of Freezer Point, both sides of the bank face seaward.

parties agree that the toe of the bank is located where it meets the coastal beach, as shown on Exhibit 3 of Dr. Muramoto's rebuttal testimony.

The parties continued to disagree about whether the coastal banks supply sediment in addition to acting as vertical buffers. The Department and Mr. Bornstein are of the opinion that the coastal banks do not serve as a source of sediment. The Commission disagrees. The parties also disagree about the location of the top of the eastern coastal bank.

Top of the Eastern Coastal Bank

Projects on a coastal bank or within 100 feet landward of the top of a coastal bank are subject to the performance standards at 310 CMR 10.30 (4) [if a source of sediment] and 310 CMR 10.30 (6) [if a vertical buffer]. The phrase "top of a coastal bank" is not defined in the Wetlands Regulations. The Department's Division of Wetlands and Waterways issued "Coastal Banks: Definition and Delineation Criteria for Coastal Banks" (Wetlands Policy 92-1) to provide guidance in identifying the top of a coastal bank. Wetlands Policy 92-1, in turn, refers to the *Guide to Coastal Regulations,* prepared by the Massachusetts Office of Coastal Zone Management, as guidance for conservation commissions and the Department. The *Guide* states that the landward boundary of a coastal bank is "the top of, or first major break in, the face of the coastal bank."

According to Wetlands Policy 92-1, a coastal bank must have a slope greater than or equal to 10:1, or 10 percent. Where the slope of a coastal bank is greater than or equal to 4:1, or 25 percent, the top of the bank is that point above the 100-year flood elevation where the slope becomes less than 25 percent. Where the slope of a coastal bank is greater than or equal to 10 percent but less than 25 percent, the top of the bank is the 100-year flood elevation. The Policy allows for the possibility of a series of coastal banks landward of the first. In that case the banks

are separated by an area, usually land subject to coastal storm flowage, with a slope of less than 10 percent.

Exhibit 3 to Dr. Muramoto's rebuttal testimony, Transect AA, shows the profile of the eastern coastal bank along a surveyed elevation transect. The 100-year flood elevation is shown as elevation 12. The slope of the revetment is 66 percent. Above the revetment is a small, sloping shelf in front of an eroded escarpment where the slope is 9 percent. The escarpment has a slope of 18 percent. Above that point the slope flattens out to less than 10 percent until it reaches the eastern face of the western coastal bank.

Dr. Muramoto testified that, based upon her observations and the surveyed transect, there are three coastal banks on the eastern side of the Site. The lowest coastal bank is behind the revetment. The second coastal bank is the escarpment itself. The third coastal bank rises from the top of the landform and also forms the eastern side of the western coastal bank. A second transect, shown on Exhibit 4 and taken to the south of Transect AA, shows the slope above the toe of the revetment as 49 percent. According to Dr. Muramoto, this bank is a continuation of the lowest coastal bank shown in Transect AA. There is a second coastal bank at this location, directly above the lowest coastal bank. It has a slope of 17 percent.

According to Dr. Rosen, the top of the bank is at the top of the revetment beneath the stones because the area directly above it has a slope of 9 percent. In Mr. Mahala's view, there is a single coastal bank on the eastern side of the Site. The top of it is at the top of the eroded escarpment, approximately 10 feet landward of the revetment.

The location identified by Mr. Mahala corresponds to the top of the second coastal bank identified by Dr. Muramoto and shown on Transect AA. Reading her testimony together with

the parties' stipulation that there is one coastal bank on the eastern side of the Site, I find that Dr. Muramoto and Mr. Mahala agree about the location of the top of the eastern coastal bank.

I find that the top of the eastern coastal bank is located at the top of the eroded escarpment. Dr. Rosen testified that he did not look above the top of the revetment because he did not see any features large enough to consider beyond that point. He cut his investigation short when he came to the escarpment although it is evident from Dr. Muramoto's testimony as well as my observations of the area at the view that the landform continues to slope upward above that point. I treat the eastern coastal bank as a single landform in light of the parties' stipulation. The parties' testimony about the location of the top of the bank, however, was influenced by their different views about how many coastal banks there were on the eastern side of the Site. The stipulation reflected their agreement that there was one bank, but it did not address how the testimony in the record about the location of the top of the coastal bank should be viewed in light of the stipulation. In order to reconcile that stipulation with the testimony they offered, I conclude that the sloping shelf in front of the revetment where the slope is 9 percent should not be taken to represent the first major break in slope. As Mr. Mahala apparently determined when he concluded that the top of the bank was at the top of the escarpment, that is an erosional feature on the face of the coastal bank and not a break in slope.

Whether the Coastal Banks Supply Sediment

According to 310 CMR 10.30 (1), a coastal bank that supplies sediment to coastal beaches, coastal dunes and barrier beaches is *per se* significant to the interests of storm damage prevention and flood control. Therefore, I turn to the parties' testimony on whether the existence of an escarpment on the eastern and western coastal banks is evidence of sediment removal and, if so, where the sediment is deposited.

In Dr. Muramoto's opinion, the coastal banks on each side of the property supply sediment to nearby coastal resource areas. She observed an undercut eroded escarpment on both the eastern and western coastal banks that, in her opinion, was caused by moving water, including tidal action, waves and storm-driven waves. According to Dr. Muramoto, the existence of the escarpments on the eastern and western sides of the Site is evidence of sediment removal. She testified that any sediment removed from the coastal banks would move downslope onto the adjacent coastal resource areas.

Dr. Rosen and Mr. Mahala did not disagree. Dr. Rosen conceded that the eroded escarpments on the eastern and western coastal banks were evidence that the banks supplied some sediment. He also testified that a basic "rule of thumb" in sedimentology was that sediments moved downward; therefore, he presumed that the sediment from the eastern and western coastal banks moved downward onto the adjacent resource areas.

Mr. Mahala acknowledged that the escarpment on the eastern coastal bank indicated that a small amount of sediment had been eroded from it during a coastal storm, by a storm tide or by wave action. Mr. Mahala acknowledged that the escarpment on the western coastal bank indicated that a small amount of sediment had been eroded from it during a coastal storm, by a storm tide or wave action, but he concluded that the bank did not play a role in nourishing nearby beaches.

Dr. Rosen and Mr. Mahala acknowledge that the escarpments on the coastal banks on the Site are evidence of erosion. In their view, however, the amount of sediment eroded from a bank and the frequency with which this occurs must be considered in determining whether the bank functions as a source of sediment and thus is significant to the interests of storm damage prevention and flood control. The Commission counters that 310 CMR 10.30 does not specify

that a particular quantity of sediment must be supplied in order for the coastal bank to be *per se* significant to storm damage prevention and flood control.

There is no dispute that the resource area below the eastern coastal bank is a coastal beach. There is no dispute that the sediment removed from the eastern coastal bank is deposited on the coastal beach below it. The dispute is simply whether the quantity of sediment supplied is sufficient for the bank to be characterized as a source of sediment under the Wetlands Regulations. The initial paragraph of 310 CMR 10.30 (1) states that "[c]oastal banks that supply sediment to coastal beaches, coastal dunes and barrier beaches are *per se* significant to storm damage prevention and flood control." There is nothing in the regulation that limits this statement to coastal banks that supply an amount of sediment above a particular threshold. I decline to read such a limitation into the regulation. In fact, 310 CMR 10.30 (1) acknowledges that sediment removal by wave action occurs in response to beach and sea conditions. This statement lends support to the Commission's position that small amounts of sediment removed over time are important. Accordingly, I find that the eastern coastal bank is *per se* significant to the interests of storm damage prevention and flood control because it supplies sediment to the adjacent coastal beach.

There is no dispute that the erosional escarpment on the western coastal bank is evidence of sediment removal through wave action. There also is no dispute that the resource area below the western coastal bank is a salt marsh. Under the Wetlands Regulations, however, in order for a coastal bank to be found significant as a source of sediment, that sediment must be supplied to a coastal dune, coastal beach, or barrier beach. There is no evidence that the western coastal bank supplies sediment to any of these resource areas. Accordingly, I find that the western

coastal bank is not significant to the interests of storm damage prevention and flood control as a source of sediment.

b. Riverfront Area

"A Riverfront Area is the area of land between a river's mean annual high water line and a parallel line measured horizontally." 310 CMR 10.58 (2)(a). Consequently, a key component to determining whether a riverfront area is present on the Site is deciding whether nearby water bodies are rivers.

"A river is any natural flowing body of water that empties into any ocean ... and which flows throughout the year. Perennial streams are rivers; intermittent streams are not rivers." 310 CMR 10.58 (2)(a)(1). The issuing authority (either a conservation commission or the Department) is directed to presume that a river or stream shown on the current USGS map is perennial unless rebutted by evidence from a competent source. 310 CMR 10.58 (2)(a)1.a.

310 CMR 10.58 (2)(c) provides that "[w]hen a river flows into coastal waters or an embayment, the river ends where it no longer has primarily riverine characteristics. Where the river's mouth cannot be readily identified, the river ends where a line drawn perpendicular to the shoreline no longer intersects the opposite bank."

The only other reference in 310 CMR 10.58 to "riverine characteristics" is found at 310 CMR 10.58 (2)(a)1.e. In distinguishing lakes and ponds from rivers, that section states: "the water body is a river if it has primarily riverine characteristics. Riverine characteristics include unidirectional flow that can be visually observed or measured in the field. In coastal areas, the unidirectional flow may be tidally influenced. In addition, rivers are characterized by horizontal zonation, as opposed to the vertical stratification typically associated with lakes, ponds, and embayments."

Witnesses

Robert Perry, P.E. testified on behalf of Mr. Bornstein concerning the rivers issues. Mr. Perry is a civil engineer. He prepared the plan of record for the Site while he was employed by Schofield Brothers of New England, Inc. He now is employed by Cape Cod Engineering, a firm he founded after leaving Schofield Brothers. He has over thirteen years experience evaluating coastal areas and delineating wetland resource areas.

Scott W. Horsley and Robert W. Gatewood testified for the Commission on the rivers issues. Mr. Horsley is a hydrologist and a principal with Horsley & Witten, Inc. He has over seventeen years of experience in "evaluating water resources projects, including the delineation of resource protection areas..." Mr. Gatewood is the Conservation Administrator for Barnstable, a position he has held for almost 13 years. He previously was the Town's Conservation Agent and worked as an aquatic biologist.

Mr. Mahala and David Foulis testified for the Department. Mr. Foulis is an environmental analyst and has worked for the Department since May 1999. He provides technical training and outreach about the Act, in particular about the interpretation and implementation of 310 CMR 10.58. From 1987 to 1998 he worked as a field botanist and wetland ecologist for research groups supporting the U.S. Fish and Wildlife's National Wetlands Inventory Program. He also served from 1987 to 1998 as a wetlands aerial photointerpreter.

Whether Maraspin Creek is a River

Mr. Horsley concluded that Maraspin Creek is a river and that its mouth is located at the northern end of Freezer Point and Blish Point where it empties into Barnstable Harbor. If that

were the case, some portion of the Site would contain a riverfront area associated with Maraspin Creek. Mr. Perry, Mr. Mahala, and Mr. Foulis agreed that Maraspin Creek is no longer a river when it reaches the Inner Harbor.[7] Mr. Horsley, Mr. Perry, and Mr. Mahala looked at freshwater flows, tidal influence, salinity values and stream morphology in the Inner Harbor in arriving at their opinions. Mr. Foulis relied on his observations in the Maraspin Marshes to explain why he found Maraspin Creek seaward of the Mill Way Bridge to be an estuary[8] and not a river.

Perennial nature; tidal influence

Mr. Horsley explained that groundwater provides the baseflow for a stream and is the key to its perennial nature. This groundwater baseflow was itself a "riverine characteristic," he stated. He measured groundwater flow adjacent to the Site. He noted that the Wetlands Regulations do not establish a minimum flow requirement for rivers. Nor do they establish a percentage of fresh water flow that must be present in a coastal environment. Mr. Horsley acknowledged that Maraspin Creek reverses flow with the incoming tide at the Mill Way Bridge, but maintained that this was indicative of unidirectional flow that is tidally influenced.[9]

According to Mr. Perry, Maraspin Creek ceases to be a river approximately ¾ mile from the Site where it enters the Maraspin Marshes. He acknowledged the existence of groundwater

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[7] Mr. Mahala testified that the mouth of Maraspin Creek was at the culvert under the bridge on Mill Way. Mr. Foulis testified that its mouth was located near the culvert on Commerce Road, as did Mr. Perry. Their difference of opinion is not material because there is no riverfront area on the Site if the river ends at either location. As I stated in the Ruling on Partial Summary Decision, "the purpose of determining the location of the mouth of Maraspin Creek is to determine whether a Riverfront Area associated with the Creek is located on the Site.' ... Where the Request for Determination of Applicability filed by Mr. Bornstein asked only for confirmation of the resource areas on the Site, there is no reason to stray beyond the Site boundaries and determine the location of resource areas that would affect property in addition to the Site." Mr. Mahala confirmed at the hearing that the Site would be more than 200 feet away from the mouth of the river were it located at the Mill Way Bridge.

[8] An estuary is defined as "(a) any area where fresh and salt waters mix and tidal effects are evident; or (b) any partially enclosed coastal body of water where the tide meets the current of any stream or river." 310 CMR 10.04. The resource area "land under the ocean" includes land under estuaries. 310 CMR 10.25 (2).

[9] Mr. Horsley maintained that 310 CMR 10.58 (2)(a)2. supported his view that Maraspin Creek is a river through the Inner Harbor. That section of the Wetlands Regulations provides in relevant part that "[t]he mean high tide line serves as the mean annual high water line for tidal rivers." There is no dispute that the Wetlands Regulations

contribution to the flow in Maraspin Creek. He testified that this was indicative of the continuous hydraulic interaction between tidal waters and groundwater along the coast.

Mr. Perry determined that the water flow in the Inner Harbor was not unidirectional because he observed that the flow under the Mill Way Bridge reversed direction approximately 2.5 hours after low tide. In Mr. Perry's view, "tidally influenced," as referenced in 310 CMR 10.58 (2)(a)1.e., means that the flow slows down, speeds up or "mill[s] around," depending on the direction of the tide and the point during the tidal cycle, as distinguished from a change in direction. Based upon the lack of unidirectional flow, water flow calculations and the salinity levels, he concluded that flow was dominated by the tide, rather than influenced by it.

Mr. Mahala agreed that the flow is bi-directional and dominated by the tide. He explained that his use of the phrase "dominated by the tide" was intended to indicate that the tides did more than just influence the direction of flow. He concluded that Maraspin Creek where it flows through the Inner Harbor adjacent to the Site did not exhibit primarily riverine characteristics.

Horizontal zonation

Mr. Horsley also measured salinity values at low tide. He determined that there was horizontal zonation[10] of salinity, with salinity values increasing closer to Barnstable Outer Harbor. He characterized his salinity measurements of 8.5 parts per thousand (ppt) as "relatively fresh," as contrasted with the salinity of Barnstable Outer Harbor, which he measured as 30 ppt.

Mr. Perry concluded that there is no horizontal zonation because plant and animal species that tolerate or require a saltwater environment dominate the Inner Harbor area. In fact, in his

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recognize that coastal rivers are influenced by the tides. 310 CMR 10.58 (2)(a)2., however, does not establish that tidal rivers are rivers for their entire length until they enter the ocean.

[10] As explained by Mr. Horsley, horizontal zonation means differences in physical parameters over a horizontal plane. He did not measure parameters other than salinity in order to determine the presence of horizontal zonation.

view, the plant and animal species exhibited biological vertical stratification[11] typical of a tidal, marine environment. Mr. Perry sampled the salinity in the Inner Harbor and Barnstable Outer Harbor. At high tide, the lowest salinity levels in the Maraspin Marshes exceeded 21 ppt, which meant it was approximately 68% seawater. He also determined that the volume of water flowing seaward under the Mill Way Bridge "constitutes only 5.06 percent of the total volume of water which flows into and out of the Inner Harbor during a twelve-hour tidal cycle." Perry Direct Testimony ¶ 17.

Mr. Foulis disputed Mr. Horsley's opinion that horizontal zonation of salinity existed in the Inner Harbor.[12] He explained that "the concept of zonation in field ecology is generally characterized by sharp geographic shifts from one entity to the next." Foulis Direct Testimony ¶ 15. In his view, Mr. Horsley's findings were indicative of horizontal gradation where, as Mr. Horsley acknowledged, the salinity measurements would change due to differences in tidal stage, lunar month and time of year.

Stream morphology

Mr. Horsley testified that Maraspin Creek maintained its meandering course throughout its length, including the section between the Mill Way Bridge and the end of Freezer Point, and that its width and depth increased as it neared the ocean. He acknowledged the presence of estuarine and marine vegetation in the lower reaches of Maraspin Creek. In his view, however, this did not negate the fact that riverine characteristics were still present.

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[11] Vertical stratification generally refers to the phenomenon exhibited by lakes, ponds and embayments where physical parameters such as temperature and oxygen vary vertically throughout the water column. As used by Mr. Perry, the term refers to changes in plant and animal life vertically due to changes in water elevation during the tidal cycle.

[12] Mr. Foulis defined horizontal zonation by reference to the hyporheic zone, a term used in 310 CMR 10.58 (1). According to Mr. Foulis, the hyporheic zone is an area of interchange between surface and groundwater that extends perpendicular to the flow of the river.

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Mr. Perry and Mr. Mahala disputed Mr. Horsley's opinion that Maraspin Creek exhibited typical stream morphology in the Inner Harbor. According to Mr. Perry, the fact that the channel becomes wider where it empties into Barnstable Outer Harbor was no doubt due to past efforts to widen a natural depression that was lower than sea level. Since the 1950s, he testified, the area has been dredged regularly to create and maintain a boat basin. Mr. Mahala testified that down-gradient of the Mill Way Bridge the waterway loses its meandering characteristic and the banks are no longer parallel.

Evidence of estuarine, rather than riverine, characteristics

Mr. Foulis testified that Maraspin Creek seaward of the Mill Way Bridge is an estuary as defined at 310 CMR 10.04 and not a river. He did not examine the Inner Harbor. He based his opinion upon an examination of the plant community composition and structure, epifaunal (mollusks and crustateans) composition, geomorphology, and surficial hydrologic indicators in the Maraspin Salt Marshes landward of the Mill Way Bridge. For comparison, he also examined these characteristics at the Commerce Road culvert.

Mr. Foulis found that the Marshes were composed of three distinct zones; each contains salt-tolerant plants. He described these plants as typical of habitats dominated by prolonged exposure to water with salt levels in excess of 18 ppt at average annual low flow conditions. The epifauna (mollusks and crustaceans) that he observed within the Marshes by the Bridge were typical of estuarine habitats.

According to Mr. Foulis, saltwater ebb and flood currents dominate the hydrology at the Mill Way Bridge. He observed that the freshwater flow at the Mill Way Bridge is much less than the flow derived from flood currents. The predominance of salt water from flood currents is a formative factor in the development of estuaries, according to Mr. Foulis. In his opinion, the

channel at the Mill Way Bridge is subject to bi-directional flood and ebb currents and is wholly tidal rather than tidally influenced.

The soils and the substrate in the Maraspin Creek channel at and seaward of the Mill Way Bridge are indicative of an estuarine environment, Mr. Foulis testified. He observed that the sides of the channel at the Bridge are characterized by features created through the bi-directional erosive forces of ebb and flood currents and that are characteristic of estuaries and embayments. Another strong indicator that the area at and seaward of the Bridge is an embayment, he stated, is the difference in cross-sectional flow volumes between the Mill Way Bridge and the Commerce Road culvert.

In short, Mr. Foulis concluded that Maraspin Creek at the Mill Way Bridge did not exhibit any riverine characteristics. Once he came to this conclusion, Mr. Foulis testified, he also concluded that the area downstream of that point, that is, within the Inner Harbor, was not a river as well.

As previously noted, when a river flows into coastal waters or an embayment, it ends where it no longer has primarily riverine characteristics. 310 CMR 10.58 (2)(c). I conclude that Maraspin Creek is not a river adjacent to the Site because it no longer exhibits primarily riverine characteristics in that area. Mr. Horsley primarily relies on the presence of groundwater baseflow within the subtidal channel through the Inner Harbor as evidence that Maraspin Creek remains a river until it empties into Barnstable Outer Harbor. The presence of one riverine characteristic, however significant, does not alone demonstrate that the waterbody exhibits *primarily* riverine characteristics, as the regulation requires.

I find that the Inner Harbor does not exhibit horizontal zonation or unidirectional flow, the other riverine characteristics relied on by Mr. Horsley. I credit Mr. Foulis's explanation for

the difference in salinity values throughout the Inner Harbor, rather than Mr. Horsley's view that the different values demonstrate horizontal zonation. While horizontal zonation is not defined in the Wetlands Regulations, its use in contrast to vertical stratification would not appear to relate to changes in salinity values that shift due to factors such as differences in tidal cycle or time of year. In addition, it is undisputed that there is no observed or measurable unidirectional flow in the Inner Harbor during most of each tidal cycle. According to Mr. Perry, Mr. Mahala, and Mr. Foulis, the effect of the tides is overwhelming. The Commission has not referred me to other riverine characteristics in the record to support Mr. Horsley's view.[13]

In contrast, the testimony of Mr. Perry, Mr. Mahala, and Mr. Foulis establishes the non-riverine character of the Inner Harbor. Mr. Foulis extensively analyzed the area landward of the Inner Harbor and concluded that Maraspin Creek at the Mill Way Bridge did not exhibit any riverine characteristics. While he relied heavily upon the habitat classification system used by the United States Fish and Wildlife Service, he nonetheless persuasively catalogued the absence of riverine characteristics at the Mill Way Bridge. The Commission did not refute his testimony by demonstrating that the habitat characteristics he relied on are characteristics of a riverine habitat or that they are invalid. While the Commission took issue with Mr. Foulis's failure to examine the Inner Harbor, it presented no evidence that would persuade me that riverine characteristics somehow appear seaward of the location examined by Mr. Foulis and found by him to be an estuary.

[13] 310 CMR 10.58 provides that "where a river's mouth cannot be readily identified, the river ends where a line drawn perpendicular to the shoreline no longer intersects the opposite bank." Mr. Horsley and Mr. Mahala applied this provision and came to different conclusions about where the river's mouth would end. For the reasons explained in fn. 7, it is not necessary in this decision to determine precisely where the river's mouth is located. In

Whether Rendezvous Creek is a River

Mr. Horsley testified that Rendezvous Creek is shown as a perennial stream on the current USGS map. Its perennial base flow is derived from a watershed much larger than the salt marshes through which it travels and includes groundwater inputs that, according to Mr. Horsley, the Department did not consider when it issued the SDA. Mr. Gatewood identified in the field four surface tributaries that flow into Rendezvous Creek, including two rather extensive bordering vegetated wetland systems.

According to Mr. Perry, Rendezvous Creek is not a river at all, but rather is a channel in a salt marsh. Any freshwater in the channel comes from nearby man-made structures and drainage ditches and is not "natural" flow. Mr. Perry acknowledged that he did not conduct any studies of groundwater flow in the area. He also acknowledged that Rendezvous Creek is shown as a perennial stream on the current USGS map, but interpreted the blue line on the map as ending where it entered the Rendezvous Marshes.

Mr. Mahala testified that Rendezvous Creek is a tidal creek. He testified that its headwaters were located near the landward boundary of the Rendezvous Salt Marshes based upon his review of the USGS topographic map. He did not locate the headwaters in the field.

I conclude that, based upon the testimony of Mr. Horsley and Mr. Gatewood, Rendezvous Creek is a perennial stream for some portion of its length and is not merely a tidal channel within the Rendezvous Salt Marshes. Nonetheless, it is the characteristics of Rendezvous Creek within the Marshes adjacent to the Site that are at issue, and I turn to that testimony now.

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any case, this provision applies only when the river's mouth cannot be readily identified by the absence of primarily riverine characteristics.

The parties' testimony was similar to that provided for Maraspin Creek. The witnesses examined freshwater flow, salinity values, stream morphology, and plant community composition in opining whether Rendezvous Creek is a river adjacent to the Site.

As he did for Maraspin Creek, Mr. Horsley relied on the fact that the Wetlands Regulations recognize the existence of tidal influence in rivers. He observed that the Wetlands Regulations do not establish a minimum flow requirement, nor do they establish a percentage of fresh water flow that must be present in a coastal environment. He concluded that Rendezvous Creek is a tidal river that is fed by fresh water, influenced by the tides, and empties into Barnstable Outer Harbor at the end of Freezer Point.

Mr. Horsley testified that at low tide he observed the Creek flowing in a clear channel through the Rendezvous Salt Marshes. The unidirectional flow he observed was toward Barnstable Outer Harbor. He testified that his salinity measurements indicated horizontal zonation of salinity and that at low tide the flow was predominantly fresh.

The basis for Mr. Perry's opinion that Rendezvous Creek is not a river mirrored his reasons why, in his view, Maraspin Creek is no longer a river adjacent to the Site. He agreed with Mr. Horsley that there probably is perennial flow in the channel adjacent to the Site and that the flow was groundwater discharge. He agreed that groundwater interacts with surface waters in Rendezvous Creek as it does in Maraspin Creek.

In Mr. Perry's opinion, the direction and volume of water flow in Rendezvous Creek is dominated by the tide. The flow is not unidirectional because, he observed, it reversed direction near the northwestern tip of the Site approximately 1 hour and 45 minutes after low tide. The volume of flow from fresh water was only 5 percent of the total volume of flow during a 12-hour tidal cycle.

According to Mr. Perry, there is no evidence of horizontal zonation in the channel area. He testified that the plant species he observed in the Rendezvous Marshes grow only in a highly saline environment. He testified that the salinity sampling by Mr. Horsley did not show horizontal zonation of salinity adjacent to the Site because the values did not always increase as one moved closer to Barnstable Outer Harbor. Mr. Perry measured salinity levels in the Rendezvous Marshes at low tide and concluded that the water was predominantly saline.

According to Mr. Mahala, the minimal freshwater flow in Rendezvous Creek was insufficient to produce unidirectional flow. He testified that tidal processes dominate the flow throughout the Creek's entire length through the Marshes. In his opinion, the width of the channel at its lower reach compared with the width at the edge of the Marshes was characteristic of the formation of an embayment. Mr. Mahala testified that riverine characteristics include a meandering nature, erosional scars on outer meanders, point bar development, and the presence of an alluvial floodplain. He acknowledged Rendezvous Creek's meandering nature and observed some erosional scour on both the inner and outer meanders of the channel in the area adjacent to the Site but did not conclude that primarily riverine characteristics were present.

Mr. Foulis testified that the characteristics of the portion of Rendezvous Creek that he examined were very similar to those he observed in Maraspin Creek at the Mill Way Bridge. He found the substantially de-watered channel of Rendezvous Creek at low tide to be characteristic of tidal flats and embayments rather than of rivers.[14] In his opinion, the salinity readings taken

[14] Mr. Foulis also concluded that, based upon his examination of the aerial photograph that is Exhibit 1 to Mr. Gatewood's testimony, the narrowest channel of Rendezvous Creek directly west of Freezer Point was completely de-watered when the photograph was taken. Mr. Foulis also relied upon the classification of that area as a tidal flat on the Department's Wetlands Conservancy Program's orthophoto map as further evidence that the channel became de-watered on occasion. The Commission submitted the testimony of Gerard Reymore to rebut Mr. Foulis. If the channel in the area adjacent to the site is de-watered, then the flow at that point is not perennial and it is not a river within the meaning of 310 CMR 10.58. I need not reach a conclusion on this point though because I find that even assuming Rendezvous Creek has perennial flow throughout the channel parallel to the Site, it still lacks primarily riverine characteristics.

by Mr. Horsley at low tide do not reflect the dominant hydrological characteristic within the area. He determined that the plant community in the Salt Marsh adjacent to the channel is indicative of the long-term polyhaline[15] environment.

Mr. Horsley's reliance upon freshwater flow alone is insufficient to establish the presence of primarily riverine characteristics. For the same reason I found that the salinity values do not exhibit horizontal zonation in Maraspin Creek, I find that they do not here either. Based upon the testimony of Mr. Perry who observed the flow changing direction, I find that the flow in Rendezvous Creek is not unidirectional and instead shifts over the course of each tidal cycle. Based upon the unrefuted testimony of Mr. Foulis, I find that the soils and substrate and the plant community are not indicative of a riverine environment. For these reasons, I conclude that the portion of Rendezvous Creek that flows through the Marshes adjacent to the Site does not exhibit primarily riverine characteristics and thus there is no riverfront area on the western side of the Site.

DISPOSITION

On the assumption that the Commissioner will adopt this recommended final decision, the Department is directed to prepare and file with the Docket Clerk a final determination of applicability in accordance with the findings and conclusions in this decision. The final determination of applicability will be issued simultaneously with the final decision. The Department shall file and serve its proposed final determination of applicability no later than 21 days after the issuance of this recommended final decision.

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[15] According to the *Classification of Wetlands and Deepwater Habitats of the United States*, December 1979, published by the United States Fish and Wildlife Service (Department's Hearing Exhibit No. 1), "polyhaline" is a

NOTICE

This decision is a recommended final decision of the Administrative Law Judge. It has been transmitted to the Commissioner for her final decision in this matter. This decision is therefore not a final decision subject to reconsideration under 310 CMR 1.01(14)(d), and may not be appealed to the Superior Court pursuant to M.G.L. c. 30A. The Commissioner's final decision is subject to rights of reconsideration and court appeal and will contain a notice to that effect. Because this matter has now been transmitted to the Commissioner, no party shall file a motion to renew or reargue this recommended final decision or any portion of it, and no party shall communicate with the Commissioner's office regarding this decision unless the Commissioner, in her sole discretion, directs otherwise.

Bonney Cashin
Administrative Law Judge

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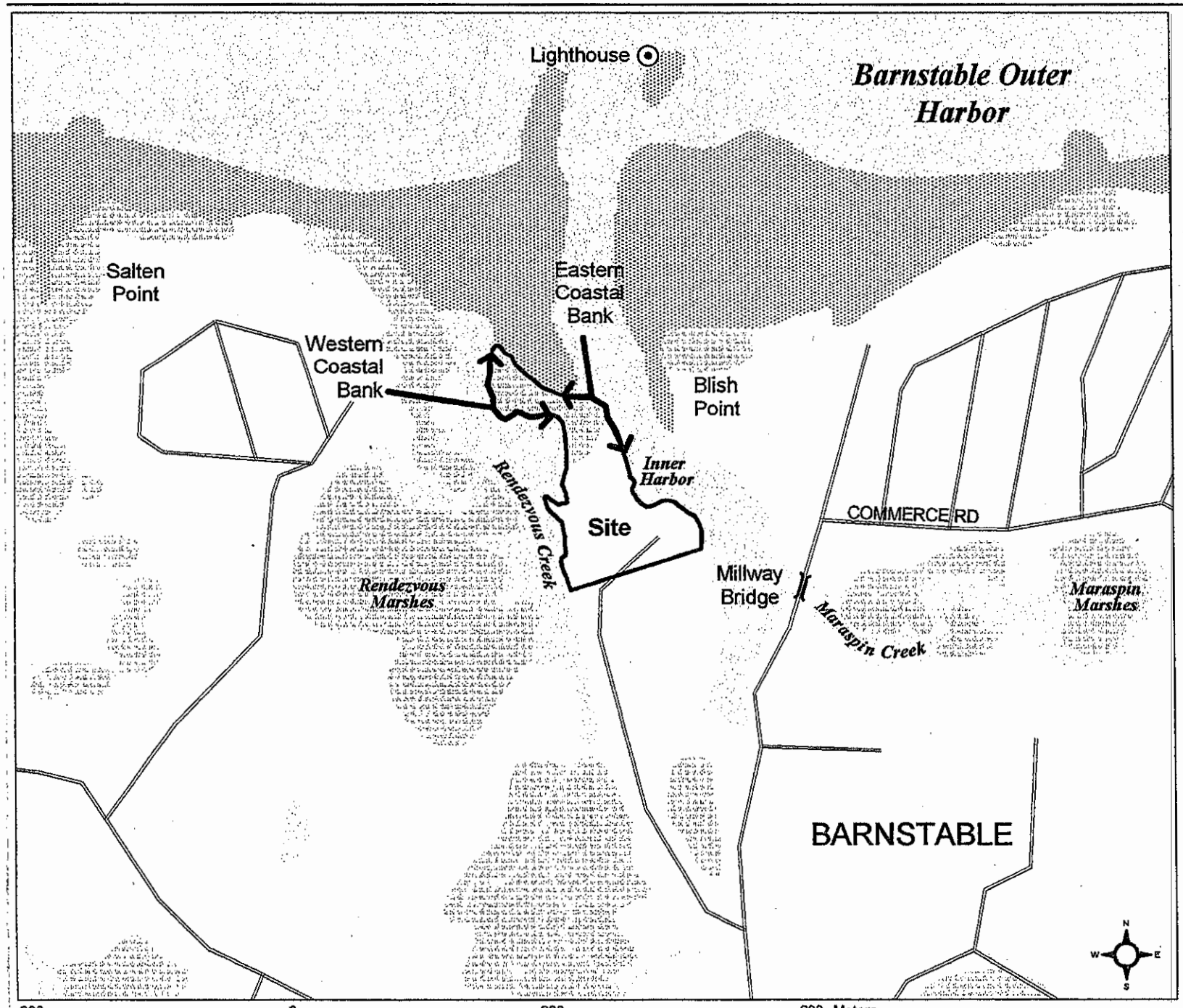
term used in the Venice Classification System for marine and estuarine systems where salinity measures 18.0-30 ppt.



In the Matter of Stuart Bornstein, Requestor
Docket Number 98-168.

Sketch attached to Recommended Final Decision.

LEGEND

- Roads
- Stream
- Parcel Boundary
- Wetland/Salt Marsh
- Surface Water
- Tidal Flat

DATA SOURCES

Aquatic features: Derived from USGS 1:25,000 Digital Line Graph (DLG) files and 1:100,000 DLG files which were enhanced by MassGIS with linework from USGS 1:25,000 topological quadrangles. 1997.

Roads: Extracted and generalized by MassGIS from USGS 1:100,000 transportation DLG files. 1993.

Parcel: Digitized on-screen and from paper maps (including town sources and 1990 APCC Atlas) by MassGIS. 1998.

Massachusetts Department of Environmental Protection

Executive Office of Environmental Affairs

MASSGIS Massachusetts Geographic Information System

Massachusetts Executive Office of Environmental Affairs - 2000

January 5, 2001

SERVICE LIST

In The Matter Of: Stuart Bornstein

Docket No. 98-168 File No. SDA

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Date: January 11, 2001