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CONTROL OF ESTUARINE POLLUTION

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In the area of environmental concern, there is a growing awareness that nearly every one of man's activities affects the environment. Our history has shown that many seemingly innocuous decisions which do not have immediate adverse effects have proven to be damaging over extended periods of time. The present condition of our nation's estuaries serves as a glaring example of this reality.

I INTRODUCTION

Estuaries¹ are one of the nation's most important assets. They are utilized for a wide range of commercial, industrial, and recreational activities while simultaneously serving a vital role in the natural cycles of fish, animal and plant life.

Because of the natural mixing of fresh and salt waters, the estuarine environment produces a wide variety of living organisms, from microscopic species to large numbers of fish and shellfish, birds, and mammals. Many species, such as clams and oysters, spend their entire life cycles in the estuaries. Others, particularly shrimp, migrate from the sea to estuarine nursery areas. In these rich waters, they grow to sub-adult size before returning to the sea to complete their life cycles. The anadromous species, such as salmon and striped bass, pass through the estuaries to their spawning grounds farther upstream, and the young return through the estuaries to the ocean. At least two-thirds of the animal populations in the oceans spend an essential portion of their life cycle in estuarine waters or are dependent on species that do. Innumerable waterfowl and shorebirds

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1. For the purposes of this article an estuary will be defined as a body of water which has a free connection to the sea and within which seawater is mixed with freshwater derived from land drainage. See Pritchard, *What is an Estuary: Physical Viewpoint*, in *Estuaries* 3 (G. Gouff ed. 1967).

depend on the plant and animal organisms of the coastal zone for their food. Many winter and nest in these waters.

The base for all animal life in estuaries is the abundant variety of plant growth, from mangroves to eelgrass and algae. They are supported by the mixing and flushing action of the tides and the organic nutrients which collect to produce the rich bottoms and wetlands.²

Estuaries' role in the support of fish and wildlife is inconsistent with their intensive use by man. This inconsistency extends to both land and water environments, and provides countless examples of the competition between resource use and resource protection. Rivers bring accumulations of municipal and industrial waste³ and urban runoff adds fertilizers and nutrients. Excessive siltation from upstream land use practices and reclamation activities of adjacent land owners have resulted in the filling of extensive water areas.⁴ Upstream diversions may change the position of the fresh water-salt water interface in the estuarine zone, thereby affecting fish and wildlife habitats.⁵

Concurrent with changing public attitudes about pollution of the environment has been rising concern over the fate of our nation's estuaries⁶—concern that ranges in direction from the effects of such pollutants as chlorinated hydrocarbons⁷ to the unknown long-term

2. U.S. President's Council on Environmental Quality, First Annual Report on Environmental Quality 176 (1970) [hereinafter cited as Council Report].

3. For example, a limited investigation of pesticides undertaken as part of the San Francisco Bay-Delta Water Quality Control Program found that between 10,000 and 20,000 pounds of chlorinated hydrocarbons entered the Bay-Delta system in 1965. The data indicated that from twenty to forty percent of the chlorinated hydrocarbons entering the system were discharged in municipal and industrial wastes. Kaiser Engineers and Assoc. Firms, Final Report to the State of California, San Francisco Bay-Delta Water Quality Control Program, at II-8, XII-23 (1969).

4. A recent study rated 62% of California estuaries as severely modified by landfill activity. U.S. Department of the Interior, Fish and Wildlife Service, 1 National Estuary Study 25 (1970).

5. Migrating birds, anadromous fish, shellfish and a wide variety of aquatic life depend upon a sometimes delicate balance for their survival. An alteration in the chemical or physical characteristics of environmental zones can severely alter the number and variety of species.

6. Estuarine problems have been the subject of a number of Congressional Committee Hearings. See, *Hearings on the Nation's Estuaries: San Francisco Bay and Delta, California Before the Subcommittee on Conservation and Natural Resources of the House Committee on Government Operations*, 91st Cong., 1st Sess., (1969); *Hearings on the National Oceanographic Program Before the Subcommittee on Oceanography of the House Committee on Merchant Marine and Fisheries*, 91st Cong., 1st Sess., pts. 1 & 2 (1969). Estuaries have also been the subject of several recent federal studies. See U.S. Dept. of the Interior, National Estuary Study (1970), and U.S. Fed. Water Pollution Control Admin., National Estuarine Pollution Study (1968).

7. Chlorinated hydrocarbon pesticides are a group of insecticides that contain at least carbon, hydrogen and chlorine. In general, they are persistent in the environment, have an affinity for fatty tissue and are toxic to numerous insects. Examples are DDT, Dieldrin, Endrin, Chlordane and Toxaphene.

effects of numerous toxic substances upon the estuarine environment.⁸ Due to the complex nature of the estuarine environment,⁹ and the fact estuarine areas are population centers,¹⁰ there is a tendency to suggest they must be considered and managed as individual environmental units. But, estuaries are not "the problem." The problem can be found in haphazard policies of development, discreet discharges of such substances as mercury, oil, sewerage, or other waste, and water use activities that contribute to salinity intrusion.¹¹

Water pollution control efforts until recently were designed primarily to protect the quality of water used for consumptive purposes, and since estuarine waters are not generally sources of domestic water, the control of estuarine pollution has lagged behind the control of pollution in entirely freshwater areas.¹² Too, a number of other factors have contributed to the estuaries' falling behind in the race for environmental protection and enhancement, including problems regarding the source and extent of pollution control efforts as well as difficulties in efforts to measure pollution in an estuarine environment. This article will attempt to shed light on some of these problems.

II

THE LEGAL BASIS FOR CONTROL

The scientific problems associated with water quality control in estuaries, which are discussed elsewhere in this article, are more than matched by the problems caused by the nation's intricate governmental systems and by the political values relating to estuarine management. Governmental responsibility is divided between federal, state and local jurisdictions.¹³ Various laws dealing with estuarine

8. Manufacturing processes are becoming more complex creating greater amounts of exotic wastes potentially toxic to humans and aquatic life; and the effects of current levels of such substances as cadmium, lead and mercury are still not fully understood. Council Report, *supra* note 2, at 52.

9. The estuarine environment is continually in a state of change. Salt and freshwater concentrations are subject to any variation in the level of freshwater input. In turn, freshwater input is determined by upstream use, seasonal variation in the weather, and variances in the year to year precipitation levels. See U.S. Fed. Water Pollution Control Admin., Marine Biology and Pollution Ecology Training Manual, at C23-1, (1970).

10. Eight of our most populous metropolitan areas are located in estuarine zones and Great Lakes areas, as are 15 of the largest U.S. cities. National Estuary Study, *supra* note 4, at 50.

11. Salinity intrusion extends to the movement of saltwater into groundwater basins as well as up streams that flow into the estuary. For a more complete discussion of this problem see Gindler and Holburt, *Water Salinity Problems: Approaches to Legal and Engineering Solutions*, 9 Natural Resources J. 329 (1969).

12. President's Commission on Marine Science, Engineering and Resources, *Our Nation and the Sea, A Plan for National Action* 74 (1969).

13. U.S. Dept. of Interior, Fish and Wildlife Service, 2 National Estuary Study 212 (1970).

management are often times conflicting, and unsettled public use rights,¹⁴ disputed titles and overlapping provisions of law make difficult the orderly administration of our estuarine resources. This section will discuss the estuarine control activities of the several levels of government.

A. Federal Government

1. Constitutional Basis of Authority

The federal role in estuarine management is supported by a number of broad congressional grants of authority. Because estuarine areas are often extensively involved in commerce, the "Commerce Power"¹⁵ affords the federal government its most significant basis from which to regulate estuarine-related activities. The Federal Water Pollution Control Act,¹⁶ which applies to interstate and coastal waters,¹⁷ and the regulation of navigation, principally by the United States Army Corps of Engineers,¹⁸ are the primary federal activities based on this power.

Under the "Property Power,"¹⁹ the federal government exercises influence in estuaries through control of property owned by the United States. Similarly, under the General Welfare Clause,²⁰ the United States, through the Department of the Interior's Bureau of Reclamation, constructs water projects on the tributaries of estuaries. The operation of these projects can have a significant impact upon the estuaries and the land and water resources that surround them.²¹

14. This is a source of confusion to many states. Recently, the California Supreme Court held that historic use of shoreline areas is to be a major consideration in determining public use. The Court also stated that the courts should encourage public use of shoreline areas whenever that can be done consistently with the federal Constitution. *Gion v. Santa Cruz*, 2 Cal. App.3d 29, 465 P.2d 50, (1970). For a discussion of the subject see Sax, *The Public Trust Doctrine in Natural Resources Law: Effective Judicial Intervention*, 68 Mich. L. Rev. 473 (1970).

15. U.S. Const. art. I, § 8, para. 3—to regulate commerce with foreign nations and among the several states. Extended to include activities "affecting commerce." See *County of Mobile v. Kimball*, 102 U.S. 691 (1881).

16. Water Pollution Control Act, 62 Stat. 1155 (1948), as amended 33 U.S.C. § § 466-466(k) (1964) [hereinafter the Federal Water Pollution Control Act in its amended form is cited as F.W.P.C.A.].

17. F.W.P.C.A. § 10(a) "The pollution of interstate or navigable waters . . . shall be subject to abatement as provided by this Act."

18. In 1935 Congress provided generally that investigations and improvements of rivers, harbors and other waterways shall be under the jurisdiction and prosecuted by the Department of the Army under the direction of its Secretary and supervision of the Chief of Engineers. Act of Aug. 30, 1935, § 1, 49 Stat. 1028, 33 U.S.C. 540.

19. U.S. Const. art. IV § 3, para. 2.

20. U.S. Const. art. I, § 8, para. 1.

21. For example, the massive Central Valley Project in California, undertaken as a reclamation project, significantly affects the flow of water through the Sacramento/San Joaquin Delta and the full effect of this project upon fish and wildlife and water quality is not yet known. See *United States v. Gerlach Livestock Co.*, 339 U.S. 725 (1950).

The "Treaty Power"²² provides an interesting basis for authority inasmuch as the United States is a party to two major multi-lateral treaties relating to pollution of the sea by oil²³ and to a number of treaties and agreements with Mexico and Canada that affect the quality and use of boundary waters.²⁴

2. Administrative Regulation

With constitutionally vested powers and the broad interpretation thereof forming a base, Congress has assigned authority for a number of estuarine-related activities to various federal agencies.²⁵

The Department of the Interior has major administrative responsibilities in the estuarine zone. The Estuarine Areas Act of 1968²⁶ gives the Secretary of the Interior review authority over federal development activities affecting estuarine resources. Furthermore, numerous agencies within the Department have administrative responsibilities ranging from the study and protection of wildlife to the development of water resources that will eventually affect the estuary.

The newly formed Environmental Protection Agency,²⁷ which houses the principal federal regulatory functions in the environmental field, is significantly involved in estuarine management. The

22. U.S. Const. art. II, § 2, para. 2. Treaties made under the authority of the United States shall be the supreme law of the land. U.S. Const. art. VI, para. 2.

23. The International Convention for the Prevention of Pollution of the Seas by Oil. 12 U.S.T. 2989 (1961). The United States Convention of the High Seas, [1962] 13 U.S.T. 2313. Recently, President Nixon made a proposal for a new treaty that would, among other things, protect the ocean from pollution. Wkly. Comp. Presidential Docs., May 25, 1970, 677-678.

24. The International Boundary and Water Commission, United States and Mexico. Rio Grande, Colo., and Tijuana Treaty, 59 Stat. 1219, T.S. No. 994. The Boundary Waters Treaty, 1909, 36 Stat. 2448, T.S. No. 548, authorized the creation of the International Joint Commission of the United States and Canada.

25. This has resulted in some confusion between agencies. Activities of one agency will often conflict or cancel the efforts of another. See *Federal Pollution Attack Gains Steam, But Long-Term Outlook Remains Cloudy*, 2 Government Executive 50-52 (1970).

26. 16 U.S.C. §§ 1221-26 (1968). The Act authorized a general study and inventory of estuaries (See § 1222), and requires all federal agencies in planning for water and land resource use and development to give consideration to estuaries, their natural resources, and their importance for commercial and industrial developments (See § 1224).

27. See Reorganization Plan No. 3 (H.R. Doc. No. 91-364) Operative Dec. 2, 1970. The Agency has assumed responsibilities formerly held by the Atomic Energy Commission regulating radioactivity from nuclear installations, which often are or will be located adjacent to or within estuaries. In addition, the Agency has also assumed responsibilities formerly held by the Dept. of Health, Education and Welfare and administered through the Environmental Health Service including functions exercised by: The National Air Pollution Control Administration, the Environmental Control Administration and the Air Quality Advisory Board, also the functions in regard to establishing tolerances for pesticide chemicals and the functions of the Bureaus of: Solid Waste Management, Water Hygiene, and Radiological Health.

Agency's Federal Water Quality Administration oversees the establishment and enforcement of federal water quality standards for interstate and coastal waters. It also administers grant programs to assist states and public agencies in the administration of water quality programs, research, and construction of water quality control facilities.^{2 8} The construction of treatment facilities with federal financial assistance has been the major factor in the upgrading of the quality of waste discharges to estuarine waters throughout the country.^{2 9}

The Defense Department has considerable influence in estuarine areas due to the presence of a number of military installations in these areas and the active role the Army Corps of Engineers has played through its civil works program.

Through activities of the Coast Guard, the Department of Transportation also performs a number of service activities directed at the beneficial use of estuarine waters. The Coast Guard is charged with the enforcement of federal laws in the navigable waters of the United States, and with the maintenance and operation of aids to navigation.^{3 0}

Many federal agencies and laws also indirectly affect estuarine areas.^{3 1} For example, a recently enacted provision of the Federal Water Pollution Control Act^{3 2} grafts the consideration of environmental factors onto the existing statutory authority of many federal agencies, the most prominent of which is the Corps of Engineers.^{3 3}

28. F.W.P.C.A. § § 6-8.

29. The nation's municipal waste-handling systems show an investment of \$880 million for the year 1969. This amount, however, did little more than cover replacement and growth needs developed in the same year. Total investment requirements will conservatively amount to \$10 billion over the years 1970-74 if all existing deficiencies are corrected and no new deficiencies incurred. U.S. Department of the Interior, Federal Water Pollution Control Administration, *The Economics of Clear Water*, Summary Report 5 (1970).

30. See 14 U.S.C., Ch. 5 (Supp. III), 33 U.S.C., Ch. 7, 33 U.S.C. 157. Also, F.W.P.C.A. § 13 provides that the secretary of the department in which the Coast Guard is operating is charged with the enforcement of federal standards in respect to the control of sewage from vessels.

31. For instance, the U.S. Forest Service, Department of Agriculture, manages the forestry aspect of watershed protection and 12 national forests involve lands that drain directly into estuarine areas. U.S. Department of the Interior, *3 National Estuarine Pollution Study*, at V-27 (1969). Presently, under the Environmental Policy Act of 1969 (Pub. L. No. 91-190, Jan. 1, 1970), all federal agencies are required to submit reports regarding the environmental impact of their proposed actions. See § 102.

32. F.W.P.C.A. § 216. Applicants for a federal license or permit to conduct any activity that may result in a discharge into the navigable waters of the United States are required to submit a certification from the state in which the discharge will originate to the effect that activity will not violate applicable water quality standards.

33. Also, F.W.P.C.A. § 21(a) requires each federal agency having jurisdiction over any real property, a facility, or engaged in any federal public works project to insure compliance with applicable water quality standards.

Furthermore, considerable federal control is exercised over state and local actions through the review responsibilities in assorted federal grant programs other than those contained in the Federal Water Pollution Control Act.³⁴

B. State and Local Government

Generally, state and local governments have the most direct authority in estuarine areas. The most substantial basis for their regulation of estuarine activities falls under the so-called police power.³⁵ This power supports state water quality regulation and land-use controls.

Many states have delegated significant authority³⁶ in estuarine management and land use to local government,³⁷ and in some cases these local controls are protected from state legislative interference by so-called "home rule" provisions under which municipal affairs or matters not of statewide significance are constitutionally protected powers of local government.³⁸

Generally, state activities in estuarine management are concentrated in state water pollution control agencies.³⁹ For the most part, these pollution control efforts have been designed to regulate municipal and industrial waste discharges.

There has been a trend toward establishing special purpose governmental agencies devoted to specialized problems affecting estuaries or a particular estuary. One of the most notable examples of the latter was the establishment in California of the San Francisco Bay Conservation and Development Commission.⁴⁰ The basic function of

34. A number of grant programs administered by the Departments of the Interior, Defense, Agriculture, and Housing and Urban Development directly affect estuarine management. For example, see California Assembly Committee on Water, Handbook of Federal and State Programs of Financial Assistance for Water Development (1970 ed.).

35. The inherent and plenary power in states over persons and property which enables the people to prohibit all things inimical to comfort, safety, health, and welfare of society. *Drysdale v. Prudden*, 195 N.C. 722, 143 S.E. 530, 536 (1928).

36. Generally, local government authority stems entirely from powers delegated by the parent state.

37. Notably, a few states have maintained or reasserted their land-use powers. See Hawaii Rev. Laws § 205-10 (1968) and [6] Me. Rev. Stat. Ann. Tit. 12 § 681-89 (Supp. 1970).

38. Article XI, §§ 6 and 8(j) of California's Constitution gives charter cities the power to "make and enforce all laws and regulations in respect to municipal affairs, subject only to the restrictions and limitations provided in their several charters."

39. A discussion of those rights, remedies and defenses relating to water quality is presented in 3 Gindler, *Waters and Water Rights* 37-195 (1967). For a summary of state water pollution control agencies see Hines, *Nor Any Drop To Drink: Public Regulation of Water Quality*, 52 Iowa L. Rev. 186 (1966-67).

40. Created in 1965 by the McAteer-Petris Act Cal. Govt. Code §§ 66600-66653 [West 1966], the Commission is charged with responsibility for preparing "a comprehensive and enforceable plan for the conservation of the water of the bay and the development of its

the Commission is to control the filling of San Francisco Bay, an activity which has already reduced the surface area of the Bay from 700 square miles to slightly over 400 square miles. The remarkable support the Commission received from the California public was shown in 1969 when the California Legislature made the Commission permanent and expanded its jurisdiction to include all the territory located between the shoreline of San Francisco Bay and a line 100 feet landward.⁴¹

C. Conflicts and Limitations

1. Federal-State

Much of the active disagreement between state and federal governments concerns the ownership of submerged lands.⁴² In 1953, Congress attempted to resolve this conflict with passage of the Submerged Lands Act,⁴³ which placed title in the coastal states to the submerged lands within their boundaries, defined their seaward boundaries as extending three geographical miles from the coastline (three marine leagues into the Gulf of Mexico), and placed these lands and their resources under applicable state law.⁴⁴ However, because coastlines consist of numerous indentations and extensions and because many coastal states have developed and extended authority over coastal islands, the definition and design of coastline boundary standards and the seaward extension of state authority are still the subject of debate.⁴⁵

President Nixon's treaty proposal of May 23, 1970⁴⁶ includes a recommendation that would establish a 12-mile territorial sea. This proposal could have a direct effect upon the regulation of estuarine pollution. Pollution of the sea is subject to the action of the tide, currents and winds. Discharges into the sea will, in many instances, float toward the coastal zone and result in degradation of the estuarine environment just as discharges into the coastal zone will have an effect on the sea. Because the President's proposal would extend United States' jurisdiction over a 12-mile area, pollution standards and regulations that include estuarine considerations could be

shoreline." For background on the Commission and its activities see: Committee on Government Operations, *Protecting America's Estuaries: The San Francisco Bay-Delta* 7-12 (1970).

41. Cal. Govt. Code § 66610B (West Supp. 1970).

42. See *United States v. California*, 332 U.S. 19 (1947); also *United States v. Louisiana*, 399 U.S. 699 (1950).

43. 43 U.S.C. § § 1301-15 (1953).

44. *Id.* § 1311.

45. See *United States v. California*, 381 U.S. 139 (1965); also *United States v. Louisiana*, 394 U.S. 11 (1969).

46. See *The International Convention for the Prevention of Pollution of the Seas by Oil*, *supra* note 23.

initiated. However, the questions of authority allocations between the federal and state governments in this area would still be unresolved. Proposed legislation was introduced in the 91st Congress providing for state planning jurisdiction over offshore areas in which the concerned states have a legitimate interest.⁴⁷

Another area of conflict has been the scope of regulation which the federal government could exercise under the Federal Water Pollution Control Act. Estuarine waters are covered by the Act because they are defined as "interstate waters."⁴⁸ The Act provides that state water quality standards for estuaries are subject to federal approval,⁴⁹ and if they are unsatisfactory the federal government may impose standards.⁵⁰

2. State—Local

Probably of more concern from a practical standpoint than federal/state conflicts are the self-imposed limitations on state ability to regulate estuarine areas. For example, despite the "public trust doctrine,"⁵¹ many coastal states have transferred ownership of submerged lands to private individuals or local government⁵² with the result that the most direct state basis for regulating the use of these lands has been lost. Only a few states have provided comprehensive state regulations covering coastal activity and development, including the placing of structures.⁵³ However, as with any exercise of the police power, a governmental agency must be able to meet changing judicial interpretations as to what constitutes the taking of property without just compensation.⁵⁴ This question was raised dur-

47. S.2802, S.3183 and S.3460, 91st Cong. (1969-70). Only one of these bills would cover the proposed 12-mile territorial sea extension (S.3183 which defines coastal zone as extending "seaward to the outer limit of the United States territorial sea"). All of these bills reserve in the Federal Government the right to review and approve the states' planning or operating programs for their coastal zones.

48. 6 U.S. Dept. of the Interior, Fish and Wildlife Service, National Estuary Study, at E-2 (1970).

49. F.W.P.C.A. § 10.

50. *Id.*

51. Under this doctrine title to the tidelands is held in trust by the state to be used by the people. The state is obligated to protect the public rights of navigation, fishing and commerce. *See Pollard's Lessee v. Hagon*, 44 U.S. (3 How.) 212,229 (1844). *See also* Council Report, *supra* note 2, at 176.

52. Exceptions include Hawaii, Texas and Alaska which own their estuarine zones. National Estuarine Pollution Study, *supra* note 31, at V-133-34.

53. Massachusetts, Connecticut and North Carolina have wetlands protection laws while Hawaii, Wisconsin, and to some extent Oregon have exercised statewide powers over the contiguous dry lands. Council Report, *supra* note 2, at 178. In 1970, several attempts were made to provide for state regulation of California's coastal activities, but they failed to gain legislative approval. *See* California Senate Bills 321, 949 and 1354 (1970). *Also* California Assembly Bills 640, 730 and 2131 (1970).

54. U.S. Const. amend. V commands that "private property [shall not] be taken for

ing the consideration of legislation to extend the San Francisco Bay Conservation and Development Commission's authority to include the regulation of structures on the shoreline.⁵⁵ Maine's Wetlands Act,⁵⁶ which was designed to protect the ecology of coastal areas, recently failed to meet the test of substantive due process.⁵⁷

Problems are also created by the frequent reluctance of local governments to establish and implement land-use plans which maximize environmental protection in estuarine areas. A local government's most important legal tools in this regard are zoning and taxation. However, local agencies are frequently restricted by a relatively small tax base to limited funds and are thus prevented from the purchase of estuarine areas. This situation also tends to encourage local planning bodies to accept industrial development (which increases employment and tax revenues) at the expense of environmental protection. Frequently, even when estuarine areas are zoned for protection of environmental values, special-use allocations or subsequent rezoning for industrial and commercial activities result in degradation of the environment.⁵⁸ Clearly, local government has given priority to its tax base and lip service to conservation. It would appear that significant state or federal financial assistance to local government will be necessary if local efforts at limiting land use in estuarine areas are to be successful. As an alternative, special tax treatment of the lands involved could be considered.

In addition to being limited by financial and special interest pressures, local government is frequently limited in its ability to manage an estuary because of real limitations in governmental jurisdiction. Typically, an estuarine area is under the jurisdiction of numerous cities, counties and other special-purpose governmental agencies which frequently have differing tax bases, powers and estuary-related priorities. Under the best of circumstances, even a limited degree of coordination among local government concerns in estuarine areas is difficult to obtain.⁵⁹ More difficulty arises when an estuary involves more than one state. The northeastern United States

public use, without just compensation." The problem of what constitutes a compensable taking of property has long been a source of confusion to scholars and courts.

55. San Francisco Bay Conservation and Development Commission, San Francisco Bay Plan 3-4, 37-38 (1969).

56. Me. Rev. Stats. Ann. Tit. 12, § 4701-09 (1970).

57. See *Maine v. Johnson*, ——— Me. ———, 265 A.2d 711 (1970).

58. National Estuarine Pollution Study, *supra* note 31, at V-147, V-155.

59. This situation prompted the Planning and Conservation League of California to comment: "The odds against a thousand city governments regulating an end to boosterism in the coastal zone of California are roughly equivalent to the classic probability of a million monkeys pecking away at typewriters and someday producing 'Hamlet.'" The Riverside Press Enterprise, Sept. 20, 1970.

has witnessed the development of several compacts designed to administer a cooperative multi-state effort at estuary protection. Of these, the Tri-State⁶⁰ Compact and the Delaware River Basin Compact⁶¹ have the broadest range of activities in relation to estuarine water quality. Although these compacts recognize the need for state-level administrative cooperation, studies have indicated their effectiveness has been limited and that many of the signatory states continue to provide administrative controls outside the framework of their respective compacts.⁶²

D. California: A Case in Point

The San Francisco Bay-Delta Estuary, located at the confluence of the Sacramento and San Joaquin rivers at the head of Suisun and San Francisco Bays, is the most important estuary in the state. The Central Valley of California, which comprises nearly 40 percent of the state's total area, is tributary to the Delta and more than 5.75 million people reside in the adjacent counties.⁶³

California has a comprehensive and broadly interpreted⁶⁴ state water quality control act⁶⁵ designed to protect the quality of state waters⁶⁶ from the discharge of waste⁶⁷ from all sources.⁶⁸ Administration of water quality control is carried out by a five-member, full-time State Water Resources Control Board,⁶⁹ and nine, nine-member⁷⁰ decentralized regional boards which act on an areawide basis. Supervision, budgetary review, approval of regional water quality plans, resolution of disputes between regional boards,⁷¹ and appeal responsibility are placed in the State Board.⁷²

Other state agencies which affect the San Francisco Bay-Delta Estuary include the State Lands Commission, custodian of ap-

60. New Jersey, New York and Connecticut.

61. Delaware, New Jersey, New York, Pennsylvania and the U.S.

62. National Estuarine Pollution Study, *supra* note 31, at V-201.

63. Final Report to the State of California, San Francisco Bay Delta Water Quality Program, *supra* note 3, at XIV-1 to XIV-35.

64. See 26 Op. Cal. Att'y Gen. 88 (1956); 27 Op. Cal. Att'y Gen. 482 (1956) and 43 Op. Cal. Att'y Gen. 302 (1964).

65. The Porter-Cologne Water Quality Control Act, Cal. Water Code §§ 13000-13951 (West Supp. 1970).

66. Cal. Water Code § 13000 (West Supp. 1970).

67. "Waste" includes sewage and any and all other waste substances . . . associated with human habitation, or of human or animal origin, or from any producing, manufacturing, or processing operation of whatever nature. Cal. Water Code § 13050(d) (West Supp. 1970).

68. See for example, State Water Resources Control Board Resolution 70-23, Aug. 6, 1970 (Cal.).

69. Cal. Water Code §§ 174-188.5 (West Supp. 1970).

70. Cal. Water Code §§ 13200-13207 (West Supp. 1970).

71. Cal. Water Code § 13320(d) (West Supp. 1970).

72. Cal. Water Code §§ 13168, 13320(a) (West Supp. 1970).

proximately 634,653 acres of state-owned land, a large portion of which is tide and submerged lands in the estuarine zones;⁷³ the Department of Water Resources, which is concerned primarily with water resources investigations and the development of freshwater supplies;⁷⁴ the Department of Fish and Game, which has enforcement authority concerning fish kills and is the State's scientific arm for investigating the effects of water pollution on marine life;⁷⁵ the Department of Health, which regulates public health aspects of water use;⁷⁶ and the Department of Conservation's Divisions of Forestry, Mines and Geology, Oil and Gas.⁷⁷ Each of these agencies exerts considerable influence in regard to management and maintenance of the water quality in the estuarine area.

Much of California's freshwater supply is concentrated in the northern part of the State and involves the extensive watershed of the San Francisco Bay-Delta Estuary. Diversions of this water supply from the Estuary to other portions of the State by the Federal Central Valley Project⁷⁸ and the State Water Project⁷⁹ affect the extent of salinity intrusion in the Delta which in turn affects the ecology.⁸⁰ Delta water users are protected by statutory provisions requiring the State Water Project, in coordination with the Federal

73. The Commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the state including the authority to lease or otherwise dispose of such lands. Cal. Pub. Res. Code § 6301 (West 1956).

74. Cal. Water Code § 150 (West Supp. 1956).

75. The provision most used by the department in its enforcement activities is Cal. Fish & Game Code § 5650 (West 1968). *See also* § 5652.

76. The department is given responsibility for the maintenance of pure water for domestic use [Cal. Health & Safety Code § 203 (West Supp. 1956)], the authority to revoke permits issued to any person supplying water for domestic use (§ 4011), and also the authority to regulate the disposal of many wastes (§ § 4401, 4400).

77. *See* Cal. Pub. Res. Code § § 630-647, 2002-2322, 3001-3234 (West Supp. 1970).

78. The Federal Central Valley Project was authorized in 1935 under provisions of the Emergency Relief Act as a reclamation project. It is a multipurpose development to supply water for irrigation, municipal, industrial, and other uses, improve navigation on the Sacramento River, control floods in the Central Valley, and produce hydroelectric energy. It includes 16 dams and some 900 miles of conduits, tunnels, and canals.

Major reservoirs include Lake Shasta on the Sacramento River, Folsom Lake and Auburn Reservoir on the American River, Millerton Lake on the San Joaquin River, and New Melones Reservoir on the Stanislaus River. Major aqueduct systems are the Delta-Mendota Canal, Friant-Kern Canal, Madera Canal, and Corning Canal. Other key features are the San Felipe Division, Trinity Division, and San Luis Division.

79. The California State Water Project is a multi-purpose water development that conserves and distributes water, produces electrical energy and provides flood control, recreation, and fish and wildlife enhancement. The initial facilities of the Project—now 95 percent completed or under construction—include 18 reservoirs, 15 pumping plants, 5 powerplants and 580 miles of aqueducts. Parts of the Project have been in service since 1962; water deliveries will be made from the southern terminus in 1973.

80. At present, the California Water Resources Control Board is considering these effects and this article makes no judgment as to the outcome of these deliberations.

Central Valley Project to provide salinity control and an adequate water supply⁸¹ and also by the State's recognition of the sensitive interrelationship between water quality and water quantity as expressed through water rights allocation.⁸² California law recognizes both the riparian⁸³ and appropriative⁸⁴ doctrines of allocation of water resources. Under this latter doctrine, permits for appropriation of water are issued by the State Water Resources Control Board.⁸⁵

The development and implementation of land-use planning programs in the San Francisco Bay-Delta Estuary is typical of the confusion and difficulties which arise on the local level. The San Francisco Bay-Delta Estuary consists of 12 counties, 104 cities and numerous limited-purpose special districts which have powers affecting the environment of the estuary;⁸⁶ there is no single- or multi-purpose agency covering the entire estuary. The San Francisco Bay Conservation and Development Commission⁸⁷ is the only agency approximating areawide jurisdiction.

Even the readily isolated problem of waste disposal is fragmented among many separate jurisdictions. Although a three-year compre-

81. Cal. Water Code § § 12202-05, 12220 (West Supp. 1970).

82. In California the Water Resources Control Board has the authority to approve appropriations by storage of water to be released for the purpose of protecting or enhancing the quality of other waters put to beneficial use [Cal. Water Code § 1242.5 (West Supp. 1970)], to take into account the amounts of water needed to remain in the source for the protection of beneficial uses, including any uses specified to be protected in any relevant water quality control plan [Cal. Water Code § 1243.5 (West Supp. 1970)], and to institute necessary court actions to adjudicate rights or to further the physical solutions necessary for the protection of the quality of groundwater [Cal. Water Code § 2100 (West Supp. 1970)]. For a discussion of water quality and water rights see Robie, *Relationship Between Water Quality and Water Rights*, Contemporary Developments in Water Law 73-83 (Water Resources Symposium No. 4, C. Johnson and Lewis, S. eds. University of Texas, 1970).

83. Under this doctrine the law recognizes that each riparian owner has a right to the reasonable use of water on land riparian to a watercourse. It is a judicially oriented common law system concerning the rights of one riparian vis-a-vis other riparians.

84. The doctrine of prior appropriation states that the first in time to use the water beneficially is the first in right.

85. Cal. Water Code § 1250 (West Supp. 1970).

86. More than 275 local public entities in the 12-county study area perform functions related to the provisions of water or sewer service. Of the 104 cities located in the 12-county Bay-Delta area, 68 provide sewer service and 48 provide water service. Sewerage functions are performed by 155 public entities in the 12 counties. In addition to the 68 cities, 44 entities operate pursuant to the Sanitary District Act of 1923 and 25 special districts operate under the County Sanitation District Act. The remaining 18 entities operate pursuant to one of 10 other acts which meet the specific needs of the service area. A total of 103 public entities provide domestic water service in the 12 counties. In addition to the 48 cities which provide water service, there are 40 districts which operate pursuant to the county water district law and 15 other entities providing water service under nine special district acts. There are 17 special flood control and water conservation districts in the 12-county Bay-Delta area. Final Report to the State of California, San Francisco Bay-Delta Water Quality Control Program, *supra* note 63, at 2.

87. See Cal. Govt. Code, note 40 *supra*.

hensive study of pollution of the San Francisco Bay-Delta area recommended in 1969 that an areawide agency be established to handle waste disposal in the area the initial response was negative both in the Legislature⁸⁸ and within the area itself. Thus, although there is a clear state interest in this estuary, the critical problem of local planning and implementation remains cumbersome and ineffective.

III

PLANNING FOR WATER RESOURCES MANAGEMENT

Failure to provide nationwide guidance of land use has complicated the problem. Local agencies empowered to decide how land is used have continued to operate within their narrow areas of authority while ignoring the regionwide results of their fragmented decisions.⁸⁹ Only recently has there been a general realization that communities were neglecting long-term resource protection to achieve short-run improvements in the tax base or economic situation. This last-minute awareness has dramatized the need for proper land-use planning techniques that can insure a predictable rate and direction of development compatible with environmental goals.⁹⁰

A. Water Quality Controls

To a limited extent, water quality controls have been used to indirectly fill the void created by the lack of adequate land-use plans. For instance, in recent years there has been an acceleration in the planning and construction of waste treatment facilities on an areawide basis.⁹¹ Because of the absence of land-use planning, such water quality planning may be subject to criticism as accomplishing only a limited purpose. Appropriate predictions of land use and consideration of other environmental factors must necessarily supplement water quality plans. Recent federal regulations emphasize the land-use planning responsibilities expected from water quality management by requiring areawide planning as a requisite to federal construction grants.⁹²

88. Cal. Assembly Bills 744 (1969) and 2310 (1970).

89. Council Report, *supra* note 2, at 184.

90. There has been some federal recognition of the need to coordinate land use planning activities with environmental considerations. See The Natural Land Use Policy Act, S. 3354, 91st Cong. (1970) which calls for ecological factors to be used as criteria in land use planning. For a discussion see Caldwell, *The Ecosystem as a Criterion for Public Land Policy*, 10 Natural Resources J. 203 (1970).

91. For example, the regional systems in San Diego, Seattle and Toronto were forerunners in the construction to accommodate areawide considerations.

92. See 35 Fed. Reg. 10756 (1970).

B. Adequacy of Water Quality Controls

The past few years have seen significant progress in the development and implementation of state water pollution control programs⁹³ through programs of indirect or direct control of waste disposal.⁹⁴ However, the effectiveness of existing and proposed waste treatment facilities is being questioned.⁹⁵ In addition there is no general acceptance in the scientific community of new planning needs, particularly as they relate to waste treatment facility design. Although it is technically simple and relatively inexpensive to reduce the oxygen-demanding characteristics of waste, it is more difficult to reduce the wide range of toxic chemicals, heavy metals, and nutrients that are discharged from most types of today's treatment plants.

Also evident are the limitations inherent in current waste discharge regulations. For example, the traditional methods of measuring pollution⁹⁶ are no longer adequate. They do not consider problems of toxicity or the long-term cumulative effects (such as increased productivity⁹⁷) of the discharge of nutrients into confined portions of the estuary.

Certain rigid governmental policies also tend to complicate the problem and may in some cases increase the already existing problems of estuarine productivity.⁹⁸

The discharge of heated wastes, primarily industrial and power

93. Council Report, *supra* note 2, at 50.

94. These include such measures as the construction of public waste treatment facilities, judicial or administrative orders requiring dischargers to either cease or correct deficiencies, and tax incentives awarded industries to bring their discharges into compliance with acceptable standards.

95. In the last few years, communities around the nation have invested large sums in improvement of waste treatment facilities but in many streams the degree of treatment needed is far beyond the technical capability of existing or proposed facilities.

There are many types of pollutants that cannot be effectively controlled by treatment such as pesticides and products that contain phosphates. Both of these pollution sources and other similar products must be controlled at the source and new federal authority is needed to assure rapid elimination of dangerous products from the market. See Final Report, San Francisco Bay-Delta Water Quality Control Program, *supra* note 3, at XX-31 to XX-40 and X-1 to X-10.

96. Traditional water pollution parameters include Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), suspended solids and coliform counts. These parameters measure the oxygen depleting characteristics, the particulate matter content and the numbers of coliform bacteria respectively in wastewaters or the receiving water.

97. Production can be defined as the total amount of cellular organic matter that is formed within a certain time from the raw material nutrients supplied. In aquatic terminology, "Production" or "Productivity" usually expresses the rate of algal growth in a body of water. This is often referred to as "algal primary productivity." See Calif. State Water Quality Control Board, *Eutrophication—A Review*, Pub. No. 34, (1967).

98. For example, the Federal Government supports the concept that secondary treatment (85% BOD removal) be provided for all communities (with limited exceptions) regardless of individual local water conditions. See proposed rule at 35 Fed. Reg. 8942 (1970).

plant cooling water, provides another threat to the estuarine environment. Small increases in the temperature can have serious effects, particularly in estuaries that support anadromous fish runs.⁹⁹ Protection from this source of pollution requires either the elimination of heated waste discharges or their rigid control.

Problems in maintenance of water quality in the estuary also encompass the difficulties involved by depletion of freshwater supplies caused by upstream diversions and storage projects. This is a critical problem in the coastal areas of the arid west, and it is becoming an increasingly significant problem in the estuaries of the Eastern United States where rainfall is more evenly divided throughout the year. Water stored primarily to meet consumptive purposes can be released in natural channels to meet environmental demands as well as the water supply needs for domestic, agricultural, and industrial uses.¹⁰⁰ But this would mean substantially increased magnitude and scope of water quality planning efforts, fully coordinated with planning for the protection and development of other natural resources. Considerations such as these suggest that protection of our nation's waters should depend less upon programs limited to the regulation of waste discharges and more upon management programs which include water quantity, water quality, and land-use controls.

IV

A CHOICE FOR THE FUTURE

The ability to provide effective environmental management programs depends upon the implementation of comprehensive development plans supported by the enforcement of land-use controls. Existing regulatory efforts of federal, state, and local government can reduce pollution loads of waters and contribute to the protection and enhancement of our nation's natural assets. But, until the use of land is controlled within a framework of areawide or statewide planning programs (in some instances, this must be multi-state), these efforts cannot prevent the continuing degradation of the total environment.

The complex nature of estuaries demonstrates the need for pro-

99. In his presentation entitled "Research on Thermal Pollution Report on the Columbia River and Estuary" presented at the Annual Pacific Marine Fisheries Commission meeting held at Coeur D'Alene, Idaho, Nov. 21, 1968, George R. Snyder reported that anadromous fish have been blocked in the Okanogan River, Washington by high water temperatures and that temperature blocks to fish migration have been observed near the confluence of the Snake and Columbia Rivers.

100. McCullough and Vayder, *Delta-Suisun Bay Water Quality and Hydraulic Study*, Journal of the Sanitary Engineering Division 801-27 (Proceedings of the American Society of Civil Engineers, Oct. 1968).

grams that can regulate pollution control activities at their source. Estuaries are an inseparable part of an upstream watershed that encompasses on urban and rural development which have a dramatic impact on the estuaries' sensitive environmental characteristics. Controls must extend not only to waste discharges but also to the development activities in the total watershed or basin of which the estuary is an integral part.

Since it may be many years before adequate plans can be developed, it is essential that existing and fragmented regulatory and planning efforts be simplified and consolidated. The wave of environmental concern has the capability of generating environmental bureaucracy of unprecedented proportions. Many federal and state agencies have strengthened their role in enforcing pollution standards, but they often compete with each other to do the most environmental good. As a result of this interagency competition many massive projects which might further degrade the environment and those projects that are needed to correct environmental damage are caught up in a web of paperwork, hearings and controversy.

The federal role in estuaries should be limited to technical support and financial assistance administered by one central agency. Although the creation of the Environmental Protection Agency is a positive step in this direction, residual power in other federal agencies¹⁰¹ creates external conflicts. Because the federal government is too far removed from the geographically and politically scattered estuaries, quality control can be most effectively exercised at the state level.¹⁰² Municipal governments on the other hand have limited financial resources, and their attempts at controlling the extensive estuarine area are often faced with a wealth of private interests that frustrate conservation-related regulations. The states in partnership with local governments have both the legal basis and the administrative ability to provide the means by which the estuarine environment can be protected and enhanced.

Recent examples in California have shown that estuaries can be effectively managed.¹⁰³ Single-minded, single-purpose programs that

101. For instance, the Department of Housing and Urban Development is involved with land use planning, The Environmental Protection Agency is concerned with environmental controls, and the Corps of Engineers and Bureau of Reclamation is concerned with public works projects.

102. The unanimous conclusion of three federal studies was that responsibility for the management of estuaries should reside with the states. See National Estuarine Pollution Study, *supra* note 31, at V-259; The National Estuary Study, *supra* note 4, at 73; and Our Nation and the Sea, A Plan for National Action, *supra* note 12, at 8.

103. Except for the persistent problem of vessel waste pollution, San Diego Bay is a clean Bay as a result of an areawide waste treatment and disposal system. Water quality control programs have substantially improved the quality of the Los Angeles Harbor and the variety and number of marine organisms are increasing in San Francisco Bay.

attempt to separate them from the total environment and assign responsibility for their management to the federal government will result in nothing more than a continuation of the present situation. State controlled management programs based on land-use planning and consideration of the total effect on the environment can be administered within a framework of cooperation between state and local government to produce maximum protection and enhancement of the estuary.