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# Dredging in the United States

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# DREDGING IN THE UNITED STATES

## AN OVERVIEW

The original intent of this paper was to examine the role of the United States Army Corps of Engineers and their monopolistic hold on the dredging industry in the United States. How did the Corps of Engineers become the experts in this maritime environment? Why did not the Navy acquire this marine related activity? To the naive observer, it may seem more logical to have this aspect of marine activity in the hands of the United States Navy, or even the United States Coast Guard. To have this seemingly marine activity under the control of the U.S. Army seems as preposterous an idea as Adolf Hitler owning 8,960 acres of valuable land in Colorado.[1] Both facts, however, are true.

The purpose was to trace the history of the U.S. Army Corps of Engineers, and follow their progression as America's dredgers. This paper trail led to the discovery of twenty-nine Public Laws, five Executive Orders, three Federal Policies as well as numerous states having their own rules and regulations regarding dredging activity. (See Appendix A.) The milestone legislation however was Public Law 95-269 of April 26, 1978. This act changed the entire organization of the dredging program within the Corps of Engineers, and was the turning point where the Corps ceased being the dredgers and became the managers of the dredging industry.

Thus, this has developed into a two part paper. The first section will follow the evolution of the United States Army Corps of Engineers from its founding to its monopolistic stronghold on the dredging industry. The second section will examine the decade since the passage

of Public Law 95-269. This section will review the legislative history which led to the enactment of the law, the reduction of the Corps' dredging plant, the growth of the private sector dredging plant, and the outlook for both the Corps and industry in the dredging business.

## THE CORPS OF ENGINEERS - AMERICA'S DREDGERS

The United States Army Corps of Engineers was created by an act of Congress on March 16, 1802. The Act directed that the Corps be stationed at West Point and constitute a military academy. Initially, the Corps of Engineers devoted most of its attention to building its school and to coastal defenses. By 1805, almost one million dollars had been spent on coastal fortifications, and the work was increasing so rapidly, that in 1808 alone, the Corps spent more than a million dollars on coastal defense. By 1811 the defenses included twenty-four forts and thirty-two enclosed batteries and masonry works.[2] Clearly, the coastal zone was of major importance to the U.S. Army.

Following the War of 1812, the Corps of Engineers turned their attention westward and away from the coasts. In 1816 under the leadership of President James Madison, Congress was charged to realize the importance of a comprehensive system of roads and canals. President James Monroe continued to beat the Army drum, as he stressed the interdependency of national defense, inland transportation and technical education.[3] In 1817, a report was completed by Major Stephen H. Long which described the Ohio, Mississippi, Illinois and Chicago Rivers as important channels of trade and communication. Major Long recommended the construction of several canal and road routes, the chief of which was a canal to connect the Illinois River with Lake Michigan near Chicago.[4] The seed of an idea for the Army digging ditches was being planted. Major Long further proposed canals to connect the Illinois, Wabash, St. Joseph and Maumee rivers.[5]

Congress appropriated $5,000 in 1820 for the Corps to survey the Ohio and Mississippi rivers from Louisville to New Orleans to determine the most practicable method to improve their navigation. General Simon Bernard and Colonel Joseph Trotten conducted this survey in 1821, and their report described obstructions to navigation such as shoals and "snags" which were trees embedded in the river. They recommended ways to remove these obstructions to enhance steamboat navigation.[6]

More marine surveys were conducted in the ensuing years. They conducted surveys on Lake Erie and recommended the deepening of the entrance of the harbor at Presque Isle, Pennsylvania. They further argued for the construction of lighthouses on Lake Huron, and proposed a breakwater at the mouth of the Deleware Bay to protect vessels from tempests and floating ice.[7] The engineering expertise of the Corps of Engineers was their strength, and they were requested by various states - Pennsylvania, Maryland, New Jersey, New York - to assist in surveys, planning and construction of roads, canals, and navigation improvement projects. They were the accepted experts. They were the most qualified team of personnel to conduct these civil functions.

During this period of 1812-1823, the river and harbor improvements were commonly executed and financed by the state and local governments. In this early period, federal responsiblity only covered navigation and safety services such as coastal charts, lighthouses, and beacons. Congress authorized states and individual ports to levy tonnage duties to pay for such work.[8]

Direct federal involvement in port construction, maintenance and dredging came about in 1824 with the enactment of the General Survey Act, which reads:

Chapt. 46. - An Act to procure the necessary Surveys, Plans, and Estimates, upon the subject of Roads and Canals.

(Sect. 1.) Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, that the President of the United States is hereby authorized to cause the necessary surveys, plans, and estimates, to be made of the routes of such Roads and Canals as he may deem of national importance in a commercial or military point of view, or necessary for the transportation of the public mail; designating, in the case of each canal, what parts may be made capable of sloop navigation: the surveys, plans, and estimates for each, when completed, to be laid before Congress.

(Sect. 2.) And be it further enacted, that, to carry into effect the objects of this act, the President be, and he is hereby authorized to employ two or more skilful civil engineers, and such officers of the corps of engineers, or who may be detailed to duty with that corps, as he may think proper; and the sum of thirty thousand dollars be, and the same is hereby, appropriated, to be paid out of any moneys in the treasury, not otherwise appropriated.[9]

Since the passage of this Act, the federal government's role in port construction and maintenance has been inextricably tied to the U.S. Army Corps of Engineers. President James Monroe advocated that the Corps serve as the national planning organization for rivers and harbors. However, Congress rejected the idea of national planning within the Corps, and they established a pattern of evaluating and funding port development themselves, on a case-by-case basis.[10]

It should be noted that the General Survey Act specifically addressed roads and canals, and intentionally omitted river and harbor work. As in the past, Congress designated the particular river and harbor projects to be surveyed and executed. The Army Corps of Engineers continued to make the surveys, plans, and estimates and reported the results to Congress, which then decided whether to make itemized appropriations for these projects on the basis of the individual plans submitted.[11]

Congress made its first appropriation for river improvement on May 24, 1824, in "An Act to improve the navigation of the Ohio and Mississippi rivers." This act was based on the earlier survey conducted by General Bernard and Colonel Totten. This law authorized $75,000 for the improvement of navigation over sand bars, and removing snags from the Ohio River below Pittsburgh. This act showed that the federal government had committed itself to river improvement, and indicated that the Corps of Engineers were to be in charge of this work.[12]

On May 26, 1824, Congress authorized the first funds for harbor improvement. In "An Act making appropriations for deepening the channel leading into the harbour of Presque Isle, and for repairing Plymouth Beach" it granted $20,000 for each of these projects. Once again, the Corps of Engineers were placed in charge of both projects.[13]

Throughout the next 160 years, the Congressional overview has continued, and has been the subject of much criticism. Specifically; this method of Congressional control provides for no national plan for ports and makes no distinction between ports of national versus local value; the system is dominated by log-rolling and pork barrel tradeoffs; the process reflects sectional favoritism; and the congress funds many projects that cannot be justified on an economic basis. The key to the success of a project is the ability of the congressmen interested in the specific project to negotiate with their peers in a process that involves trading support for each other's public works activities.[14] They are playing politics.

There has been no need to change the structure of America's dredgers. The system has worked; nothing is broken - nothing needs fixing. The Corps has performed adequately in all assigned tasks. West Point was producing Engineers, and the technology associated with all

aspects of river and harbor maintenance and improvement has grown exponentially. The structure of the military made it virtually impossible for any other agency to encroach on their area of responsiblity. The Army had developed a unique skill that no other government agency - including the Navy - possessed. (The United States Naval Academy was not founded until 1845.)

At the acme of the Corps' dredging operations, they operated a substantial fleet of assorted dredging plant. Table (1) is presented to indicate the size and diversity of the dredges owned and utilized by the Corps of Engineers.[15]

TABLE 1

U.S. ARMY CORPS OF ENGINEERS DREDGING PLANT

| Type Dredge | Fiscal Years | | | | | |
|---|---|---|---|---|---|---|
| | 1938 | 1940 | 1951 | 1970 | 1978 | 1980 |
| Seagoing Hopper | 28 | 27 | 20 | 16 | 14 | 13 |
| Cutterhead Pipeline | 47 | 41 | 27 | 12 | 11 | 8 |
| Dustpan Pipeline | 16 | 15 | 10 | 8 | 6 | 5 |
| Open Suction Pipeline | 10 | 7 | 2 | 0 | 0 | 0 |
| Dipper | 14 | 12 | 5 | 2 | 1 | 1 |
| Bucket | 7 | 6 | 5 | 3 | 3 | 3 |
| Sidecasting | 0 | 0 | 0 | 2 | 3 | 3 |
| Special Purpose | 0 | 0 | 0 | 0 | 1 | 1 |
| Total | 122 | 108 | 69 | 43 | 39 | 34 |

With this fleet of dredging plant, the Corps of Engineers has been involved in the construction of over 25,000 miles of commercially navigable waterways in the United States. These waterways serve 130 of the nation's 150 largest cities and allow water carriers to transport one-fourth of the nation's ton-miles of inter-city cargo. There are 107 commercial ports and 416 small boat harbors that have federally authorized channels. The ports and harbors handle nearly two billion tons of cargo and serve over seven million pleasure craft annually.[16] This is no small area of responsibility, and no agency is anxious to take it away from the Army Corps of Engineers.

Besides the expertise, experience and equipment developed by the Corps of Engineers, the federal bureaucracy itself has developed over the years to such a degree that any change in procedures would be tantamount to reinventing the wheel. (See Appendix B for the listing of steps required to approve a major navigation project.)

Similarly, the average timeframe required for approval of major navigation projects is over twenty-one and a half years. (The milestones and timeline are presented in Appendix C.) As can be seen, the Army Corps of Engineers is so well entrenched in this industry, that it is not realistic to expect any changes in the existing status quo.

While the Army Corps of Engineers seems well protected from takeover within the federal hierarchy, they have not been immune to the competition presented by private business. Since 1888, the Corps of Engineers has operated under the provisions of 33 USC 622 (see Appendix D) and 33 USC 624 (see Appendix E). These laws required that all federal dredging projects be performed in the most economical or advantageous manner by use of either Corps or industry dredging plant. Table 2 presents a summary of the expenditures and workload for both the Corps and Industry.

TABLE 2

SUMMARY OF EXPENDITURES AND WORKLOAD FOR
THE DREDGING PROGRAM OF THE CORPS OF ENGINEERS
1963 - 1977
(Dollar & Cubic Yards - Millions)

| | Corps | | | | Industry | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fiscal Year | $ | % of Total | Cubic Yards | % of Total | $ | % of Total | Cubic Yards | % of Total | $ | Cubic Yards |
| 1963 | 35 | 21.1 | 162 | 34.8 | 131 | 78.9 | 318 | 66.2 | 166 | 480 |
| 1964 | 36 | 25.4 | 126 | 30.8 | 106 | 74.6 | 283 | 69.2 | 142 | 409 |
| 1965 | 41 | 27.7 | 143 | 34.4 | 107 | 72.3 | 273 | 65.6 | 148 | 416 |
| 1966 | 42 | 30.7 | 145 | 37.2 | 95 | 69.3 | 245 | 62.8 | 137 | 390 |
| 1967 | 41 | 37.3 | 144 | 44.0 | 69 | 62.7 | 183 | 56 | 110 | 327 |
| 1968 | 43 | 38.4 | 138 | 40.8 | 69 | 61.6 | 200 | 59.2 | 112 | 338 |
| 1969 | 44 | 38.3 | 155 | 45.2 | 71 | 61.7 | 187 | 54.8 | 115 | 342 |
| 1970 | 49 | 38.3 | 156 | 39.8 | 79 | 61.7 | 236 | 60.2 | 128 | 392 |
| 1971 | 52 | 36.9 | 158 | 44.3 | 89 | 63.1 | 199 | 55.7 | 141 | 357 |
| 1972 | 55 | 39.0 | 158 | 50.2 | 86 | 61.0 | 157 | 49.8 | 141 | 315 |
| 1973 | 56 | 35.7 | 153 | 49.0 | 101 | 64.3 | 159 | 51.0 | 157 | 312 |
| 1974 | 70 | 39.8 | 190 | 49.2 | 106 | 60.2 | 196 | 50.8 | 176 | 386 |
| 1975 | 82 | 39.6 | 164 | 49.4 | 125 | 60.4 | 168 | 50.6 | 207 | 332 |
| 1976 | 84 | 35.0 | 125 | 43.6 | 156 | 65.0 | 162 | 56.4 | 240 | 287 |
| 1977 | 86 | 36.3 | 128 | 43.0 | 151 | 63.7 | 170 | 57.0 | 237 | 298 |
| Averages | 54.4 | 35 | 149.7 | 42 | 102.7 | 65 | 209.1 | 58 | 157 | 358.8 |

Source: U.S. Army Corps of Engineers, "Report to Congress, Minimum Dredge Fleet Study," Vol. 4, p. 24.

It is noteworthy that within the fifteen years of data presented in Table 2, the total workload of cubic yards removed has decreased from 480 to 298 million cubic yards for a reduction of 38%. Meanwhile, for the same period, the cost of this dredging has increased from $166 million to $237 million. This is an increase of 43%. If the expenditures had followed an increase related to an eight percent escalation factor, the 1977 expenditure for the total dredging program would have been $488 million vice the actual $237 million.[17]

A summary of dredging workload and expenditures for the period 1963 - 1977 is presented in Table 3.

TABLE 3 [18]

DREDGING WORKLOAD AND EXPENDITURES (1963 - 1977)

| Program | Workload (Cubic Yards Millions) | | Production Percentage Change | Expenditures ($ Millions) | | Expenditure Percentage Change |
|---|---|---|---|---|---|---|
| | From | To | | From | To | |
| Total | 480 | 298 | -38 | 106 | 237 | + 43 |
| Improvement | 263 | 45 | -83 | 107 | 62 | - 42 |
| Maintenance | 217 | 253 | +17 | 59 | 175 | +197 |

For an extended period, private industry dredges had been used to perform approximately 85% of improvement (new construction) dredging. As can be seen in Table 3, this particular area of the workload was hard hit from 1963 - 1977.[19] This severe reduction of available work put severe financial hardships on the private dredging industry. At approximately the same time, the Corps reported to Congress that most of its plant was obsolete and that a replacement program was necessary. This combination of events caused Congress to place a moratorium on the

construction of new Corps dredges, and to review the roles of the Corps and the private sector in meeting federal dredging needs.[20]

Thus, the stage is set for the beginning of the end for the U.S. Army, and their monopolistic hold on America's ditch digging. They have risen from their initial tasking of surveying rivers and constructing coastal defenses to an annual dredging budget of $237 million and operators of almost forty vessels in 1978. They had proven themselves to be the technical masters; they wrote the book; they were the accepted experts. In 1977, however, they were faced with an aging and worn out fleet, and a competitor that was grasping at a congressional life line for help.

Perhaps Representative Harsha best stated this dilemma in his address on the House floor in 1977.

> Since 1888 the Corps of Engineers has been able to determine whether dredging should be done by Government plant or by private firms. If the Corps has interpreted their authority to mean that unless the Government fleet is completely utilized, private industry will have no work available to them. This is to say that the Federal Government has a monopoly. Since it is fair to assume, in my opinion, that Members support the free enterprise system, is it not unusual that we have allowed for a government monopoly in the dredging sector?[21]

## THE CORPS OF ENGINEERS

## AMERICA'S DREDGING MANAGERS

On April 26, 1978, President Carter signed Public Law 95-269 (Appendix F). This law had a significant effect on the U.S. Army Corps of Engineers and their relationship with the dredging industry. The foundation of this law was based on numerous factors which will be examined in this section of this paper. Among the factors to be discussed are: decline in the Federal dredging workload, availability and condition of Corps and industry dredging plant, a change in the attitude of the American public concerning environmental consequences, and the rising budgetary deficits.

Through World War II, America had experienced a continuous development of its waterway system to support expanding requirements for commercial, national defense and recreation uses. Since the end of World War II, however, the overall dredging needs and requirements have decreased drastically. While there have been a large number of deep draft channels and harbors constructed around the world since World War II such as Rotterdam, the Netherlands; Dunkirk and Le Harve, France, there have been no such projects constructed in the United States. Due to the limited scope of new construction and the large decrease in maintenance dredging since 1963, the financial condition of many American dredging companies deteriorated.[22]

In 1968 and 1969, the Corps made an effort to initiate a program for industry to compete for maintenance dredging. However, this project was discontinued in 1970 because over 79 percent of this type of work was performed by the Corps' seagoing hopper and dustpan dredges -

neither of which the industry had available in their fleet.[23] (For a brief description of dredging plant, see Appendix G.)

In May 1972, the General Accounting Office (GAO) issued a report to Congress entitled "Observations on Dredging Activities and Problems." This report recommended that the Corps undertake a comprehensive study of Federal dredging requirements and consider various alternatives to meet these needs in the most economical manner. The GAO also recommended that the Corps furnish the results of this study to Congress for their use in determining the Corps' role in meeting the future Federal dredging requirements.

This study, entitled the "National Dredging Study", was begun in September 1973, by a private consulting firm, and was completed in August 1974. Inter Alia, this study found:

- The most economical and optimum allocation of the program between the Corps and the industry is in the range of 25-35% Corps and 65-75% industry.

- That about 45% of the industry revenues are derived from work done for the Corps, and the remainder from work done for others.

- The number of active companies declined from 157 to 87, a 44% decrease during the period 1964 - 1972 due to a decline in the public and private workload.

- That environmental restrictions have been an increasing restraint on dredging activities since 1968 and have materially reduced the size of the dredging market. The high cost of replacing or modernizing capital equipment and the impact of inflation on operating costs were also cited as reasons for the decline in the dredging workload since 1968.

- That about 10% of the dredging firms earned over 55% of the total industry revenues; and that even the larger dredging firms were quite small when compared with general construction firms.

- That the total industry fleet totalled 457 dredges; including 264 cutterheads, 161 buckets, 13 dippers and 19 hydraulic suction dredges. Those dredges with a discharge pipeline diameter of 12 inches or less were not included in this total.

- That many of the Industry dredges were well past a normal 20-year useful economic life; and that extensive refitting, rebuilding, and repairing were required to keep the fleet operational.

- That only one existing cutterhead dredge had the capability of dredging effectively at depths in excess of 70 feet.

- That there was little prospect of the industry improving its productivity without the introductin of new equipment and technology.[24]

Regarding the Corps' plant, the National Dredging Study made the following findings:

- That a "testing of the market" program be conducted by soliciting bids on work performed by Government dredges was desirable to establish the capability of the industry to accomplish the work at reasonable prices. To this end, a planned advertising schedule was proposed for that work which the industry expressed an interest in, and which it desired to submit bids.

- That the Corps should continue to operate, maintain, and seek authority to upgrade and replace its dustpan and small active cutterhead dredge fleets as conditions dictated, until such time as industry demonstrated that it could accomplish this workload on a timely basis and at a reasonable cost.

- That the Corps should continue to operate, maintain and seek authority to upgrade and replace its small sidecaster dredge fleet as dictated by workload requirements.[25]

Thus, it can be correctly assumed that neither the Corps of Engineers nor private industry had the capability to perform all dredging required in the United States in 1974. The National Dredging Study further recommended that the Corps and industry should cooperate and share the dredging workload.[26]

The "Testing of the Market" (TOM) began in 1977 and placed industry dredges in direct competition with government dredges. Congress, with the passage of P.L. 95-269, changed the TOM Program into the Industry Capability Program (ICP). The ICP directed the Corps to make available 30,000,000 cubic yards (CY) of hopper dredge work to the industry each year from fiscal years 1979 through 1981. It also provided for scheduled meetings between the Corps and industry representatives, at which time the Corps set forth the jobs to be advertised under the ICP. Plans and specifications were prepared, the work advertised, and industry bid competitively against the Corps. If the bid of the lowest responsive bidder did not exceed the Corps' estimate by more than 25%, the work was awarded to the industry. If the low bid exceeded the government estimate by more than 25%, then the project was completed by the Corps dredging plant. This program commenced on February 25, 1977 and continued until the end of fiscal year 1981.

There were 148 jobs originally advertised in the ICP. Two of these jobs were split between the Corps and industry, and one job awarded to the Corps was not performed. The data is treated as if the split jobs were four separate jobs, and the unperformed job was not included. Thus, there were a total of 149 jobs in the five year program. The

total volume of work advertised in the ICP was 151,708,322 cy, of which 130,027,013 cy (85.7%) were actually excavated. The value of the work involved in the ICP was $175,291,241 based on the government estimate, while the actual cost of the work performed was $164,251,785 (93.7%).[27] Table 4 presents a year by year analysis of the work performed and cost of dredging.

TABLE 4

INDUSTRY CAPABILITY PROGRAM
(FY 1977 through 1981)

| | CY Estimate | $ Government Estimate | CY Actual | $ Actual |
|---|---|---|---|---|
| FY 77 | 18,354,492 | $19,233,118 | $15,201,188 | $18,408,075 |
| FY 78 | 19,922,508 | 18,752,289 | 14,699,013 | 18,044,036 |
| FY 79 | 51,938,338 | 49,136,443 | 41,325,422 | 45,345,605 |
| FY 80 | 34,462,214 | 48,945,296 | 33,396,891 | 49,550,068 |
| FY 81 | 29,530,770 | 39,224,095 | 25,404,499 | 32,896,001 |
| Total | 151,708,322 | $175,291,241 ($1.16/cy) | 130,027,013 | $164,251,785 ($1.26/cy) |

Source: U.S. Army Corps of Engineers, "Industry Capability Program," p.4.

Of the 149 jobs, 75 were performed by hopper dredges, 24 by bucket dredges, 42 by cutterhead hydraulic dredges and 8 by dustpan dredges.[28]

The overall results of the five year program prove that the dredging industry was capable of growth and meeting the challenge. Of the 149 jobs in the program, 83 (55.7%) were awarded to the industry. There were 151,780,322 cy advertised in the ICP, and of these, 95,449,378 cy (62.9%) were awarded to industry. Of the 130,027,013 cy actually excavated, 92,253,377 cy (70.9%) were excavated by industry plant. Considering the costs of the ICP, the total estimated cost was $175,291,241, and of this amount, $114,175,477 (65.7%) was awarded to industry contracts. The actual costs incurred were $164,251,788 and of this sum, industry dredges earned $116,259,214 (70.8%). Industry competed most successfully on the larger jobs, probably due to the mobilization costs involved in transporting the appropriate equipment to the smaller projects. It was also noted that industry's success in hopper dredge work increased in the later years, as more new equipment became available within the dredging industry.[29]

The distribution of work on the basis of types of dredging plant is presented in Table 5. Perhaps another reason for industry's later success in hopper dredge work was due to experience gained by industry, and the retirement of Corps hopper dredges.[30] It is important to note that there was substantial variation in the type of plant actually used to perform the job and what the government based its estimate on using. For example, there were 93 jobs advertised as hopper dredge jobs, whereas only 75 jobs (80.6%) were actually performed with hopper dredges.[31] This could be an important trend which deserves further study by the Corps of Engineers.

TABLE 5

Industry Capability Program
Distribution of Work by
Dredge Type

| Type of Plant Used in Govt. Est. | Number of Awards | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | To Industry | | | | | | To Government | | | | | | |
| | 77 | 78 | 79 | 80 | 81 | Sub Total | 77 | 78 | 79 | 80 | 81 | Sub Total | Total |
| Hopper | 7 | 4 | 10 | 13 | 16 | 50 | 3 | 6 | 15 | 12 | 7 | 43 | 93 |
| Bucket, Dipper | 3 | - | 3 | 0 | 4 | 10 | 2 | 4 | 2 | 2 | 1 | 11 | 21 |
| Hydraulic Cutter Head | 2 | 5 | 6 | 6 | 0 | 19 | 4 | 1 | 1 | 0 | 1 | 7 | 26 |
| Dustpan | 0 | 0 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 5 | 8 |
| Sidecaster | - | 1 | - | - | - | 1 | - | - | - | - | - | 0 | 1 |
| Totals | 12 | 10 | 20 | 20 | 21 | 83 | 10 | 12 | 19 | 15 | 10 | 66 | 149 |

Source: U.S. Army Corps of Engineers, "Industry Capability Program," p.9.

Yet another requirement of P.L. 95-269 (Appendix F) directed the U.S. Army Corps of Engineers to determine the minimum federally-owned fleet and reduce the Corps' plant to that necessary to perform emergency and national defense dredging requirements. The following definitions were derived by the U.S. Army Corps of Engineers and were presented to Congress in 1982. They are important in that they present to Congress the Corps' interpretation of terms used in P.L. 95-269:

> Minimum Fleet: The term minimum fleet as used throughout this study refers to the least number of dredges necessary to provide an immediate federal dredging response in the United States (CONUS) and overseas to either: (a) emergencies, (b) national defense needs, or (c) National interest requirements. The size of the minimum fleet will not be sufficient to respond to these dredging needs simultaneously. Risk factors associated with the lack of response to multiple requirements were taken into account, and analyzed in determining the size

of the minimum fleet. Minimum fleet requirements were assessed on a regional basis, recognizing the geographic limitations in achieving a timely response to global needs for emergency and national defense dredging.

Emergency Dredging: The term emergency dredging refers to dredging performed by federally-owned dredges in response to unexpected and/or unscheduled situations requiring an immediate dredging response in order to (1) protect human lives and property and/or (2) maintain or restore federal navigation channel dimensions to provide for the minimum disruption of essential waterborne commerce and the economic livlihood of a region or regions.

National Defense Dredging: The term National Defense Dredging means that dredging undertaken to provide support for Department of Defense activities and which is directly related to the defense needs of the United States, such as troop and supply movements, support of naval bases, and military construction. These dredging needs may occur in both peace and war and may be located anywhere in the world that military deployment is required.

National Interest Dredging: This term is used to mean any dredging determined to be in the best interest of the nation by the Congress, Department of Defense and the State Department. Such interests can be both within CONUS and worldwide.[32]

These terms thus established the Corps' new role in the dredging industry. The one time giant of the industry was now reduced to a level at which it could not respond to all of the National needs - simultaneously. P.L. 95-269 mandated the Corps to reduce its dredging fleet as industry demonstrated its capability to perform work in a timely manner and at a reasonable cost under the ICP. Since 1977, industry has constructed and placed into operation, fourteen Hopper Dredges, three large Cutterhead Dredges and one Dustpan dredge. Meanwhile, the Corps has retired twenty-four dredges (fourteen Hoppers, four Dustpans, four Cutterheads and two Dippers). The Corps also constructed three new Hopper dredges. Thus, as of December 1987, the minimum fleet of the U.S. Army Corps of Engineers was: four hopper dredges, two cutterhead dredges, three dustpan dredges and three sidecaster dredges, for a total of twelve dredges.[33]

## The Corps of Engineers

## Their Future Role in Dredging

With the passage of P.L. 95-269, the Corps has transitioned from being the nation's largest dredging contractor to the largest dredging customer. Their new role is somewhat defined in a six year effort - fiscal years 1988 - 1993 entitled the "Dredging Research Program."

> The program will focus on five main areas, namely - materials - what is dredged and the properties that affect dredging operations; mechanics - analyzing equipment and systems used to carry out dredging operations; monitoring - measuring, reporting and recording pertinent characteristics of the dredging operations; management - means for directing and controlling a dredging operation or a program of operations and lastly, technology transfer - methods and media to ensure timely transmittal of research results to users - to include the dredging industry.[34]

This five steps approach to management is the key to the future role for the Corps. They are the managers and scientists.

Another example of their managerial technique is the development of a "Five Year National Dredging Plan" scheduled for fiscal years 1987 - 1991. This plan uses the Corps' computer capability to list all dredging requirements on a project-by-project basis for all Corps, Navy and most major private sector work.

> With the passage of the Water Resources Development Act of 1986, the rush to proceed with port improvements by Corps districts and state officials is a major concern from a national perspective. Many factors can impact the overall program if too many projects are brought on-line at one time, not the least of which is -- how much can the Government fund in any given year? How are dredge contractors' bonding requirements affected? Is there sufficient industry capability in types, sizes and numbers of dredges to perform new work and the necessary maintenance work at any point in time? How does the Corps program impact the Navy's dredging program for maintenance dredging and the new

> homeporting requirements? How can we eliminate bid openings for dredging work in close succession or even on the same day in different locations - and how can all the new work dredging be accomplished within the next 5 years so that the 'sunset clause' in Public Law 99-662 does not take affect for those not started.[35]

This "Five Year National Dredging Plan" will be the tracking mechanism for every dredge type for every region of the nation. The plan's summary will indicate the number and type of plant required on each project and will thus display any shortages or excesses in the industry plant on a month to month basis during the entire five year period.[36]

The Water Resources Development Act of 1986 (P.L. 99-662) has had major impact on the future of dredging operations in America. This 191 page law has fourteen titles which include inter alia: Cost Sharing, Harbor Development, Inland Waterway Transportation System, Flood Control, Shoreline Protection, Water Resources Conservation and Development, and Water Resources Studies. One of the highlights of this law is that improvement dredging and future maintenance work will be cost shared between the government and the users of the waterways.[37] The Corps believes that this legislation will result in an expenditure of about $800 million in improvement dredging within the next five years and a potential expenditure of nearly $1.5 billion over the next ten years.[38] The Corps is clearly managing a major project in the national interest.

Yet another important role for the Corps to continue is their responsibility, concern and obligation to protect the environment. An example of their progress in this sector was the 'Dredged Material Research Program".

> The Dredged Material Research Program (DMRP), the largest single research endeavor undertaken by the civil works portion of the Corps of Engineers, is a comprehensive nationwide environmental study of the disposal of dredged material. The program was authorized by the River and Harbor Act of 1970 and was assigned in May 1971 to the Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, for problem definition and assessment and development of the research plan. Work under the program began at WES in March 1973, with completion scheduled for March 1978. The objectives of the DMRP are to provide information on the effects of dredging in all environmental situations and to develop technically satisfactory, economically compatable, and environmentally feasible dredging and disposal alternatives, including consideration of dredged material as a manageable resource.[39]

The Corps' findings are surprising to some people. "Their findings show that only 3% of the material dredged each year from our Nation's waterways is contaminated and should be handled in a special way and restricted to confined disposal."[40] Thus, dredge "spoil" or "waste" is now referred to as a resource and is called "dredged material" by the Corps. In recent years, they have developed several beneficial uses for dredged material including: Creating artificial marshlands or wetlands; Creating artificial islands; Creating artificial beaches; Providing nourishment to existing beaches; Creating boat launch or fish access sites; Using dredged material for structural protection, and Using dredged material for land fills.[41] The Corps has already used each of these examples, and is continually looking for new and better methods to use the dredged material. It is now considered an asset vice a liability.

Besides obeying the better known laws and regulations that affect the Corps and Industry such as: the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, and the numerous federal and state laws (see Appendix A), the Corps has taken the initiative to work through legal roadblocks. An example of the Corps'

leadership is shown in the 1980 dredging project in Canaveral Harbor, Florida. The Corps worked with the Fish and Wildlife Service and the National Marine Fisheries Service as required by the Endangered Species Act of 1973, to protect the large number of loggerhead sea turtles (a threatened species) known to be residing in that area. Not only did the agencies cooperate to remove 1,250 of these sea turtles from the dredging site, but the Corps made modifications to the dragheads on their hopper dredges to reduce the threat to these sea turtles.[42] This is a clear indication of the Corps going the extra mile to help solve environmental problems, and still get the job done.

The dredging industry has met the challenge of the ICP and the Army Corps of Engineers have demonstrated their mettle to adjust and adapt to their new role as dredging managers. With the work created by P.L. 99-662 and the environmental management needed for the future - this industrial military team is working well together, and should continue to do so throughout the 1990's.

## ENDNOTES

[1]David Wallechinsky and Irving Wallace, The People's Almanac (Garden City, New York.: Doubleday & Co, Inc., 1975), 77.

[2]Hill, F.G., Roads, Rails, and Waterways (Norman, Oklahoma: Univeristy of Oklahoma Press, 1957), 5.

[3]Ibid., 18.

[4]Ibid., 23.

[5]Ibid., 23.

[6]Ibid., 25.

[7]Ibid., 29.

[8]Marine Board, National Research Council, Dredging Coastal Ports (Washington, D.C.: National Academy Press, 1985), 20.

[9]Acts of the Eighteenth Congress. The act was approved April 30, 1824.

[10]Marine Board, op. cit. 20.

[11]Hill, F.G. op. cit. 162.

[12]Ibid., 163.

[13]Ibid., 164.

[14]Marine Board, op. cit. 21.

[15]U.S. Army Corps of Engineers, "Report to Congress, Minimum Dredge Fleet Study; Volume 1 and Volume 4" (Washington, D.C. 1982). pp. 16 and 33.

[16]Ibid. Volume 3. p. 1.

[17]Ibid. Volume 2. pp. 15-16.

[18]Ibid. Volume 2. p. 15.

[19]Ibid.

[20]Ibid. Volume 1. p. iv.

[21]Congressional Record - House. September 27, 1977.

[22]U.S. Army Corps of Engineers, Vol. 5. p. 5.

[23]Ibid.

[24]Ibid. Vol. 3. pp. 42-43.

[25]Ibid. Vol. 5. pp. 13-14.

[26]Ibid.

[27]U.S. Army Corps of Engineers, Industry Capability Program for Fiscal Years 1977-1981 Five Year Summary (Washington, D.C.: USACOE. Water Resources Support Center., 1987), pp. 2-3.

[28]Ibid. p. 5.

[29]Ibid. p. 8.

[30]Ibid. p. 9.

[31]Ibid. pp. 9-10.

[32]U.S. Army, Corps of Engineers, Vol. 2. p. 41.

[33] U.S. Army Corps of Engineers, Industry Capability Program, op. cit. pp. 45-48.

[34]Vincent Montante, "The Corps of Engineers National Dredging Program, Yesterday, Today and Tomorrow". (Unpublished, undated).

[35]Ibid.

[36]Ibid.

[37]Public Law 99-662 of November 17, 1986.

[38]Vincent Montante, op. cit.

[39]Mary K. Vincent, "The Dredged Material Research Program", The Military Engineer, No. 452; Nov-Dec 1977, p. 413.

[40]Vincent Montante, op. cit.

[41]Brig. Gen. W. O. Bachus, "Beneficial Uses for Dredged Material", The Military Engineer, No. 436; Mar-Apr, 1975. pp. 72-73.

[43]Joseph C. Joyce, "Protecting Sea Turtles While Dredging," The Military Engineer, No. 481, Jul-Aug, 1982. pp. 282-283.

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Act of March 2, 1919, 40 Stat. 1290.

Act of April 26, 1978, Public Law 95-269.

Act of November 17, 1986, Public Law 99-662.

Bachus, W. O. Brig. Gen., "Beneficial Uses for Dredged Material," The Military Engineer, V. 67: 72-72, March-April, 1975.

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## APPENDIX A

## POLICY AND LEGISLATION PERTINENT TO DREDGING

(a) Public laws.

(1) American Folklife Preservation Act, Pub. L. 94-201; 20 U.S.C. 2101, et seq.
(2) Anadromous Fish Conservation Act, Pub. L. 89-304; 16 U.S.C. 757, et. seq.
(3) Antiquities Act of 1906, Pub. L. 59-209; 16 U.S.C. 431, et seq.
(4) Archeological and Historic Preservation Act, Pub. L. 93-291; 16 U.S.C. 469, et seq. (Also known as the Reservoir Salvage Act of 1960, as amended; Public Law 93-291, as amended; the Moss-Bennett Act; and the Preservation of Historic and Archeological Data Act of 1974.)
(5) Bald Eagle Act; 16 U.S.C. 666.
(6) Clean Air Act, as amended, Pub. L. 91-604; 42 U.S.C. 1857h-7, et seq.
(7) Clean Water Act, Pub. L. 92-500; 33 U.S.C. 1251, et seq. (Also known as the Federal Water Pollution Control Act; and Public Law 92-500, as amended.
(8) Coastal Zone Management Act of 1972, as amended, Pub. L. 92-583; 16 U.S.C. 1451, et seq.
(9) Endangered Species Act of 1973, as amended, Pub. L. 93-205; 16 U.S.C. 1531, et seq.
(10) Estuary Protection Act, Pub. L. 90-454; 16 U.S.C. 1221, et seq.
(11) Federal Environmental Pesticide Control Act, Pub. L. 92-516; 7 U.S.C. 136.
(12) Federal Water Project Recreation Act, as amended, Pub. L. 89-72; 16 U.S.C. 460-1(12), et seq.
(13) Fish and Wildlife Coordination Act of 1958, as amended, Pub. L. 85-624; 16 U.S.C. 661, et seq. (Also known as the Coordination Act.)
(14) Historic Sites of 1935, as amended, Pub. L. 74-292; 16 U.S.C. 461, et seq.
(15) Land and Water Conservation Fund Act, Pub. L. 88-578; 16 U.S.C. 4601-4601-11, et. seq.
(16) Marine Mammal Protection Act of 1972, Pub. L. 92-522; 16 U.S.C. 1361, et. seq.
(17) Marine Protection, Research and Sanctuaries Act of 1972, Pub. L. 92-532; 33 U.S.C. 1401, et seq.
(18) Migratory Bird Conservation Act of 1928; 16 U.S.C. 715.
(19) Migratory Bird Treaty Act of 1918; 16 U.S.C. 703, et seq.
(20) National Environmental Policy Act of 1969, as amended, Pub. L. 91-190; 42 U.S.C. 4321, et seq. (Also known as NEPA; often incorrectly cited as the National Environmental Protection Act.)
(21) National Historic Preservtion Act of 1966, as amended, Pub. L. 89-655; 16 U.S.C. 470a, et seq.
(22) Native American Religious Freedom Act, Pub. L. 95-341; 42 U.S.C. 1996, et. seq.

(23) Resource Conservation and Recovery Act of 1976; Pub. L. 94-580; 7 U.S.C. 1010, et seq.
(24) River and Harbor Act of 1889, 33 U.S.C. 403, et seq. (Also known as the Refuse Act of 1889.)
(25) Submerged Lands Act of 1953, Pub. L. 82-3167; 43 U.S.C. 1301, et seq.
(26) Surface Mining Control and Reclamation Act of 1977, Pub. L. 95-89; 30 U.S.C. 1201, et seq.
(27) Toxic Substances Control Act, Pub. L. 94-469; 15 U.S.C. 2601, et seq.
(28) Watershed Protection and Flood Prevention Act, as amended, Pub. L. 83-566; 16 U.S.C. 1001, et seq.
(29) Wild and Scenic Rivers Act, as amended, Pub. L. 90-542; 16 U.S.C. 1271, et seq.

(b) Executive orders.

(1) Executive Order, 11593, Protection and Enhancement of the Cultural Environment, May 13, 1979 (36 FR 8921; May 15, 1971).
(2) Executive Order, 11988, Floodplain Management, May 24, 1977 (42 FR 26951; May 25, 1977).
(3) Executive Order, 11990, Protection of Wetlands, May 24, 1977 (42 FR 26961; May 25, 1977).
(4) Executive Order, 11514, Protection and Enahncement of Environmental Quality, March 5, 1970, as amended by Executive Order, 11991, May 24, 1977.
(5) Executive Order, 12088, Federal Compliance with Pollution Control Standards, October 13, 1978.

(c) Other Federal policies.

(1) Council on Environmental Quality Memorandum of August 11, 1980: Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act.
(2) Council on Environmental Quality memorandum of august 10, 1980: Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory.
(3) Migratory Bird Treaties and other international agreements listed in the Endangered Species Act of 1973, as amended, Section 2(a)(4).

(d) Selected state legislation, lead agencies, and concerns.

(1) Maine: Department of Environmental Protection for coastal and great ponds projects (Tidal Wetlands Act 38 Maine Revised Statutes Annotated Sections 471-478 and Great Ponds Act 38 MRSA Sections 386-396, respectively). Department of Inland Fish and Wildlife for fill projects on rivers and streams (Alteration of Rivers, Streams and Brooks Act 12 MRSA Sections 7776-7780). The Board of Environmental Protection may establish any reasonable requirement to ensure that the applicant does not contravene environmental quality.

(2) New Hampshire: Water Supply and Pollution Control Commission (Resource Statutes Annotated, Subsection 149.8A) and the Wetlands Board (RSA, Subsection 483A). The Water Supply and

Pollution Control Commission requires that there be no degradation of water quality.

(3) Massachusetts; Conservation Commission of locality directly affected by the project (Sate Wetlands Protection Law, Chapter 131, Section 40). A local Conservation Commission may attach special conditions to an application to ensure proper response to its concerns when discharge to a wetlands is proposed.

(4) Rhode Island: Coastal Resources Management Council. (General Laws, Chapter 279, Section 1). The Coastal Resources Management Council is concerned with state coastal plan consistency and permitting activities in territorial waters and saltwater wetlands.

(5) Connecticut: Commissioner of the Department of Environmental Protection, (Marine Mining Statute, Section 25-7d for new dredging work and structures and Dredging Statute, Section 25-11 for regulating building of marine structures). The Department of Environmental Projection requires containment of materials disposed of on upland sites. In-water disposal permits may require special conditions to protect fish and wildlife recommended by the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service.

(6) New York: Department of Environmental Conservation (Environmental Conservation Law, articles). The Department of Environmental Conservation may specify seasonal restrictions to protect spawning. It may also specify certain types of dredging and containment procedures to alleviate environmental impact.

(7) California: California Coastal Commission (Proposition 20, 1972; California Coastal Zone Act, 1976). Requires port master plan; lead agency for review of port projects. Water Control Board (California Resources Code). Permit authority over effects of dredging/filling on water quality. Department of Fish and Game (California Resources Code). Review and comment authority over effects of proposed projects on fish and wildlife. Air Resources Board (California Resources Code). Permit review authority over sources of stationary (point-source) air pollution has been applied to dredging equipment and port facilities.

(8) Oregon: Department of Land Conservation and Development. Statewide goals and guidelines for coastal resources. Department of Fish and Wildlife (Oregon Administrative Rule). Classifies estuaries.

(9) Washington: Shoreline Hearings Board (Shoreline Management Act). Permit appeal authority. Department of Ecology (Washington Resources Code). Water and air quality permit authority; review of proposed projects for effects on fish and wildlife.

Source: Marine Board, National Research Council, Dredging Coastal Ports (Washington, D.C.: National Academy Press, 1985), 152-155.

APPENDIX B

## PLANNING, APPROVAL, AUTHORIZATION AND FUNDING PROCESS FOR MAJOR NAVIGATION PROJECTS

1. Congress authorizes study.

2. Congress appropriates funds.

3. Following appropriation of funds, District Engineer conducts initial public meeting to review draft plan of study. This provides opportunity to identify and discuss local problems and alternatives emphasizing national economic efficiency and environmental quality.

4. District Engineer
   - Investigates all alternatives
   - Performs limited
     - technical feasibility studies
     - environmental assessments
   - Proposes most feasible solutions in preliminary feasibility report.

5. Formulation stage--Stage public meeting to discuss most feasible alternatives.

6. District Engineer
   - Investigates formulation stage alternatives
   - Performs detailed
     - technical feasibility studies
     - environmental assessments
   - Selects plan for proposal in detailed Feasibility Report (FR)
   - Distributes draft Environmental Impact Statement (EIS) & FR (15 days prior to state public meeting)
   - Files draft EIS with EPA.

7. Public meeting--tentative plan proposed and discussed.

8. States, agencies, interest groups, public respond to draft EIS and draft FR.

9. District Engineer
   - Review comments to draft EIS & FR
   - Prepares recommended
     - Final EIS
     - Final FR.

10. Division Engineer

- . Reviews
- . Modifies as Appropriate
  - Final FR as Appropriate
  - Final EIS
- . Issues public notice requesting public views be sent to Board of Engineers for Rivers & Harbors (BERH)
- . Forwards recommendations to BERH.

11. Board of Engineers for Rivers & Harbors

- . Considers Views of
  - Public
  - States
  - Agencies
- . Reviews and provides recommendations
  - Final EIS
  - Final FR.
- . Transmits to chief of engineers.

12. Chief

- . Reviews Board report
- . Prepares his draft recommendations
- . Distributes for outside review
- . Files final EIS with EPA
- . Circulates to public for 30-day review period and to governors, federal departments (90-day review period).

13. Chief

- . Reviews comments received
- . Modifies report as appropriate
- . Prepares record of decision (ROD).

14. Chief

- . Forwards recommendations to Secretary of the Army for consideration
  - Final Report
  - Final EIS
  - ROD.

15. Secretary of the Army

- Reviews
- Coordinates with OMB
- Prepares his recommendations
- Forwards final FR, final EIS
- ROD to Congress (6 mo.).

16. Project Authorization

- Congress holds hearings
- Congress includes in Water Resources Development Act or other legislation
- President signs.

17. OMB

- Reviews Corps budget
- Submits to Congress.

18. Project Funding

- Congress includes in Appropriations Act
- President signs.

19. Local interests guarantee to fulfill obligations required by law (e.g., real estate, cost sharing, maintenance, operation, flood zoning).

20. District Engineer

- Formulates pre-construction planning general design memoranda
  - Updates EIS as required for Sec. 404 compliance, obtains necessary Water Quality certificates
  - Issues public notice and conducts at least one public meeting (36 mo.)
- Obtains additional congressional authorization as appropriate (24 mo.)
- Initiates and completes construction (60 mo.)
- Operates and maintains.

Source: Marine Board, National Research Council, Dredging Coastal Ports (Washington, D.C.: National Academy Press, 1985), 195-196.

APPENDIX C

AVERAGE SCHEDULE FOR NAVIGATION PROJECTS

| ACTIVITY | |
|---|---|
| Survey/study authorized | |
| Funds for study appropriated | 4.9 years |
| Study/survey sent to division | 4.1 years |
| Report sent to Congress | 1.5 years |
| Project authorized | 0.6 year |
| Initial funds appropriated for preconstruction planning & engineering | 1.9 years |
| Initial construction funds appropriated | 5.8 years |
| First contract award | 2.8 years |
| YEARS | TOTAL TIME 21.6 |

Source: General Accounting Office, 1984.

## § 622. Method of doing work generally

It shall be the duty of the Secretary of the Army to apply the money appropriated for improvements of rivers and harbors, other than surveys, estimates and gaugings, in carrying on the various works, by contract or otherwise, as may be most economical and advantageous to the Government. And all works of improvement authorized to be prosecuted or completed under contracts may, in the discretion of the Secretary of the Army, be carried on by contract or otherwise, as may be most economical or advantageous to the United States. In all cases where the project for a work of river or harbor improvement provides for the construction or use of Government dredging plant, the Secretary of the Army may, in his discretion, have the work done by contract if reasonable prices can be obtained.

Aug. 11, 1888, c. 860, § 3, 25 Stat. 423; July 25, 1912, c. 253, § 1, 37 Stat. 222; Mar. 2, 1919, c. 95, § 3, 40 Stat. 1287.

## § 624. Limitation on power to let contract based on estimation of cost

No part of the funds appropriated for works of river and harbor improvement shall be used to pay for any work done by private contract if the contract price is more than 25 per centum in excess of the estimated cost of doing the work by Government plant: *Provided*, That in estimating the cost of doing the work by Government plant, including the cost of labor and materials, there shall also be taken into account proper charges for depreciation of plant and all supervising and overhead expenses and interest on the capital invested in the Government plant, but the rate of interest shall not exceed the maximum prevailing rate being paid by the United States on current issues of bonds or other evidences of indebtedness.

Mar. 2, 1919, c. 95, § 8, 40 Stat. 1290.

# Public Law 95-269
# 95th Congress

## An Act

Apr. 26, 1978
[H.R. 7744]

To amend the Acts of August 11, 1888, and March 2, 1919, pertaining to carrying out projects for improvements of rivers and harbors by contract or otherwise, and for other purposes.

Rivers and harbors, improvements.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That section 3 of the Act of August 11, 1888 (25 Stat. 423; 33 U.S.C. 622), is amended to read as follows:

"SEC. 3. (a) The Secretary of the Army, acting through the Chief of Engineers (hereinafter referred to as the 'Secretary'), in carrying out projects for improvement of rivers and harbors (other than surveys, estimates, and gagings) shall, by contract or otherwise, carry out such work in the manner most economical and advantageous to the United States. The Secretary shall have dredging and related work done by contract if he determines private industry has the capability to do such work and it can be done at reasonable prices and in a timely manner. During the four-year period which begins on the date of enactment of this subsection, the Secretary may limit the application of the second sentence of this subsection for work for which the federally owned fleet is available to achieve an orderly transition to full implementation of this subsection.

"(b) As private industry reasonably demonstrates its capability under subsection (a) to perform the work done by the federally owned fleet, at reasonable prices and in a timely manner, the federally owned fleet shall be reduced in an orderly manner, as determined by the Secretary, by retirement of plant. To carry out emergency and national defense work the Secretary shall retain only the minimum federally owned fleet capable of performing such work and he may exempt from the provisions of this section such amount of work as he determines to be reasonably necessary to keep such fleet fully operational, as determined by the Secretary, after the minimum fleet requirements have been determined. Notwithstanding the preceding sentence, in carrying out the reduction of the federally owned fleet, the Secretary may retain so much of the federally owned fleet as he determines necessary, for so long as he determines necessary, to insure the capability of the Federal Government and private industry together to carry out projects for improvements of rivers and harbors. For the purpose of making the determination required by the preceding sentence the Secretary shall not exempt any work from the requirements of this section. The minimum federally owned fleet shall be maintained to technologically modern and efficient standards, including replacement as necessary. The Secretary is authorized and directed to undertake a study to determine the minimum federally owned fleet required to perform emergency and national defense work. The study, which shall be submitted to Congress within two years after enactment of this subsection, shall also include preservation of employee rights of persons presently employed on the existing federally owned fleet.".

Study.

Submittal to Congress.

SEC. 2. Section 8 of the Act of March 2, 1919 (40 Stat. 1290; 33 U.S.C. 624), is amended to read as follows:

"SEC. 8. (a) No works of river and harbor improvement shall be done by private contract—

"(1) if the Secretary of the Army, acting through the Chief of Engineers, determines that Government plant is reasonably available to perform the subject work and the contract price for doing the work is more than 25 per centum in excess of the estimated comparable cost of doing the work by Government plant; or

"(2) in any other circumstance where the Secretary of the Army, acting through the Chief of Engineers, determines that the contract price is more than 25 per centum in excess of what he determines to be a fair and reasonable estimated cost of a well-equipped contractor doing the work.

"(b) In estimating the comparable cost of doing the work under subsection (a)(1) by Government plant the Secretary of the Army, acting through the Chief of Engineers shall, in addition to the cost of labor and materials, take into account proper charges for depreciation of plant, all supervising and overhead expenses, interest on the capital invested in the Government plant (but the rate of interest shall not exceed the maximum prevailing rate being paid by the United States on current issues of bonds or other evidences of indebtedness) and such other Government expenses and charges as the Chief of Engineers determines to be appropriate.

"(c) In determining a fair and reasonable estimated cost of doing work by private contract under subsection (a)(2), the Secretary of the Army, acting through the Chief of Engineers, shall, in addition to the cost of labor and materials, take into account proper charges for depreciation of plant, all expenses for supervision, overhead, workmen's compensation, general liability insurance, taxes (State and local), interest on capital invested in plant, and such other expenses and charges the Secretary of the Army, acting through the Chief of Engineers, determines to be appropriate.".

Approved April 26, 1978.

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LEGISLATIVE HISTORY:

HOUSE REPORT No. 95-605 (Comm. on Public Works and Transportation).
SENATE REPORT No. 95-722 (Comm. on Environment and Public Works).
CONGRESSIONAL RECORD:
Vol. 123 (1977): Sept. 27, considered and passed House.
Vol. 124 (1978): Apr. 5, considered and passed Senate, amended.
Apr. 18, House agreed to Senate amendments.

APPENDIX G

## BASIC METHODS OF DREDGING

The two primary techniques of removing sedimentary deposits within ports and navigational waterways are hydraulic and mechanical. The selection of which method to use is based primarily on the sediment type, water depth, sea conditions, location, proximity to the disposal area and availability of equipment. Numerous dredging plants are available to use within the two techniques.

### Hydraulic Dredges.

Dustpan - uses an intake or suction pipe to pump soft, free-flowing alluvial material, employing water jets on the end of the intake pipe to loosen the material before lifting and pumping it through a pipeline.

Cutterhead - uses a rotary cutter on the end of the intake pipe. Although originally best suited for relatively soft material, technological improvements altered this unit so it could excavate compact deposits such as sandstone, limestone and coral rock. With a submerged ladder pump, it can dredge at depths of up to 100 feet or more. Material is transported by pipeline to either the final point of deposition or for placement in dump barges for transportation by towing.

Hopper - uses drag arm suction units to pull material from the bottom and pump it into hoppers or bins aboard. As a self-propelled, self-contained ship, it needs no supporting equipment to transport material to a disposal site. Hopper dredges are able to work in congested areas without interrupting shipping, but their greatest advantage is the capability of working in areas subject to heavy weather conditions.

Sidecasting - uses two dragarms to pick up the bottom material, and pump it through a discharge pipe supported by a discharge boom. It is a shallow draft, self contained dredge that uses natural currents to carry dredged material away from the channel.

Mechanical Dredges.

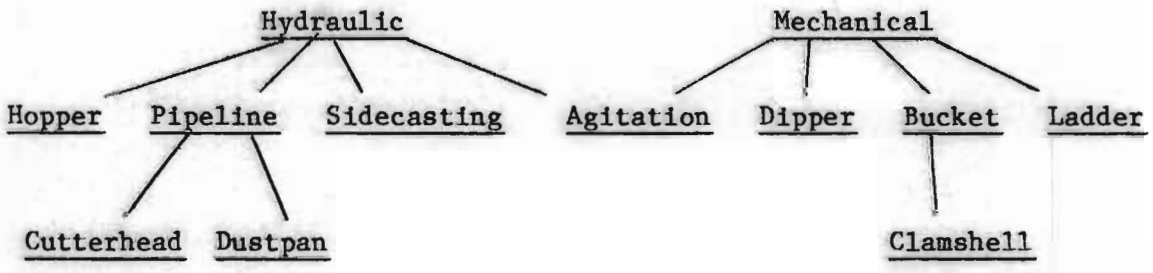
Clamshell - uses a bucket suspended from a boom by cables and is primarily for excavating loose alluvial soil. Its method of operation lends itself to working in confined areas.

Dipper - uses a power shovel to rip hard material such as rocks, and highly compacted soil. It has proven extremely successful in excavating glacial till formations (essentially boulders and clay).

Ladder Bucket - uses a series of buckets on a continuous chain and has general application in mining sand and gravel. It has limited application within the U.S.

Agitation - using hydraulic equipment, the bottom material is removed from the channel bed and put back into suspension in the water for disposal out of the channel by the action of the current.

The following figure represents the most common methods used by the Corps of Engineers and industry.




Source: John M. Eddinger, "American Dredging: The Turning Point," The Military Engineer, V. 70, n. 458 (November-December, 1978), pp. 390-391.