Renewal of Brooklyn's Gowanus Canal Area

Maureen McManus, Keith W. Jones, Nicholas L. Clesceri, Ivor L. Preiss

WHAT will it take to revitalize our most depressed urban areas? The answer has eluded policy makers for the past four decades, and the consequences of that failure are compounded each year. Fortunately, the renewed federal effort to "empower" urban America takes a new direction by acknowledging that environmental decay retards the economic and social vitality of inner cities. It also suggests that environmental rehabilitation must be a part of any urban renewal project.

There is, perhaps, no better example of how environmental neglect can ravage an urban area than the once-thriving Gowanus Canal community in southwest Brooklyn. Urban sociologist Philip Kasinitz has written, "In few locations in America are the social impacts of environmental decisions as obvious as on the Brooklyn waterfront. This ethnically diverse, working-class community has been shaped and battered by egregious land use practices from the Robert Moses era until today. In few places do so many crucial urban and environmental issues—waterfront management, the coexistence of housing and industrial space, waste management, highways and other infrastructure, and the future of public housing—come together in so small a space. At present, the community is at a crossroads: will the old waterfront be a center for renewal, or be converted into a dumping

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ground for noxious uses? Clearly, these issues have tremendous significance for area residents."

Because the problems recognized by Kasinitz are so complex and interconnected, they cannot be handled singly: neither one at a time nor by one organization. If the problems are to be addressed, we must create multi-skilled teams including scientists, technology professionals, educators, community leaders, bankers, insurance specialists, lawyers, and private sector groups who are all committed to working in conjunction with local, state, and federal agencies to develop integrated plans. This paper describes the status of the efforts of one such team to remediate and redevelop the Gowanus Canal Community in Brooklyn, New York.

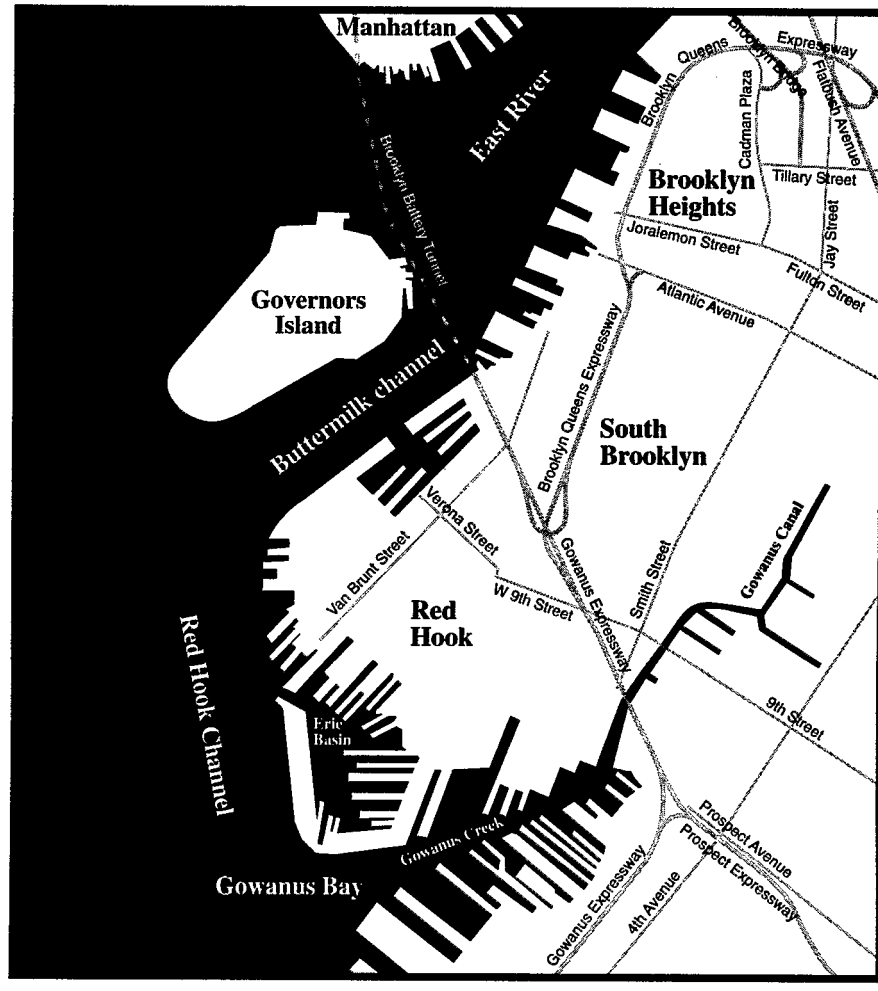
The Gowanus Canal Region

The Gowanus Canal stretches from the Red Hook Channel of New York Harbor northeast into South Brooklyn. (See Figure 1.) It is traversed by the Gowanus Expressway and, several blocks north, by an elevated section of the New York City subway. The Public Place Site (See the cover photo.) is located on the west bank of the canal immediately north of the subway crossing. The region has been settled since colonial times and now has many typical urban ills. These include land areas contaminated by industrial activity and poor infrastructure maintenance, and the Gowanus Canal, containing a large volume of silt and sewage contaminated with industrial waste—a source of odors and potential disease.

Historically, the Gowanus Canal was central in developing industrial areas and neighborhoods along its banks; today, it remains important because it affects physical and economic development, environmental quality, and the health of the community. Despite both its historic and current importance, the canal is badly deteriorated, badly polluted, only marginally useful, and a source of environmental and health problems for the Gowanus community. The condition of the canal presents serious problems—noxious odors, visual pollution, health hazards, deterioration of property values, and missed opportunities for redevelopment.

Years of neglect by city government (which is legally responsible for maintaining the canal) led in the late 1960s to the failure of a flushing tunnel that kept (relatively) clean water circulating through the canal. The tunnel was never repaired. As a result, the canal became largely stagnant, while contaminated sewage and silt were allowed to accumulate. Bulkheads and other structures deteriorated, combined sewer overflow controls broke down, and industrial pollution along the canal worsened.

FIGURE 1
Map of the Gowanus Canal Area



Environmental contamination of the buildings and industrial sites along the canal is another barrier to the area's economic growth. The research costs to assess the extent of needed remediation and the legal fees associated with the question of future liability of potential environmental hazards of the area's industrial sites are major obstacles to attracting bankers, developers, and investors.

The population of the area is diverse both ethnically and economically and resides in well-defined neighborhoods including Red Hook, Carroll Gardens, and lower Park Slope. The total population in the Gowanus region is about 50,000 people. The ethnic profile is varied: the Red Hook area is almost completely African-American and Hispanic; Carroll Gardens is largely white. The economic status of the residents

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ranges from those below the poverty level in Red Hook to those who are comfortably middle-class in Carroll Gardens. Both neighborhoods are in close proximity to abandoned industrial land and dilapidated factory buildings that adversely affect the entire community.

The residents of Red Hook have been socially, economically, and geographically isolated from the rest of Brooklyn by physical and sociological factors. "Surrounded on three sides by water and cut off from the rest of Brooklyn by an elevated highway, Red Hook is perhaps America's clearest manifestation of socially isolated poverty" *(3)*. Red Hook's working class residents, who once made a living on a working waterfront that no longer exists, began abandoning the area and its churches, stores, and community institutions in the 1950s. Abandoned and blighted, the community is no longer connected to any income-earning potential and remains outside the mainstream economy. About 67 percent of the working-age population have never held a job, while only 33 percent have been employed at some stage of their lives. Chronic problems like unemployment and crime cut off the residents from the larger community, while drugs and violence—and the fear of crime—continue to ravage the people of Red Hook.

Kasinitz, "Missing the Connection"

To this list of the causes and effects of endemic poverty, urbanists have added the problems associated with abandoned properties, dumping, and contamination.

A Comprehensive Plan

In the past, when policy makers singled out factors that inhibited investments in inner cities, they focused on crime rates, poor housing, poor education, and the unavailability of a trained work force. What was given little attention were the issues of liability associated with unexpected environmental problems. More and more, however, when faced with these uncertainties, bankers are reluctant to lend, developers to build, and businesses to invest.

The organizations traditionally charged with addressing inner-city issues, Community Development Corporations (CDCs), have not been equipped to handle contaminated lands and their attendant environmental and legal problems. It is now being recognized that in order to redevelop cities, multi-organizational partnerships must be formed to devise comprehensive plans which address issues of land reclamation and liability as well as the traditional issues of housing, jobs, and education. In fact, if initial efforts are supported by federal, state, or local funding, reclaiming contaminated lands can lead directly to economic development, the production of jobs, and opportunities for education.

The project we are describing has at its center the cleanup of the Gowanus Canal and an abandoned industrial site known as the Public Place Site. As envisioned, the project will be undertaken by a partnership of private, non-profit, and governmental organizations and will have an educational, as well as an economic, component. In fact, the educational and economic developments will flow from the cleanup.

Institutional Partnerships

When the environmental contamination of the Gowanus Canal was recognized as being an almost insurmountable obstacle to development, the Gowanus Canal Community Development Corporation (GCCDC) formed a partnership with the U.S. Department of Energy's Brookhaven National Laboratory (BNL) and with Rensselaer Polytechnic Institute (RPI). The latter institutions had already formed an earlier partnership, the Brookhaven Rensselaer Environmental Partnership (BREP)[1]. The purpose of the GCCDC-BREP partnership is to clean up the Gowanus Canal and at least one publicly owned site. It will also work with businesses in the area to evaluate and reduce harmful pollution and develop improved methods for remediation of the sites.

The Gowanus Canal Community Development Corporation was created in 1978 as a non-profit organization to bring about the revitalization of the industrial, commercial, and residential areas adjoining the Gowanus Canal. Its projects include working for affordable housing, providing social services, and fostering economic development and environmental improvement.

The Brookhaven Rensselaer Environmental Partnership is currently part of a test project to assess the feasibility of vitrification and other beneficial reuses of contaminated sediments dredged from the Gowanus Canal. The urban-industrial transformation pilot of the Gowanus Canal area is one of several programs employing technical solutions and partnerships between a community development corporation and a DOE national laboratory to reclaim and reuse derelict urban lands.

The current national debate on the re-authorization of the federal Superfund program, along with other legislation relating to the reuse of industrial sites, has relevance to the partnership's second project—the Public Place Site. Because the outcome of the debate is uncertain, however, (See Dinsmore pages 9-20.) the GCCDC will explore the possibility both of cleaning up the site and of resolving liability problems through the joint participation of government, private sector remediation companies, and environmental insurance providers. Private par-

ticipants using a mixture of public and private financing could remediate the site, indemnify future liability for the site, and use the clean and insured property as collateral.

Gowanus Canal Cleanup

The cleanup of the Gowanus Canal is a long-standing and much-studied problem. Large sums of money have been spent in the past to remove some of the causes of the contamination. Construction of the $400 million Red Hook sewage treatment plant is a case in point. At this time, the NYC Department of Environmental Protection is carrying out a project to reactivate a flushing tunnel from Buttermilk Channel to the head of the canal. (See Figure 1.) When operational, the increased flow of water will help increase the concentrations of dissolved oxygen and thus reduce odors from the sediments. However, a complete solution must include dredging the entire canal and removing approximately 300,000 cubic yards (cy) of accumulated sediments. An economically and environmentally effective solution to this part of the problem is not, at this point, entirely clear.

Dredging the canal twenty years ago would have been a relatively simple task. Then, it was possible to dispose of the dredged materials by ocean dumping. Now, however, biotoxicity effects are more closely regulated and simple ocean dumping or ocean dumping with capping is, in a practical sense, forbidden for contaminated sediments such as those that are found in the canal. Disposal of the materials in an upland disposal site might be considered, but costs for such a procedure would be a prohibitive $100-$400 per cubic yard. A solution to the high costs associated with dredging might be found in new technologies. These could lead to lower costs and even to the creation of a treatment facility. Such a facility would provide the community with jobs as well as a cleaner canal.

How best to dispose of contaminated sediments is not an issue for this one waterway only. It is of great importance to the entire Port of New York/New Jersey and to other ports around the country. The changes in ocean dumping regulations have caused an almost complete cessation of dredging in New York Harbor. As a result, channel depths have decreased and access to the port is becoming more difficult for larger vessels. In an effort to cope with the problem, funds were recently made available to the Environmental Protection Agency under the Water Resources Development Act of 1992 to test new sediment decontamination technologies.

BREP is active in all aspects of the harbor sediment work. The Gowanus Canal project will benefit from this work by serving as a demonstration site for testing the technologies being considered for treating the harbor sediments. If the area possessed a sediment treatment plant, the harbor work would assure Gowanus of a constant source of employment for at least a decade.

What's There?

In 1994, in preparation for the repairs that will be made to the canal's flushing tunnel, New York City had the concentration of metals and organic materials in the canal's sediment measured. Not surprisingly, when measured against other waterways, New York State standards, and other criteria, the canal's sediment samples were found to be contaminated with metals and organic materials. (See Tables 1 and 2.)

Hazen and Sawyer

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Before the canal can be dredged, the question, "Where will the dredged material go?" must be addressed. Permission for disposing of the sediments in the ocean or at landfill sites will be given only after testing shows that the sediment, in the case of ocean disposal, does not cause toxic effects or accumulate in marine organisms, or, in the case of landfill disposal, does not leach from the material. One of the first steps in the canal cleanup, therefore, must be a comprehensive analysis of all the possible environmentally and economically acceptable methods of disposing of the sediment.

Given the concentrations of metals and other contaminants, it is unlikely that the dredged materials from the Gowanus Canal can be dumped in the ocean. An alternative approach is to use decontamination technologies to render the materials harmless so that they could then be disposed of in an environmentally sound and effective way.

Useful Technologies

Malcolm Pirnie, Inc.

A recent study conducted for the Corps of Engineers examined EPA databases to find existing technologies that have shown promise at pilot or full-scale levels in decontaminating sediment and soil. The study, while not exhaustive, found several technologies that offer promise. Following is a partial list of these technologies and the companies that created them.

Soil and sediment washing. This technology separates the sediment particles on the basis of size. The individual size fractions can then be treated as necessary. (Bergman, USA).

Low energy extraction process. This process uses patented solvents to remove organic compounds from soils and sediments. The inorganic compounds are not removed. (Art International, Inc.).

Critical fluid solvent extraction. Organic compounds are extracted from sediments and soils using a proprietary technology that employs liquefied gases. The inorganic compounds are not removed. (CF Systems, Inc.).

Therm-O-Detox System. A chemical additive and heating of the sediment is used to drive off organic compounds. The inorganic compounds are not removed. (ETG Environmental, Inc.).
Dehalogenation/stabilization/solidification. A patented additive is used to destroy many chlorinated and other types of organic contaminants. The resulting material is mixed with concrete so that the contaminants, including inorganic compounds, are immobilized. (Funderburk and Associates).

Stabilization/solidification with silicate compounds. Silicate compounds are used to solidify organic and inorganic compounds into a solid cement-like material. (Silicate Technology Corp.).

Anaerobic Thermal Processor (ATP) System. This anaerobic thermal desorption system uses a rotary kiln process. Organic compounds are destroyed, but inorganic materials remain in the treated material. (Soil Tech ATP Systems).

There are several other technologies which would also be well suited for use at the canal. Two of them are vitrification and fluidized bed reactor approaches. Both of these technologies have been supported extensively by the Department of Energy over the years so that there is a strong existing technical data base. In both cases, high temperatures are used to destroy aromatics, PAHs, PCBs, dioxins, etc. Vitrification produces a glass which captures most metals in a silicate matrix. Beneficial reuse of the product is possible. The fluidized bed reactor operates at lower temperatures that are sufficient to destroy chemical compounds but not sufficient to produce vitrification. Metals that remain in the product must be considered separately. One way to do this would be to operate a two-stage process with vitrification being used only on the sediments with high metal contents.

It is important to remember that the total metal weights are high, even for the comparatively small volumes of materials taken from the canal. For instance, if we assume that we will treat around 100,000 tons of material, then, if the lead concentration is taken to be 1343 ppm (See Table 1.), there will be 134.3 tons of lead in the final material. Beneficial use of the vitrified material must, therefore, be considered

TABLE 1
New York State Guidelines for Effects of Metals on Marine Organisms and the Concentration of Metals in the Sediments of Four Waterways in the Port of New York/New Jersey

	Concentration (parts per million - dryweight)					
Metal	*Lowest Effect Level*	*Severe Effect Level*	*Gowanus Canal*	*Newark Bay*	*Arthur Kill*	*Newtown Creek*
Antimony	2.0	25.0	<21	NA	NA	NA
Arsenic	6.0	33.0	10	9-17	17-25	5-33
Beryllium	NA	NA	1	NA	NA	NA
Cadmium	0.6	9.0	11	1-2	1.5-3	1-20
Chromium	26.0	110.0	151	175	161	305
Copper	16.0	110.0	630	105-131	178-304	61-770
Lead	31.0	110.0	1343	109-136	111-261	68-554
Mercury (total)	.15	1.3	3	2-3	2-4	1-3
Nickel	16.0	50.0	88	33-40	20-60	12-140
Selenium	NA	NA	2	NA	NA	NA
Silver	1.0	2.2	21	2-4	2-5	2-3
Thallium	NA	NA	<42	NA	NA	NA
Zinc	120.0	270.0	1130	188-244	230-403	104-1260

Sources: *Audrey Massa — metal concentrations for Newark Bay, Arthur Kill, and Newtown Creek*
Robert Smith — metal concentrations for the Gowanus Canal
N.Y.S. Department of Environmental Conservation — effect levels

NA=Not available

carefully because of its high metal concentration. While water leaching of the metals is not expected to be a severe problem, as shown by the results of Toxic Characteristic Leaching Procedure (TCLP) testing (EPA Method 1311), the metals could be released if the material were used for road or sidewalk surfaces or other applications where abrasion could generate dust.

Public Place Site Development

Much of the land along the canal is believed to be contaminated as a result of past industrial activities. It is important to carry out remediation of these sites for two reasons. First, runoff from the land can degrade the water and contaminate the sediments that will accumulate in the canal following dredging. Second, any redevelopment of the area will require removal of any hazardous conditions. The Public Place Site at Smith Street and the canal (See Figure 1.) is an example of an area that needs attention. It is an approximately six-acre site formerly used as a manufactured gas plant and now owned by New York City. If this area can be brought to an environmentally acceptable condition, the land can again be used productively. Plans for the site have been discussed in the community, but specific decisions have not been made about its cleanup and the final disposition of the land.

In any case, several proposals for redeveloping the site have been abandoned because of the uncertainty about its contamination and the concomitant possible future liability for developers. Although a study was conducted in 1989 to determine the levels of contamination that exist on the Public Place Site, definitions of "cleanliness" are elusive, and the standards are hotly debated by developers, regulators, and environmental groups. Such sites are legal and financial burdens for governments instead of being the assets they could be if redevelopment were possible.

The site was studied by contractors of the New York State Department of Environmental Conservation in 1990. Both soil and groundwater samples were analyzed and were found to contain metals, PCBs, insecticides, and organic contaminants. Because they threaten human health and because they raise many liability issues, the levels of these contaminants will have to be lowered before it will be possible to obtain the permits and funding necessary to develop this land.

Roux Associates, Inc.

Many methods for treating these contaminated soils exist, including some of the approaches mentioned in the discussion of the treatment of the canal sediments. The cleanup of these sites is technically feasible. The roadblocks to accomplishing the task lie in the economic and legal situations discussed earlier.

TABLE 2
Concentration of Volatiles and Other Contaminants in Gowanus Canal Sediments

	Concentration (parts per million)
Contaminants	*Gowanus Canal*
Benzene	8
Toluene	20
Chlorobenzene	9
Ethylbenzene	79
Total xylene (o.m.p.)	54
Total petroleum hydrocarbons	24742

Source: Robert Smith

Economic Development

Restoring the Gowanus Canal could lead to an economic renewal of the entire Gowanus region because it would make the area attractive to developers. Similarly, cleaning the surrounding abandoned land would stimulate construction and the creation of new businesses. Thus, investing in the cleanup should be seen as a capital investment which will be paid off through increased taxes to government as the result of increased property values and increased economic activity. Meanwhile, a concomitant improvement in social conditions could lead to reduced costs for welfare, police, and social services. Obviously, the private sector would also benefit from the improvement in neighborhood conditions and the creation of new business opportunities.

Creating new jobs is central to any program of economic development. A Gowanus cleanup would require facilities to recycle and treat waste materials including contaminated sediments. Building such a facility in the area, given a suitable location and community acceptance, would produce numerous jobs. For instance, if vitrification were the technology to be adopted to treat the soil and sediment, a vitrification center would have to be built to handle the materials, and that center would be a source of employment. Other processes associated with studying and treating the contaminants would also produce jobs—some requiring special training and education.

Environmental Education and Training

Education is an important component of the Gowanus area renewal project. As the canal cleanup can serve as a focus for economic

development, it can also serve as a focus for educational activities. The first step is to increase the community's awareness of the economic, social, and health effects of the environmental problems connected with the canal, so it can mobilize and address those problems. Then, an educational network can be formed to link environmental courses offered at local public schools and at two and four-year colleges to community residents who are interested in pursuing environmental education and training to obtain related jobs.

The institutional members of the partnership involved in the cleanup will also undertake educational projects that will include:

- developing a community environmental program devoted to the environmental problems of the Gowanus Canal area and to questions that would relate to developing new economic activities in the neighborhoods. This would include activities related to sediment and soil decontamination, treatment of industrial wastes, and recycling.

- using the environment as a focal point for improving basic skills in the public schools

- using the study of the environment and environmental remediation at the community and technical college level as a career path with new job opportunities. New York City Technical College of the City University of New York is located close to the canal and will be the leader in this effort. Community colleges in the region will be involved whenever practicable.

- developing new opportunities by creating student and faculty internships at the various educational institutions and at Brookhaven National Laboratory, and applying materials, developed in existing DOE-funded, BNL science education programs for minority outreach, to the work in Brooklyn

- working with the U. S. Environmental Protection Agency in their public outreach efforts with respect to issues relevant to the dredging of New York Harbor. This will mean including all interested groups in the planning of any remediation projects for the canal and its surrounding lands.

Conclusion

We have described the beginning of a partnership between public and private groups aimed at reclaiming and improving urban lands and

waters that have been contaminated with toxic materials as a result of past industrial activities.

The methods to be used for financing the planning effort have yet to be created since there is no clear source of funding for an effort that crosses the lines of responsibility of so many different entities. In addition, there is need to recognize and enable a strong participation from the DOE National Laboratories in this type of activity. While this will be a new direction for DOE, it is justified by the overlap between DOE programs and the need for urban cleanup. Methods for financing the R&D and educational activities by a combination of public and private funding need to be developed.

While there are many obstacles to the development program we have described here, we are, nevertheless, sanguine about the ultimate success of this endeavor.

Notes

[1]Many of the conditions present in the Gowanus Canal are present in other sections of the New York-New Jersey region. For instance, deciding how to dispose of contaminated sediments from the canal is closely linked to deciding how to dispose of material dredged from the entire Port of NY/NJ. BREP has expanded its scope in recognition of this fact and has now initiated a Multistate Alliance (BREP MSA) in collaboration with scientists at the New Jersey Institute of Technology, Rutgers University, and Stevens Institute of Technology to provide, in part, technical and other resources to the Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (COE) who are the lead agencies for the work on harbor sediments. The close connection and coordination with the entire region will benefit the specific work in the Gowanus Canal region.

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