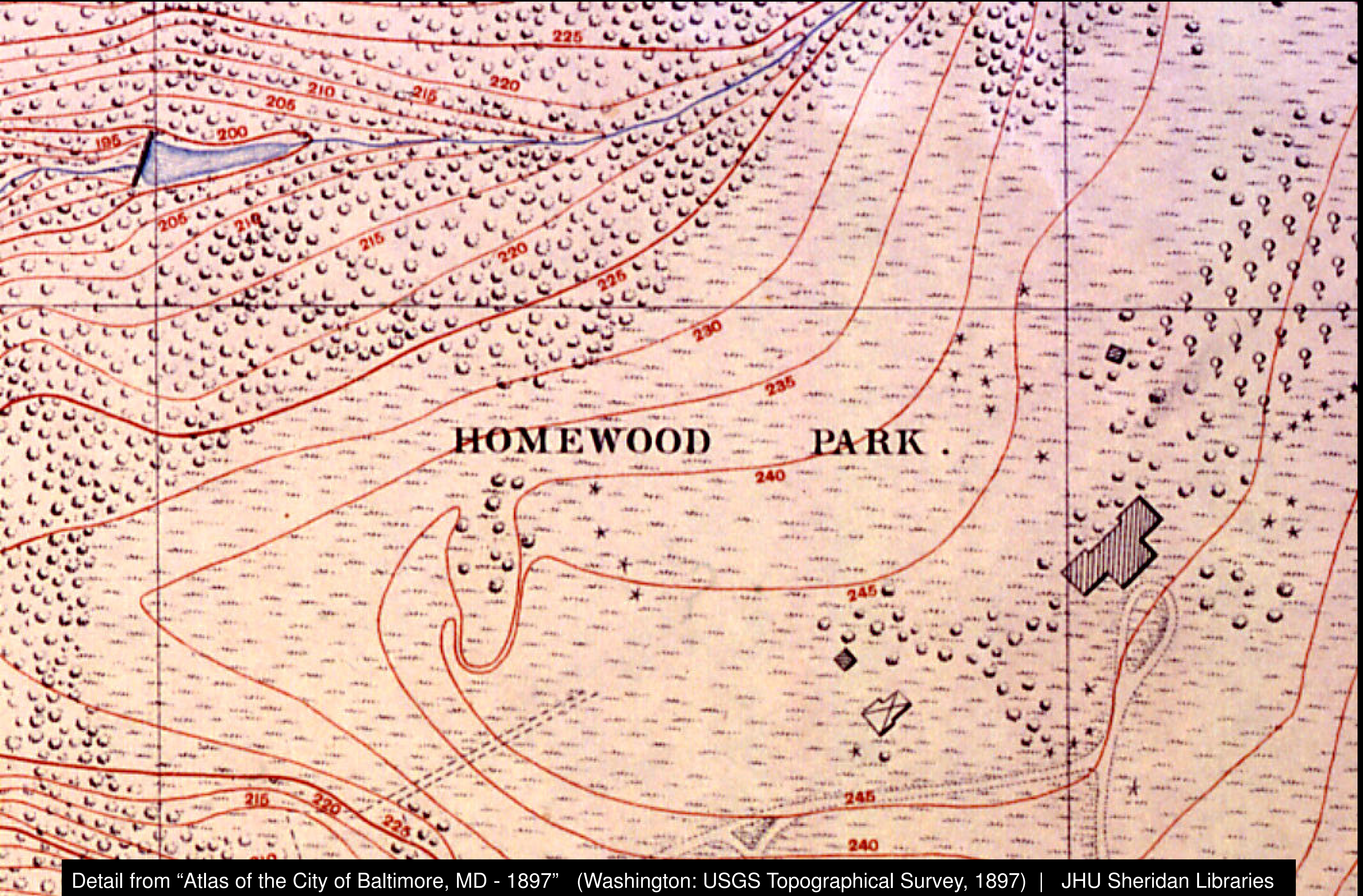
26 *Sustenance and Waste Management*

These days we take for granted, both in municipal regions and in rural areas, a minimum level of services such as police, road maintenence, and education. But this wasn't always so.

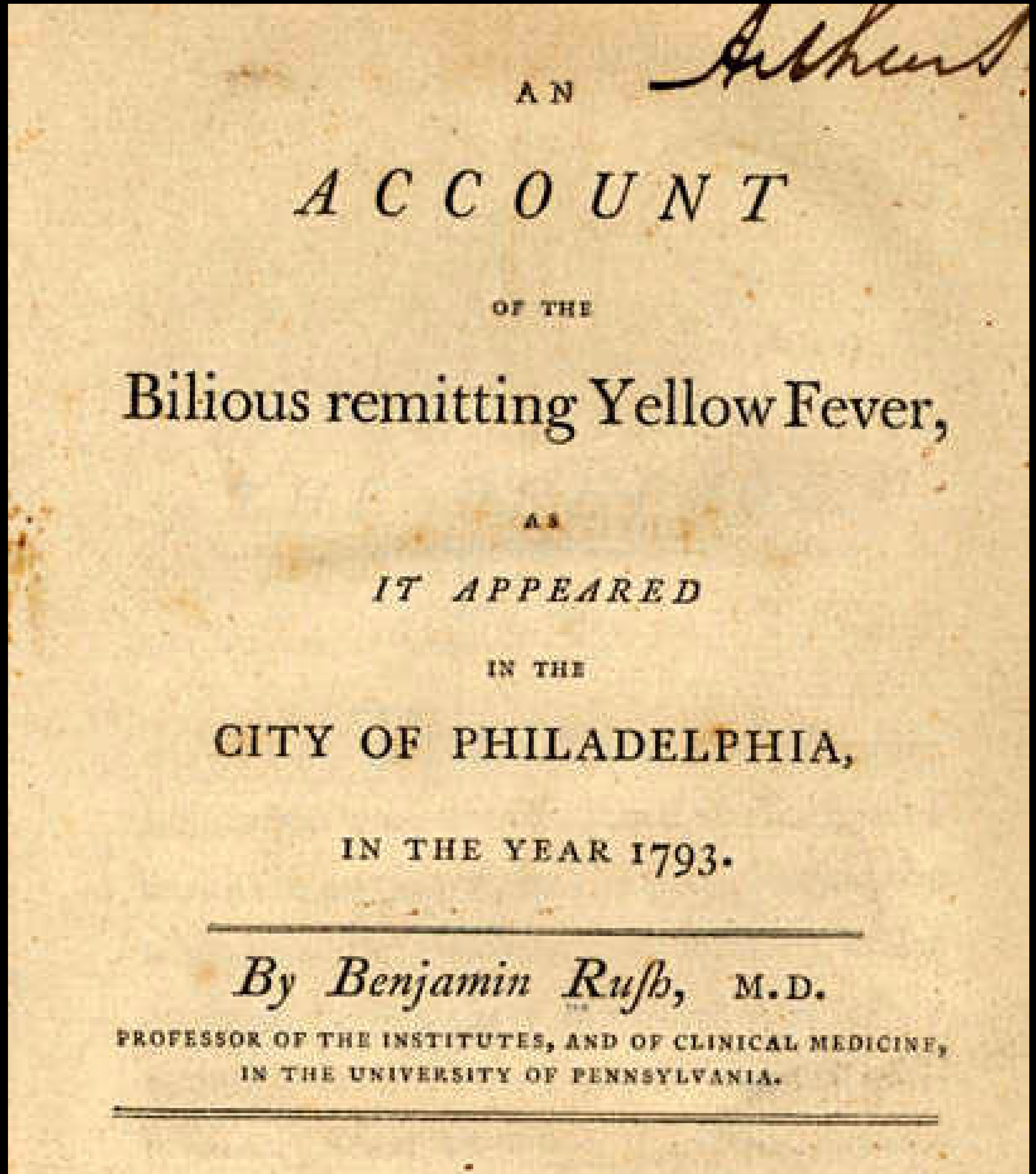
During much of our nation's history, cities were the only *loci* of these and other services. To live outside the city required either the means for self-support or else doing without. Even today, one of the distinctions between "town and country" is often the supply of that most basic resource: *water* and *sanitation*.



Detail from "Atlas of the City of Baltimore, MD - 1897" (Washington: USGS Topographical Survey, 1897) | JHU Sheridan Libraries

Homewood, at the time of its construction, had no recourse to a central source of potable water. Water for drinking and washing was brought up from a fenced-in well. It is thought, too that cisterns may have been used to capture rainwater for domestic use. Further afield, 1000 feet from the house, was a small artificial pond, probably built some time after the original house. Water sources of this sort, which were common to that time and to historical times before and since, depended upon human-power (or, sometimes, animal power) to deliver water which itself was not under pressure. Water for drinking and bathing was served by ladles or poured from vessels and was typically disposed, too, by human action — poured, tossed, or carried from their place of use by hand.

When one depends on human efforts for water-collection, the scale of consumption is naturally proportionate to available manpower. Even with a cadre of servants and slaves, consumption is relatively small. In a sense, pre-technological methods of water collection were, except in times of drought, intrinsically sustainable.



AN

ACCOUNT

OF THE

Bilious remitting Yellow Fever,

AS

IT APPEARED

IN THE

CITY OF PHILADELPHIA,

IN THE YEAR 1793.

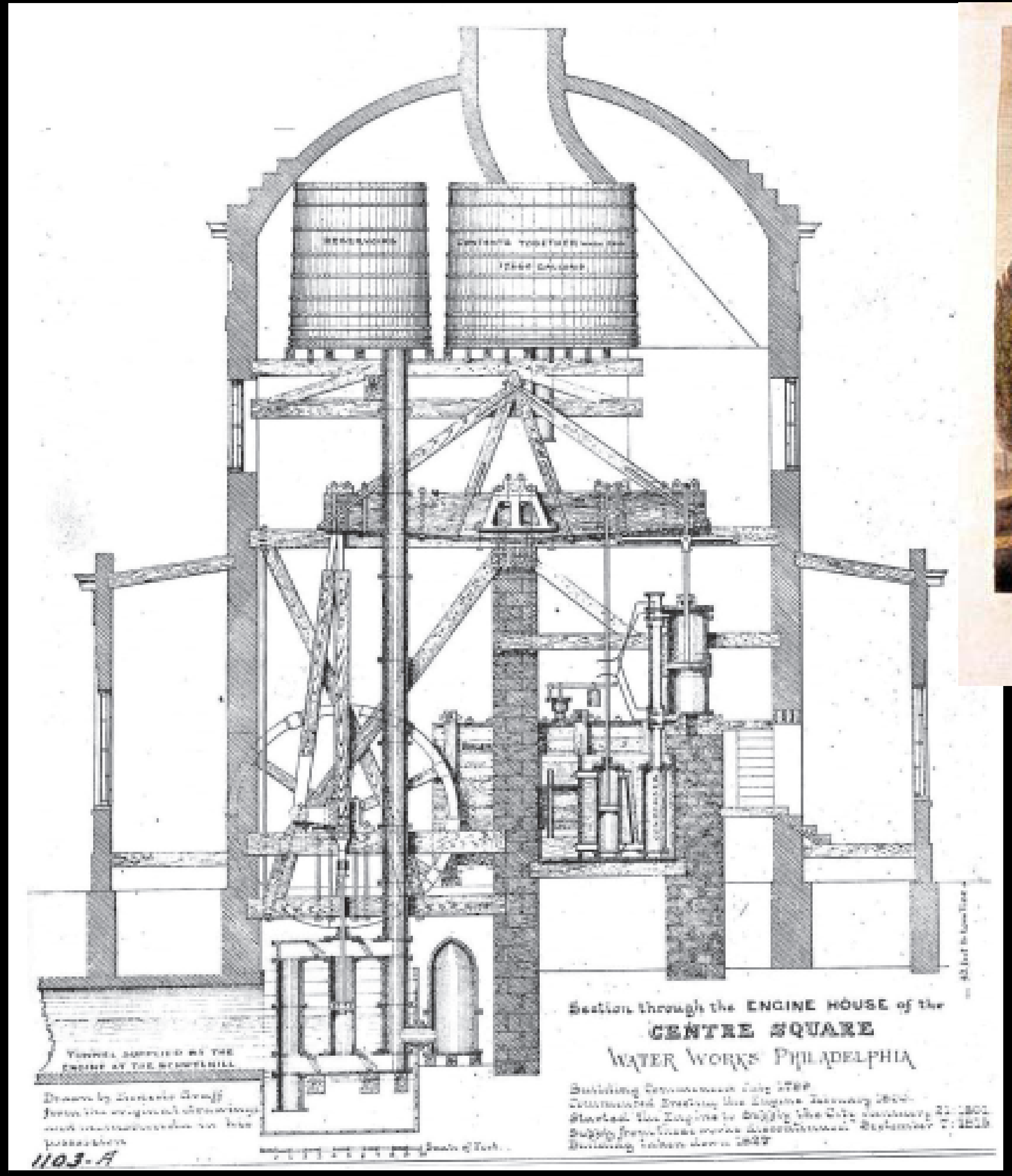
By Benjamin Rush, M.D.

PROFESSOR OF THE INSTITUTES, AND OF CLINICAL MEDICINE, IN THE UNIVERSITY OF PENNSYLVANIA.

Meanwhile, at the time of Homewood's founding, a movement was afoot in American cities to provide water for city residents in a different way. Two factors influenced the decision of Baltimore's municipality — like Philadelphia's and New York's before — to provide a centralized source of water: disease and fire.

Baltimore's 1794 Yellow Fever epidemic joined with recurring property-damaging fires to draw the attention of the City's citizens, its government, and its private entrepeneurs towards the need for a water source which was pure, constant, and pressurized.

As mentioned earlier the settlement patterns of wealthier citizens had been influenced by the fear of Yellow Fever, but at the end of the 18th century, the general public could look to technology to provide a solution.



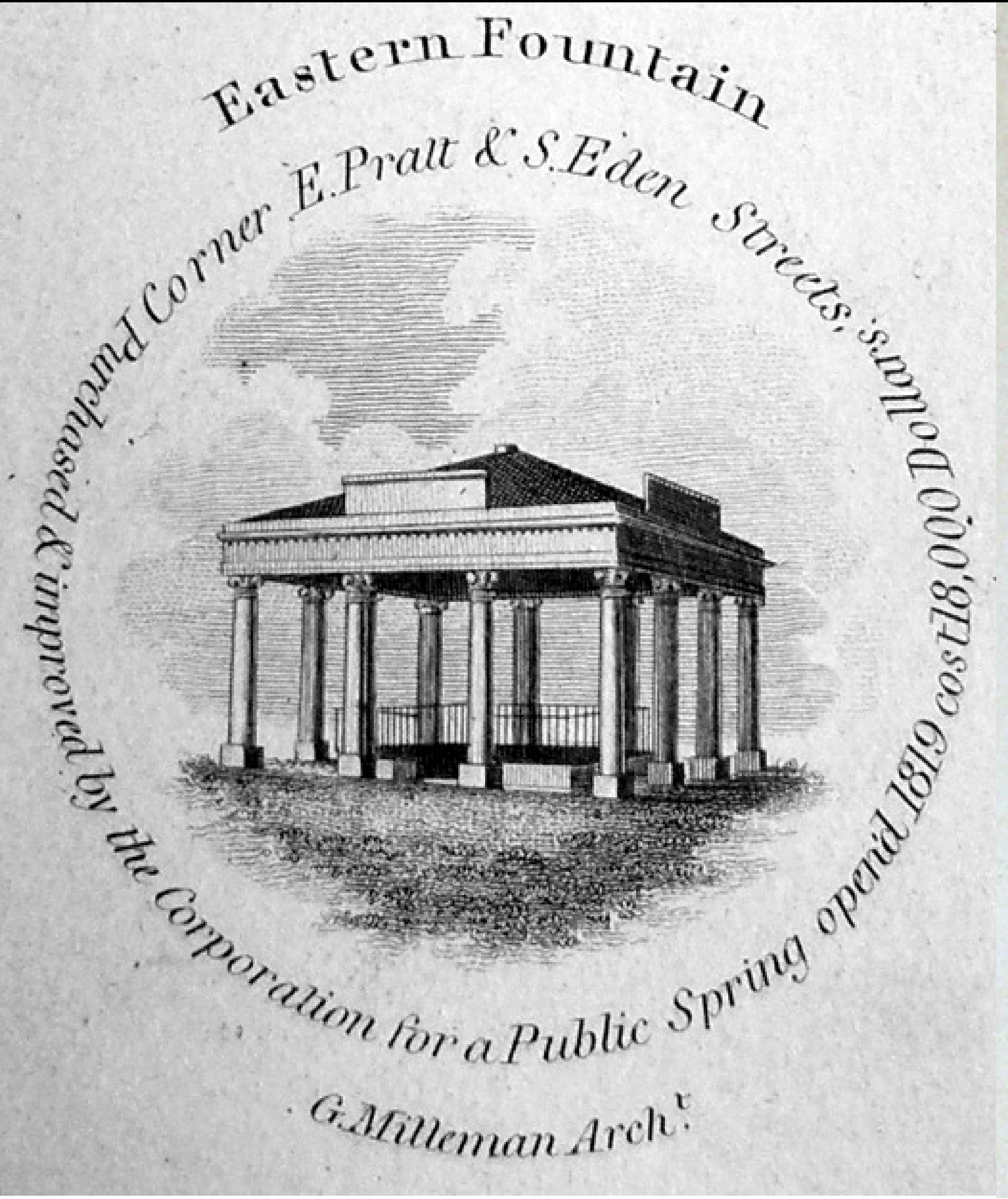
"The WATER WORKS, in Centre Square" in *The City of Philadelphia, in the state of Pennsylvania North America; as it apeared in the year 1800,* (Springland Cot: W. Birch and Sons, 1800)

Excelerio Graff, "Section through the ENGINE HOUSE of the CENTRE SQUARE Water Works" (Philadelphia, circa 1860) | Philly H_20

Coal-fed steam engines, such as those which more famously allowed Robert Fulton to power his steam-boats, allowed water to be collected without requiring the enormous capital investment of precise, gravity-fed lines.

Significantly for the history of architecture, many of the Union's first professional architects were themselves involved in the design and provision of water pumps to the first municipal water systems. Benjamin Latrobe, who was a partner of Fulton, designed Philadelphia's first waterworks, illustrated here. Some time later, while in Baltimore, Latrobe, Robert Mills and others offered their expertise to the private businessmen who sought to provide water to the city.

By the 1820's, a reservoir had been established at a relatively low elevation, for pressurized distribution by steam-powered pumps.



Images by Joseph Cone, engraver, from Plan of the City of Baltimore... (New York: C.P.Harrison, 1823) | George Peabody Library, JHU

In addition, four city-administered springs had been established within City boundaries and had been given special architectural treatment. Illustrated here are two of them, considered architecturally significant by Baltimore's citizenry at that time. Although brought about by private investment, these fountains reflect the consensus had been established about the city's corporate responsibility for the water supply.

In fact, future solutions for Baltimore's supply depended upon municipal expansion. Greater density of habitation resulted naturally in a scale of consumption which was, locally, unsustainable. In addtion, demand for pressurized water leads, too, towards inflated expectations for ever greater personal consumption.

We hear today about our "carbon footprint," but perhaps the real measure of each human's "individual geography" is his or her "water footprint":

How much territory is required to provide potable water to a person?

Chiffelle, T., *Map of the City of Baltimore and ... County... including the Valley of the Great GunPowder River,* (Baltimore: 1852) | E. Pratt Library

Homewood's "water footprint" expanded less due to its own changes than to those changes in the surrounding area. Maps from the middle of the 1800's illustrate plans for acqueducts passing by the Homewood estate both to the east and to the west. Reservoirs were established to the east and the west of Homewood, roughly at its latitude; even today, the reservoirs at Druid Hill and at Montebello exist to supplement the primary treatment facilities established later.

Here on the right, you can see the first such plan, dating to 1852, which proposes to draw water from the Gunpowder River, essentially where Loch Raven exists today.

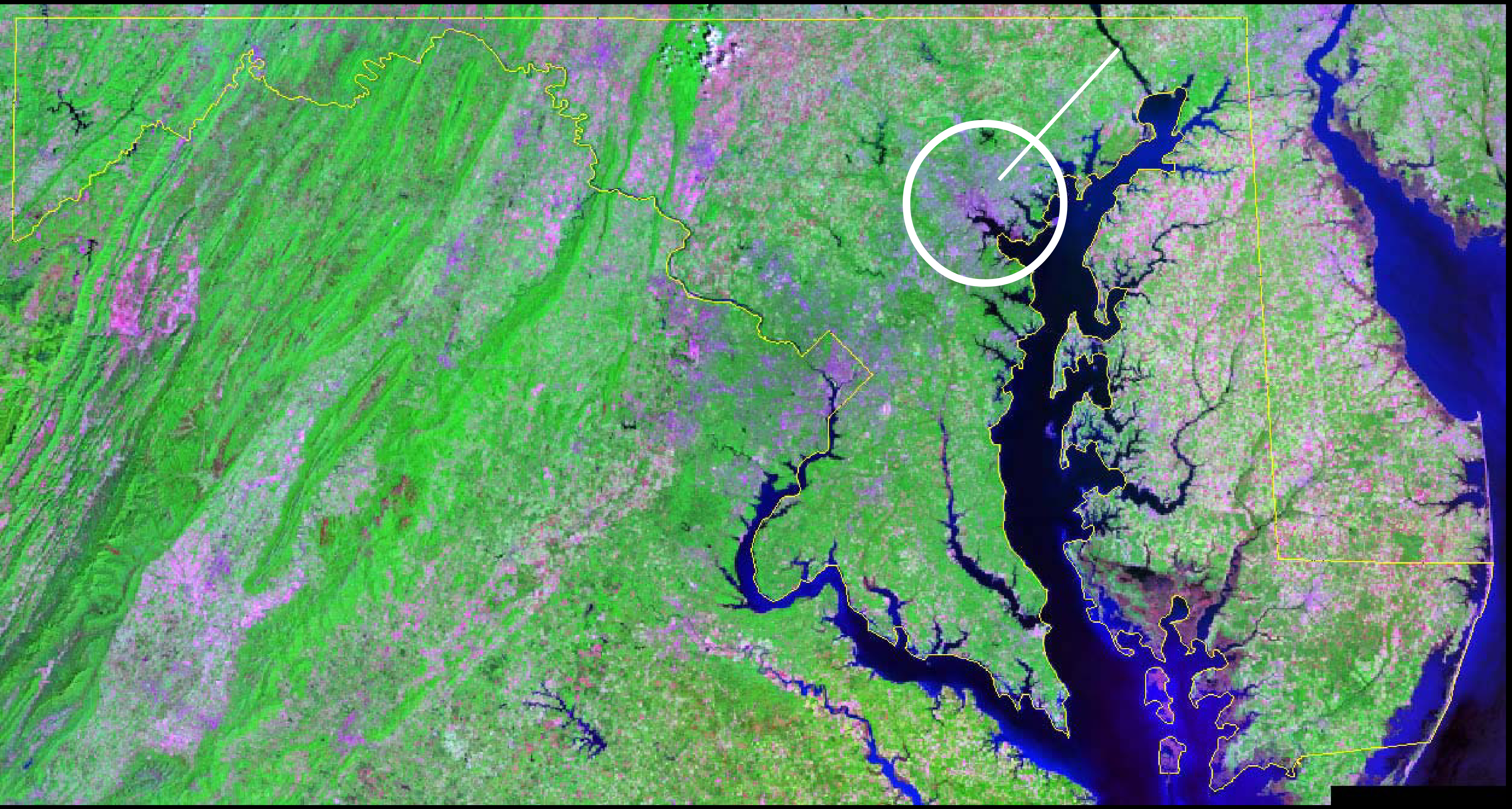
As you can see in the detail, natural streams to the East of Homewood were to be dammed and captured for use of reservoirs fed by the acqueduct.

Slade, J., *Plan of Baltimore and Vicinity Showing the Proposed Routes for Bringing Water ...* (Baltimore: 1853) | E. Pratt Library

More directly relevent to what was actually built — and to Homewood's own ecology! — was this plan, dated 1853. This proposal shows how the Jones Falls and Gwynn Falls watersheds were to serve the city, by way of reservoirs, one of which was immediately adjacent to Homewood.

The dam at Lake Roland dates to the years immediately following this plan; but the reservoir at Stony Run never did materialize, probably because the development of Druid Hill Park later in the 1850's allowed a single, larger reservoir to serve the system's purposes. The dam across Gunpowder Falls and the pipeline to Montebello was eventually constructed about 15 years later.

Currently, Baltimore's water supply derives its raw water from four "impoundments": Liberty Reservoir (1954), Loch Raven Reservoir (1915), Pretty Boy Reservoir (1932), which feeds Loch Raven. The Susquehanna River at the Conowingo Reservoir (1966) is the fourth source.



"Satellite Image Map of Maryland" (NASA / Landsat GeoCover: 2000) | Geology.com

This is hardly a pipeline of Chinatown proportions. It is dwarfed by Los Angeles' 242 mile pipeline from the Colorado River. But this scale of regional interdependence is important to keep in mind when we ask ourselves what Homewood Mansion has to teach us about Sustainable Design.

Can this contemporary, "wide-area" management of resources be sustained over the lives of our descendants? If so, what kinds of *human-factor* infrastructure makes this possible? Among governments, technical disciplines, and social services, which must be better "designed" to anticipate long-term needs?

Once again, the lesson is this: *Every designed environmental system must have both small-scale and large-scale parameters defined, understood, and not simply taken for granted.*

These factors are, over the long term, extraordinarily dynamic, if not fragile.

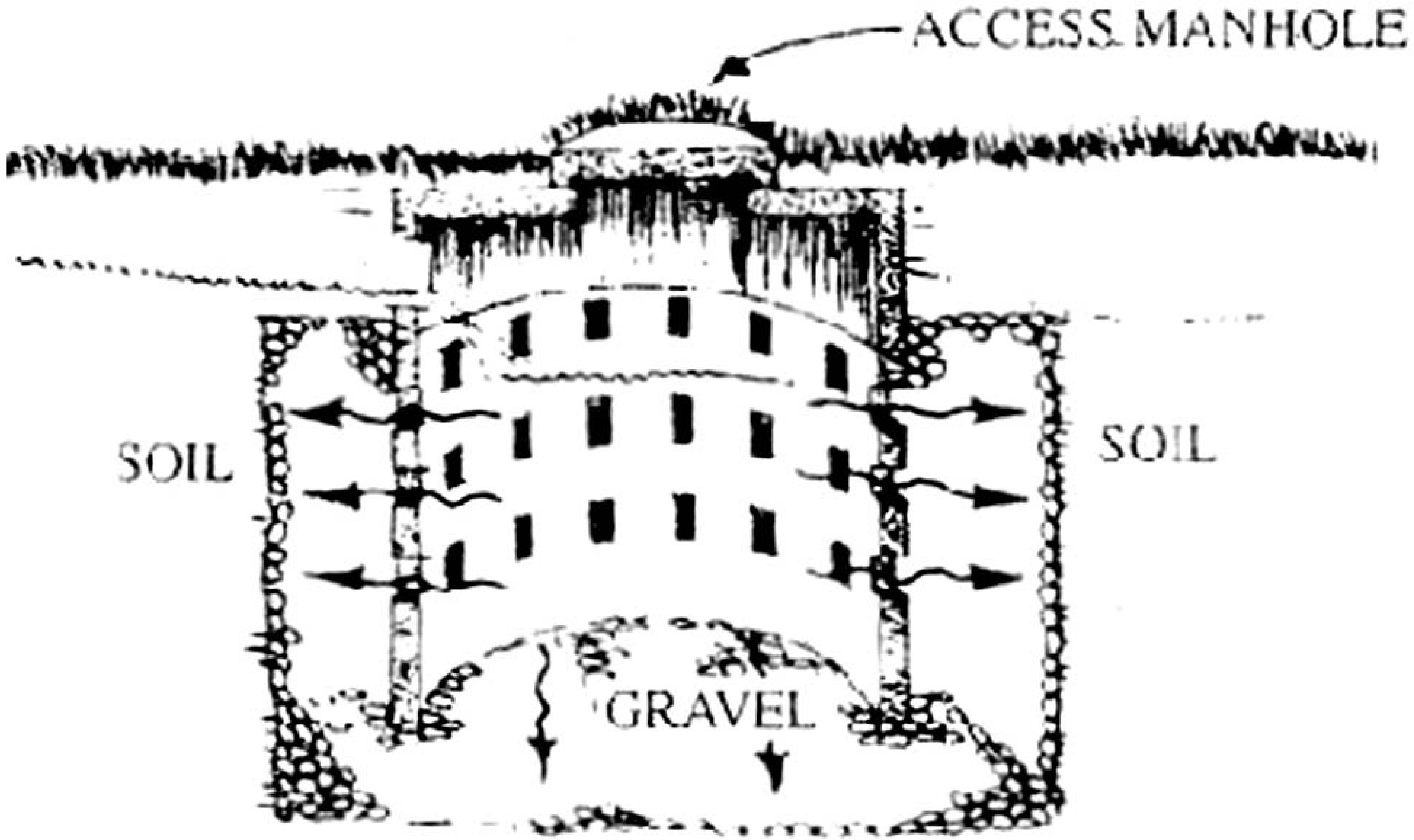
For example: Everybody likes a fountain. And bringing fresh water to everybody who needs it is wonderful.

But there's a catch: Once the water is consumed, where does it go?

As we all know, no one can simply "hold it in"; what goes in must also come out. Nevertheless, throughout most of our urban history we thought little, as a society, about what happens "downstream."

By the end of 19th century, water consumption had reached 52 million gallons *a day*. The water all flowed in with nowhere to go!

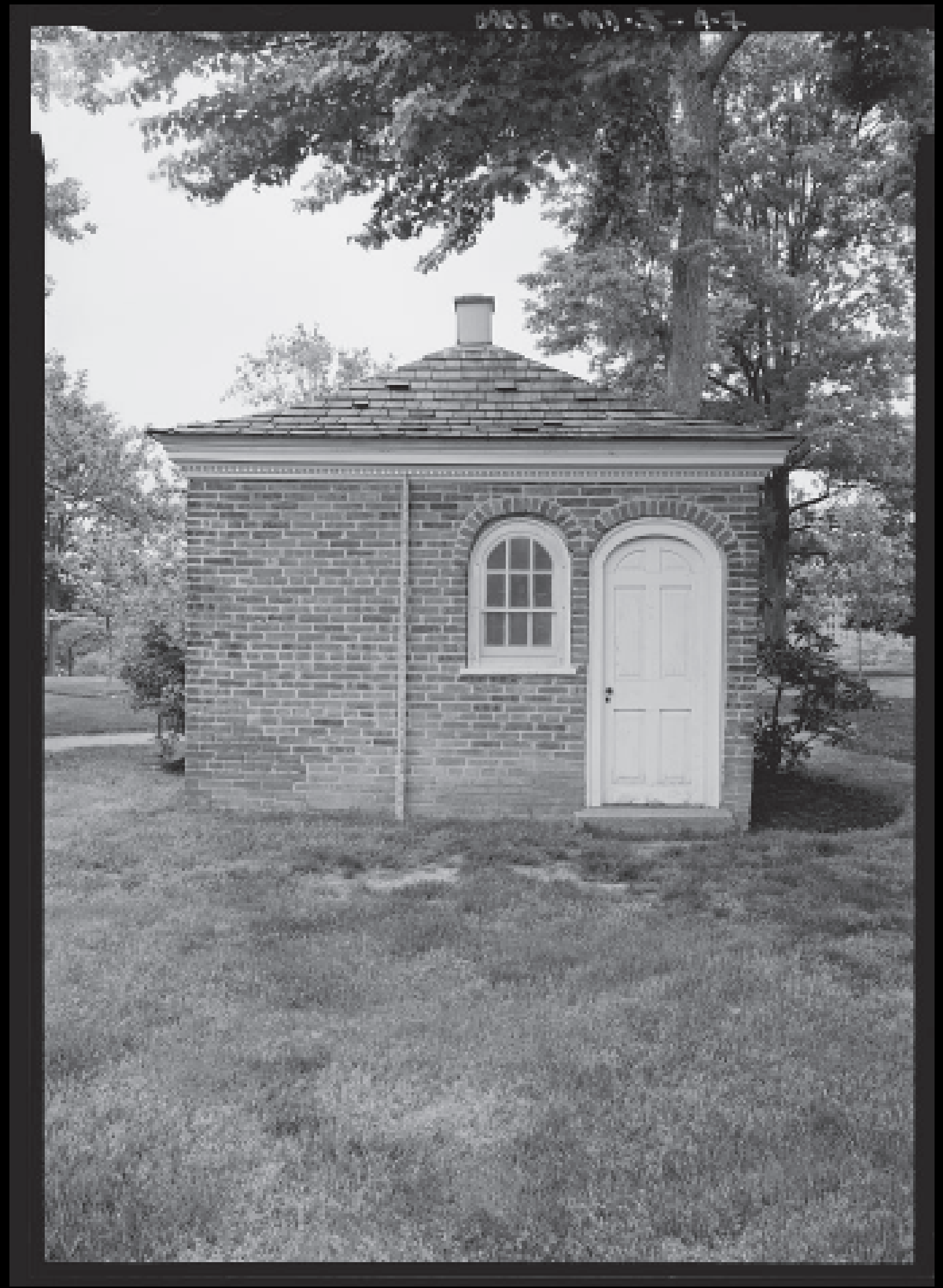
Actually, the water did go somewhere. It went into the streets, into nearby streams, and into cesspools — especially cesspools.



"Drainage pits - also called drywalls or cesspools," as described by **Fogle's Septic Services**, Sykesville, MD

Thoughout most of the 19th century, it was typically thought that the soil immediately surrounding cesspools would absorb most of the effluent introduced into it. But these were not scientifically-designed septic and leaching systems — they were *cesspools*.

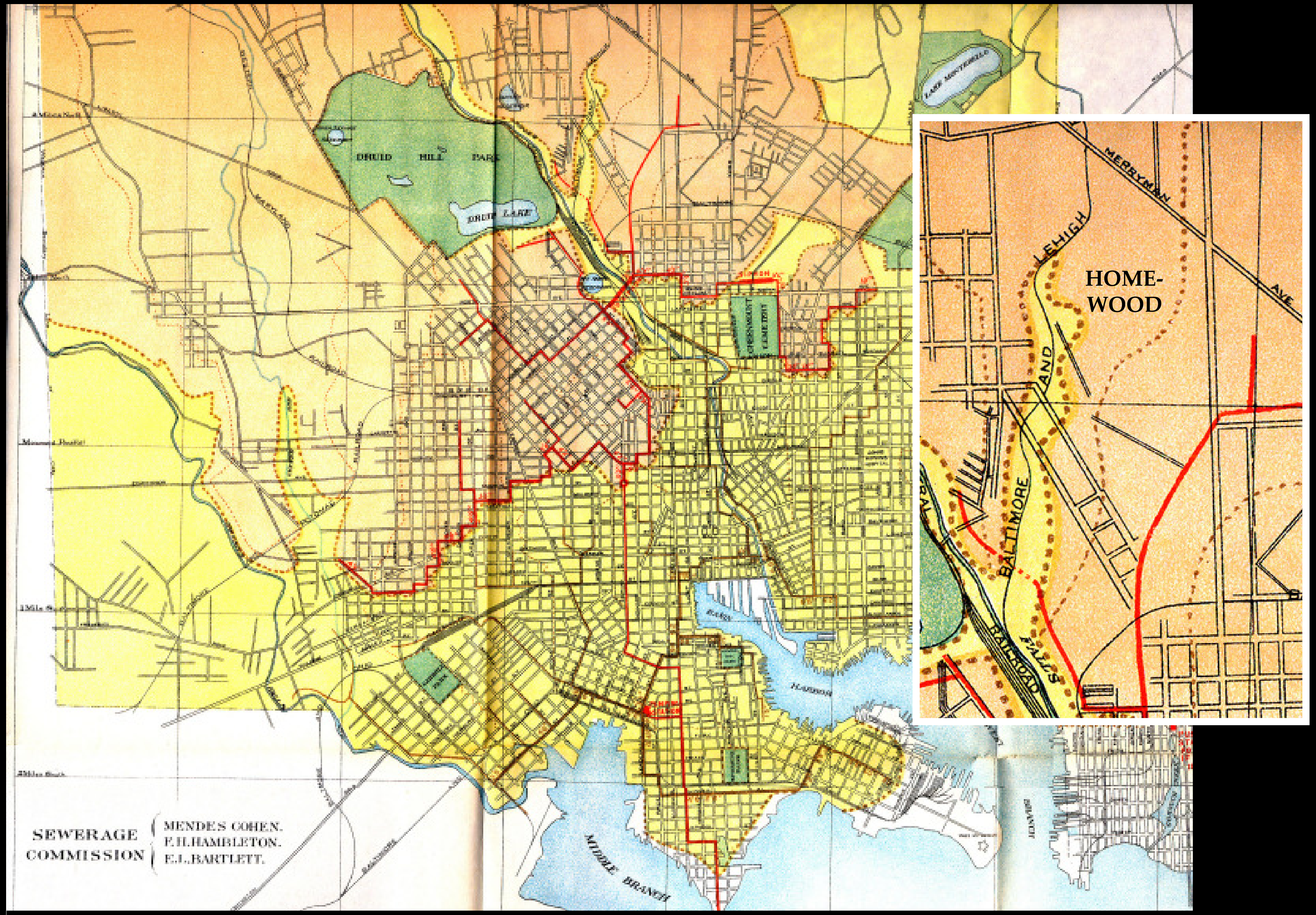
The situation was compounded by the increasing hardscape of Baltimore's roads and buildings. Once used, water had typically nowhere to go but *over* the surfaces under which the cesspools lay.



Homewood Privy, *Historic American Buildings Survey*, Library of Congress, Survey number HABS MD-35-A-7, HABS MD-35-A-10

Homewood Mansion and the Wymans' Villa were obviously excepionally well-situated to avoid such conflicts, since the estate grounds and topography were more than sufficient to sustain its small number of residents throughout its history up to 1900. The original "privvy" remains to this day, only a few yards to the north of the Mansion.

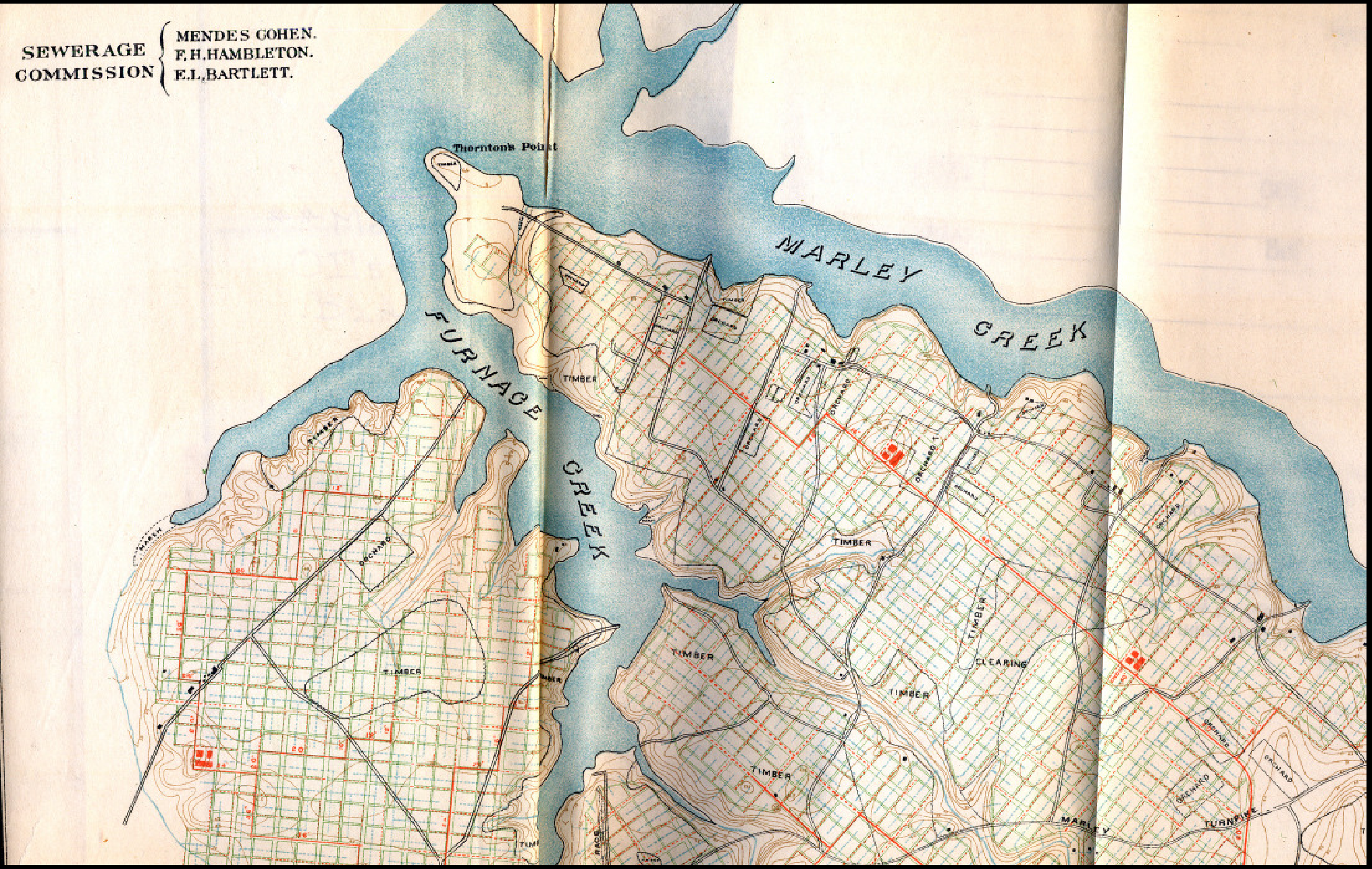
Yet outhouses and manually-evacuated cess-pits would certainly not suffice the Johns Hopkins University's plans for the site. How did Homewood — and Baltimore — meet this challenge?



Cohen, M., et al,"Filtration Scheme," *Report of the Sewarage Commission...* (Baltimore: The Friedenwald Co., 1897) | E. Pratt Free Library

In the 1890's a commission was appointed by Baltimore's municipality to study the technical issues surrounding the provision of a "scientific system of sewerage" for the City. Their report acknowledges that up to this point, there was neither system nor science in the removal of waste from Baltimore's dwellings and businesses. They imply that the Jones Falls provided too easy an expedient, which explained the foul condition in which it emptied into the Patapsco.

The result of their study was a list of three schemes, one of which is shown here. The red lines represent the trunks of a proposed sewage collection system, all of which would be directed along a single line across the middle branch and on to Glen Burnie. The tan color illustrates those parts of the city which would depend upon gravitation for waste flow; the yellow those areas which would require pumping stations to provide movement. At the contour at which these two fields meet would run the main trunk lines, in advance of their collection and direction towards the south.



Cohen, M., et al,"Filtration Field Layout," *Report of the Sewarage Commission...* (Baltimore: The Friedenwald Co., 1897) | E. Pratt Free Library

In this particular scheme, a sewage filtration field would have been located in what was undeveloped waterfront in Anne Arundel County. Such a system depends upon extensive acreage through which to process the flow of sewage, more or less like a gigantic leaching field for an enormous septic tank. The treated effluent would be released to the Patapsco adjacent to these fields; but the sediment would be removed either to incineration or dispersal.

But as ecologically invasive as this process may appear to us now, the other studied process would well have been worse: disposal of untreated waste via dilution, direct to the Chesapeake Bay.

Cohen, M., et al,"Dilution Scheme Outfall" *Report of the Sewarage Commission...* (Baltimore: The Friedenwald Co., 1897) | E. Pratt Free Library

Here is the lesson of Homewood and the City, a lesson by negative example: *True sustainable design must account for waste as* nourishment, *not merely as flotsam.*

Bill McDonough's *Cradle to Cradle* effectively sloganizes it as "Waste Equals Food." Or, rather, waste *should* equal food, since in our contemporary society the two are not equivalent. Throughout most of Homewood's history, this equation depended on qualities of scale. At a small scale, for instance, human waste is nutritious as fertilizer for the surrounding ecology; but at a large scale, our aggregate waste is toxic.

This is in many ways a technological challenge, but it is one which can no longer be ignored. At the very least, we have already become that much more aware, as your reaction to this map's meaning demonstrates.

Transportation Biohazard Operational Concept
Application of Technology to Transportation Operations in Biohazard Situations

1.0 Introduction

Each state Department of Transportation (DOT) is charged with the provision of an efficient and safe transportation system that enhances economic competitiveness and livability in the state. State DOTs occasionally are subject to emergencies and disasters that can threaten a safe and secure environment for travel. While state DOTs have developed Emergency Operations Plans (EOPs) and incident specific annexes, procedures and training to address many potential emergencies, there is the perceived need for additional guidance in managing events related to the accidental or intentional release of biological agents. These events may stem from the spread of microorganisms (bacteria, viruses, fungi) or toxins through the air as aerosols or in food or drink. A release affecting people could cause illness, death, fear, societal disruption, and economic damage. A release affecting agricultural plants and animals may primarily cause economic damage, loss of confidence in the food supply, and possible loss of life. A biohazard event could be caused by a terrorist attack or by an accidental release or contamination.

During response to these events, personnel from DOT districts and departments must coordinate with personnel from various public health, public safety, and emergency management agencies to perform a range of services. In these situations, unfamiliar tasks may have to be carried out in potentially threatening environments to protect motorists, employees, emergency responders, DOT vehicles and property, and surrounding communities. The Transportation Biohazard Operational Concept has been developed to support the efforts of state DOTs in defining their organizational structure, roles and responsibilities, processes and policies for managing a biohazard event. The operational concept clarifies the transportation functions to be performed during a biohazard situation by specifying the processes through which these functions are accomplished.

The operational concept should provide a blueprint for building consensus among transportation, emergency management, public health, agriculture and veterinary medicine, and public safety stakeholders on critical issues involved in biohazard events. This includes identification of required planning and response activities; multi-jurisdictional mutual aid and operating agreements; selection of operational strategies, standards, protocols; communications interfaces; and the application of technology. The operational concept will set a common vision to guide management of the transportation network during these events. It will be used to seek support from the emergency and transportation management communities, and to enhance the capabilities of current Intelligent Transportation System (ITS) technology to support these events.The operational concept does not exist in a vacuum. It builds on existing transportation and community emergency response plans, emergency response procedures, training, drills and exercises. It also builds on recommendations from the public health, agriculture, and veterinary medicine communities regarding how best to manage these types of emergencies.

The operational concept addresses all phases of the emergency management life cycle, specified by the Department of Homeland Security (DHS) in the National Response Plan (December 2004): Awareness – steps taken to identify, confirm, and monitor an event; Prevention – steps taken to avoid

Excerpted from Research and Innovative Technology Administration, *Final Report Application of Technology to Transportation Operations in Biohazard Situations.*. (Washington: US DOT, 2005) | http://www.its.dot.gov

Today the issue of sewage, sanitation, and public health has taken on the character of Hollywood science fiction, tempered by a kind of org-speak which immediately dulls most laypersons' attention. Research for the biological sciences, active today in buildings accross Homewood Campus, makes extensive use of radio- and bio-active substances.

Although both scientific and managerial technques are firmly in place to abate such hazards, it is worth asking — at least in the context of this symposium — both how and if considerations of Sustainability may be perpetually balanced with the University's dedication to such research. Does a real (or preceived) threat to Hopkins' adjacent neighborhoods outweigh the obvious rewards of Hopkin's chemical and biological studies? Is a means of abatement "sustainable" if it depends upon removal of biohazards, their subsequent transportation through occupied areas, and their disposal somewhere entirely different and beyond our control?

What other options might exist for the practice of scientific research, if its support systems change due to other, ecologically- or politically-driven changes?