Hazardous Waste Regulation: An Evaluation from an Historical Perspective*

I. Introduction

The Clean Air Act,[1] the Federal Water Pollution Control Act[2] and the National Environmental Policy Act[3] together testify to an unprecedented national mandate for comprehensive environmental protection in the United States. The awakening came as more than 200 years of growth and development finally overtaxed the country's air and water resources. The many important inquiries during the early 1970s concerning environmental problems focused on pollution abatement and protection of deteriorating national resources. Little attention, however, was given to the origins of the pressing environmental crisis. Certainly this should be the threshold inquiry. Without knowledge of why problems exist today, planning programs for the elimination of pollution discharges will necessarily be hamstrung by preconceived, and possibly ill-conceived, perspectives. Furthermore, optimal solutions to future environmental problems can only be achieved with an understanding of past mistakes.

This note examines the City of Philadelphia's development of its water and sewerage system as a case study of governmental response to increasing pressures of growth and industrialization. Based on this historical record, the paper advances guidelines for future environmental regulation. Finally, the paper evaluates recent hazardous waste legislation and regulation and discusses potential strong points and shortcomings of these in light of the lessons learned from Philadelphia.

* The author thanks Prof. Jay Feinman of Rutgers University School of Law, Camden, and Kenneth R. Myers of Morgan, Lewis & Bockius for comments on drafts of this note, and Rohm and Haas Co. for time to prepare it.

1. 42 U.S.C. §§ 7401-7626 (Supp. I 1977).
2. 33 U.S.C. §§ 1251-1376 (1976 & Supp. I 1977 & Supp. II 1978).
3. 42 U.S.C. §§ 4321-4361 (1976).

II. THE HISTORIC RECORD OF ENVIRONMENTAL PLANNING: PHILADELPHIA, A CASE STUDY

A. *Philadelphia Prior to 1850: Public Water Supply and the Urban Environment*

Eighteenth century Philadelphia practiced on-site methods of water supply and wastewater disposal. Water was supplied by private or public wells. Domestic wastewater was disposed of in two fashions: fecal waste in privy pits and washwater in streets and gutters. While these practices were acceptable to less densely populated towns or rural societies, Philadelphia's trend toward high density development, pioneered by Benjamin Franklin,[4] brought on the downfall of on-site wastewater disposal. As population and population density increased,[5] it became apparent that the homestead could not long absorb the simultaneous burdens of supplying water and disposing of sewage in a growing metropolis. Those who tasted the well water in Philadelphia's crowded blocks found that the closely spaced privy pits had contaminated nearby wells.[6] The yellow fever epidemics of 1793 and 1797 forced Philadelphia to develop its public water supply system. When the synergistic effect of both high population density and poor soil (sand) for sewage disposal is considered, it is no wonder that Philadelphia moved to create a water system forty-one years before any of its sister cities.[7]

Philadelphia's water system, conceived by Benjamin Latrobe in 1801, consisted of a transmission culvert, which supplied water by gravity from the Schuylkill River to a pumping station on the outskirts of the town at Center Square, and 29,963 feet of transmission lines. The original pipe consisted of bored out logs of yellow pine, but it was conceded even at that time that the logs must soon be replaced by cast iron.[8] Installation cost for the distribution system

4. Franklin began the "alley process" by subdividing his Market Street house lot and building three rental houses thereon. Ultimately the entire interior block was developed and became Franklin Court, thus ending William Penn's hopes for a "Green Town." S. WARNER, JR., THE PRIVATE CITY: PHILADELPHIA IN THREE PERIODS OF ITS GROWTH 15-16 (1968) [hereinafter cited as WARNER].

5. In 1775, Philadelphia's urban population was 16,560, or 28,552 persons per square mile. But by 1800, these figures had increased to 41,220 and 48,494, respectively. *Id.* at 12, 51.

6. Immigrant English engineer and architect Benjamin Latrobe noted the seepage of waste through the sandy Philadelphia soil. T. HAMLIN, BENJAMIN HENRY LATROBE 157 (1955).

7. WARNER, *supra* note 4, at 102 n.4.

8. It has been postulated that selection of wooden pipe for Philadelphia's water

varied from sixty to seventy cents per foot. The merchant class members of the Watering Committee demonstrated a genius for economy and labor management by compensating workmen with a combination of wages and alcoholic beverages.[9] In 1824 the Center Square system was replaced by the Fairmount Waterworks, which consisted of a pumping station that lifted water from the Schuylkill River to an elevated storage reservoir on Fairmount Hill. The Fairmount installation distributed water to the city by gravity.

The availability of wholesome water, while eliminating a serious public health problem, spurred rapid industrial and domestic development. The growth of Philadelphia from 1820 to 1850 exceeded its rate for any other period (1820-1830, 38%; 1830-1840, 37%; 1840-1850, 58%). Of equal significance, water consumption had begun to rise toward modern levels. Doubling since 1823, it reached twenty gallons per capita per day by 1837.[10] Rapid population and industrial growth in conjunction with increased water use set the stage for the next environmental crisis for the City of Philadelphia. The city water system was a double-edged sword, raising the standard of living for Philadelphians while creating ever growing quantities of wastewater for disposal. The solution to the yellow fever epidemics of 1793 and 1797 merely postponed the ultimate consequences of high density development and industrialization.

distribution system was a result of imperfect communication of state of the art engineering techniques to the new world. WARNER, *supra* note 4, at 105 n.9. This is unlikely. Immigrant English engineer Latrobe was surely aware of the use of cast iron pipe. Wooden pipes were probably selected for reasons of expediency. The absence of the coal and heavy iron fabrication industries in the new world during the 1800s would require cast iron pipe shipments from Europe. Given the impact of the recent yellow fever epidemics, sound policies for public health would require an immediate solution to water supply problems by use of easily available and relatively inexpensive wooden pipe.

In total, 241,604 feet of pine log were installed, the last installation being in 1832. The system was gradually retrofitted with cast iron, the last wooden pipe being replaced on December 15, 1858. When removed from Broad Street, "these logs were taken from the ground in a perfectly sound state and still fit for use, except along streets where large steam engines have been introduced; at these points the street load pressure upon them was too great, hence their removal at this time." F. Graff, Jr., Scrapbook (ca. 1858-61) (unpublished collection of newspaper articles for the period compiled by Frederick Graff, Jr., City of Philadelphia Chief Engineer 1847-55, 1867-72, available courtesy of the Philadelphia Water Department Archives) [hereinafter cited as F. Graff].

9. City of Philadelphia, Report of the Committee for the Introduction of Wholesome Water, Etc. 7-78 (1801).

10. WARNER, *supra* note 4, at 106, 107.

B. *Philadelphia 1850-1905: The Failure of Local Urban Planning*

The Philadelphia water system was pioneered by the Watering Committee of the City Council. The Committee was composed of members of the wealthy merchant class. Their ideal was to see the city-wide standard of living raised and disease eradicated by the distribution of wholesome drinking water. The ultimate impact of their efforts was perhaps less than the committeemen hoped. One survey of the period concludes:

> [t]he addition of adequate water did not end environmental pollution. To some extent, it aggravated it, for now cities had to dispose of vast quantities of water brought in by the new aqueducts. Existent surface drainage was inadequate. The new water closets of the 1860s and 1870s overflowed the old privy waste disposal systems, soaked the urban water tables, and converted large portions of city land and streets into a stinking morass. Once again the solution was physical and technical. During the 1870s and 1880s, city leaders undertook expensive programs of sewer building. They also began massive paving programs to improve drainage and to cover the wastewater-saturated soil of urban streets. The engineers who shepherded these projects emphasized their sanitary functions nearly as much as their traffic-bearing functions.[11]

The above passage described conditions that existed in the late nineteenth century in the major eastern metropolitan centers, *e.g.*, Boston and New York. Philadelphia's experience was no different. Figure 1 shows an annual summary of the city's completed sewers. From 1868 to 1875, Philadelphia experienced increased sewer construction. However, from 1876 to 1882, sewer installation decreased sharply. This decreasing trend is contra-intuitive when the population figures on Table 1 are considered. Between 1870 and 1880, population increased by 2.3% per annum or 173,148 persons. Population pressures and correlative industrial growth should have maintained sewer construction at a rate equal to that from 1860-1870, when population increased by 108,493 persons or only 1.9% per annum. In order to understand the reason for this phenomenon, it is necessary to examine wastewater disposal techniques and water quality information for the period.

11. Schultz & McShane, *To Engineer the Metropolis: Sewers, Sanitation and City Planning in Late-Nineteenth Century America*, 65 J. AM. HIST. 389, 393 (1978) [hereinafter cited as Schultz & McShane].

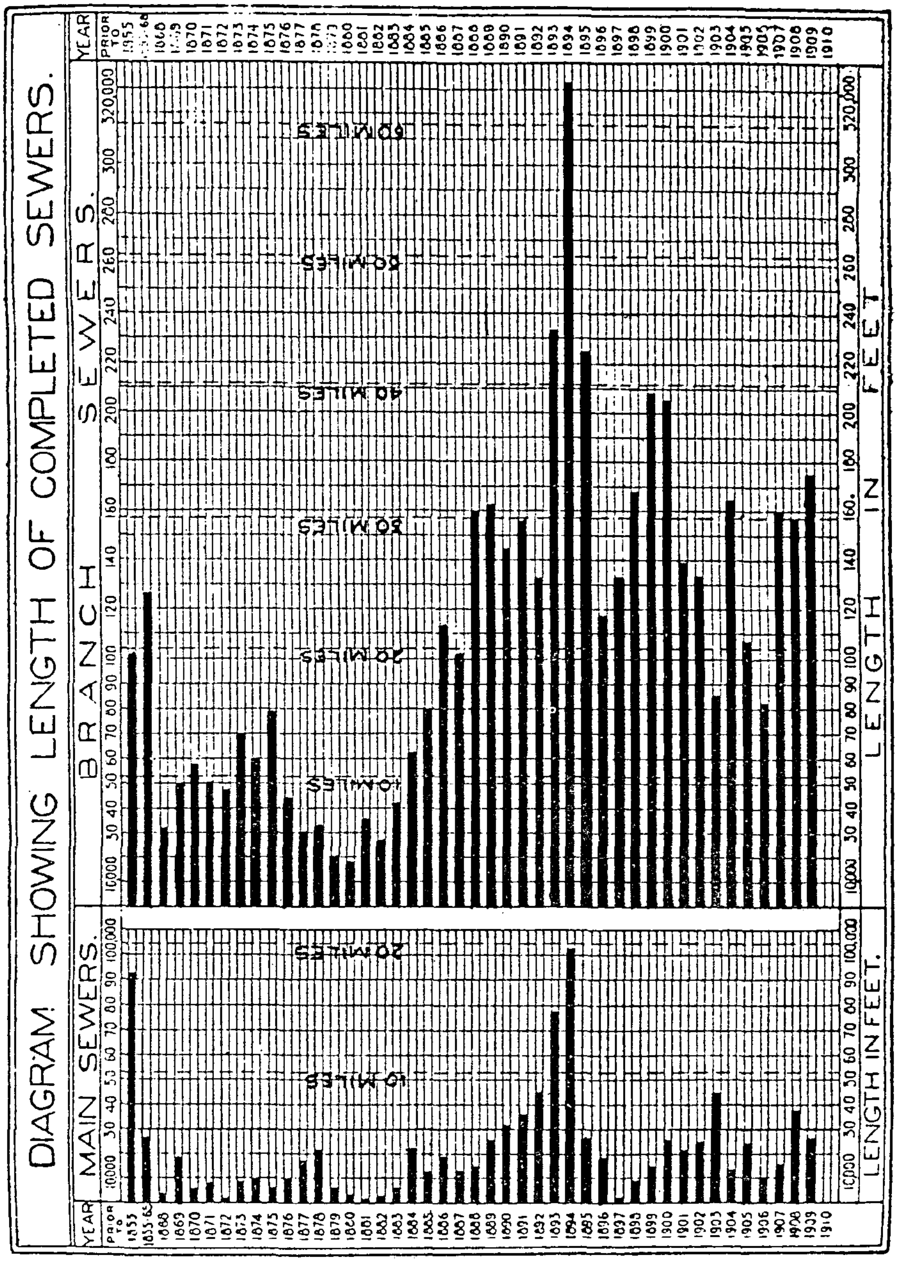


FIGURE 1
Source: Bureau of Surveys, Department of Public Works, City of Philadelphia, Mayor's Annual Report 274 (1909).

TABLE 1[12]

CITY OF PHILADELPHIA POPULATION STATISTICS FROM U.S. CENSUS REPORTS

Year	*Population*	*Annual Percent Increase*
1684	2,500	....
1777	21,767	8.3
1790	42,520	7.3
1800	70,287	6.5
1810	88,988	2.7
1820	119,325	3.4
1830	167,325	4.0
1840	258,037	5.4
1850	408,762	5.8
1860	565,529	3.8
1870	674,022	1.9
1880	847,170	2.3
1890	1,046,964	2.4
1900	1,293,697	2.4
1910	1,549,008	2.0
1920	1,823,158	1.6

1. Wastewater Disposal Practices

Information on common practices for the disposal of wastewater in the middle to late nineteenth century is notably lacking in detail. Some generalities, however, can be made. At least in theory, as late as 1898, human fecal waste and domestic cooking and wash water were disposed of separately.

> Throughout [Reading, Pennsylvania] cesspools and privy wells are seldom cleaned until they become full and new wells are sometimes dug instead of emptying old ones, though this is forbidden by the Board of Health. Of the 9,000 privy vaults and cesspools in the city, only about 520 were cleaned last year. The contents are removed to farms outside the city. . . .
>
> There is only one public sewer and that takes the place of the lower portion of a natural brook, yet on account of unusually good facilities for gutter drainage and the common practice of thus disposing of domestic wash water, probably three-fourths of all the wastewater of the city passes directly to the river. And although no water closet connections with the one sewer are allowed, it is almost certain that much fecal matter reaches the river by the following peculiar arrangements.[13]

12. City of Philadelphia, Water Supply of Philadelphia Reports 1897-1898, 1899-1920 (1924) [hereinafter cited as Water Supply Reports].

13. City of Philadelphia, Documents Relating to the Pollution of the Schuylkill River 8-9 (1898) (published in Water Supply Reports, *supra* note 12).

The "peculiar arrangements" alluded to above were those made by the local citizenry to locate privies over cavernous limestone formations. This scheme allowed the contents of the privies to seep through fissures in the limestone to the Schuylkill River, obviating the distasteful and costly task of cleaning the pit.

Urban wastewater in the middle to late nineteenth century was, then, ultimately disposed in the nearest stream, whether by design, through a street gutter or sewer, or inadvertently via poorly constructed privy vaults. None of the practices appears in retrospect to have been environmentally sound. But these practices represented the best available technology for the era.

2. Local Politics, Metropolitan Pollution

Nevertheless, state of the art technology did not solve Philadelphia's environmental problems. As the city grew westward, development along the banks of the Schuylkill caused growing amounts of wastewater to be discharged at points above the Fairmount water intake with serious consequences. During the summers of 1856 and 1857, people in Kensington were obliged to shun city water and were forced to draw drinking water by the bucket from the Delaware River. On October 25, 1858, the Philadelphia Evening Bulletin reported that "the water in the present dam, between Manayunk and Fairmount, is injured by the great quantities of dye water and other filth, let into the river below the upper dam, which is situated at Flat Rock, immediately above Manayunk."[14]

At this time, waste disposal practices were a function of political policy rather than engineering practice. On July 4, 1858, the Sunday Dispatch called attention to two chronic sources of pollution, the Gunner's Run catfish cleaning houses and a "nasty culvert" at the foot of Coates Street above the Fairmount Water Works. The culvert was built prior to consolidation of the separate municipal entities into a metropolitan Philadelphia government. The skirmishes between upstream and downstream factions are amusing in hindsight, but bespeak what was a serious threat to the public health:

> [the culvert] was built with a direct and spiteful determination to injure water used by the city. It now drains a large portion of the region above Coates Street and west of Broad. . . . The dirty stuff is pumped up now for the delectation of the Spring Gardenites [from whom the sewage originated] as well as

14. F. Graff, *supra* note 8.

> for the people of the Old City, Southwark and Moyamensing. How much longer we are to be forced to drink the water thus tainted with impurity is a hard thing to predict, such is the apathy of the councils. The remedy is an easy one. A short culvert . . . would turn aside this drain and discharge it in the Schuylkill below the basin. . . . We have spoken of this matter two or three times in the last three years . . . but the affair was safely put to sleep under the nursing of a committee.[15]

The outcry was not limited to the "uninformed" public. On April 30, 1859, the chief engineer for the City of Philadelphia reported that cleaning of sediment from impoundments was ineffectual to improve water quality in light of the "emptyings of sewers and other filth" which made the water supply "at times unfit for use."[16]

Clearly, neither the people nor the engineering profession was blind to the environmental problems caused by the waste disposal practices described above. Why then was an unacceptable dilution technique practiced many years after the assimilating capacity of the receiving streams was reached?

Unlike the water department whose early course was charted by the civic-minded merchants of the Watering Committee, sewer construction was controlled by the new political bosses coming to power after consolidation of the old city and the outlying county districts in 1854. The water system deteriorated under the new regime.[17] Historical responsibility for the slackness of pollution abatement at this time probably rests on the shoulders of these otherwise eminently adaptable men.[18] One writer explains:

15. *Id.*
16. *Id.*
17. WARNER, *supra* note 4, at 108.
18. In fact, the "short culvert," or interceptor sewer, requested in the July 4, 1858, Sunday Dispatch editorial, *see* F. Graff, *supra* note 8, was not constructed until 1883. Bureau of Surveys, Department of Public Works, City of Philadelphia, Report on the Collection and Treatment of the Sewage of the City of Philadelphia 14 (1914) [hereinafter cited as Sewage Collection and Treatment]. Throughout this period, development and sewer construction (*see* Figure 1) increased the pollution load to the impoundment above the Fairmount water works. The city constructed almost one million feet of sewers between 1858 and 1883 (*see* Figure 1), all of which ultimately discharged to the Delaware or Schuylkill Rivers. Why the city chose to build sewers which contaminated its water supply and elected not to install a single foot of sewer to protect drinking water quality is a question which arouses some curiosity. The public's demand for this interceptor escaped official notice until 1875 when the Board of Health first acknowledged the problem. *See* text accompanying note 24 *infra*.

To understand why citizens permitted such circumstances to exist, the structure of antebellum municipal government must be explored. During the late-eighteenth and early-nineteenth centuries the task of municipal administration began to shift from the exclusive promotion and regulation of trade to a more general concern for residents' well-being. By the eve of the Civil War, most city governments still more closely resembled their medieval predecessors than today's city administrations. State legislators saw cities principally as sources of patronage. Mayors were figureheads. Common councils exercised quasi-executive, quasi-judicial authority. Individual aldermen often retained control over most expenditures in their own wards. City employees such as policemen came into and left office in the revolving door of each election. Real estate speculators generally controlled land-use decisions and almost alone anticipated future growth; their major goal was to subdivide land to maximize short-run profits. Because of their traditional mistrust of centralized government, Americans usually turned to the local ward politicians or even to private groups or individuals for such vital urban services as water supply, street sanitation, and even fire protection. With the power to govern scattered in bits and pieces among a bewildering variety of offices, boards, and commissions, in effect no one governed.[19]

3. Rising Concern

Astounding as it may seem, during the period 1840-1880 the city government was responsible for but one act in furtherance of improved water supply, the purchase of watershed uplands.

In 1844, largely at the instigation of the College of Physicians, the city purchased a tract of land on the east bank of the Schuylkill above Fairmount Dam now known as Lemon Hill, in order to protect Fairmount pool from sewage pollution.

The Act of Assembly of March 26, 1867, creating Fairmount Park, stated that the land taken was to be "an open public place and park for the health and enjoyment of the people of said City and the preservation of the purity of the water supply of the City of Philadelphia." Under this Act, 3,448 acres of land are now embraced in park property along the banks of the Schuylkill River, Wissahickon Creek and their tributaries. The funds invested therein may be considered as expended toward the same purpose as the works recommended for the collection and treatment of the sewage inasmuch as they both are to protect the purity of the source of the city's water supply.[20]

19. Schultz & McShane, *supra* note 11, at 391.
20. Sewage Collection and Treatment, *supra* note 18, at 118, 119.

By the 1870s, the quality of drinking water, especially from the Schuylkill River, had begun to stir concern within the city government. The City Board of Health report of chemical analyses of the Schuylkill River, shown on Table 2, indicated an almost tenfold increase in organic matter between 1842 and 1870. This, in conjunction with the increase in sulphuric acid and concomitant decrease of carbonate of lime characteristic of waters containing acid mine drainage,[21] was evidence of a deteriorating if not unacceptable water supply. Yet as late as 1874, the Board of Health nonetheless concluded that the Schuylkill was an acceptable drinking water source.[22]

One year later, however, the Board of Health made a dramatic turnabout. Referring to the Schuylkill River, the Board reported that "the quality of the water . . . is rapidly deteriorating. This is no recent discovery. The cause of this deterioration is the discharge of sewage into the river at no great distance from the reser-

21. The effect of acid mine drainage on the city's water supply was noted in a New York Tribune article ca. October 1859. *See* F. Graff, *supra* note 8. According to the article, "113 collieries" were then in operation and discharging coal washings into the Schuylkill and its tributaries. The article reports that "in some cases the water is so highly charged with acid that iron of the gangway railroads is consumed in a few months requiring new rails." The impact of acid mine drainage on the Schuylkill in the vicinity of Philadelphia was minimized by the neutralizing effect of the limestone waters of the Maiden and Tulpenhocken Creeks. Both the Tribune and the city, *see* City of Philadelphia, Select Council Journal (1874) [hereinafter cited as 1874 Select Council Journal], reported that the water below those points was "pure and limpid" from the natural neutralization of the acid mine water by the limestone creeks.

Natural neutralization was a mixed blessing, however. Acid mine waters if introduced into the Fairmount water impoundment would have oxidized organic matter from domestic sewage and destroyed pathogens. Whether acid mine drainage was an environmental asset or liability to nineteenth century Philadelphia is open to debate.

Acid mine drainage ultimately posed a serious problem to both water quality and navigation. From 1904 to 1939 alone, 24,000,000 cubic yards of coal washings accumulated in the Schuylkill. UNITED STATES ARMY, WATER DEPARTMENT REPORTS ON SCHUYLKILL RIVER 17 (1939).

22. How the Board of Health could find the rapidly deteriorating waters of the Schuylkill acceptable is confounding. The possibilities range from politics to public relations. Thus, the Board compared Philadelphia water quality in 1852 to that of Boston and New York in 1870 (*see* Table 2) in order to report a politically acceptable comparison. Even so, Philadelphia's drinking water quality barely passed muster. Eighteen years of growth would impact disfavorably on the Schuylkill water quality. Therefore, use of 1870 data would probably show Philadelphia's drinking water quality to be substantially below that of New York and Boston. Given the rate of deterioration of the quality of the Schuylkill from 1850-1870, use of 1870 data could have been politically embarrassing.

TABLE 2[23]

NUMBERS REPRESENTING GRAINS IN UNITED STATES GALLON

	Solid residue	Inorganic matter	Organic and volatile
Charlestown*	4.48	3.27	1.21
Boston†	2.45	1.80	0.65
New York‡	4.78	4.11	0.67
Philadelphia§	4.08	4.04	0.04

NUMBERS REPRESENTING PARTS IN 100,000

	Solid residue	Inorganic matter	Organic and volatile
Charlestown*	7.69	5.62	2.07
Boston†	4.20	3.08	1.12
New York‡	8.20	7.07	1.15
Philadelphia§	6.99	6.93	0.06

* Prof. W. R. Nichols.
† Prof. W. R. Nichols, 1870.
‡ Prof. Chandler, 1870.
§ Prof. Boyé, 1852. Schuylkill water.

DIRECT ANALYSIS OF SCHUYLKILL WATER

NAMES OF SUBSTANCES FOUND	*Boyé, Fairmount, 1842*	*Booth & Garrett, Fairmount, 1854*	*Booth & Garrett Fairmount, 1862*	*Phillips, Fairmount, 1870*
Lime	1.226	1.404	1.457	....
Magnesia	0.230	0.696	0.835	....
Soda and potassa	0.455	0.343	0.131	....
Sulphuric acid	0.302	1.417	1.508	....
Chlorine	0.086	0.168	0.139	....
Alumina and oxide of iron	0.077	0.068	0.075	....
Silex and insoluble matter	0.395	1.080	0.339	....
Organic matter	0.036	....	....	0.257
Total amount per gallon directly determined	4.421	6.109	7.040	4.498

RATIONAL ANALYSIS OF SCHUYLKILL WATER

NAMES OF THE CALCULATED COMPOUNDS	*Boyé, Fairmount, 1842*	*Booth & Garrett, Fairmount, 1854*	*Booth & Garrett Fairmount, 1862*	*Phillips, Fairmount, 1870*
Sulphate of lime	....	2.409	2.564	0.287
Sulphate of soda	0.560	....	....	0.479
Sulphate of potassa	....	....	....	0.435
Chloride of sodium	0.153	0.307	0.229	0.487
Carbonate of lime	2.190	0.736	0.716	1.562
Carbonate of magnesia	0.484	1.412	1.753	0.601
Carbonate of soda	0.185	0.292	0.017	....
Oxide of iron and alumina	0.077	0.068	0.075	0.093
Silex and insoluble matter	0.395	1.080	0.339	0.297
Organic matter	0.036	....	....	0.257

23. 1874 Select Council Journal, *supra* note 21, at 461-63.

voirs, mostly within the corporate boundaries of the city, a cause which the civil authorities have the power to remedy."[24]

The 1875 report marks the first governmental notice of the pollution problem in the city's water supply. The report relies heavily on an examination of the Schuylkill River by Charles M. Cresson, M.D., dated March 3, 1875. (This report was also the first to find that a pollution problem existed in the Delaware River.) It is tempting to postulate that the complacent 1874 Board of Health report spurred a skeptical Cresson in his tests. But it is incontestable that use of an unbiased consultant allowed the Board of Health to take a much firmer stand on the pollution issue. By divorcing the message from the messenger, the Board positioned itself to attack City Hall's neglect of pollution problems. The Board's newly aggressive stance was manifest in this salvo concerning the discharge of sewage from Falls Village and Manayunk[25] into the Schuylkill:[26]

> [b]ut there still remain at the Falls Village and Manayunk and at a few other points along the river, serious nuisances, the removal of which we feel it to be our bounden duty to urge most emphatically. . . . In manifest violation of law, and by the full knowledge of Councils, the discharge of foul matter into the Schuylkill, at the points above mentioned, is of daily occurrence. Against this evil we again solemnly and earnestly protest. If the city deems it prejudicial to her business interests to impose any inconvenience upon the manufacturing establishments that are the main offenders, then it is incumbent upon her to provide, without further delay, an unobjectionable means of escape for the impurities that now find their way into the river. *A means of drainage for the Falls Village and Manayunk has become an im-*

24. 1 City of Philadelphia, Select Council Journal 1234 (1875).

25. *See* note 18 *supra*.

26. Comparison of the membership of the Select Councils of 1874 and 1875 shows that six of the 29 seats changed hands in 1875. The changes by ward are as follows:

Ward	*1874 Select Council*	*1875 Select Council*
3	John C. McCall	John Monroe
7	John A. Shermer	Nathan Spering
10	William B. Hanna	John McCullough
20	William Baldwin	John A. Miskey
27	Joseph P. Boon	O. Howard Wilson
29	Christopher Binder	John Fox

Extant records do not indicate whether the change was a function of the water contamination issue or merely allowed for unbiased reporting of the problem.

> *perative necessity*. The sanitary welfare of the city demands that the purity of the water of the Schuylkill shall be preserved.[27]

The need for an intercepting sewer was reiterated by the Board of Health in 1876 with renewed vigor. "Our object is to guard the public health. . . . Until this is done we shall not rest content."[28]

From the above discussion, the reason for decreased sewer construction between 1876-1883 becomes apparent. The warnings given to the city by the Board of Health in 1875 and 1876 were heard. In response, the city began to minimize sewer construction in 1876 in an effort to prevent growing wastewater flows from reaching its water supply. The city continued to protect the Schuylkill in this manner until 1883 when development pressures revived sufficiently to compel construction of the Manayunk intercepting sewer.

4. Sewers Before Rivers

From 1885 to the early 1900s, Philadelphia experienced what could be termed a "golden age" of sewer construction. (*See* Table 1). Unprecedented lengths of sewers were installed. In 1894 alone, 450,000 feet of sewers were constructed, more than the combined total from 1877-1885.

Whatever its impetus, increased sewer construction was not the solution to Philadelphia's contaminated drinking water problems. Rather, greater numbers of sewers only increased pollution loads on streams which eventually flowed into the municipal water supply. Philadelphia was confronted with an unpleasant choice: either construct sewers to improve hygiene with regard to wastes, thereby degrading the water supply for the city at large; or protect the Delaware and Schuylkill from further deterioration by not building sewers, and suffer the local health and drainage problems experienced in the 1860s. Philadelphia chose the former course.[29] The same pattern was followed all along the rural banks of the Schuylkill with large quantities of non-local domestic wastewater being discharged to the city water supply. (*See* Table 3).

27. 1 City of Philadelphia, Select Council Journal 1235-36 (1875) (emphasis original).

28. 2 City of Philadelphia, Select Council Journal 522 (1876).

29. It can be said that building sewers at the expense of water quality is at least the aesthetically acceptable choice. Walking in sewage discharged by faulty on-site disposal systems is far more visible and far more susceptible to public awareness than is drinking it.

TABLE 3[30]

SUMMARY OF POLLUTION OF THE RIVER SCHUYLKILL BY DOMESTIC SEWAGE FROM INVESTIGATIONS MADE IN THE YEAR 1884

(Population estimated for January 1, 1885)

	DISTRICTS						
	FIRST	*SECOND*	*THIRD*	*FOURTH*	*FIFTH*	*SIXTH*	*SEVENTH*
	(Whole Valley above Reading)	*(From Upper Boundary of Reading to mouth of Manatawny Creek)*	*(From above Manatawny Creek to intake of Phoenixville Water Works)*	*(From Phoenixville Water Works to Norristown Water Works)*	*(From Norristown Water Works to Conshohocken Water Works)*	*(From Conshohocken Water Works to Roxboro' Pumping Station)*	*(From Roxboro' Pumping Station to Fairmount Pumping Station)*
Drainage area	656.9 sq. mls.	398.0 sq. mls. 1,054.9 " §	149.4 sq. mls. 1,204.3 " §	517.6 sq. mls. 1,721.9 " §	29.5 sq. mls. 1,751.4 " §	38.5 sq. mls. 1,789.9 " §	74.0 sq. mls. 1,863.9 " §
Population	91,000	95,000 186,000 §	28,000 214,000 §	66,000 280,000 § †	22,000 302,000 §	18,000 320,000 §	52,000 372,000 §
DOMESTIC SEWAGE							
Daily water supply, *representing domestic waste water	2,600,000 gals.	4,500,000 gals. 7,100,000 " §	200,000 gals. 7,300,000 " §	500,000 gals. 7,800,000 " §	1,000,000 gals. 8,800,000 " §	80,000 gals. 8,880,000 " §	
Population having water-closet drainage into the river	5,000	12,000 17,000 §	750 17,750 §	1,100 18,850 §	2,800 21,650 §	1,100 22,750 §	4,150 26,900 §
Population having wash-water drainage into the river	22,000	40,000 62,000 §	5,000 67,000 §	3,000 70,000 §	4,500 74,500 §	1,500 76,000 §	9,000 85,000 §

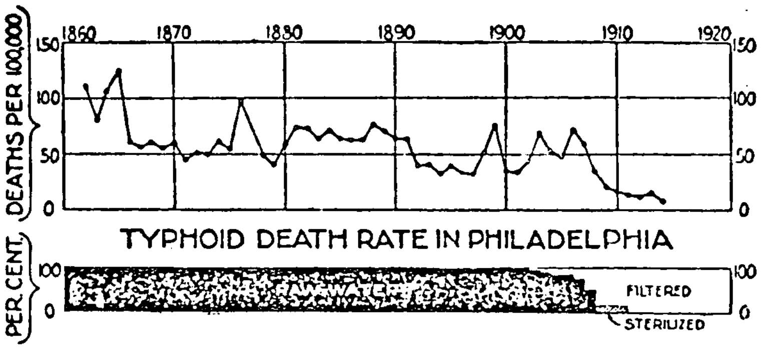
§ Total, from head waters of Schuylkill to foot of district

* From public supply only.

† Perkiomen water-shed above Schwenksville not included in the remainder of this column.

Ironically, the first generation of sewer facilities did little to protect public health. Typhoid fever, a dreaded companion of unsanitary sewage, persisted in the last decades of the century. From 1870 to 1891, the typhoid fever death rate averaged 62 deaths per 100,000 population, with a minimum and maximum of 38.2 (1879) and 92.2 (1876), respectively. "Equally striking in this regard is the fact that the disease did not show its ravages for a period and disappear, but was constant through all the years—the deaths representing never less than 1.94% of the whole number of deaths in any years or more than 4.03%."[31] This conclusion is supported by the typhoid death data presented in Figure 2 below. The city was plagued by a typhoid problem until the introduction into the water system of sand filters and chlorination facilities in 1910-1911.[32]

FIGURE 2[33]



Philadelphia became more and more oblivious to its drinking water problem, constructing a growing sewer system and increasing pollution loads to its water supply. By 1900, Philadelphia had

30. City of Philadelphia, Documents Relating to the Pollution of the Schuylkill River 75 (1898) (published in Water Supply Reports, *supra* note 12).

31. City of Philadelphia, Water Supply and Filtration 91 (1897) (published in Water Supply Reports, *supra* note 12).

32. Prior to 1910-11, Philadelphia distributed untreated raw river water throughout its water system. Once filtration and disinfection were added, the typhoid rate dropped dramatically. The effect of filtration upon typhoid had been known in Germany in 1893, *see* Sewage Collection and Treatment, *supra* note 18, at 26, and in England by 1892. *See* FAIR, GEYER & OKUN, ELEMENTS OF WATER SUPPLY AND WASTEWATER DISPOSAL 14 (1971). By the turn of the century 125 water plants in the United States had treatment facilities. Rowland & Heid, *Water and the Growth of a Nation*, 48 WATER POLLUTION CONTROL FED'N J. 1682, 1686 (1976). Philadelphia, pioneer of the urban water suppliers 100 years earlier, was the last of the great cities to make these improvements. As a result, an estimated 13,600 unnecessary deaths due to typhoid occurred in Philadelphia between 1870 and 1890.

33. Sewage Collection and Treatment, *supra* note 18, at 26.

taken only two measures to divert sewage from its drinking water supply. These were projects leading a portion of the wastewater flow away from Cobbs Creek and the Schuylkill River by interceptor sewers.[34] Otherwise, the city had abdicated its role as protector of the aqueous environment. Water quality apparently could not be achieved by the local government. Only extra-urban forces could be expected to ensure public health and control water-borne disease.

C. *The Act of 1905: State Intervention*

State intervention came in 1905 in the form of water quality legislation. The 1905 Act was introduced by Algernon B. Roberts of Montgomery County. Roberts argued that the increase in typhoid fever was linked directly to drinking water contaminated with sewage. He supported sewage treatment and water filtration as solutions to the typhoid problem. Opponents of the Roberts bill focused on the effects the legislation would have on industry. Representative William Irwin (Blair County) and Senator Arthur Dewalt (Lehigh County) noted that the bill would have granted the Commissioner of Health power to deny discharge permits to industries which polluted Pennsylvania's rivers and streams. Dewalt felt that strict enforcement of the law would close many factories and leave thousands of residents unemployed. On March 28, 1905, the bill passed in the House of Representatives by a vote of twenty-eight to thirteen. Allegheny County Senators David A. Wilbert and John W. Crawford supported the measure. An historian furnishes this analysis:

> [o]n April 22, 1905, "an Act to preserve the purity of the waters of the State, for the protection of the public health" became law. The new law charged the Pennsylvania commissioner of health with the responsibility for protecting the waters of the state from sewage pollution. In order to reach this objective, the law required public and private authorities to file applications for permits to extend existing sewer systems which discharged into bodies of water. These applications included descriptions of existing sewer systems and proposed methods for sewage treatment. The commissioner was required to review each permit application and evaluate the effects increased pollution would have on particular bodies of water. The commissioner issued permits and required comprehensive sewage surveys as various communities filed applications to extend existing sewer lines.[35]

34. *See* note 18 *supra*.

35. Gregory, *A Study in Local Decision Making: Pittsburgh and Sewage Treatment*, 57 W. PA. HIST. MAG. 25, 36 (1974) [hereinafter cited as Gregory].

Philadelphia's response to the legislation was slow. In 1908, the city established the Spring Garden experimental testing station for the purpose of studying the various sewage treatment techniques pioneered in Europe over the preceding twenty-five years.[36] In 1909, the city repudiated the notion, which it had embraced for 200 years, that wastewater dilution was the antidote to pollution. "[D]ilution," the mayor admitted, "cannot be entertained as affording any permanent solution of the problem, both from its inherent defects, and from the known antagonism of the Health Department."[37] Finally, with candor if not discomfiture, Philadelphia, "[u]nder pressure from the state, if for no other reason" admitted its need for a municipal sewage disposal works.[38]

The plan mandated by the 1905 Act was submitted to the state and approved on August 30, 1915.[39] Basically the plan called for increased interceptor sewer construction to divert sewage from the drinking water supplies and for construction of three treatment facilities along the Delaware River. These facilities were to be devoted to screening of gross solids at the Southeast Works and screening and primary clarification in the Northeast and Southwest Works.[40]

However, treatment by the screening technique would have removed few pollutants from the wastewater. It was small consolation that primary clarification would remove at best thirty-five percent of the objectionable materials. In reality, the Philadelphia plan was merely a restatement of the dilution theory of wastewater treatment, in that it diverted sewage flows from the Schuylkill to a river with greater assimilative capacity, the Delaware.

III. Discussion: Lessons from Philadelphia's Past

Early Philadelphia was nurtured by the widely held view, articulated by Thomas Paine in his essay, *Common Sense*, that America was a land of unlimited natural resources. But as has been seen above, dramatic population growth revealed the fallacy in such thinking: misuse *could* despoil resources, after all.

Scientists' acceptance of the germ theory of disease by 1847 laid the foundation for systematic safeguards on drinking water to combat typhus. But Philadelphia dragged its feet. Antipollution mea-

36. 2 City of Philadelphia, Mayor's Annual Message 294 (1908).
37. 2 City of Philadelphia, Mayor's Annual Message 265 (1909).
38. 2 City of Philadelphia, Mayor's Annual Message 20 (1912).
39. 2 City of Philadelphia, Mayor's Annual Message 300 (1915).
40. Sewage Collection and Treatment, *supra* note 18, at 7.

sures were not impracticable. Boston implemented a plan in the late 1850s which included early efforts at land use control and reconstruction of sewers to divert wastewater to more appropriate receiving streams.[41] By contrast, Philadelphians did not receive official acknowledgement of their pollution problem until 1875; local government's corrective was not in place until 1883 and even that was but meager. Ironically Philadelphia, a leader in water distribution technology in the New World under the city's proud burgher Watering Committee, was twenty-five years behind the rest of the world in establishing water and wastewater treatment. Not even plans announced in 1897—but never implemented—for a new thirty-mile aqueduct to carry pristine drinking water to the city,[42] could redeem nineteenth century governments' legacy of neglect.

This Philadelphia story demonstrates four common shortcomings in government responses to the problem of waste disposal:[43] a) the inherent feebleness of local, as opposed to regional, environmental planning; b) the tendency of environmental planning to be reactive and retrospective rather than initiative and prospective; c) the tendency of environmental planning to be "open-loop" in nature; d) the tendency of elected officials and planners to use the absence of a tangible environmentalist mandate as a pretext for downgrading environmental concerns. Each of these tendencies will be discussed in detail below.

A. *Local v. Regional Planning*

History shows that local planning efforts are hindered by local political interests. Philadelphia entered the nineteenth century a leader in municipal services under the management of the Watering Committee. But mismanagement ultimately eroded the city's quality of life, in the process conferring upon Philadelphia an unsought distinction: the first major city to recycle typhoid-infested drinking water into its water supply.

41. Schultz & McShane, *supra* note 11, at 404.

42. City of Philadelphia, Water Supply and Filtration (1897) (published in Water Supply Reports, *supra* note 12). The plan sought to remove unpolluted drinking water from the rural reaches of the Schuylkill and to transport the water via pipeline to Philadelphia. In essence, an unpolluted man-made river was proposed to replace the man-polluted natural river.

43. As used in this context, "environmental planning" is not limited to land or water resources planning *per se*. Rather, the term refers to all environmental legislation and regulation as a plan or guide to effectuate an environmental goal.

Environmental planning cannot be accomplished on the local level for a number of reasons. Local planning institutions are more susceptible to the pressures of local interests than are state or federal agencies because of the high degree of political involvement in most local planning agencies.[44] Given such an atmosphere, decisions having harmful environmental impacts disproportionate to community benefit are not uncommon. For instance, local leaders often assign higher priority to employment goals than to environmental objectives. Forced to choose between jobs and environmental quality, local planners tend to support job-creating activities at the expense of environmental protection. Such an outcome is less likely when environmental goals are pursued by more detached and broadly responsive state or federal agencies.[45] This is not to say that local planning has no role in environmental protection. Knowledge of local conditions and needs is more efficiently gathered by local planners; but this familiarity by its very nature too often leads to provincial thinking when a more cosmopolitan approach is needed.[46] Further, local environmental planning horizons are likely to be directly related to the lengths of the terms of office of local officials. Clearly, two- to six-year environmental planning is a pointless endeavor.[47]

The tendency of local officials to deprecate environmental issues is linked to the inherently parochial nature of municipal interests.

44. Local planning, zoning and sewer boards or authorities usually have members who are appointed by elected officials or are themselves elected officials serving both legislative and administrative functions. Board staff, if any, are under control of politicians or their appointees, and are usually without the benefit of union protection. Thus, politically expedient results are not difficult to achieve.

45. In EPA v. Nat'l Crushed Stone Ass'n, 101 S. Ct. 295 (1980), the Supreme Court declined to infer the existence of economic hardship variances in the "best available technology" pollution abatement requirements of 33 U.S.C. § 1314(b)(2) (1976 & Supp. I 1977). The Court rejected the notion of parallels with such variances as are found in 33 U.S.C. § 1314(b)(1) (1976), whose antipollution provisions are entitled "best practicable control technology currently available." In so holding the Court noted that Congress estimated that 200-300 plant closings would result from the unfavorable economic impact of the Clean Water Act. If water quality were determined by local interests faced with the loss of employment by its electorate, it is most probable that economic hardship variances would have been granted.

46. Even if municipal agencies make the environmentally "correct" decision, local economic, legal and technical resources are usually inadequate to defend sound environmental policy in the courts. In the end, the result is the same as if an unsound decision was originally made.

47. In at least one respect, bureaucratic inertia at state and federal levels might serve to dampen the oscillations caused by vacillating public opinion, protecting long-range environmental plans from political and popular vagaries.

Extraterritorial downstream or downwind impacts are not an issue. When political pressures to increase revenues by increasing sales of water to growing industries during the 1880s and 1890s superceded water quality concerns, Philadelphia built more sewers which discharged more pollution to the Schuylkill and Delaware Rivers. Between 1880 and 1905, Philadelphia evinced no concern about the impact the "golden age of sewer construction" had on downstream water quality at Chester and Wilmington.[48]

When local fiscal resources hang in the balance, the equation of minimal cost with minimal protection of the environment becomes too easy to rationalize. For example, when faced with increasing pollution loads on the Schuylkill River from domestic sewage outfalls in the 1850s, Philadelphia's first response was to curtail sewer construction to protect water quality. This represented the least-cost response, solely a product of local rationalization—yet the resulting benefit was too skimpy to justify it. Even when forced to treat its discharges under the Act of 1905, Philadelphia took ten years to formulate its plan, which, as it happened, provided little in the way of wastewater treatment. One is forced to conclude that pollution abatement mandates must confine the tendency of localities to stray from the region's requirements for upgraded standards as well as for timely compliance.

B. *Retrospective v. Prospective Planning*

At first blush, "planning" would appear to be prospective *per se*. However, history shows that environmental controls are typically promulgated in response to existing intolerable conditions in the environment, not to protect natural resources from anticipated degradation. Environmental planning is thus usually reactive in nature and retrospective in outlook rather than initiative and prospective. Past "planning" efforts were really not planning at all. They were instead remedial.

Even complex measures having forward-looking aspects are usually premised on the success of clean-up programs. The "revival" of Lake Erie is a case in point. With future conduct regulated and continuing pollution loads diminished or eliminated, the natural re-

48. Philadelphia cannot be faulted for its lack of concern. Indeed, the tenor of the time was to "let thy neighbor clean thy wastewater for thee." *See generally* Gregory, *supra* note 35. Although respected persons and institutions of the time condoned the discharge of sewage without treatment, these included, conveniently, upper riparian owners.

cuperative powers of the ecosystem have begun to return water quality in the lake to an acceptable state. One commentator lavishes deserved praise on this monument to effective planning:

> [j]ust 10 years ago, Lake Erie was so choked with algae that its beaches were closed, and fish could not survive its waters. The Cuyahoga River was so polluted that it caught fire.
>
> Both these bodies of water are now surrounded by blossoming parks and clean beaches, being enjoyed by human and animal life alike.
>
> The rejuvenation of these and other waters throughout the country is largely due to the Clean Water Act, originally enacted in 1972 and amended in 1977.[49]

The dramatic improvements referred to by the author rest on two dynamic principles. First, man may check future despoliation—and did with the Act—by prohibiting untreated pollution discharges. However, man was not involved in the removal of those vast quantities of wastes which were discharged into Lake Erie and the Cuyahoga River before the passage of the Act. The second principle is the cleansing, assimilative power of nature—here, the lake ecology slowly asserting itself, abetted by the prospective ban on untreated discharges.

Looking ahead, the second of these two principles is in some jeopardy. Human inventiveness has produced substances which can belabor the earth's natural recovery from excessive pollution loads, or perhaps even render it impossible. Nineteenth century pollution, being natural in origin, was amenable to biodegradation. Today, hazardous refractory pollutants and radioactive waste products are unaffected by the earth's natural assimilative capacity. For these compounds, there can be neither dilution, disposal nor natural treatment. Ultimately, the daily summation of even trace amounts of toxic refractory wastes will permanently overload and damage our environment. Faced with this prospect of irreparable harm, legislators should not rely upon traditional planning concepts which merely project future pollution loads with blind faith in the ecosystem's assimilative capacity. Legislators must now insist upon stringent production controls and prohibitions which at the outset prevent these compounds from entering the ecosystem.

Unquestionably, production controls seem harsh in a free enterprise economy such as that of the United States today. However,

49. Chaffee, *Fine Tuning Construction Grants for the Eighties*, EPA J., Sept., 1980, at 8.

gradual and rational adjustments now are preferable to drastic ones at some future date. But more to the point, toxic wastes present the most vivid evidence that pollution is uneconomical. Thus, proper controls would in the long run promote rather than hinder economic growth.

In summary, future environmental planning must become just that, true planning with emphasis on prevention and not on reaction. This is necessary because the traditional assumption of a resource's absorption of and recovery from waste pollution does not hold true for toxic wastes. The ecosystem will not afford man a second chance if hazardous refractory waste problems are mismanaged.

C. *Open- v. Closed-Loop Environmental Planning*

Nineteenth century environmental planning in Philadelphia was generally limited to water supply and distribution. Annual reports to the mayor are replete with river yield data, water system distribution information and water sales records. However, history has shown that nineteenth century environmental planning failed to address the problem which was the natural consequence of supplying ever-growing quantities of water to Philadelphia, *i.e.*, wastewater treatment and disposal. Thus, the city failed to close the "loop" created by its plan by not considering the impacts of the environmental planning itself on the environment.

More recent legislation provides a parallel. The Federal Water Pollution Control Act ("FWPCA")[50] mandates a comprehensive system to implement water quality goals on a national scale.[51] In so doing, the Act required wastewater treatment to be more thorough than ever before. The natural consequence of higher treatment was the production of sludge[52] in growing quantities. Further, stringent wastewater discharge limitations made more economical the relatively unregulated disposal of wastes as solids. In effect, a portion of the total national water pollution load disappeared only to turn up in inadequate containers as solid waste. Years later, the open

50. 33 U.S.C. § 1251 (1976 & Supp. III 1979).

51. *See generally* Hall, *The Clean Water Act of 1977*, 11 NAT. RESOURCES LAW. 343 (1978); Note, *Federal Water Pollution Control Act Amendments of 1972*, 17 NAT. RESOURCES J. 511 (1977).

52. "Sludge" is the mixture of water and residual solids realized by many wastewater treatment processes. To some extent, it can be viewed as the aggregate of the pollutants removed from wastewater by treatment.

loop created by the FWPCA was closed with the passage of the Resource Conservation and Recovery Act of 1976 ("RCRA").[53] The effectiveness of that legislation when viewed from an historical context will be discussed below.

D. *The Planning Process and the Public Response*

Lastly, it must be noted that public reaction to planning for environmental protection has remained virtually unchanged over the past 100 years or more: environmental protection was and is both politically and popularly a secondary concern.[54] It is commonly seen as a drag on positive economic growth, a "cost" to be added in order to obtain a development "benefit."

The evaluation of pollution control by means of a cost/benefit analysis points to two tendencies for the future: (i) the tendency to implement the minimum cost and therefore minimum benefit response; (ii) the tendency to underestimate the true cost of pollution.

Philadelphia again provides an example. Economic expediency was probably decisive in the continuation of sewage discharge without treatment and the distribution of unchlorinated, unfiltered drinking water there. However, the practice might have differed had there been credible projections of the lost man-hours due to typhoid, decline of riverfront property values, losses to the commercial river fishery, and aesthetic decay which in fact occurred. The minimum cost yielded a minimum of net benefit. If planning so characterized failed in the nineteenth century, how is it to succeed as the twenty-first century approaches?

Certainly such a viewpoint will be greeted with skepticism. There will be those who will argue that industry, the country's lifeblood, cannot operate within the constraints proposed, that regulation has industry "hamstrung" in an interlocking web of redundancy. History records the same arguments on the Commonwealth Senate floor during debate on the Act of 1905.[55] In that chamber, fortunately, wiser heads prevailed. Yet we still carry with us the cost/benefit analysis. So long as receptiveness to environmental planning remains low, pollution controls will have to be demonstra-

53. 42 U.S.C. §§ 6901-6987 (1976 & Supp. II 1978).

54. *See* note 35 and accompanying text *supra* for the feared industrial impacts of the Act of 1905. Similar assertions are published daily today.

55. *See* text accompanying note 35 *supra*.

bly economical at the outset. Discussion of the ultimate wisdom of the cost/benefit approach is beyond the scope of this note. But suffice it for now to say that this effective presumption *against* environmental protection is one of the "costs" of current public attitudes toward planning.

IV. DISCUSSION: THE HISTORICAL MODEL APPLIED TO HAZARDOUS WASTE REGULATION

On December 11, 1980, President Carter signed into law the Comprehensive Environmental Response, Compensation and Liability Act of 1980.[56] Informally known as "Superfund," the Act provides "for liability, compensation, cleanup and emergency response for hazardous substances released into the environment and the cleanup of inactive hazardous waste disposal sites."[57] Superfund completes federal efforts to regulate hazardous waste transportation, disposal and treatment begun with RCRA and regulations promulgated thereunder.[58] Hazardous waste management regulation under Superfund and RCRA dovetails neatly with the regulation of the production of hazardous substances under the Toxic Substances Control Act ("TSCA").[59]

In concert, TSCA, RCRA and Superfund form the trident of hazardous waste environmental planning. The purpose of TSCA is to prevent unreasonably hazardous materials from ever entering the ecosystem. Under RCRA, hazardous materials determined to yield social benefits commensurate with environmental risks are managed during treatment, transportation and disposal. Superfund is the trident's keystone and fail-safe system, identifying past non-RCRA regulated hazardous waste dumpsites while creating financial resources for remedial activities caused by releases of hazardous substances into the environment.

Overviews of TSCA[60] and RCRA[61] being readily available, none will be offered here. Due to its recent vintage, no overviews of

56. Pub. L. No. 96-510, 94 Stat. 2767 (to be codified at 42 U.S.C. §§ 9601-9657).

57. This language is found in the preamble to the Act.

58. 40 C.F.R. § 260 (1981).

59. 15 U.S.C. §§ 2601-2629 (1976 & Supp. I 1977).

60. Zener, *The Toxic Substances Control Act: Federal Regulation of Commercial Chemicals*, 32 BUS. LAW. 1685 (1977).

61. Andersen, *The Resource Conservation and Recovery Act of 1976: Closing the Gap*, 1978 WIS. L. REV. 633; Symposium, *The Resource Conservation and Recovery Act of 1976—The Newest Environmental "Sleeper,"* 33 BUS. LAW. 2555 (1978).

Superfund are yet available. A brief summary of the statutory provisions of Superfund is presented below.

A. *Superfund: Summary of Important Provisions*[62]

The Act adds materially to the powers and duties of the Environmental Protection Agency ("EPA") and the President. It completes the regulation of hazardous substances initiated by RCRA.

The major thrust of Superfund is in four areas. First, it imposes new reporting requirements for (i) unpermitted "releases," that is, spills of hazardous substances into the environment in excess of specific "reportable quantities," and (ii) existing and abandoned hazardous waste disposal facilities that are not within the RCRA hazardous waste permit program.

Second, it imposes excise taxes on oil importers and refineries and on the manufacturers and producers of forty-five chemical feedstocks and inorganic chemicals, effective April 1, 1981. These taxes will finance the bulk of Superfund ($1.3 billion) with the remainder of the fund ($220 million) to be supplied by general appropriations.

The third aspect of Superfund legislation is a comprehensive program to identify and remedy abandoned hazardous waste sites and chemical spills on land and waters. The $1.6 billion Hazardous Substance Response Fund will also be used to pay claims awarded for injuries to natural resources. The Act does *not* authorize claims against the fund for personal injury or economic damages suffered by individuals or businesses, except as consistent with the National Contingency Plan to be promulgated by the President by June 9, 1981.

Fourth, the Act also establishes a Post-Closure Liability Trust Fund, which will assume the liability of owners and operators of hazardous waste disposal facilities that have been permitted and closed in accordance with the regulations issued by EPA under RCRA. The Post-Closure Liability Trust Fund will be financed by a tax on the receipt of hazardous waste at disposal facilities. Collection of this tax will commence after September 30, 1983, and continue as long as the balance of the fund does not exceed $200 million.

62. The author wishes to acknowledge and thank Kenneth R. Myers, Kenneth A. Rubin and Susan L. Gordon, all of Morgan, Lewis & Bockius, for their contributions in preparing the Superfund summary.

1. Statutory Definitions

Section 101 of Superfund establishes a lexicon of statutory terms, each with its unique definition. The definitional aspects are most important in deciding whether or not a party is subject to the various statutory duties mandated by the Act.

"Facility," probably the term with the broadest definition, means any building, equipment, pipe (including sewer pipes of publicly-owned treatment works), well, impoundment, container, land or air vehicle, or any area where "hazardous substances" (as defined) have been deposited. The term does not include consumer products.

"Federally permitted release" means any discharge or emission permitted under the Clean Air Act,[63] the Federal Water Pollution Control Act ("FWPCA"),[64] the Safe Drinking Water Act,[65] RCRA, the Atomic Energy Act,[66] or the Marine Protection, Research and Sanctuaries Act.[67]

"Hazardous substance" means any material or pollutant designated as hazardous or toxic under the FWPCA or the Clean Air Act, hazardous waste as defined by RCRA, substances subject to regulation pursuant to TSCA, as well as any other substance defined as hazardous by EPA. The term does not include petroleum, crude oil or natural gas.

"Natural resources" means any land, air or water resource, including biota, therein owned or managed by federal, state or local government.

"Owner or operator" means the owner or operator of any facility (active or inactive) or vessel, or the common carrier or shipper of any hazardous substance.

"Release" means any spilling, leaking, emitting or disposing into the environment but does not include releases within workplaces, engine exhaust emissions, nuclear incident releases or normal application of fertilizer.

"Transport" or "transporation" means the movement of substances by any mode, including pipeline.

"Vessel" means every type of craft capable of transportation on water.

63. 42 U.S.C. §§ 7401-7626 (Supp. I 1977).
64. 33 U.S.C. §§ 1251-1376 (1976 & Supp. I 1977 & Supp. II 1978).
65. 42 U.S.C. §§ 300f to 300g-10 (1976 & Supp. I 1977).
66. 42 U.S.C. § 2011 (1976).
67. 33 U.S.C. §§ 1401-1444 (1976 & Supp. I 1977).

2. Notification Requirements

A release of a hazardous substance in quantities equal to or greater than one pound (or the reportable quantity under section 311(b)(4)[68] of the FWPCA) from a facility, if it is not a federally permitted release, must be reported immediately by the responsible person at the facility to the National Response Center under Superfund sections 102 and 113. A fine of $10,000, imprisonment for one year, or both, are provided for failure to report. The quantity of release requiring notification may be changed by regulation.[69]

Where hazardous substances have been treated, stored or disposed of at past or present facilities which do not have interim status or a permit under RCRA, the amount and type of the hazardous substance, as well as known or suspected releases of such substances, must be reported to the Administrator of the EPA on or before June 9, 1981. Persons having the duty to report are (i) the owner or operator of the facility, (ii) anyone owning or operating the facility at the time of disposal of hazardous substances at the facility, and (iii) any transporter who selected the facility for treatment, storage or disposal of hazardous substances. Knowing failure to notify can lead to a fine of $10,000, one year in jail, or both, as well as loss of the defenses to and limitation of liability allowed in Superfund. Records of past disposal must be retained for fifty years under regulations to be adopted by the EPA.

3. The National Contingency Plan

Under section 105, the President (or his designee) shall revise and publish by June 9, 1981, the National Contingency Plan ("NCP") for removal of oil and hazardous substances. The revision shall include a plan with procedures and standards for responding to releases of hazardous substances, including: (i) methods for discovering facilities at which hazardous substances have been deposited; (ii) methods of evaluating costs for appropriate remedial efforts; (iii) determination of federal, state and local roles; and (iv) means of assuring that remedial actions will be cost effective. The President may delegate all of his powers under Superfund without restriction.

68. 33 U.S.C. § 1321 (1976 & Supp. I 1977 & Supp. II 1978).

69. Regulations under most provisions of Superfund are subject to congressional veto.

4. Presidential Powers

In addition to the powers described elsewhere in Superfund, section 104 grants the President plenary powers to respond to the release or threat of release of hazardous substances into the environment. The President may undertake such investigations and studies as he deems necessary to assess the extent of the release, the potential danger to the public health or the environment, and the remedial response thereto. Remedial efforts are not to be undertaken by the President until the state affected by the release has been consulted and the state has agreed to the following: (i) assume future maintenance of remedial activities; (ii) provide a disposal site for the hazardous substance; and (iii) assume ten percent of the total remedial cost. All remedial actions proposed by the President must be cost effective. The President may enter into a contract with a state or municipality to undertake remedial actions, which contract is subject to the cost sharing provisions of the Act. Duly designated representatives have the power to request information relating to hazardous substances from any person owning or operating a facility which generates, transports, stores or treats hazardous substances. Designated representatives also have the right to enter and inspect facilities that generate, treat, store or dispose of hazardous substances. Information gathered during such inspections will be available to the public unless found to be confidential under 18 U.S.C. § 1905 (1976).

5. Liability and Defenses

Liability arises under section 107 whenever there is a release or a threatened release which results in response costs. Liability is imposed for: (i) costs of removal or remedial action incurred by a governmental agency; (ii) costs of removal or other remedial action properly incurred by third persons; and (iii) damages due to loss of natural resources, including all costs of assessing damages. Those people liable for the response and remedial costs are: (i) the owner or operator of a facility where the release or threatened release occurs; (ii) those persons who owned or operated the facility at the time of disposal of the hazardous substance; (iii) those persons who arranged for the disposal or treatment of the hazardous substance, or for the transportation for disposal or treatment of the hazardous substance; and (iv) any transporter of the substance who selected the disposal or treatment facility where the release occurred. The only defenses to liability are acts of God, acts of war, or a showing of due care where injury resulted from the acts of third parties other than agents, employees or independent contractors. Liability covers cleanup costs, plus other damages under the Act not to exceed $50 million (including damage to natural resources and damage assessment costs). No limitation of liability will be allowed in the following instances: (i) where an actual or threatened release is the result of willful misconduct or willful negligence within the privity or knowledge of a party; (ii) where the primary cause of the release is a knowing violation of applicable safety, construction or operating standards or regulations by a party; or (iii) where a party fails to provide all reasonable cooperation upon request of any responsible public official. Punitive damages are authorized against any responsible person who fails to provide a remedial action ordered by the President.

6. Indemnification

Under several difficult and complex provisions of section 107 of the Act, contracts for indemnification for damages and rights of subrogation may not transfer Superfund liabilities, but insurance arrangements are specifically approved. Existing causes of action, including subrogation, additional liability under state laws, and pending litigation, are preserved.

7. Financial Responsibility

Owners or operators of vessels over 300 gross tons operating within the navigable waters of the United States must establish evidence of financial responsibility under section 108, *e.g.*, insurance, guarantee, surety bond or qualification as self-insurer, of $300 per gross ton or $5 million, whichever is greater. By December 11, 1985, the President is required to promulgate regulations mandating that facilities maintain evidence of financial responsibility reasonably consistent with the degree and duration of the risk associated with the activities at those facilities. Liability claims may be asserted directly against a guarantor, who may invoke all rights and defenses available to owners or operators.

8. Claims Procedure

Section 112 delineates the claims procedure. In the first instance, claims must be presented against the owner, operator or guarantor of the vessel or facility from which a hazardous substance has been released. If the claim has not been satisfied within sixty days, the claimant may file an action in the federal district court where either (i) the release occurred or (ii) the defendant resides, may be found or operates his principal place of business. Alternatively, the claim may be presented to the Hazardous Substance Response Fund ("Fund") for payment. If no settlement is reached between the claimant and defendant within forty-five days of the filing of the claim, the President may pay the claim from the Fund. Upon the President's request, the Attorney General shall commence an action on behalf of the Fund to recover amounts paid on claims. Such an action may be commenced against any owner, operator, guarantor or any other person liable for the damages caused for which compensation was paid from the Fund. Damages include interest, administrative and adjudicative costs and attorney's fees. A three-year statute of limitations applies to claims.

9. Taxation Provisions

Superfund provides for the establishment of two trust funds which are to be used to remedy the damage caused by the release of hazardous substances into the environment and to replace natural resources lost by such occurrences. These funds are termed the Hazardous Substance Response Trust Fund ("RTF") and the Post-Closure Tax and Trust Fund ("PCF").

The RTF is funded by a tax of $0.79 per barrel on: (i) crude oil received by United States refineries; (ii) imported petroleum products; and (iii) domestic crude oil used in or exported from the United States. The tax must be paid by: (i) the refinery operator; (ii) the person "entering" the petroleum products; and (iii) the person using or exporting the crude oil, respectively. In addition, a tax is imposed on the chemicals listed below in the amounts shown on Table 4.

TABLE 4

	Superfund Tax Dollars per Ton
Acetylene	4.87
Benzene	4.87
Butane	4.87[70]
Butylene	4.87
Butadiene	4.87
Ethylene	4.87

70. Butane is exempt from taxation when used as fuel.

TABLE 4

	Superfund Tax Dollars per Ton
Methane	3.44[71]
Naphthalene	4.87
Propylene	4.87
Toluene	4.87
Xylene	4.87
Ammonia	2.64[72]
Antimony	4.45
Antimony trioxide	3.75
Arsenic	4.45
Arsenic trioxide	3.41
Barium sulfide	2.30
Bromine	4.45
Cadmium	4.45
Chlorine	2.70
Chromium	4.45
Chromite	1.52
Potassium dichromate	1.69
Sodium dichromate	1.87
Cobalt	4.45
Cupric sulfate	1.87
Cupric oxide	3.59
Cuprous oxide	3.97
Hydrochloric acid	0.29
Hydrogen fluoride	4.23
Lead oxide	4.14
Mercury	4.45
Nickel	4.45
Phosphorus	4.45
Stannous chloride	2.85
Stannic chloride	2.12
Zinc chloride	2.22
Zinc sulfate	1.90
Potassium hydroxide	0.22
Sodium hydroxide	0.28
Sulfuric acid	0.26[73]
Nitric acid	0.24[74]

Tax liability for the chemicals listed is placed upon manufacturers, producers and importers.

71. Methane is exempt from taxation when used as fuel or for the production or manufacture of fertilizer.

72. Ammonia is exempt from taxation when used for the production or manufacture of fertilizer.

73. Sulfuric acid is exempt from taxation when used for the production or manufacture of fertilizer.

74. Nitric acid is exempt from taxation when used for the production or manufacture of fertilizer.

These taxes will terminate on September 30, 1985, or at any time when the unobligated balance in the RTF exceeds $900 million and the projected unobligated balance in the RTF for the following year exceeds $500 million. The taxes have provisions intended to eliminate the possibility of double taxation. Taxes for RTF are effective April 1, 1980.

Funds placed in the RTF are available for use in connection with releases or threats of releases of hazardous substances into the environment including: (i) response costs; (ii) unsatisfied claims under the Clean Water Act; (iii) claims for injury, destruction or loss of natural resources; and (iv) costs of studies and efforts appurtenant thereto.

In addition, Superfund provides a tax of $2.13 per ton of hazardous waste disposed (dry weight basis) for the PCF. This tax is imposed upon the owners or operators of hazardous waste disposal facilities permitted under RCRA. Taxes for the PCF will commence September 30, 1983, and continue for successive years as long as the unobligated balance of the PCF does not exceed $200 million. Funds in the PCF will be available to cover damages caused by facilities which qualify under RCRA and which have fully complied with RCRA post-closure requirements.

10. Key Statutory Deadlines

Table 5 summarizes key statutory deadlines for various Superfund activities.

TABLE 5

Important Dates Under Superfund

December 11, 1980	Approval by President
December 11, 1980	Reporting requirements
March 22, 1981	Claims Arbitration Board appointed
April 1, 1981	RTF tax on petroleum and chemicals effective
June 9, 1981	Report notice of facilities to EPA
June 9, 1981	National Contingency Plan publication
December 11, 1982	Report on insurance for post-closure financial responsibility
June 11, 1983	Determination re post-closure private insurance
September 30, 1983	PCF tax on hazardous waste effective
December 11, 1983	Prior claims barred under three-year limitation
September 30, 1985	RTF and PCF taxes lapse
December 11, 1985	Facilities financial responsibility regulations

11. Forthcoming Regulations

EPA is reported to be expediting preparation of regulations to implement the new legislation. Certain provisions of the Superfund legislation contain ambiguities that await resolution by EPA regulation or clarifying amendments from Congress.

Sections 102 and 103, requiring immediate notification for release of one pound of hazardous substance, fail to define a time period in which the discharge of one pound will trigger reporting requirements. Other environmental statutes with similar reporting requirements specify the time period as one day, but, until further guidance is obtained, there is a possibility that a release of one pound of hazardous substance over any period of time will trigger this reporting obligation. Likewise, there may be some confusion about what chemicals are considered hazardous substances. For the purposes of the Superfund legislation, hazardous substances include about 300 chemicals designated under section 311 of the FWPCA, another 129 toxic pollutants listed by EPA under section 307(a) of the FWPCA, seven hazardous air pollutants listed under section 112 of the Clean Air Act, any imminently hazardous chemical substance or mixture with respect to which EPA has taken action pursuant to section 7 of TSCA, and any hazardous waste listed or having the characteristics identified pursuant to section 3001 of RCRA. Altogether, this includes about 1000 specific chemicals and an enormous variety of wastes having one or more hazardous characteristics.

B. *Hazardous Waste Regulation Evaluated in Terms of Historical Planning Models*

To recap, it is the thesis of this note that the Philadelphia experience during the nineteenth century provides instruction in proper planning for control of hazardous wastes. Effective hazardous waste regulatory planning must be regional in scale,[75] prospective in outlook,[76] and must address the ultimate adverse environmental impacts caused by the planning process.[77]

Studied in concert, TSCA, RCRA and Superfund represent a comprehensive regulatory system which has as its intent: (i) control of the generation of hazardous substances; (ii) control of the trans-

75. *See* text accompanying note 43 *supra* (in particular, "tendency A").

76. *See* text accompanying note 43 *supra* (in particular, "tendency B").

77. That is, the planning process must be closed-loop and not open-loop. *See* text accompanying note 43 *supra* (in particular, "tendency C").

portation, treatment and disposal of hazardous wastes; and (iii) development, implementation and financing of remedial responses to past, present and future releases of hazardous substances into the environment. Under a broad, systematic scrutiny, environmental planning under the three acts meets the historically based test for regional, closed-loop, prospective planning. More detailed scrutiny raises some questions.

1. Regional v. Local Planning

Toxic waste regulation under TSCA, RCRA and Superfund entails predominantly federal government supervision. Both RCRA and Superfund also provide for implementation of state hazardous waste management activities.[78]

Under the historic mandate for regional planning, the TSCA-RCRA-Superfund trident clearly passes muster. No planning can be more broad in its application than federal planning. However, a potential weakness can be found in the probable assumption of RCRA's hazardous waste management duties by the states.[79] History demonstrates that local municipal leaders could not resist the political pressure exerted by commercial interests and that ultimately state intervention was necessary to maintain environmental quality. A logical twentieth century extension of Philadelphia's nineteenth century experience would hold that the states today are equally incapable of resisting commercial pressures in modern technological society.[80] It is reassuring to note the requirements that state hazardous waste management plans be "equivalent" and "consistent" with the federal plan under RCRA and that state plans provide for adequate enforcement,[81] but danger signs are also present. Both Congress[82] and EPA[83] are on record as favoring state as-

78. RCRA permits individual states to develop and implement statewide hazardous waste management plans in a manner similar to state assumption of water pollution control duties (NPDES) under 33 U.S.C. §§ 1344(g), 1344(h) (1976 & Supp. I 1977). *See* 42 U.S.C. §§ 6941-6949 (1976 & Supp. II 1978). Superfund section 104(d) permits the President to contract with any state or municipality to take remedial actions caused by the release of hazardous substances into the environment.

79. 42 U.S.C. §§ 6941-6949 (1976 & Supp. II 1978).

80. Indeed, research in progress indicates that two of the three wastewater treatment plans mandated by the Act of 1905 and proposed by Philadelphia in 1915 were not fully operational until the 1950s.

81. 42 U.S.C. § 6926(b) (1976).

82. *See* 122 CONG. REC. 21,393, 21,401 (1976) (remarks of Sen. Randolph); H.R. REP. No. 1491, 94th Cong., 2d Sess. 9 (1976), *reprinted in* [1976] U.S. CODE CONG. & AD. NEWS 6238, 6247-49.

83. *Resource Conservation and Recovery Act of 1976: Hearings on H.R. 14496*

sumption of RCRA responsibilities. Additionally, federal enforcement of hazardous waste management plans will not likely be effective at current levels of staffing and funding and in a national political climate favoring reduced federal regulatory intervention. Thus, the scenario is set for individual states to offer plans representing something less than the "equivalent" of the federal plan under RCRA. Faced with this Hobson's choice, EPA might well approve less than "equivalent" planning schemes.

On the other hand, the states might be inclined to implement hazardous waste management requirements more stringent than federal standards in order to create economic disincentives for intrastate hazardous waste disposal. Because stricter treatment or disposal requirements translate into increased disposal costs, market economics will channel hazardous wastes into jurisdictions with less stringent standards and correlative lesser disposal costs.[84] The result could be that neighboring states might try to out-regulate each other in an effort to force hazardous waste management activities into adjoining states.[85]

The Philadelphia experience demonstrates that local public funds are only begrudgingly spent on environmental protection. Therefore, the absence of federal funding or incentives for solid waste storage, treatment or disposal facilities in the RCRA system should cause relatively slow response times, at least insofar as municipal projects are concerned.[86] Considering that more than half of the 20,000 municipalities in the nation have not yet achieved compli-

Before the Subcomm. on Transportation and Commerce of the House Comm. on Interstate and Foreign Commerce, 94th Cong., 2d Sess. 97-100 (1976) (statement of Sheldon Meyers).

84. Transportation costs must also be considered, total disposal cost equalling the sum of treatment (if any), transportation and landfill disposal costs (sometimes known as "tipping fee"). Extra costs for more stringent treatment and disposal requirements in State *A* might be spent on transporting the waste to less strictly regulated State *B* where the total disposal cost will be less.

85. Solid waste has been determined to be an article in interstate commerce and therefore not subject to importation restrictions by the states. Philadelphia v. New Jersey, 437 U.S. 617 (1978). Hazardous waste, being a subspecies of solid waste, would likewise be free to cross state boundaries.

86. Granted, "household waste" is specifically excluded from regulation under RCRA, 40 C.F.R. § 261.4(b)(1) (1981), and thus municipal landfills accepting only household waste are also exempt. Absence of federal funding for municipally managed treatment, storage or disposal facilities will necessarily place hazardous waste treatment, storage or disposal operations in the private sector. Whether minimization of cost can be realized by private enterprises, exacting a profit, absent the tax benefits and direct public responsibility characteristic of governmental activities, remains to be seen.

ance with 1977 secondary treatment requirements under the federally funded Clean Water Act, as opposed to eighty-five percent industrial compliance without federal funding,[87] absence of federal grant monies could be a blessing.[88]

2. Open- v. Closed-Loop Planning

The hazardous waste regulation trident appears to address all potential impacts of the planning process. It therefore represents "closed-loop" planning. In contrast with the Clean Water Act, which turned a portion of the national water pollution load into a solid waste disposal problem, RCRA mandates ultimate treatment and disposal and not a mere change of pollutant form. The National Contingency Plan and the tax-supported trust funds mandated by Superfund serve as the means to remedy future malfunctions of past and future storage, treatment and disposal facilities.

The only area arguably left unregulated is the production of off-specification chemicals, product precursors, byproducts and intermediates. Disposal of these materials is assuredly controlled by RCRA.[89] But these substances, it could be argued, are not being manufactured or distributed for commerce and are therefore exempt from the testing[90] and premanufacturing notices[91] of TSCA. If so, hazardous substances could be generated without the risk/benefit analysis mandated by TSCA[92] and materials which could pose a significant waste management problem could enter the RCRA regulatory scheme.

Such a contention was made with respect to chemicals produced during research and not offered for commerce in *Dow Chemical Co. v. EPA*.[93] The court held that chemicals produced during re-

87. Chafee, *Fine Tuning Construction Grants for the Eighties*, 6 EPA J. 8, 9 (1980).

88. This is not to say that municipal programs would be more expedient without federal funding and that therefore unfunded municipal programs would be preferable to funded ones. Rather the statement refers to the successful industrial response to the Clean Water Act absent federal funds vis-à-vis the municipal response.

89. *See* the broad definition of "hazardous waste" in 40 C.F.R. § 261.3 (1981), 40 C.F.R. § 261.33 (1981).

90. 15 U.S.C. § 2603 (1976).

91. 15 U.S.C. § 2604 (1976).

92. 15 U.S.C. § 605 (1976) imposes a "reasonable risk" test on EPA. Manufacture of chemicals presenting an unreasonable risk to human health and the environment may be prohibited. Reasonableness of risk, as defined in the provision, is inversely proportional to the benefit accruing therefrom.

93. 605 F.2d 673 (3d Cir. 1979).

search were subject to TSCA, notwithstanding the fact that they were not manufactured for "commercial purposes." The holding would apply by analogy to product precursors, intermediates and byproducts, thus requiring TSCA approval before those substances can become a disposal problem.

RCRA closes the loop in another interesting way. It could be asserted that RCRA discourages recycling by requiring "paperwork" (in the form of a manifest) for transportation of recycled wastes.[94] The required manifest, however, is in reality no more than the normal shipping papers which would accompany any shipment of raw materials. RCRA thus encourages recycling not via administrative mandate, but through market economics. Demand for approved disposal sites and treatment facilities in conjunction with high disposal costs associated with secured facilities will cause economic pressure to recycle. This places the recycling initiative upon industry. Intimate understanding of hazardous materials makes industry uniquely qualified to implement successful and profitable recycling programs.[95]

3. Prospective v. Retrospective Planning

Superfund represents the nation's first attempt at prospective planning. The National Contingency Plan will be the blueprint for remedial actions necessitated by the release of hazardous substances into the environment. The two trust funds which will support remedial responses assure timely rehabilitation efforts. However, some shortcomings are evident.

Clearly, RCRA emphasizes disposal in secured landfills.[96] As discussed above, the legislation promotes the remaining disposal alternative, recycling, solely through indirect influence upon market economics. Two points deserve mention in regard to reliance on the landfill disposal mode.

94. 40 C.F.R. § 261.6 (1981).

95. Indeed a new profession has emerged—solid waste brokerage—whose members use computers to match demand and supply of normally discarded hazardous wastes.

96. A "secured landfill" is an ultimate repository for hazardous waste characterized inter alia by: (i) an impervious liner to prevent leachate (contaminating fluids produced by the interaction of the waste and rainwater) from entering the environment; (ii) suitable daily and final cover to prevent rodent infestation and to serve as vector control; and (iii) wells which monitor groundwater and detect contamination indicative of a breached liner.

First, landfill disposal actually provides long-term storage rather than an ultimate repository for hazardous wastes. Granted, most non-hazardous and some hazardous wastes will decompose into harmless substances to be reabsorbed into the environment. However, many refractory hazardous wastes cannot be assimilated into the ecosystem nor processed into a permanently inert state. For these wastes, secured landfills are merely long-term storage sites made as safe as possible. These wastes must ultimately be disposed of, managed or monitored by future generations. Thus, the hazardous waste trident is vulnerable in the time dimension to the significant hazardous waste problem of management.

Second, while mandating secured landfill disposal, RCRA fails to promulgate hard technical design guidance for facilities and facility siting. In short, RCRA proscribes certain conduct but does not prescribe any solutions. Under these circumstances, the stage is set for parochial interests with microcosmic viewpoints to prevent siting and construction of hazardous waste treatment, storage and disposal facilities in their own locales. Needed hazardous waste facilities will always be built "somewhere else" or viewed as a *gestalt*, nowhere at all.[97]

V. CONCLUSION

Philadelphia's development of water supply and sewage systems in the nineteenth century indicates that effective environmental planning must be regional in scope, closed-loop in nature and prospective in outlook. In connection with waste disposal and treatment, Philadelphian efforts which lacked these qualities were doomed to fail from their inception. More recent environmental planning in the hazardous waste area under TSCA, RCRA and Superfund represents the first systematic attempt to apply these historically dictated principles. However, analysis reveals several shortcomings in these areas history has demonstrated to be crucial.

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97. This restates the historical model insofar as local planning entities are less able to make tough environmental planning decisions than are regional ones. Whereas nineteenth century Philadelphia failed to construct pollution control facilities due to local political susceptibility to commercial pressures, twentieth century planners will experience similar popular pressure to keep hazardous waste facilities out of their own jurisdictions.

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