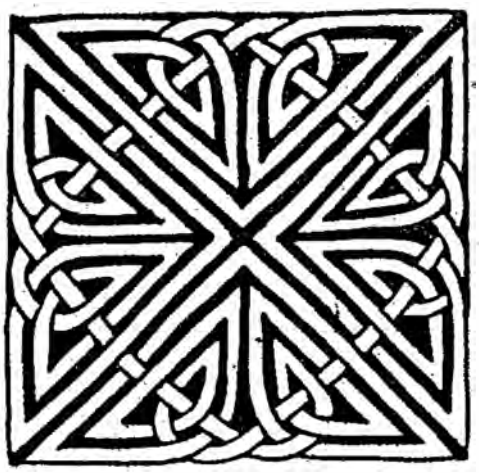
FLOWED MEADOW NEIGHBORHOOD:

An Environmental Design Charrette

Newton & Waltham, Massachusetts



Report by
BArC - Boston Architectural research Center
320 Newbury Street, Boston, MA 02115
(617) 536-3170 ext. 214

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An Environmental Design Charrette

A project of
BArC - Boston Architectural research Center
Green Decade Coalition/Newton
Architects for Social Responsibility

In conjunction with
The Committee on the Environment of
The American Institute of Architects

CREDITS

Project Steering Committee

Bill Boehm
Larissa Brown
David Del Porto
Daniel Glenn
Shirley Kressel
Jay Lee
Karen Nelson
Chris Royer
Peter Smith

Project Coordinator

John Rood

Research Team

Larissa Brown
Gina Calventi
Carolyn Hall
Shirley Kressel
Jay Lee
Karen Nelson
Chris Royer
Jim Stolecki

Principal Report Authors

Larissa Brown
Shirley Kressel
Chris Royer

Charrette Team Members

Jay Lee-Facilitator
Karen Nelson-Facilitator
Glenn Allen
Gloria Champion
Michael Chin
Jeremy Liu
Matthew Miller

Charrette Team Members (cont.)

Bill Boehm-Facilitator
Larissa Brown-Facilitator
Cynthia Campisano
Heather Heimarck
Paul Leveille
Ellen Levine
Miguel Linera
Jon Seward
Kevin Smith

Jestena Boughton-Facilitator
Peter Smith-Facilitator
Ron Aberle
Jeff DiCastro
Peter Levasseur
Jerry Ludwig
Paul Pandolfo
Marion Phallis
John Rossi
Anatol Zuckerman

Shirley Kressel-Facilitator
Chris Royer-Facilitator
Susan Brown
Susan Glenn
Paul Kamoski
Marion Linden
Daren Sawyer
Diana Shank
Brooks Stewart

Daniel Glenn-Facilitator
Joan Brigham
David Del Porto
Tom Grayson
Maureen Harrington
Chris Harrison
Mike Kyes
Fritjof Palmeijer
Annie Reed
Pat Ribbeck

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Jestena Boughton, AIA/COTE
Cynthia Campisano, Environmental Health & Engineering, Inc.
Gloria Champion
Dan Driscoll, Metropolitan District Commission
Gina Foglia, Foglia Design Associates
Kathy Garnett, Department of Environmental Management
Susan Glenn
Chris Gribbs, AIA/COTE
Helen Heyn, Newton Conservation Commission
Bruce Leish, Carol Johnson Associates
Peter Levasseur
Valerie Lofland
Sterling McMurrin, Michael Singer Associates
Matthew Miller
Julia O'Brien, Metropolitan District Commission
Newton Alderman Ken Parker
Sam Picariello
Alison Richardson, Brown & Roe
Kathi Rood
John E. Thomas, Beals and Thomas, Inc.
Anatol Zukerman

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	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8 AM							
9 AM			HOLD/mk		HOLD/PMBD discussion/mk		
10 AM				Dev't Rev. Team Meetings: 10AM-OPEN; 11AM- OPEN			
11 AM							
12 PM							
1 PM				staff meeting for l and use planners			
2 PM			Meeting- Danielle				
3 PM			Mike/Steve Weekly				
4 PM							

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1 INTRODUCTION

"What sustainability refers to is a very old and very simple concept — the ability to keep going over the long haul. As a value, it refers to giving equal weight in your decisions to the future as well as the present. You might think of it as extending the Golden Rule through time, so that you do unto future generations (as well as your present fellow beings) as you would have them do unto you."

Robert Gillman - from Sustainability: The State of the Movement

WHAT IS A CHARRETTE?

A charrette is an intensive brainstorming session lasting a relatively short period of time in which designers focus on a specific place and set of design issues in order to produce a concept or strategy for use of the and in that place.

FLOWED MEADOW CHARRETTE

At the suggestion of members of the Green Decade Coalition/Newton, the Flowed Meadow charrette was organized by the Boston Architectural research Center (BArC), the research division of the Boston Architectural Center (BAC), an independent school of architecture. The charrette was one of nineteen Environmental Design Charrettes sponsored by the Committee on the Environment (COTE) of the American Institute of Architects in the fall of 1995. The purpose of these charrettes, in the words of COTE coordinator Donald Watson, was to provide "a publicly visible way by which architects and environmental design professionals can address the sustainable environmental design issues of ecomomic opportunity, social equity, and enviromental responsibility in the planning and design of buildings, communities, and regions."

BArC organized a steering committee of architects, planners, students, and scientists to prepare the charrette during the summer and fall of 1995. A briefing booklet was distributed to charrette participants to familiarize them with the site. This is an expanded version of that booklet. BAC students in the Sustainable Design Studio did important work researching the site and preparing analysis drawings on such topics as wetlands and drainage, wildlife habitat, and land use. Two weeks before the charrette, particpants spent a Saturday listening to presentaions on the Charles River basin, wetlands, landfill reclamation, and the design of solid waste infrastructure, and they visited the site. Finally, on Friday evening, October 6, 1995, people converged on Newton City Hall to begin the charrette. Design professionals, planners, environmental scientists, artists, and students worked in five teams until Sunday afternoon to produce five sustainable visions of the Flowed Meadow area.

This environmental design charrette gathered individuals from diverse backgrounds to examine current practices and to begin the process of developing strategic ideas for this site - working at the scale of the region, of a community, of a site, of an architecture, and of an individual. To dwell and participate in a community, one must have a relationship with an authentic place. Architecture, planning, and landscape design can help create the conditions to make material and cultural environments into meaningful, authentic places that foster sustainable communities by restoring and building the physical, biological, and historical layers of a site. These design arts can help reshape our relationship to our surroundings and our neighbors, by revealing connections between the poetics of place, sound ecological development, and individual actions.

ENVIRONMENTAL SUSTAINABILITY AND DESIGN

The Charles River

In the broadest sense, an environmentally sustainable society provides dignified lives for all its members, does not extinguish other forms of life, and does not use up physical and biological resources needed by future generations of all forms of life. It requires an attitude of responsibility and stewardship, "the land ethic" described by Aldo Leopold:

> The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land....In short, a land ethic changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also respect for the community as such. [*A Sand County Almanac with Essays on Conservation from Round River* (New York, 1966), pp. 239-240]

This model has become increasingly necessary and increasingly rare over the course of the twentieth century. The immense demographic and technological scale of twenty-first century global society will strain the natural world, not only in the anthropocentric sense that we need natural resources for our support and social reproduction, but also in the wider sense that our survival and quality of life depend on the survival and reproduction of other species. The environmental scientist Daniel B. Botkin, winner of the 1991 Mitchell International Prize for Sustainable Development, emphasizes our responsibility to the natural world:

> The answers to the old questions -- What is the character of nature undisturbed? What is the influence of nature on human beings? What is the influence of human beings on nature? -- can no longer be viewed as distinct from one another. Life and the environment are one thing, not two, and people, as all life, are immersed in the one system. When we influence nature, we influence ourselves; when we change nature, we change ourselves....Nature in the twenty-first century will be a nature that we make; the question is the degree to which this molding will be intentional or unintentional, desirable or undesirable. [*Discordant Harmonies: A New Ecology for the Twenty-first Century* (New York, 1990), 188, 193.]

How can design promote environmental sustainability? Sustainable design focuses attention on relationships and processes rather than on objects:

- It works with natural flows of matter, energy, and information rather than against them.
- It conserves rather than wastes resources such as energy, water, and materials.
- It encompasses the time dimension, showing sensitivity to historic character and to the unfolding of the future, including issues of management and maintenance.
- It considers impacts at varying scales, from the local site to the larger region and beyond.
- It is socially and economically viable.
- It is a process of placemaking, investing spaces with meaning and identity, and enhancing community.
- It reveals rather than disguises ecological processes and human relationships to them.
- It respects all users of a site, not just human beings.

Sustainable design also operates with economy of means. Landscape architect Michael Hough calls this the principle of "doing as little as possible". This implies,

> first, an understanding of the processes that make things work; second, providing the structure that will encourage the development of diverse and relevant natural or social environments; third, knowing where to intervene to create the conditions for them to occur; and fourth, having the humility to let natural diversity evolve on its own where it will. [*Out of Place: Restoring Identity to the Regional Landscape* (New Haven, 1990), 193.]

Finally, sustainable design must be practical and pragmatic, in the words of Hough, "starting where it is easiest":

> Beginning where it's easiest.... has to do with where most people are and where one can be reasonably certain of a measure of success from efforts made, no matter how small. Successes in small things can be used to make connections to other larger and more significant ones. (*Out of Place*, p. 194)

SUSTAINABLE ECONOMIC AND SOCIAL DEVELOPMENT

"Sustainable development" is a contentious concept undergoing a constant process of refinement. For our purposes, it is less important to find the best definition than to focus on the realities which have made defining it a central concern of our time: population growth, urbanization, suburbanization, high energy consumption, reduction in natural habitat, pollution, possible climate change, and growing economic inequality.

> Population densities brought by urbanization are orders of magnitude above those of pre-industrial societies, and they have led to unprecedented densities of energy flows and raw material consumption. This intensive metabolism generates huge volumes of concentrated wastes, and poses unprecedented problems in removing and controlling a growing number of pollutants....Nothing sets modern industrial civilization so much apart from its traditional agricultural predecessors as the huge flows of energies supporting the well-being of an average person. [Vaclav Smil, *Global Ecology: Environmental Change and Social Flexibility* (New York, 1993), 41, 49.]

We depend on distant suppliers for the food, energy, and material goods that we consume, and we have traditionally sent our wastes to marginal and peripheral places. Classical market economics only counts costs and benefits to individuals and institutions. An economic actor has an incentive to make society bear as many of the costs of production as possible, while capturing for himself the majority of the benefits (profits). This is what is meant by externalizing costs.

> Pollution is a prime example of an external cost imposed on society: national output may only be maintained by allowing a certain degree of pollution that detracts from the quality of life. A company will include the private costs of materials, labor, and capital used in producing goods and services, but will not count the social costs of pollution involved. [C. Pass, et al., *The Harper Collins Dictionary of Economics* (New York, 1991), 184-185.]

Sustainable economic development implies the internalization of costs which traditionally have been spread to society as a whole or, even worse, to future generations. The first steps are already being taken towards transforming industrial processes to eliminate the need to dump and bury waste. Engineers are beginning to talk about "design for disassembly [and] recycling":

> Manufacturers of the next century....will need to pay attention to the entire product life cycle, worrying not only about the materials used and created in the course of manufacturing but also about what happens to a product at the end of its life. Will it become a disposal problem, or can it become a source of refined materials and energy? [Robert A. Frosch, "The Industrial Ecology of the 21st Century", *Scientific American* (September 1995), 178.]

Accounting for and reducing all costs is only one part of sustainable development. There is also a social dimension to sustainable development, "the difference between those who travel first-class as opposed to steerage on spaceship earth". [David Pepper, *The Roots of Modern Environmentalism*, (New York, 1989), 175.] The externalized costs of economic life are typically not borne equally by all members of any particular society or by all members of the global society. Wastes often disappear from affluent communities to reappear in "sinks".

> Sinks are places of last resort into which powerful groups in society shunt, shove, dump, and pour whatever or whomever they do not like or cannot use: auto carcasses, garbage, trash, and minority groups....Sinks have one timeless aspect--a topographical awkwardness which makes them uninhabitable or undesirable by current middle-class standards. Sinks are apt to be swampy, low-lying, or otherwise difficult to develop....Many sinks have a bad name going back to nineteenth-century typhoid or malaria epidemics. [Grady Clay, *Close-Up: How to Read the American City* (Chicago, 1973, 1980), 143.]

Sustainability therefore also means the pursuit of a community life which is more economically and socially just:

> It is very important for us to come to an understanding that the psychological relationship that we have to ourselves, to fellow human beings, to nature, and to technology is at the heart of the struggle to create sustainable, socially just cities....There are a lot of parallels between our alienation from nature and our alienation from each other. [Carl Anthony, "Foundations of Environmental Justice," *The Urban Ecologist*, (Fall 1993), 25, 30.]

By itself, design cannot change economic systems or political power, as the failure of so many design utopias of the past, from garden cities to LeCorbusier's "machine for living", attests. But designers can contribute by using their particular expertise to draw attention to the environmental impact of our social and economic practices and to design meaningful places that promote greater economic and social equity.

THE FLOWED MEADOW CHARRETTE AND SUSTAINABILITY

The Flowed Meadow charrette was about waste, abandonment, and reclamation. The charrette area encompassed several landfill sites and one abandoned incinerator site along the border between the cities of Waltham and Newton, MA. Although both cities are densely populated residential suburbs of Boston, residents of Newton are very affluent and those of Waltham are more solidly middle-class, with significant industrial as well as residential areas. The charrette site also included former and present wetlands and bordered the Charles River where the river was permanently flooded nearly a century ago. These sites are monuments to the perception of wetlands as wasted space or lost space. They demonstrate a failed response to the rapid waste production of affluent consumer society, and to the formation of abandoned waste lands.

The charrette teams were asked to give answers to several questions.

- What should happen to, or on, these sites?
- What does it mean to do "sustainable design" for an environment which is already profoundly altered and dependent on human management?
- How should communities understand and take responsibility for their role as producers of waste?

The solutions proposed by the charrette teams may also have broader application. There are approximately 140 active landfills and 460 inactive and closed landfills in Massachusetts alone, and the active landfills will reach their capacity on average in five years. These numbers can be multiplied throughout the country and the world. The charrette process was an opportunity to explore new ways of reclaiming these waste lands, reintegrating them into the human and natural communities and heightening understanding of the relationship between human production of wastes and the natural world.

2 THE CONTEXT

"Wastes are traditionally dumped at the edges of settlement...in areas where the powerless live, where land claims are weak, and where controls are soft....When searching for the public dump or for nuisance industry in any New England town, look first along its boundaries with adjacent towns."

Kevin Lynch- from Wasting Away

THE SOCIAL ENVIRONMENT: HISTORY AT FLOWED MEADOW

The name "Flowed Meadow" is a sign of the long history of human uses of the land and water along the Newton-Waltham border. Understanding that history will help people create a sustainable vision today. "Flowed" lands were created when English settlers and their American descendants built dams on the Charles River to use the power of the water. The charrette sites are adjacent to the largest mill pond created on the Charles, the Lakes District. Over the last two centuries, the widened river and its shallow coves bordered by wetlands have been used by industry, for recreation, and as waste sinks -- dumps and landfills -- while Newton and Waltham have become densely-populated suburbs in metropolitan Boston.

Before European settlement

The history of human uses of the river basin begins long before the nineteenth century. The Charles River emerged about 11,000 years ago as the last glaciers of the Ice Age retreated. It took a meandering course around deposits of glacial till, bedrock, and slowly melting ice, becoming, at 80 miles, the longest river in Massachusetts. Extensive wetlands developed along the river in many locations and mixed forest emerged on the uplands.

Archeological evidence indicates a human presence in Eastern Massachusetts from about 10,000 years ago. By the time of English colonization, Native Americans had been living in the region for millennia and modifying their environment to enhance hunting and agriculture. Fire was the Indians' most powerful environmental tool. They used fire to clear land for villages and fields; to burn underbrush in upland forest, creating park-like edge environments to attract deer and other game; and to clear forest, making meadows for hunting. Indians also built fish weirs of stakes, stones, and clay to catch the alewives, shad, and salmon which came up the river in the spring.

The Creation of the Lakes District and Flowed Meadow

Soon after English settlers arrived, they began modifying the river for their own purposes. By 1640, settlers in Dedham had diverted water from the Charles to the Neponset at the "Mother Brook" in order to increase the flow for mills. This diversion of water also drained some of the wet meadows downstream along the Charles. By the eighteenth century many small private dams had been built on the river.

The advent of industry transformed the river when the Boston Manufacturing Company raised an existing dam at Moody Street in 1814 to power the first integrated textile factory in the country. The river powered the looms and the factory included both spinning of thread and weaving of cloth. Before raising the dam, the company had to acquire "flowage rights" from the upstream property-owners. About 200 acres in all were flowed, some submerged to create the coves of the Lakes District and another 40 to 50 acres of pasture partially inundated to create the flowed meadows of our Charrette sites.

The Nineteenth Century: The Oldest Suburbs and the Canoeing Craze

In the early nineteenth century Newton and Waltham were sparsely settled with small villages, outlying farms, and a few mills along the river. The arrival of the "Newton Special" in 1843 -- passenger service to downtown Boston -- began the transformation of Newton into a residential suburb. An 1848 map of Newton shows houses clustered in villages, of which West Newton and Auburndale are closest to the charrette sites. Both Cram's Cove and Purgatory Cove were larger than today, separated by "Morse's Island," the present Riverview Avenue peninsula. The coves flow without a defined boundary into a large area of wetland meadows. No houses are shown near these coves or meadows, and only one house is shown anywhere near the river in this area, about 300 feet from the end of Ware's Cove.

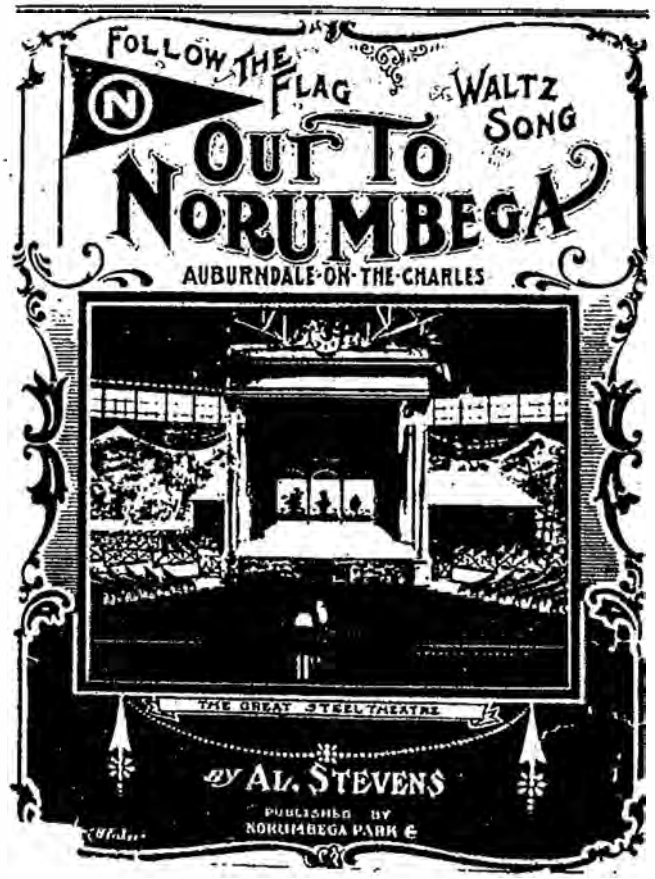
Newton's population was 3,351 in 1846, when the train service was still new, but the attractions of suburban living appealed both to prosperous businessmen and the less affluent, so that by the late 1860s nearly 12,000 people lived in the town. Soon the Lakes District became a favorite recreation spot. Auburndale residents started a tradition of Fourth of July celebrations on the river. Boat clubs sprang up and an annual autumn parade of decorated boats passed by illuminated houses, fireworks, and band music along the shore. By the 1890s, when Newton had a population of over 24,000, a champion canoe racing club was established in Auburndale and some five thousand canoes were moored in the Lakes District.

Waltham was a smaller city, with an 1890 population of some 19,000, and it had a more industrial character than Newton. However, substantial homes were built on Crescent Street, along the Charles, and northern Riverview Avenue. The present Riverview Avenue peninsula was still an island then, and there were plans to build cottages on the entire island. There was a bandstand at Forest Grove and a bridge to small Fox Island in the middle of the river. The Waltham Boat and Canoe Company had a large boathouse on the east side of Cram's Cove (also called Nightcap Cove). At the end of Cram's Cove was Packard's Cove, where the incinerator and part of the present Woerd Avenue landfill site now exist. In winter, the coves were used for skating and ice was harvested from the shallow frozen coves and stored in straw in ice houses.

City-dwellers' craving for outdoor recreation in the maturing industrial cities of the late nineteenth and early twentieth centuries resulted in the public parks movement. Olmsted designed the Emerald Necklace.

The Charles near the Charrette site at the turn of the century.

The Metropolitan Parks Commission (soon to be the MDC) was founded and a study of the Charles River recommended public control of the river banks for public health and recreational purposes. At the turn of the century, the Lakes District was one of the most important recreational areas in the Boston area. Norumbega Park opened in 1897 at the present site of the Marriott Hotel. It was an amusement park offering canoeing, picnicking, an outdoor theater, a restaurant, a zoo, a carousel, a penny arcade, and other attractions. Patrons came by trolley from Boston and suburban stations, and by canoe from up and down the river.



Sheet music cover.

Twentieth Century Transformations

Norumbega Park was successful through the 1930s and 40s by converting its theater into the Totem Pole Ballroom, where swing bands and popular vocalists, such as Benny Goodman and Frank Sinatra, entertained the crowds. But cars, new suburbs, and rock and roll brought another transformation of habits and attitudes. The public park movement receded in the 1920s, and private cars offered people more choices for recreation. Norumbega and the Totem Pole closed in the early 1960s.

At the turn of the century there was much more water in the Charrette area than there is today. The Riverview Avenue peninsula was an island connected to the mainland by Rumford Avenue and Woerd Avenue. The peninsula is still called "The Island" in Waltham. The waters of Packard's Cove reached almost to Lexington Street, and Purgatory Cove flowed into a large wetland encompassing the present Rumford Avenue landfill, which was connected by Brunnen Brook (now in a culvert) to another wetland on the present site of the Burr School and the old Pine Street dump. As the shallow man-made coves and wetlands suffered the effects of sedimentation, the main current of the river increasingly passed them by and their waters became more stagnant. Some 4000 cases of malaria were reported in Newton between 1890 and 1894, and over 400 in Waltham in the same period. This is part of the reason why wetlands, which we now recognize as essential to environmental survival, were for long seen as wastelands best filled in. The first wetlands in the charrette area to be filled in were Packard's Cove, the lower end of Cram's Cove, and the Pine Street wetland.

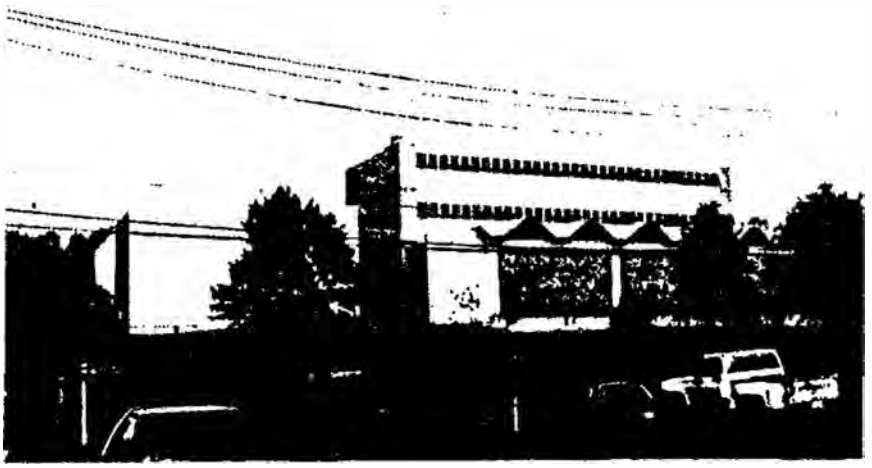
The boathouse on Cram's Cove burned down in 1912 and soon after, a small dump for coal ashes (from home heating furnaces) was started in Packard's Cove. As early as the 1920s, the City of Waltham promised that the dump would be transformed into a playground and park, but only the Moody Street playground, abutting the dump, was built in 1933. In 1935, some 35,000 tons of ashes were being dumped there annually, along with old cars. By 1937 Packard's Cove was filled all the way to Rumford Avenue. The Pine Street wetland in Newton, part or all of which had been a gravel pit, was also filled in gradually during the first half of this century, though wetlands remained on the Burr School site.

By the 1920s and 1930s, the residential areas surrounding the coves and wetlands were middle- and working-class communities. Immigrant families moved into the area, which was still semi-rural, with barns behind the older houses. Multi-family and small single-family houses were built. The lower part of the Waltham island was occupied by a variety of industries: factories making bicycles, fireworks, asphalt.

Woerd Avenue and Rumford Avenue became major dumps only in the late 1950s and early 1960s. The population grew and other city dumps were closed down with postwar suburban expansion. A fenced playground was tenuously established at the top of the Woerd Avenue dump in 1952 while dumping still continued around it, but in 1958 rubbish was pushed over the fence and the playground obliterated. Between 1958 and 1975 the Woerd Avenue dump grew by 40 feet. A lifelong resident believes that no organic, industrial, or incinerator waste was ever dumped there, but other sources mention incinerator ash. Car tires continually rise to the surface and there is evidence of roofing and telephone poles. The landfill was capped in 1975.

The Rumford Avenue site was a wetland until 1961. By 1970, the Burr School wetland had been filled for the creation of the school playing fields and the Rumford Avenue dump had filled in half of the large wetland from the avenue to the west and it was 10 to 20 feet higher in elevation. Ten years later, portions of the landfill had risen 40 feet above its original level. In the early 1970s the Rumford fill was still operated as a traditional dump rather than a sanitary landfill. Because the surface was not regularly covered, vermin from the dump were infesting the neighborhood. Leachate into Purgatory Cove from both Rumford and Pine Street was also a concern and the underground pipes were sealed.

The City of Newton hoped to solve its solid waste disposal problems with the construction of an incinerator in 1966 that was supposed to last for twenty years. The incinerator was in operation between 1967 and 1975. It never functioned effectively, with one burner out of the two often out of service. The incinerator failed to meet air quality standards and water from precipitator tanks contaminated a small stream on the site, which was the last remnant of Packard's Cove and is now culverted, sending pollutants into Cram's Cove. The incinerator residue was dumped in the Rumford Avenue landfill.



Newton's abandoned incinerator building.

The relationship of the surrounding community to the landfills and incinerator has its complexities. Children and adolescents are drawn to the abandoned sites, which are urban wilds in an otherwise very controlled environment. One resident who grew up and still lives near the Woerd Avenue site says that as a child in the 40s, he and his friends spent hours playing at the dump. The abandoned incinerator, though much more dangerous, exercises the same fascination today.

In general, however, resident concern about the sites has waxed and waned. The relatively high proportion of renters, generally a more transient population, in the area immediately surrounding the sites has made it more difficult for neighborhood activists to organize the community around this issue. With the rise of the environmental movement in the 1970s, however, residents were active in the effort to improve water quality in the coves and close the incinerator. They also complained about roaches and rats from the Rumford Avenue dump, forcing the city to seal 15 acres of the dump with two feet of sandy loam. The landfill stopped receiving new rubbish in the 1970's and is now operated as a municipal compost facility, recycling depot, and DPW staging area.

The economic and demographic transformation of the 1980s and early 1990s also affected the neighborhoods. The cost of modest single family homes in Newton skyrocketed, while the South Waltham neighborhood near Moody and Crescent Streets has become the home of many new low- and moderate-income immigrant families. Densely populated South Waltham is underserved in terms of open space, recreation facilities, and access to the river.

Newton now sends its waste to a huge incinerator in Millbury, MA, a former mill town in the Blackstone River Valley which is much less affluent than Newton. It could be argued that Newton has therefore successfully externalized disposal of its non-recyclable waste. It is the people of Millbury who contend with the garbage trucks from Newton and elsewhere lumbering down Route 20, and who see the incinerator chimney rising high over their town.

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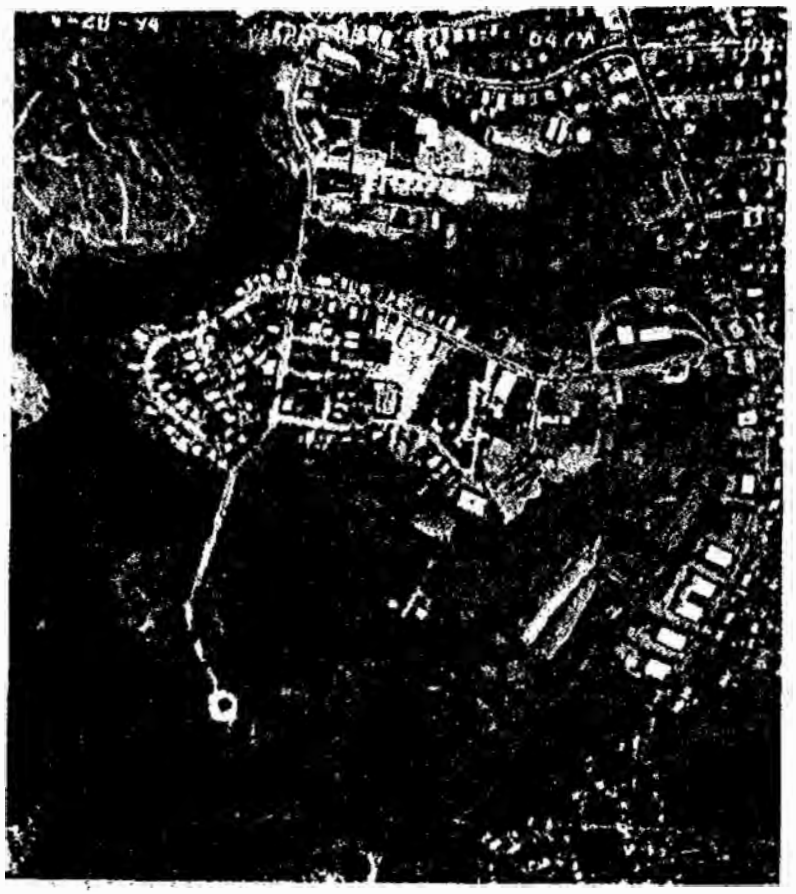
NATURAL ENVIRONMENT



Aerial view of Flowed Meadow neighborhood.

Several significant natural factors should be considered in exploring sustainable treatment of this highly disturbed area. This is a brief summary of very complex conditions caused by decades of human manipulation of the land and water. More detailed information in available technical reports should be consulted in developing action plans.

Regional Context

The area of interest in this study covers a crescent of the Charles River basin at the border of the cities of Waltham and Newton, including wetlands which were created by the damming of the River. The Charles River meanders 80 miles, through 21 towns, draining a 300-square-mile watershed which includes 33 lakes and ponds and seven major tributaries. The slope of the river and flood plain is very gradual, resulting in wide flood plains, wetlands, and meander belts.

The river has been heavily used for industry and waste disposal, and has suffered severe pollution; recent clean-up efforts have made recreational uses more feasible, and the Friends of the Charles River has performed important advocacy functions to promote restoration.

Climate

Climatic conditions are variable, with frequent flooding, drought, temperature swings and high winds. Rainfall is between 40" and 50" annually, with record highs in the 60"'s and lows in the 30"'s. Temperature extremes can range from 100 degrees in summer to 20 degrees below zero in winter; mean monthly range is 67-72 in summer and 25-29 in winter. Frequent storms arise from the west and southwest, and occasional storms of tropical origin, traveling up the Atlantic Coast, caused severe flooding of the Charles in the past, leading to the construction of the current pumping station at the mouth of the inner harbor to control flood levels. Flooding danger upstream increases as urbanization covers flood plains with impervious surfacing.

Geology

The area has experienced heavy glacial activity. A layer of glacial till overlies the conglomerate and slate bedrocks of the Boston Basin. Superficial till deposits have influenced the course of the river, with resistant till and rock outcrops creating points of deflection for meanders. The mechanical processes of soil and topography formation by glaciation result in variable conditions of soil slope, permeability, and depth to bedrock and to water table.

Soils

This is an area of stratified sands and gravels, with minor amounts of silts and clay deposited by glacial meltwaters. Alluvium deposits of finer materials lie deep along the river as well. The area of Flowed Meadow was mapped as a swamp of muck (black organic material with plant fibers and silt) and peat, whose stability qualities are entirely different from those of sands and gravels. Around the Waltham Woerd Landfill, glacial till includes a compact and generally impervious mixture of clay, silt, gravel, cobbles, and boulders. Because of the variability, the Soils Conservation Service mapping of specific soils and such characteristics as depth, drainage and erosion hazard should be consulted for specific areas when considering siting of construction, land uses, plantings, and circulation and access.

Slopes

Slopes vary greatly along the river edge as well as at the numerous landfill sites in the area. The slope map should be consulted to consider building feasibility and erosion hazard for specific areas of interest, as well as to site water use facilities and access and circulation routes.

Topography

Because of discontinuity in land-making processes, both by natural and human forces, current elevations vary dramatically along the wetland crescent. The topographic map should be consulted to consider such elements as circulation, views, shadow patterns, landmarks.

Hydrology

Water is the key natural feature of this area; protection and use of water and wetland resources will be major considerations in any strategy promoting sustainability in the Flowed Meadow neighborhood.

Ground water in the area around the landfills generally discharges towards the Charles, much of it flowing into Purgatory Cove. Surface water drainage from the landfills, based on existing ground surface topography, flows into Purgatory Cove or Flowed Meadow and eventually into the Charles River and its flood plains. Local hydrology is affected by the elevation of the Flowed Meadow flood plain, which is outlet-controlled by a pump station used for flood and mosquito control. A 60 inch diameter drain pipe drains Brunnen Brook under the Pine Street fill, the Burr School fill billfolds, and the Rumford fill; the pipe is now broken within the latter fill, and may be rerouted around the mound's west side into Purgatory Cove.

Domestic water is municipally supplied; wells are no longer in use to avoid any contamination danger. However, according to a 1990 study, "the quality of the surface water from Purgatory Cove indicates that landfill leachate has had minimal impact on the water in the Cove. ...It is possible that the surface water in Flowed Meadow may be impacted by leachate discharging directly into the wetlands from the western slope of the landfill rather than the discharge of contaminated ground water,"

indicating that capping would ameliorate this impact. Reports indicate that contamination in ground water has been coming from a drain pipe discharging from the Landfill, and from the broken Brunnen Brook drain line that carries surface water from a catch basin between the landfill and the industrial area on Riverview Avenue. More detailed information is available in technical reports.

Wetlands in flood plains serve crucial functions; they protect the uplands from flooding by absorbing water, and protect water quality in the river by filtering sediments and contaminants. Wetlands have been mistreated for many years; misunderstood as an untidy miasma of disease vectors, marshes and swamps (the latter contain trees) have been drained and filled, either for development or waste disposal, destroying both their protective capacities and their very rich plant and animal habitat. Literature is available describing natural wetlands as well as efforts to restore or create wetlands as mitigation for destruction, as current laws require.

Vegetation

Natural vegetation is primarily deciduous tree cover of various oaks, hickories, red maple and birch, with hemlock and white pine softwoods. Planting must especially respect drainage conditions and slope. Much of the area's vegetation is disturbed by fill washout and industrial uses. Purgatory Cove, itself a wetland until its exchange with the river was obstructed by the replacement of an open bridge by a culverted embankment, is overgrown with aquatic plants, such as water chestnuts, supported by excessive organic contaminants (this is called eutrophication).

Wildlife

The Natural Heritage Program lists no rare, threatened or endangered species of fish or wildlife. However, wetland, grassland and forest habitats can sustain rich biodiversity, and restoration of the natural ecology of the area will result in a more varied and healthy wildlife balance.

Scenic Resources

The Charles River Lakes Area (Forest Grove, Mount Feake Cemetery, Maple Cove, Sandy Hook, and Purgatory Cove) is considered one of the most scenic areas in the entire river corridor. Restoration of its environmental health would make this an important scenic and recreational asset to the towns.

Landfill Contents

Since the early 1960's, these lowland/wetland landfills have received various types of refuse, which are not precisely documented. Included are municipal solid waste, incinerator ash, industrial wastes and inert DPW materials, from different times. There is probably no liner or barrier to ground water in any of the fills. Plans for materials recovery will require specific research, from available reports and interviews with City officials, on landfill contents and depth of various layers.

Land Ownership

Landowners of parcels in the vicinity include the State, the Cities, and private corporations and individuals. Ownership, Zoning, and Conservation mapping should be consulted when formulating action plans, to plan land assembly and to recognize various applicable protective and zoning regulations.

SOURCES:

City of Waltham Planning Department. *Open Space and Recreation Plan.* 1994 Update.

Waltham Conservation Commission. *The Charles River, Waltham.* Wacker & Associates, 1974.

City of Newton, by Camp, Dresser & McKee, Inc. *Initial Site Assessment of Rumford Avenue Landfill.* April 1994.

City of Newton, by Camp, Dresser & McKee, Inc. *Revised Operations and Post-Closure Use Plan, Rumford Avenue Landfill.* March 1994.

City of Newton, by Camp, Dresser & McKee, Inc. *Preliminary Investigations at Pine Street Landfill Site and Burr School.* December 1994, Vols. I & II.

3 THE CHARRETTE PROCESS

"...When you build a thing you cannot merely build that thing in isolation, but must also repair the world about it... and the thing which you make takes its place in the web of nature."

Christopher Alexander - from A Pattern Language

The Flowed Meadow charrette was an exercise in designing for stewardship, or, more technically, human habitat management. An entire constellation of environmental and sustainability issues emerged from the practical consideration of these sites:

- The functioning of both the built and "natural" environment in this area is very much dependent on human intentions, actions, and vigilance.
- Waste disposal areas have traditionally been sited near town borders and in wetlands, as here.
- Waste disposal areas have traditionally been sited in the poorer parts of town, which, relatively speaking, was the case with these sites.
- If the waste produced in these communities is no longer stored there, it must be sent somewhere else, to other communities willing to accept it (or unable to refuse it) for financial reasons.

SCOPE

The physical limits of the area considered by charrette teams is somewhat amorphous and wide ranging. North to south the area measures roughly three quarters of a mile and it is over a mile east to west. The site straddles the Newton/Waltham town line, as well as the Charles River. It is at the heart of what is referred to as the "Lakes District" of the river.

The site includes the following five focal areas that are of special interest, because they have been or are currently being used for waste disposal

A. Rumford Avenue Incinerator, Newton
B. Rumford Avenue Landfill, Newton
C. Pine Street Landfill, Newton
D. Woerd Street Landfill, Waltham
E. Sawyer Road Landfill, Waltham

The charrette provided an opportunity to consider how the reuse of these sites might be part of a unified plan to contribute to the fabric of the Flowed Meadow Neighborhood.

TEAMS

There were five multi-disciplinary design teams, each with 8 to 10 members. Team members had a complementary mix of skills and knowledge. Roving experts were available during the course of the weekend to provide advice and feedback to each of the teams. An electronic link with experts at other charrette sites around the country was also available.

PROGRAM

There was no prescribed program requiring specific uses of the land or provisions for particular functions. Instead, participants were responsible for conceptualizing appropriate programs and solutions. The following questions were used by the charrette teams to help guide the design process.

A. How does the design consider the context at different levels of scale? Watershed? Municipality? Neighborhood? Different ecological niches that comprise the site?
B. Is the design economically self-sustaining? How will the design have to be maintained and managed in the future, and who will have responsibility for these tasks and their costs?
C. How does the design affect the flow and quality of water -- on the sites, off the sites, into streams and coves, into the Charles River watershed?
D. How does the design promote natural plant diversity and succession -- aquatic, wetland, and upland?
E. How does the design affect wildlife of all kinds?
F. How does the design reuse or recycle existing waste or waste produced by implementation of the design itself?
G. Are renewable sources of energy being used? Are they being used efficiently?
H. Has change over time been considered? Will it adapt and age gracefully?
I. How does the design serve the needs of the neighborhood and enhance local community?
J. How is the design usable in all seasons -- to humans and non-humans?
K. How does the design serve the needs of the larger community?
L. How does the design incorporate history?
M. How does the design demonstrate stewardship?

4 DESIGN AND DEVELOPMENT GUIDELINES

Our understanding of the practice of sustainable design and development is constantly evolving. The complexity and subtlety of the process are what make it such a challenging, yet rich and fascinating endeavor. The process cannot be reduced to a series of prescribed steps, nor can the current thinking on the subject be summarized in a set of rules of thumb.

For the purpose of a charrette, however, participants had to have some shared assumptions to serve as a foundation for the group process. The following design and development guidelines were offered to help provide grounding and focus for the design exploration.

GREENWAYS

A greenway is a linear open space established along a natural corridor, such as a river or ridgeline, or man made right-of-way, such as an old railroad bed. A type of greenway that may be appropriate for the charrette site is one that serves as an open space connector linking nature reserves, recreational areas, or cultural features. The following design guidelines for greenways, that have the twin goals of providing recreational opportunities and preserving nature, were suggested by Daniel S. Smith and Paul Cawood Hellmund in their book Ecology of Greenways. (1993, pp. 120-121.)

- Select places for recreation that offer settings and recreational opportunities that are scarce in the surrounding region so that unique recreational areas are protected.
- Design networks of greenways so that there are opportunities for both short and extended recreational visits.
- Set boundaries so that greenways are wide enough to provide both high-impact corridors of concentrated recreational use.... and zones that are virtually undisturbed. This action will provide a balance between recreational opportunities and nature preservation by separating the potentially conflicting uses.
- Locate and design facilities (trails, access points, picnic areas, visitor centers, etc.) to enhance recreational experiences as well as minimize environmental impact.
- Establish a system of zones - based on the capability of the landscape - that allows certain activities only in designated zones. The zones will provide a diversity of recreational activities while separating particularly destructive types of recreation from sensitive areas.
- Design spur trails off of primary trails to provide access to ecologically sensitive areas, rather than through or along a sensitive area.
- Locate centers of activity, such as parking lots, picnic areas, and visitor centers, at the edge or outside of a greenway. Locate them in environments that are common in the area and durable.

LAND ADJACENT TO A RIVER OR WETLAND

Rivers and wetlands are protected by the Massachusetts Wetlands Protection Act, which is administered on the state level by the Department of Environmental Protection and on the local level by the municipal Conservation Commission. The areas of interest protected in the Act are flood control, storm damage, prevention of pollution, marine fisheries, ground water, public or private water supply, and wildlife habitat. The legislation regulates activities that involve filling, dredging, excavating or altering in or near a wetland or water body. Thus, virtually any construction activity involving site preparation (such as the paving of surfaces or the erection of a small structure) that is within 100-feet of a wetland or river must be reviewed and approved. Even alterations to the landscape such as the removal of trees or bushes, vista pruning, or the changing of land contours that could affect nearby wetlands or water bodies are of concern. Projects involving filling or dredging within wetland areas are also regulated on the federal level by the Army Corps of Engineers

Activities are not specifically prohibited within wetlands, rivers, and their buffer zones. If a development project conforms to prescribed environmental criteria, it may be permitted. These criteria are established as performance standards in the wetland regulations in order to define specific requirements and restrictions for projects proposed within wetland resource areas. The particular resource areas that exist within the Flowed Meadow project area are identified below, along with a summary of the corresponding performance standards.

Vegetated Wetlands (wet meadows, marshes, swamps and bogs)

- Proposed work that would result in the loss of up to 5000 square feet of wetland may be permitted as long as it is replaced with a wetland area that will function in a manner similar to the area that is lost.
- Work that would result in the loss of up to 500 square feet of wetland may be permitted if the proponent demonstrates that it is not reasonable to scale down or otherwise redesign the project so that no wetland area is lost.

Land Under Water Bodies and Waterways (under any creek, river, stream, pond, or lake)
Proposed work within this category of wetland area must not impair the wetland functions. The functions include:

- Water carrying capacity within a defined channel
- Maintenance of ground and surface water quality
- Capacity of the wetland to provide important fisheries and wildlife habitat

Land Subject to Flooding (bordering and isolated areas)

- Proposed work within *bordering land subject to flooding* shall provide compensatory flood storage. Therefore, filling within this category of resource area must be balanced by excavating another area that would maintain the existing flood storage capacity.
- Proposed work within isolated land subject to flooding shall not cause a displacement of flood water and shall not adversely effect public or private water supply or ground water supply.
- The capacity of the above resource areas to provide wildlife habitat shall not be impaired by the proposed work.

Banks (natural banks and beaches)

- Proposed work along a bank shall not impair its physical stability, the water carrying capacity of the existing channel, or the capacity of the resource area to provide fisheries and wildlife habitat.

LANDFILLS

There are four major technical problems to be considered when planning to reuse a landfill site. Although the importance of these depends on the particular site, a developer must assess methane gas generation, leachates, hazardous wastes, and differential settlement. As a rule, it is not recommended that buildings be constructed on former landfills. Only in extenuating circumstances and with proper precautions should such a reuse be considered.

Methane Gas Generation
Methane gas is generated as a product of anaerobic organic decomposition in landfills. The gas has a foul odor and can stunt or kill vegetation. If it accumulates, it can asphyxiate animals or even cause explosions. For these reasons, methane gas must be controlled in the following ways.

- An impervious surface can be placed over landfills to control where the gas is emitted
- Passive or active gas venting mechanisms must be installed
- For any building, a gas monitoring/correction system should be installed

Leachates
Water passing through a landfill can leach out chemical and biological decomposition products. These leachates can contaminate ground water, as well as adjacent wetlands or waterways. The following precautions should be taken to minimize the production of leachates.

- An impervious surface can be placed over landfills to control surface water infiltration
- The area should be graded for drainage of surface water while controlling erosion
- Planting of vegetation increases evapotranspiration and stabilizes slopes for erosion control

Differential Settlement
Due to waste decomposition and superimposed loads, differential settlement of the landfill surface can occur. Settlement of this nature can wreak havoc with buildings and infrastructure. The result can be buckling of pavement, cracking of foundations, collapse of buildings, and breaking of utility lines. When differential settlement may jeopardize a project, the following measures should be considered.

- The landfill can be compacted
- Wastes that are likely to settle can be segregated or removed
- A thick cover material can be applied to the top of the landfill
- An appropriate reuse can be selected
- Buildings can be engineered to prevent damage

Hazardous Wastes
Hazardous wastes that are toxic to plants and animals and corrosive to building materials may be buried in a landfill. If there is evidence that harmful materials are present, there are several alternatives.

- An impervious liner can be placed over landfills
- An appropriate reuse of the site can be selected
- The hazardous materials can be removed from the site

ABANDONED INCINERATOR BUILDINGS AND SITES

Determining an appropriate future use of an abandoned incinerator building must consider the physical characteristics and condition of the building, as well as applicable building codes and zoning regulations.
The proposed use of the building must also consider the potential for residual contamination resulting from the previous incineration operation. Sources of contamination may have included storage of waste materials and the combustion process itself. This process generates a residue due to incomplete combustion that may contain toxic compounds. If the incinerator burner was fueled by oil, then there may be an abandoned underground storage tank that is a potential source of subsurface contamination.

The above issues must be addressed at some point regardless of whether the building is used in the future. The level of contamination and the extent of remediation that may be required will impact the feasibility of reusing the building.

SOURCES:

Greenways
Daniel S. Smith and Paul Cawood Hellmund. *Ecology of Greenways*.. Minneapolis, 1993.
Landfills
The Council. *Refuse to Reuse*. 1982.
Rivers and Wetlands
City of Dartmouth Conservation Commission. *A Guide to the Wetland Protection Act.*
Department of Environmental Quality Engineering. *310 CMR 10.00 Wetlands Protection.* 1989.

5 CHARRETTE TEAM PROPOSALS

The Flowed Meadow charrette teams produced five distinct proposals for the charrette area. However, similar principles and concepts emerged in all five proposals from the characteristics of the site itself, the theme of sustainability, and the teams' understanding of community preferences for the site.

- *Community Action, Education, and Understanding.* All the proposals are based on the idea that sustainability depends on community responsibility for the environment. Whether through an action group organized to implement and maintain the plan, locally-based nature education, research activities, new public regulation of nonpoint pollution, or new pubic agencies, all the proposals envisioned direct community participation in creating a sustainable Flowed Meadow area.

- *Wetland Restoration and Maintenance of Environmental Health and Diversity.* Restoration of wetlands and improvement of water quality is central to all the proposals. Recognizing that the Lakes Region was created by human activities, the charrette teams saw restoration of the wetlands as a sustainable way to improve water quality in the coves and the river itself and reverse the trend towards loss of biodiversity resulting from invasive species. All the plans include extensive natural area, both wetland and upland, to provide a variety of habitats for plants and animals.

- *Mixed Land Use.* All the teams valued the current diversity of land uses in the area: single family to multi-family residences, light industry, commerce, and recreation. the plans propose enhancing this diversity with additional high-density housing, retaining the light industry sector (with the hope that it would focus on ecologically sustainable production), or transforming the Lexington Street corridor into a mixed commercial/residential street.

- *Sustainable Economic Production and Waste Management.* Mush of the Flowed Meadow area during this century was designated a dumping ground. All the teams envisioned more sustainable economic production that could use, but not use up, the resources on this site. Suggestions include landfill mining, materials recovery facilities, a native plant nursery, aquaculture, and urban farming.

- *Municipal Use.* The Newton Department of Public Works currently uses part of the Rumford Avenue landfill for composting, materials storage, and a recycling depot. Every town or city needs to find space somewhere for these activities. In the future these needs are more likely to increase than decrease. Most of the teams, therefore, explicitly set aside space for Public Works to use for composting and materials storage, while suggesting other facilities for recycling.

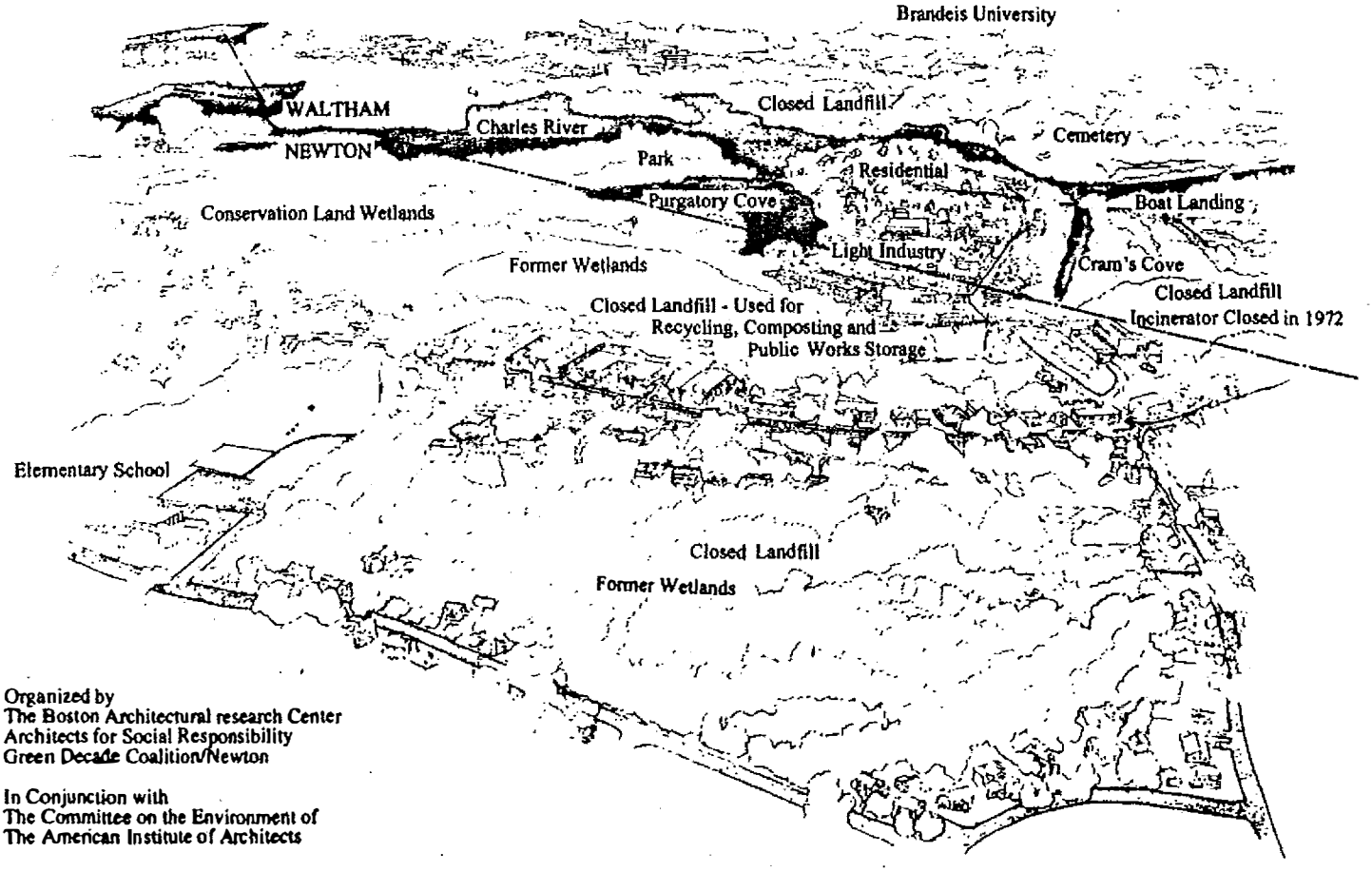
- *Recreation.* The recreational importance of this region is well established. In all of the proposals the Flowed Meadow area reconnects with the green corridor along the Charles River, providing nature based recreation.

Each of the five teams offers different alternatives for use of the landfills and incinerator site, location of new activities, and implementation stages. In all proposals the goal is to envision a transformation of this landscape of waste into a landscape of healthy environmental reproduction, sustainable economic production, and community stewardship.

FLOWED MEADOW NEIGHBORHOOD

Environmental Design Charrette - Newton & Waltham, Massachusetts

The *Flowed Meadow Charrette* is about waste, abandonment, and reclamation in a landscape profoundly altered by humans. The study area encompasses several landfill sites and one abandoned incinerator in the Charles River Basin along the border of the cities of Newton and Waltham in the metropolitan Boston area. The "flowed meadows," coves, and broad river in this area were created in 1814 by a dam downstream. These lands are the last major green spaces along the river before it meets the densely urbanized shores closer to Boston. Existing conservation and recreation lands are part of a proposed green river corridor.



Organized by
The Boston Architectural research Center
Architects for Social Responsibility
Green Decade Coalition/Newton

In Conjunction with
The Committee on the Environment of
The American Institute of Architects

Environmental and Social Context

Social Landscape:

- history of farming, industry, boathouses and canoeing, fishing, skating
- existing mixed land uses - single and multifamily residential, light industry, commercial, recreation and open space
- community desires environmental clean up, dismantling of incinerator, and recreational uses of land
- Newton Public Works Dept. desires continued use of a portion of one landfill for recycling, composting, and materials stockpiling
- recent improvements in river water quality and recreation use

Solid Waste Issues:

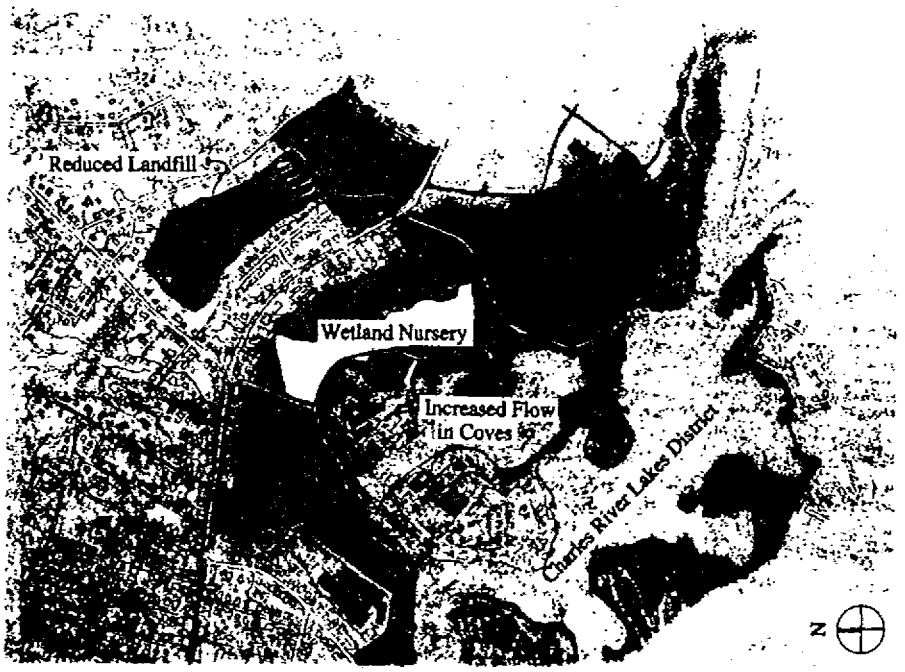
- no impermeable liners for landfills
- known and potential soil contamination
- known and potential ground and surface water contamination
- potential for differential settling of landfills
- methane generation must be monitored and vented
- potential recoverable resources

Natural Features:

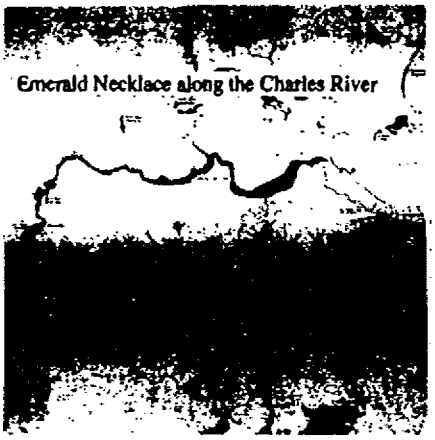
- shallow coves and wetlands
- invasive vegetation (phragmites, purple loosestrife, water chestnuts)
- wildlife habitat (including 4 species of heron)
- nutrient-loading (eutrophication) of coves resulting from urban land use practices

FLOWED MEADOW NEIGHBORHOOD

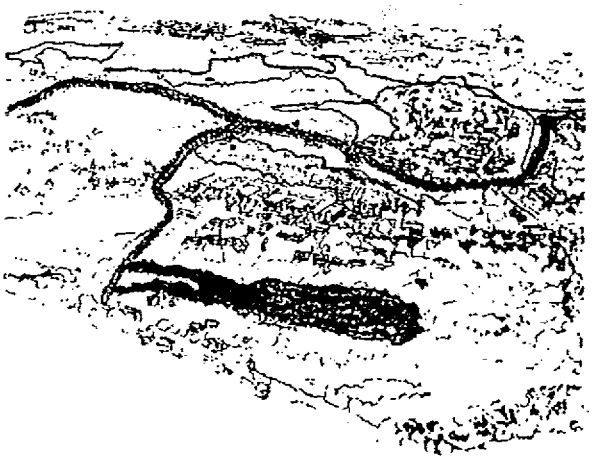
Environmental Design Charrette - Newton & Waltham, Massachusetts



Twenty-Five Year Proposed Plan of Local Conditions and Landfills



View of Environmental Center for Research (Former Incinerator Building)



Urban Greenway along the Charles River

View of Wetland Plants in Nursery

View of Coves

Detail of Improved Riparian Edge

Riparian Emerald Necklace

To connect important natural amenities to distressed neighborhoods, educational institutions, and vital surrounding communities, we propose an emerald necklace along the length of the Charles River. This urban greenway will include public parks, former landfills, and wetland farms to forge an ecological and cultural identity that includes disparate communities and fosters an understanding of the interdependence of economic and ecological processes.

The Charles River and existing undeveloped land will link the health of one community to the health of another. Through this mutual recognition of interdependence, a cross-jurisdictional decision-making process can facilitate constructive planning and promote development.

5 year plan
Establish "Cross-jurisdictional Lakes District Citizen's Advisory Commission to develop future framework.
Combine education and economic incentives to make public aware of their own waste.
Every school playground in Newton and Waltham will have a composting area managed by children.
Link education to sites surrounding schools.
Determine green space opportunities along the Charles for recreation and protected open space.
Reduce waste and pollution by changing values.

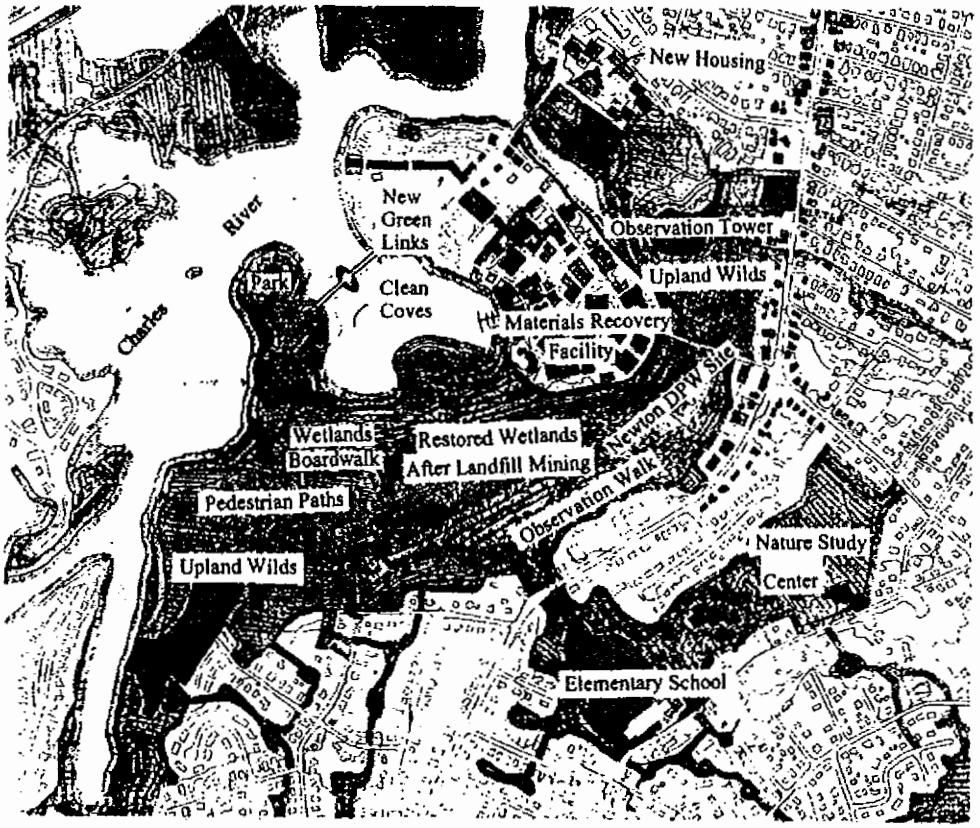
25 year plan
Prepare landfills as resources for wetlands nursery.
Use incinerator building as arboretum and educational resource modeled after the Mass Audubon Sanctuary.
Reduce diversion of the Charles River at the Mother Brook and increase flow in coves.

100 year plan
Rumford landfill becomes community gardens.
Incinerator building continues as educational resource.
Reduce Pine Street landfill and use to grow local food.
Morse Island develops as an eco-commercial park, as an aqua-cultural farm, and as a research center for ecological harvesting.
Provide links along riparian corridor.
Make the water of the Charles River potable.

Team Members
Glenn Allen
Gloria Champion
Michael Chin
Jeremy Liu
Jay Lee
Matt Miller
Karen Nelson

FLOWED MEADOW NEIGHBORHOOD

Environmental Design Charrette - Newton & Waltham, Massachusetts



The 100-Year Plan

Features:

- Landfill Mining
- Restored Wetlands
- Cove Improvements
- Nature Education
- Legal Protection
- Continued Mixed Land Use
- Community-Based Restoration and Recycling
- Visual Access from High Points

Restoration Activities:

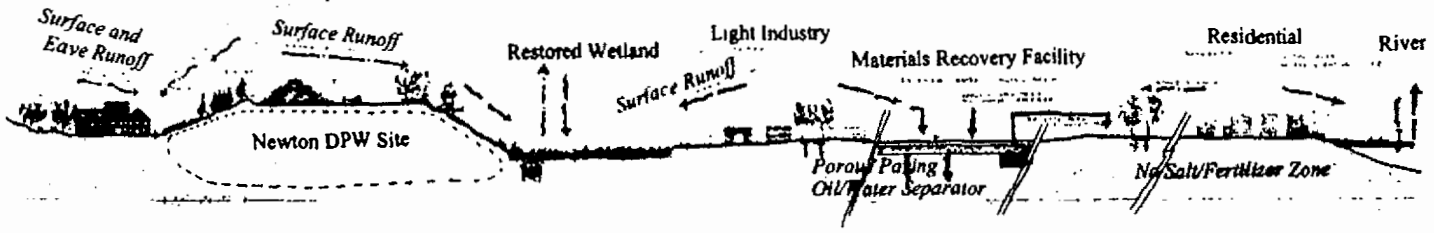
Promotion of Biodiversity

- Planting of Native Species
- Removal of Invasive Exotics
- Linkage of Varied Ecological Zones
- Expanded Wildlife Habitat

Water Quality Improvement

- Restoration of Wetlands Water Filtration Functions
- Elimination of Point Pollution

Wet Meadow Water Filtration



Bringing Back the Meadow *Community-Based Ecological Restoration*

The preservation and enhancement of the last major urban wilds downstream on the Charles River is the most urgent task at Flowed Meadow. A century from now this area can be a permanently protected green corridor whose healthy ecological processes have been restored and are maintained by the residents and businesses of Newton and Waltham.

The process requires landfill mining, the dismantling and recycling of the abandoned incinerator, establishment of a materials recovery facility for businesses and consumers, creation of a nature study center near the elementary school, restoration of the wetlands, and linkage of the upland and lowland green corridor by paths, observation points, boardwalks and boat landings. At the same time, the area can continue to provide space for Newton's composting and public works needs.

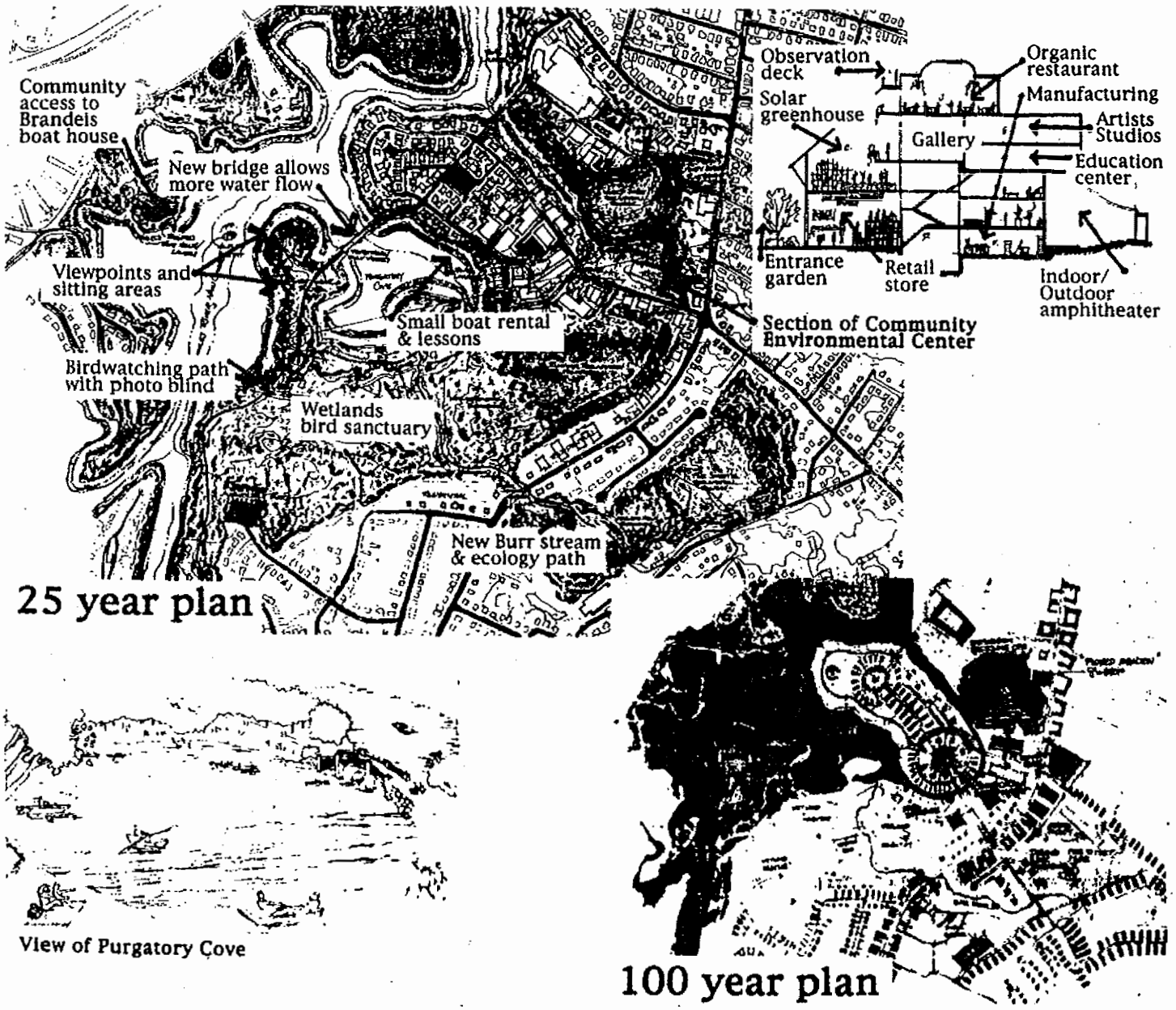
Early steps towards the 100-year vision include a complete environmental assessment of all sites, a landfill mining pilot project, enlargement of culverts at the coves, public education on nonpoint pollution, and acquisition of two parcels of land.

A strong organization composed of citizens from both Newton and Waltham is essential for successful ecosystem restoration and management. Neighborhood stewardship can "bring back the meadow."

Team Members:
Bill Boehm
Larissa Brown
Cynthia Campisano
Heather Heimarck
Paul Leveille
Ellen Levine
Miguel Linera
Jon Seward
Kevin Smith

FLOWED MEADOW NEIGHBORHOOD

Environmental Design Charrette - Newton & Waltham, Massachusetts



View of Purgatory Cove

Waste & Water: *Integration in the Lakes District*

The process of healing the Flowed Meadow Community must go beyond curing the soil, water and wildlife. An enhanced sense of pride in the place must be restored in order for this community to be sustainable.

The opportunities are:

- Creating green links between what are now disconnected waterways and land areas.
- Connecting coves and widening their outlets to the river to begin the healing of the waters
- Enhancing interaction with land and water to renew a cultural relationship to nature.
- Harnessing local energy: solar, wind, methane, & plants for electricity, heat, and purification.

Charrette Team:

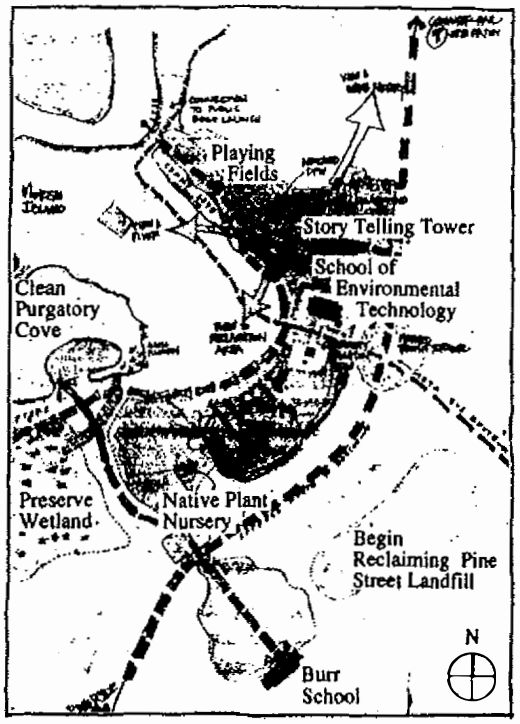
Ron Aberle
Jestena Boughton
Jeff DiCastro
Peter Levasseur
Jerry Ludwig
Paul Pandolfo
Marion Phallis
John Rossi
Peter Smith
Anatol Zuckerman

This team focussed on implementing a vision for a realistic sustainable community:

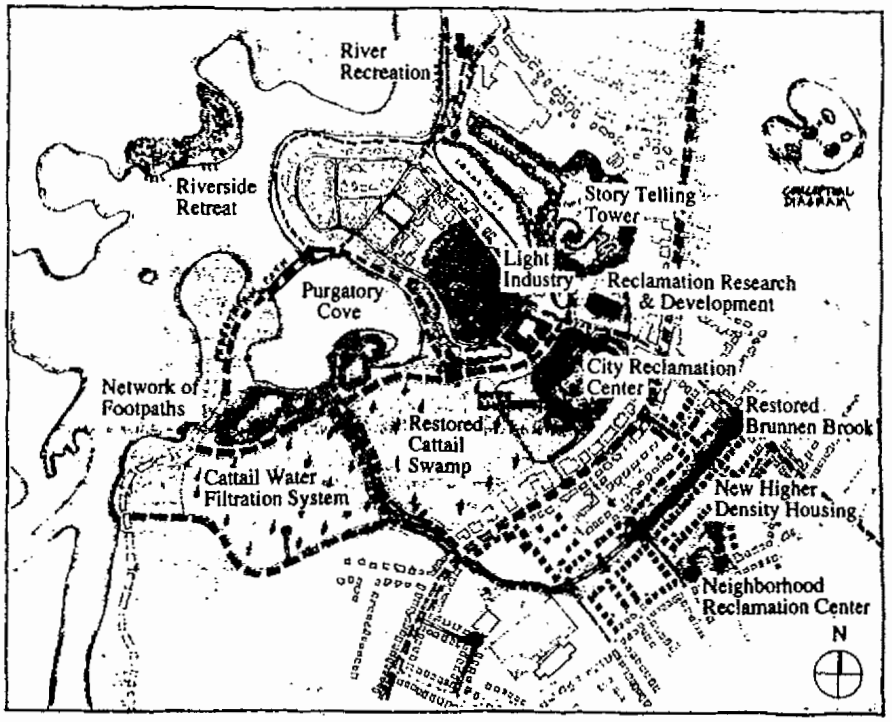
- Establish Joint-Cities Commission & pass new ordinances for managing the Lakes District
- Transform the incinerator building into a new community jobs/education recycling facility
- Establish green walkways to link activity areas
- Encourage industries to follow beautification standards to enhance industrial complex
- Increase recreational use of waterways
- Rezone to allow increased housing density within three story height limit.
- Encourage co-housing with shared personal vehicles, eating and grounds maintenance
- Implement programs for village snow storage to eliminate hauling and central storage

FLOWED MEADOW NEIGHBORHOOD

Environmental Design Charrette - Newton & Waltham, Massachusetts



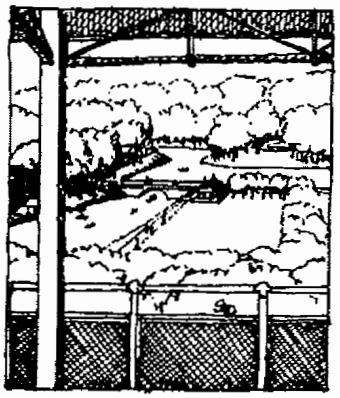
Flowed Meadow Neighborhood Within Five Years



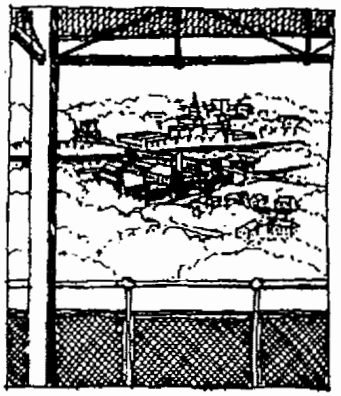
Flowed Meadow Neighborhood Within Fifty Years

View to Tower from Moody Street

View to Reclamation Center from Tower



View to Cram's Cove from Tower



View to Watch Factory from Tower

Full Cycle *Industrial Revolution to Reclamation Revolution*

This area was a wellspring of the *Industrial Revolution* in America. The "flowed meadows" were created when the Charles River was dammed to provide power for the first integrated textile factory in the country. Ironically, it was the mass consumption, made possible by similar mills, that led to the proliferation of landfills that now mar the neighborhood.

In the 21st Century, economic, technological, and social forces may bring the Flowed Meadow Neighborhood full cycle from the *Industrial Revolution* to the *Reclamation Revolution*. Studies indicate that the growing costs associated with producing virgin materials will lead to the rapid expansion of a "secondary materials economy" in which used materials are recovered and reprocessed. The Worldwatch Institute projects that cities will become a more important source of materials than rural mines and forests. The combination of readily available material resources, a progressive populace, and innovative entrepreneurs could make this area the cradle of yet another revolution.

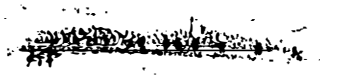
In this scenario, a reclamation research and education complex is developed along Rumford Avenue. To the north and south of it, filled land is reclaimed to improve the health of the local ecosystem, while physically and spiritually reconnecting the community to the Charles River. Replacing the mill tower symbolically is a lookout tower atop the Woerd Street Landfill. From there the neighborhood's story of change and adaptation can be told.

TEAM MEMBERS

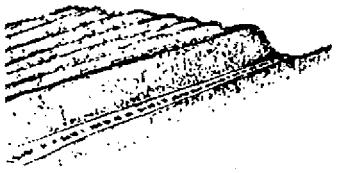
Susan Brown
Susan Glenn
Paul Kamoski
Shirley Kressel
Marion Linden
Chris Royer
Daren Sawyer
Diana Shank
Brooks Stewart

FLOWED MEADOW NEIGHBORHOOD

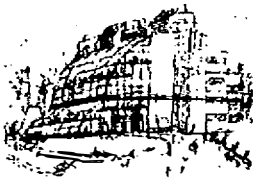
Environmental Design Charrette - Newton & Waltham, Massachusetts



Public Art: Giant Infatable Waterchestnut for summer festivals at Purgatory Cove.



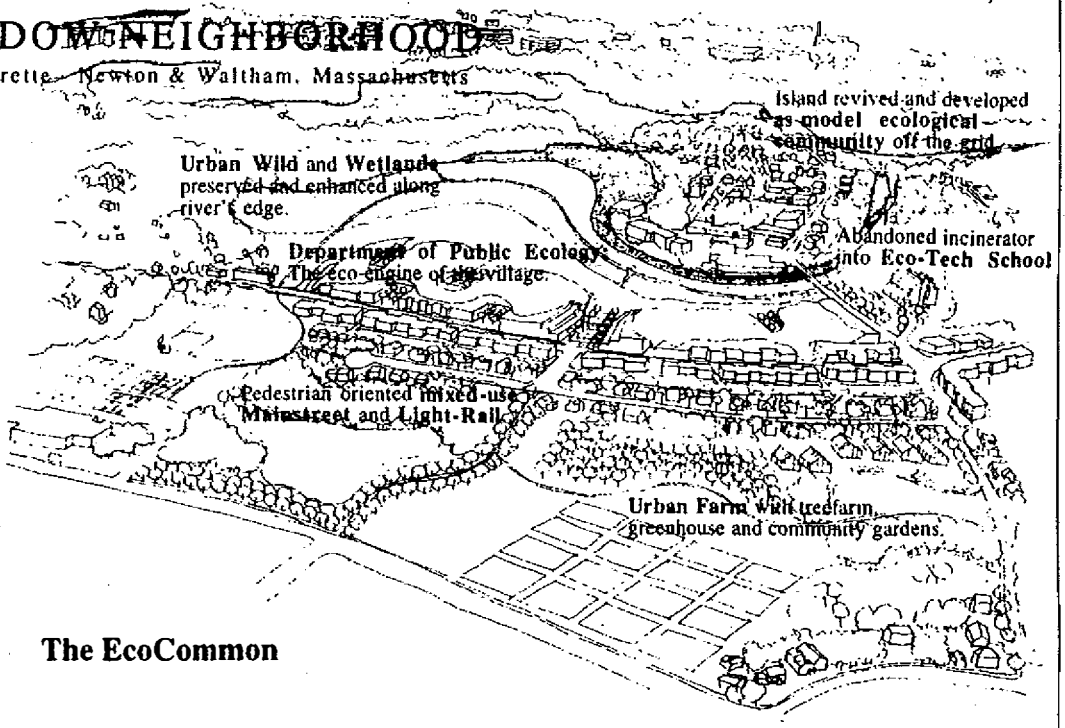
Public Art: Bronze lines of poetry by local poets in grass berms.



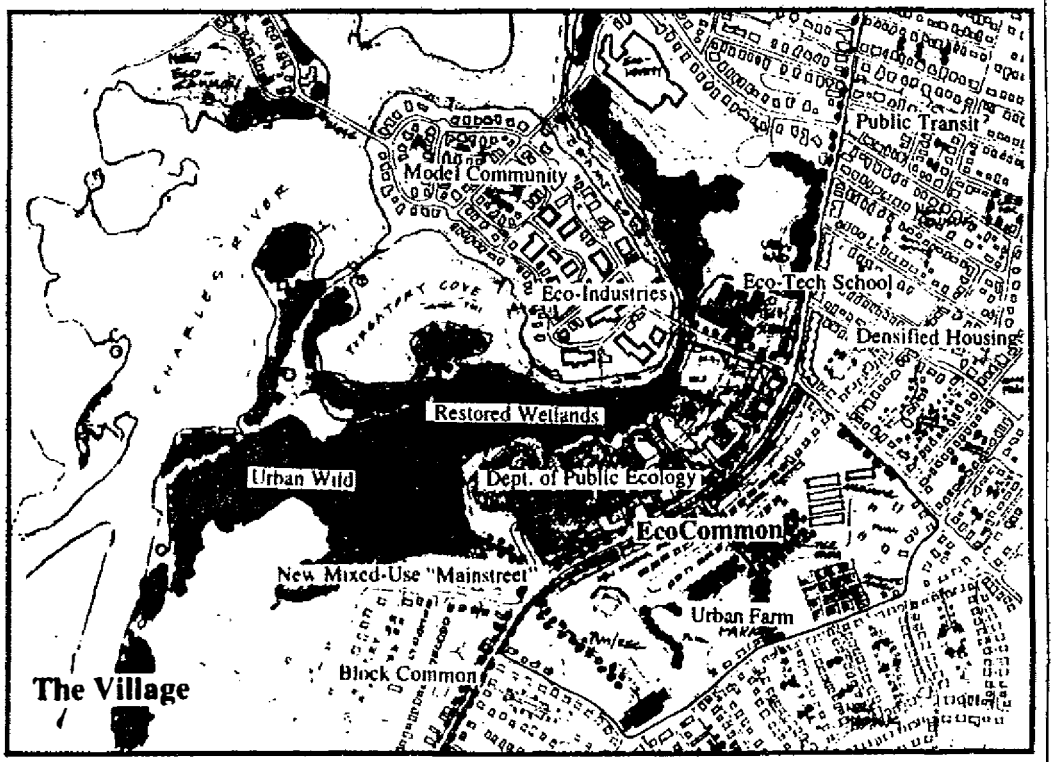
Abandoned incinerator transformed into **Eco-Tech School.**

Pedestrian oriented **mixed-use Mainstreet** and **Light-Rail.**

Housing densified to optimize infrastructure and reduce sprawl.



The EcoCommon



EcoCommon Village *From Landfill to Ecological Park*

A time-honored centerpiece of New England communities, the common, is re-interpreted dormant landfills are mined and transformed into a center for resource management and re-utilization. This Eco-Common integrates restored wetlands, a Material Recovery Facility (MRF), an Eco-Tech School, an Urban Farm, a pedestrian oriented retail/housing "mainstreet", a new light rail station, and outdoor recreation areas into a single ecological park at the center of a densified and revitalized neighborhood. At the heart of the EcoCommon is a Department of Public Ecology, carved out of the Rumford Avenue Landfill. Underground, beneath a new park, a MRF, a recycled product production center, composting and public works will take place. Viewing courts above provide access for public education. The original route of the Charles River through the Flowed Meadow is re-established, purging the coves of sediments and reforming the island for development as a model ecological community. Through grassroots organizing efforts Block Commons will develop for urban gardening, recycling, composting, and shared play.

Team:
Joan Brigham
David DelPorto
Daniel Glenn
Tom Grayson
Maureen Harrington
Chris Harrison
Mike Kyes
Fritjof Palmeijer
Annie Reed
Pat Ribbeck

7 BAC DESIGN STUDIO PROPOSALS

A group of seven Boston Architectural Center students who participated in the Flowed Meadow charrette were enrolled in a concurrent design studio that pursued specific ideas for implementation of sustainable treatments of the site and context area. the students recommended that the Rumford landfill be mined for resource reclamation. The following projects were proposed to replace the landfill:

- Wetland restoration designed to address the groundwater contamination, coupled with a harvesting program to control invasive aquatic vegetation,
- Water cleansing system using low-tech biological mechanisms for remediating cumulated contamination in both sediments and water,
- Architectural design in resource recovery mining facilities to be located within community contexts,
- Infill mixed use community linking the Newton and Waltham neighborhoods surrounding the Rumford landfill site,
- Parkland designed to bring community residents to the river and to teach them the historic and natural value of the landscape,
- Facilities combining resource recovery, on-going recycling, and public education about sustainability, and
- Design facilities consolidating waste management functions for Newton and Waltham, and liberating open space for recreational uses.

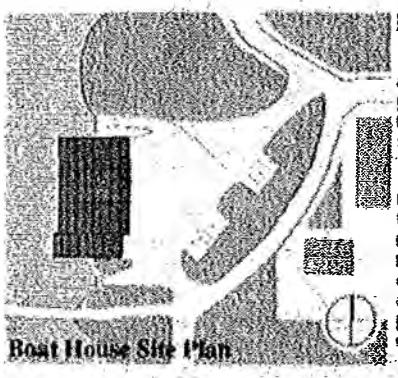
Two of the students' projects are summarized in the following pages.

Flowed Meadow Studio

Instructors: Shirley Kressel, Geoff Pingree, Jay Lee

Jonathan G. Seward

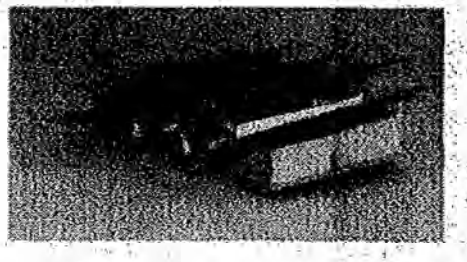
Boat House & Operations Center



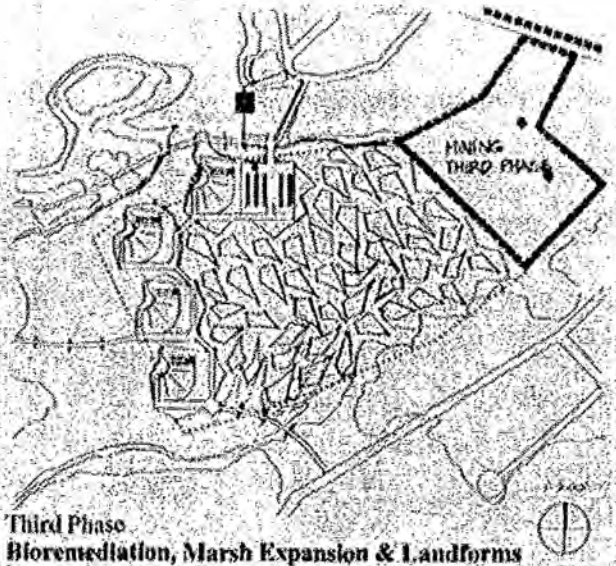
Boat House Site Plan

The Boathouse houses the aquatic harvesting operation equipment and an Operations Center for remediation in the Lakes Region. Sited on pilings in an existing industrial area, it is fabricated in prefabricated sections to allow reuse. Wave shaped roof panels optimize daylighting, ventilate the slip bays, and conduct rain away from the work yard.

A pilot program of aquatic harvesting has been successful. It must be thoroughly repeated for many years to reach a sustainable state. The boathouse and composting operation are planned to operate at a volume twice the current yearly harvest. Floating equipment will remove pest plants for composting at upland sites in the reclaimed landfill, producing valuable compost, reducing the organic materials in the waterways available to aquatic plants. Over time, the Lakes will deepen, shorelines becoming pronounced; new plant composition and character improving habitat, water quality and the recreational value of the river and meadows.

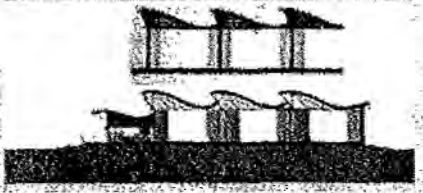


Charles River Elevation



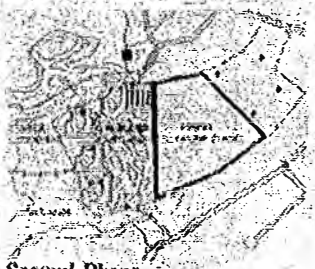
Third Phase
Bioremediation, Marsh Expansion & Landforms

South Elevation

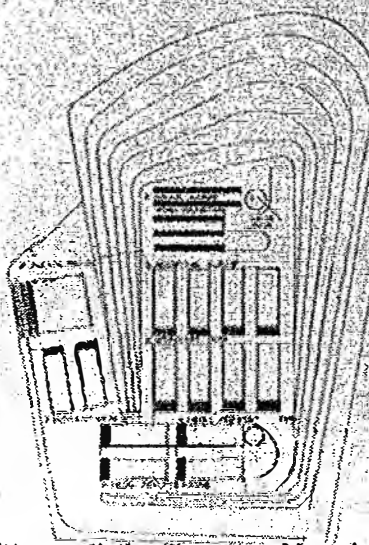


Boat House Plan Scale 1/8" : 1' - 0"

First Phase



Second Phase



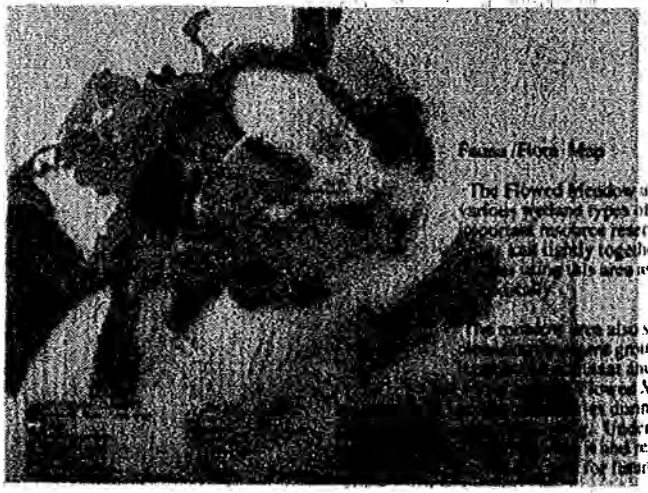
Bioremediation Treatment Mound

Sculptural, terraced hills (made of soil reclaimed from concurrent mining of the existing landfills) rise from the marsh sites for the purification of contaminated water prior to release to the Charles River. Ground water currently flows through the landfills en route to the Charles. Confidence is lacking for existing or proposed technology to successfully cap or mitigate this problem over time.

Using specific plant communities and fauna in optimized series we selectively immobilize and concentrate aromatic hydrocarbons, heavy metals and organic nutrients, allowing for their finely tuned removal. The ultimate goal is to facilitate the economic and safe reintegration of pollutants as feed stocks for industrial and biological processes where they become valuable resources.

South facing mounds maximize solar aspect, relying on gravity to move treated water through the beds prior to discharge into the marsh. Increased flow and velocity, and reduced nutrient loads reduce the rates of upland meadow former edge.

Public trails cross this site through a new, expanded series of paths. As ground water quality becomes acceptable these growing mounds will become intended forested uplands in the midst of an expanding marsh system, increasing ecological richness, wildlife, recreational values, and flood control protection.



Fauna / Flora Map

The Flowed Meadow area represents a dense mosaic of various habitat types of rich ecological diversity and is an important resource reservoir for both fauna and flora. Small [illegible] together provide maximum benefit for animal [illegible] this area as a refuge and others relying on it [illegible]

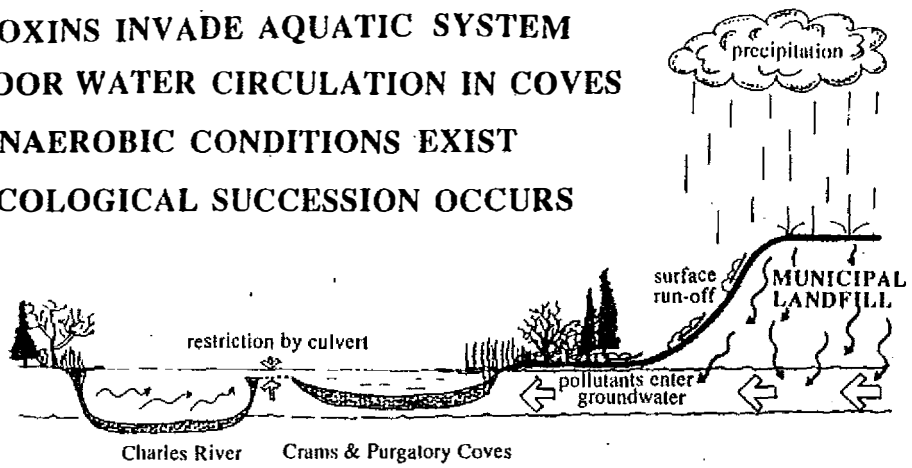
The meadow area also serves to protect the waterway by [illegible] ground and surface water that flows through [illegible] and nutrient loading into the Charles. [illegible] Meadow area acts as a buffer and holding [illegible] during rains and times of snow melt, helping [illegible] Understanding this site, its composition, the [illegible] represented within it are essential to [illegible] for future action.

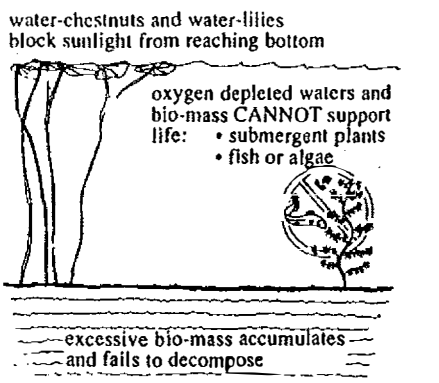
Area Foliage Map

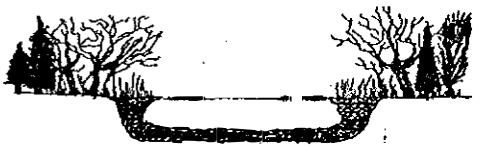
Forest Field Riparian Corridors Poss. Links

PRESENT IMPACT ON WATER & COVES

- TOXINS INVADE AQUATIC SYSTEM
- POOR WATER CIRCULATION IN COVES
- ANAEROBIC CONDITIONS EXIST
- ECOLOGICAL SUCCESSION OCCURS







poor circulation in congested waterway results in bio-mass accumulation on bottom caused by fallen leaves, dead water-chestnuts and water-lilies

HEALING THE WATERS OF FLOWED MEADOW

Prepared by: John M. Rossi AIAS 1995 - 96 Boston Architectural Center

Water is the single most important feature of the Flowed Meadow Site. Water not only offers recreation, inspiration, and aesthetic satisfaction, but is the single most important element for sustaining all life on our planet. Restoring the waters is the first tangible step to creating a sustainable future for the Flowed Meadow Neighborhoods.

The coves function as a filter absorbing non-point pollutants before they reach the headwaters of the Charles River. It is evident the present nutrient input exceeds the coves' natural processing abilities. The result is eutrophication. Algae blooms and evasive plant species choke off the coves, inlets, and edges of the Charles River. Sunlight does not penetrate the surface of the water and oxygen is depleted by aerobic bacteria, thereby eliminating bio-diversity of plant and animal species. The excessive bio-mass that accumulates is both nutrient rich and toxic.

BIO-REMEDIATION: is the use of plants and other organisms to extract contaminants and absorb toxins and heavy metals.

RHIZOFILTRATION is an aquatic-based bio-remediation system illustrated here. This low impact method of ***Healing the Waters*** can provide an ongoing reduction and prevention of toxic contaminants that are presently discharging into the coves and the Charles River.

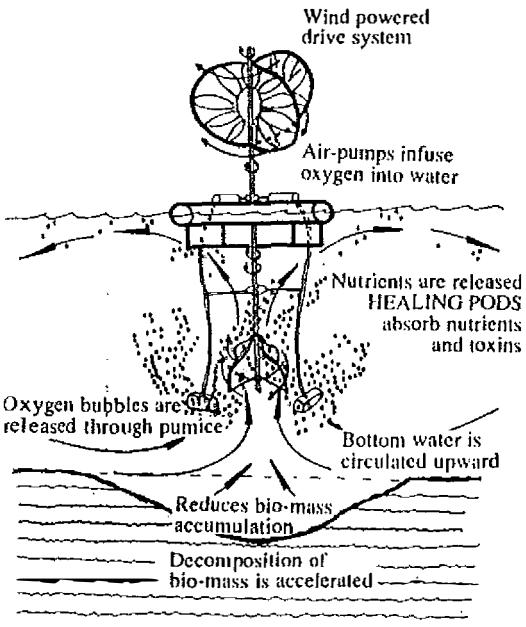
ADVANTAGES: These processes presently meet the approval of regulating agencies. Success has been proven in a range of applications in the US, Canada, Ukraine, and England. ***Healing the Waters*** will benefit residents of Waltham and Newton and the many downstream communities abutting the Charles River.

moss grows from edges along with water-chestnuts, water-lilies, and surface algae to create a floating mat

shrubs and trees grow in from edges closing water completely off — the result is that coves will die a premature death and bury themselves

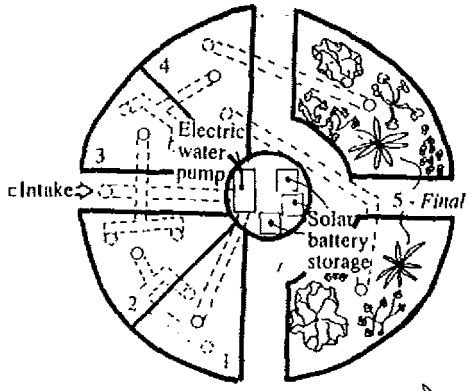
AERATION & CIRCULATION

***AIR-1* SYSTEM**

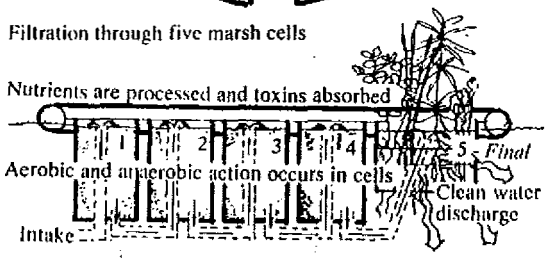


HEALING PODS

circulation through system



Filtration through five marsh cells



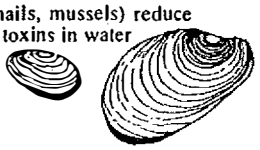
ECO-SYSTEM of HEALING PODS

Pumice Stone: porous surface increases surface area for microbial communities

Aeration: oxygen is dispersed through water

Bacteria: breakdown contaminants, convert ammonia to nitrates, digest sediments

Filter Feeders: (clams, snails, mussels) reduce organic matter, breakdown toxins in water



Plants: uptake nutrients, complex toxins, and heavy metals

- FERNS and FUNGI
- PENNYWORT
- DUCKWEED
- WATER VELVET
- INDIAN MUSTARD
- SUNFLOWER
- WATER HYACINTH

8 CONCLUSION

A hundred years ago no one knew how the Flowed Meadow neighborhood would change over the next century. The boaters and skaters of the 1890's probably would have been surprised and saddened to see the cones and wetlands become dumping grounds, with mountains of refuse rising near the banks of the river. No one predicted it and no one planned it.

Likewise we cannot predict what Flowed Meadow will be like in the late twenty-first century. the visions of a sustainable Flowed Meadow neighborhood that emerged from this environmental design charrette are simply sketches of possible futures. Maintaining the environmental health of landscapes like Flowed Meadow--created in large part by the actions of human beings--while still providing for the needs of human communities, is the challenge that faces us all. The charrette proposals offer an opportunity to consider which futures might be preferable, and how we might plan to make them reality.

9 APPENDIX

- *Summary of Environmental Issues* , by Cindee Campisano, Project Scientist, Environmental Health & Engineerng, Inc.
- *September 22, 1995 Memorandum* , by John E. Thomas and Carla J. Zimmerman, Beals and Thomas, Inc.
- *Map of Area*

Summary of Environmental Issues 10/6/95
Flowed Meadow Neighborhood, Newton and Waltham, MA
Environmental Design Charrette

Cindee Campisano
617-964-8550 (W)
617-924-9087 (H)

Overview

One of the challenges of environmental design for the Flowed Meadow Neighborhood will be the many uncertainties associated with the future of the waste disposal sites in the area. The four landfills and the former incinerator site have come under varying degrees of regulatory scrutiny in the past; the level of regulatory agency involvement in the future remains to be seen.

Potential contamination of soil, water, air, and building materials must also be assessed. Minimization of potential exposure to contaminants at these sites must be a consideration of design alternatives. Potential receptors of these exposures are both human and environmental.

Hydrogeology

On a regional basis, groundwater and surface water from the charrette study area flow to the Charles River. Locally, groundwater and surface water around highlands (such as the landfills) flows radially to low-lying areas. Neither groundwater nor surface water (the Charles) is used as a drinking water supply in the study area.

Investigations by the USGS and IEP Geoscience indicate that much of the area along the river in the study area is underlain by stratified drift deposits of sand and gravel. Groundwater flows readily through these deposits. Wetland soils (including peat) underlie the Flowed Meadow, and likely underlie portions of the landfills which were typically created in pre-existing wetlands.

The 100-year flood plain includes areas below an elevation of 39 NGVD (in the study area) and encompasses the Flowed Meadow wetland and other low-lying areas around the Charles. As indicated by John Thomas and Carla Zimmerman in their memo on wetlands, these areas are very important for flood storage. Any filling in the 100-year flood plain should be compensated by the creation of equivalent flood storage in a nearby area. The wetland nature of the Flowed Meadow and other low-lying areas, in addition to setback requirements, and the location of the 100-year flood plain places obvious restrictions on many types of land use.

deteriorated, may have carried contaminated groundwater to Purgatory Cove or the gravel pack around the pipe may provide a preferential path for groundwater flow. The pipe itself has been capped and remediation of the pipe is planned as part of site closure.

The City of Newton hopes to continue using portions of the Rumford Avenue Landfill for their recycling transfer station, composting, and for stockpiles of various materials.

A preliminary investigation of the Pine Street Landfill was conducted by CDM. This landfill was used for municipal waste prior to the opening of the Rumford Avenue Landfill (1930's to the early 1960's). Results of soil gas sampling near the landfill "did not detect concentrations of volatile organic compounds (VOCs) that pose a threat to human health or safety". A limited groundwater investigation did not reveal significant groundwater impacts at the site, but samples collected are not considered representative of the entire site. The only potential concern identified by this study is the generation of methane gas by landfill wastes.

Methane generation is a potential concern at all of the landfill sites. It is a natural product of biodegradation of organic wastes. Methane is the primary component of natural gas and is colorless, odorless, and tasteless. It is an asphyxiant and can be explosive, and can travel through soil gas into structures. Buildings constructed at or near landfill sites should be designed to prevent infiltration of soil gases, and monitoring systems for methane are recommended. At some landfill sites methane is recovered or 'mined' and used as fuel.

Any design options for the reuse of the former incinerator site and building will need to consider potential residual contamination of building materials and environmental media. The incinerator was used to process municipal waste from 1967 to 1975. If environmental testing has been conducted, the results were not available for this review. Heavy metals and PAHs are two types of contaminants that could potentially be found onsite, particularly in building materials and soils. Subsequent to demolition, building materials may potentially require disposal as hazardous waste, an expensive undertaking. Some types of contamination can be removed by surface cleaning (depending upon the nature of the contaminant and the building material). This site is reportedly used for salt storage by the Newton DPW.

General considerations for all landfill sites in the study area:

- Any excavation of soils for building or landscaping purposes will likely trigger requirements for environmental testing to determine how the excavate can be used or disposed of. Planners should also consider that excavation of contaminated materials can create exposure hazards through the transport of fugitive dust and volatile components through air. Given that much of the

If significant contamination by hazardous materials is discovered at a site, the Massachusetts Contingency Plan (MCP) (310 CMR 40) applies. These are the regulations governing the disposition of hazardous waste sites in Massachusetts. Requirements can vary significantly depending upon the nature of contamination at the site and the potential for the site to affect human health and welfare, and the environment. Environmental assessment and appropriate remediation are required for sites that are governed by these regulations. Activities at these sites must be in accordance with established protocols. It is possible that MDEP could restrict activities at a such a site until remediation is complete.

The Rumford Avenue Landfill is the only landfill in the study area that is listed by the MDEP as a hazardous waste site under the MCP. The USEPA is also assessing this site.

The Massachusetts Environmental Protection Act (MEPA) requires that an environmental impact report (EIR) be completed for any major construction project funded by the state that may cause a significant impact (negative or positive) to the environment. Types of projects that may be subject to the MEPA process include:

- Any new nonresidential construction project that alters 50 acres or more of land.
- Any project which results in the dredging, filling, or alteration of one or more acres of bordering vegetated wetland or salt marsh.
- Stream channelization or relocation of 2,000 feet.
- New surface impoundments of 1 billion or more gallons of water.
- Construction of a building with a height of 300 feet or more.
- Construction of 350 or more residential units.
- Any project creating 1,000 or more parking spaces.

Rumford Avenue Landfill; Post-Closure Plans

Current site operations at the Rumford Avenue Landfill include:

- Disposal of inert materials such as street sweepings, trench excavate, construction debris, etc.
- Leaf composting
- Recycling drop-off area
- Stockpiling and processing of stone
- Stockpiling and processing of loam
- Stockpiling and processing of asphalt
- Stockpiling of miscellaneous materials such as sand and gravel

With the exception of inert materials disposal, these activities are expected to continue after the landfill has reached its capacity. The estimated remaining operating life of the landfill is about eight years (to the year 2003). Only street sweepings and trench excavate are currently added to the landfill; disposal of

BEALS AND THOMAS, INC.

Two Westborough Business Park
200 Friberg Parkway
Westborough, Massachusetts 01581-3911

Tel. 508-366-0560
Fax: 508-366-4391

MEMORANDUM

TO: Charette Participants

FROM: John E. Thomas, Carla J. Zimmerman

DATE: September 22, 1995

REFERENCE: BSA/BSLA
Design Charette
Flowed Meadow
BTI Project No. M-2649

Purpose: To summarize the functions (physical, chemical, and biological processes or attributes) and the values (the importance of each function to the community) of the wetlands abutting the Flowed Meadow landfills.

Classification and Description: This wetland, located southwest of and adjacent to the active landfill, is classified as a palustrine forested and shrub/scrub wetland. This classification includes "all wetlands dominated by trees, shrubs, persistent emergents.." (Cowardin et. al. 1979). The broad-leaved deciduous red maple (*Acer rubrum)* dominates the overstory, primarily located around the perimeter of the wetland. The existing red maples are primarily saplings, and are currently showing signs of stress (premature browning of leaves). The central area of the wetland contains a cattail bed in an area with standing water, that is being infringed upon by the invasive phragmites. Cattails are also distributed widely throughout the wetland, apparently choked out by dense undergrowth which includes aster, goldenrod, grasses and other species. It appears that the system may be evolving from a wetter cattail marsh system into a less wet shrub/scrub and forested system.

Functions: This list of probable functions has been compiled from several of the available wetland techniques currently utilized for formal wetland assessment. (see references)

Nutrient Uptake/Transformation
Retention of Toxics
Floodflow Alteration
Sediment Stabilization
Conservation Potential
Aquifer Recharge
Visual/Aesthetic/Education

Habitat
Migratory/Resident/Breeding/Over-wintering Bird
Invertebrate
Reptile and amphibian
Mammal

Nutrient Uptake/Transformation and the Retention of Toxics

Through settling, photooxidation, denitrification, chemical precipitation, mineral uptake by vegetation and other bio-geochemical processes, nutrients, pollutants and sediments are removed by vegetation or settle into wetland sediments. The wetland basin collects runoff from upland areas and retains or detains the runoff before it can reach the Charles River.

Nutrient transformation is a function that represents the biotic and abiotic processes that convert elements from one form to another-- in effect "recycling" them back into a form that can be utilized by vegetation. Wetlands provide an environment that not only produce biomass (vegetation, woody debris, etc.) which it can recycle, but also collects leaves, humus, woody debris, etc. from stormwater and overland runoff for the same recycling. The conditions in a wetland like slow or standing water supports the chemical transformations that require anaerobic conditions.

This function has a particularly high value for this site. Due to the wetlands location adjacent to the Charles River, this function provides protection to the water quality of the river by retaining toxics and excess nutrients that might otherwise be discharged into the river. Historically, the marshes and wetlands along the river have served as "sinks" for these toxics and nutrients. The loss of these wetland systems through filling has resulted in the loss of the natural filtration capabilities of the wetlands. The results are painfully evident around Flowed Meadow in the eutrophic conditions seen in Purgatory Cove and Cram's Cove, and the Charles itself.

For future design considerations, the wetland can also retain any toxics and nutrient laden debris that might be washed over any upland impervious surfaces that are constructed over the existing landfill. To enhance this function, shallow water quality basins may be constructed along the edge of the landfill in conjunction with a drainage system containing catch basins and water quality inlets and would be in accordance with best management practices. These basins must be lined to prevent any possible leaching of pollutants from the adjacent landfill.

Floodflow Alteration

The wetland is within the 100 year floodplain of the Charles River, according to FEMA Flood Studies. The 100 year floodplain elevation is at 39 NGVD. According to the Flood Study the elevation upstream at the Moody Street Dam is approximately 136 ±. These elevations indicate that the rise between the ordinary water level in the Charles River and the 100 year flood plain is approximately 2.5 feet. A wetland located between the river and upland structures plays the important role of holding the flood waters during these flood events and preventing them from reaching the upland structures.

To protect this function, design of the landfill area should avoid filling below elevation 39. Should any work be proposed at the toe of the slopes adjacent to the wetland areas, compensatory flood storage of a volume equal to that which was filled should be provided in an adjacent area. Boardwalks or other site improvements considered for the wetland portions of the property should be designed to ensure their structural integrity with inundation to elevation 39 during the 100-year storm event.

Sediment Stabilization

As a direct result of the low, flat, nature of the wetland, and the fact that there is little or no defined channels of flow at the northern end adjacent to the landfill and residential areas, the

wetland, the wetland is effective at binding soil and dissipating erosive forces of overland flow of stormwater runoff. This function has a particularly high value in that it prevents the discharge of sediments into downstream areas such as Purgatory Cove and the Charles River, reducing the turbidity of the water column and the destruction of benthic organism habitat. Sediment discharge to the wetland area should be limited to avoid increasing the elevation of the area and creating an environment more favorable to less desirable species of vegetation (phragmites, purple loosestrife).

Conservation Potential

The conservation potential for the Flowed Meadow wetland is relatively high, due to the fact that landowners of parcels in the vicinity include the State and the Cities of Newton and Waltham. More importantly, since the City of Newton has indicated that they are open to using a municipal parcel on Lexington St. to link the Burr School Playground open space through city owned wetlands to the Charles River and connecting to adjacent City and MDC recreational space, the conservation function is increased for Flowed Meadow as part of a much larger "belt" to be conserved. The value of conserving this wetland is increased due to the lack of existing large wetland areas along the Charles River due to historic filling.

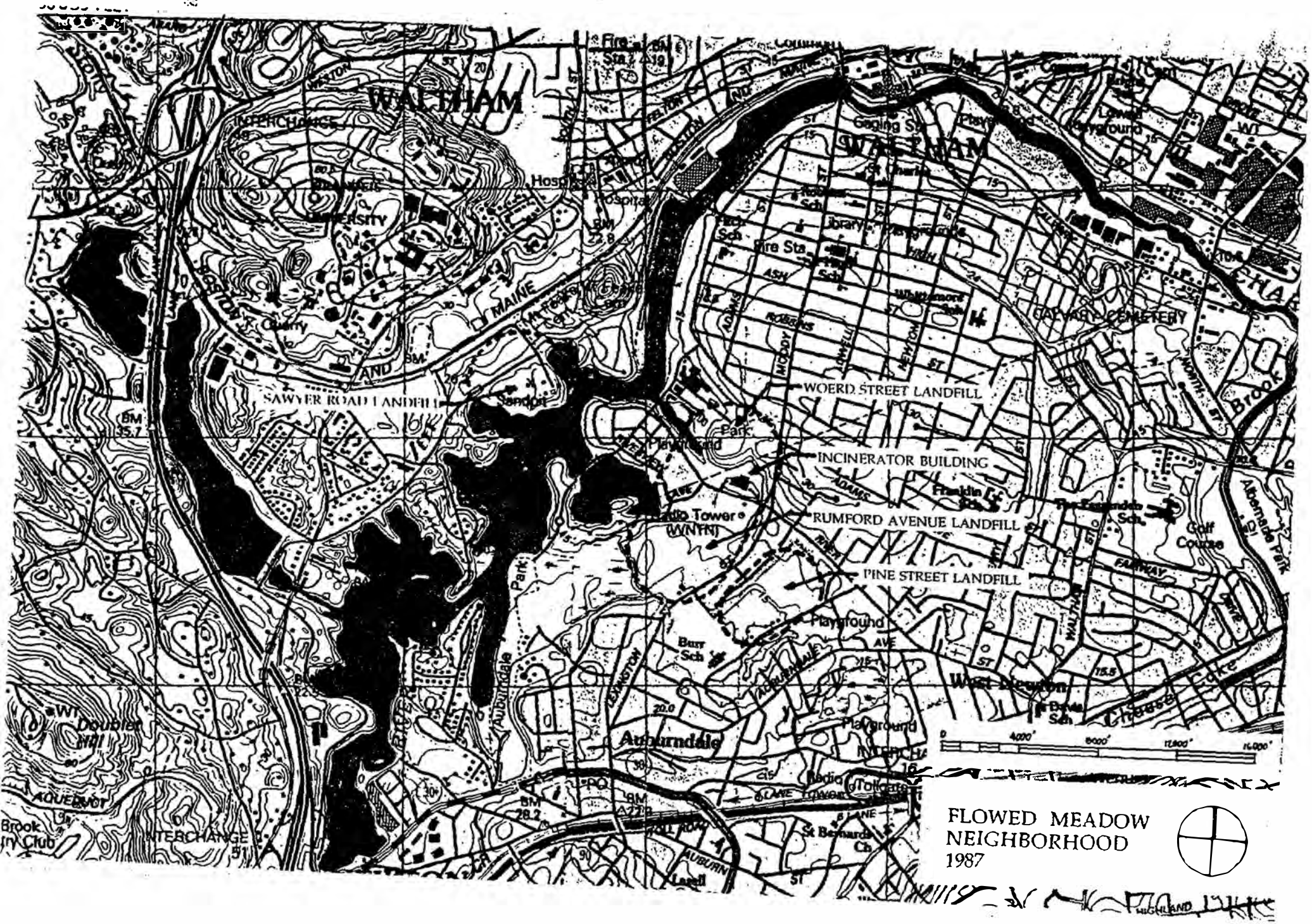
Recreation/Aesthetic/Education

This function particularly applies to wetlands that are easily accessed and the value increases in wetlands that are part of a public park or conservation project. The potential for the Flowed Meadow wetland to provide this function is high, particularly when taking into consideration the possible connection to the Burr Street School, which currently has an entire third grade curriculum based on the Charles River. Designs should consider viewing platforms and boardwalks to provide access for passive recreation such as birdwatching. Smaller pools or water quality basins constructed around the edge of the Flowed Meadow wetland should include in their designs techniques and components to enhance the habitat function, which would in turn increase the recreational and educational value.

Habitat

The variety of vegetation and proximity to open water increases the potential for this wetland to provide habitat. As mentioned above, the value of this habitat contributes to the recreation/aesthetic/education function and design should reflect the goal of enhancing wildlife habitat. The water quality basins should be constructed at accessible edges of the wetland. The strategic placement of boulders and logs can attract reptiles and amphibians and artificial nesting and loafing sites can be constructed to attract waterfowl and other birds, as well.

The Charles River Watershed Association has noted that four species of heron have been observed within the Flowed Meadow site, as well as painted and box turtles. Evidence of deer was observed during the Beals and Thomas' site visit. Various migrating, overwintering, and resident waterfowl would be expected, as well as additional bird species, small mammals, amphibians, and reptiles.



FLOWED MEADOW
NEIGHBORHOOD
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