DREDGE DISPOSAL TECHNIQUE IMPROVES AGRICULTURAL LANDS

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WHAT IS THIN LAYER DISPOSAL?

Thin layer disposal is the process by which hydraulic dredged material (usually from fresh water rivers) is deposited in a Confined Disposal Facility (CDF) in relatively thin layers. When the drying process is complete, the consolidated material is about 4 to 5 feet in thickness. Placing this material on cleared agricultural land allows the land to continue functioning for agricultural purposes. Why is this so important? Historically, disposal placed on agricultural lands through the hydraulic dredge process has rendered the lands useless. There is a saying among Delta farmers that "they ain't making no more cotton land." This saying was true until thin layer disposal became a reality. This process not only improves the quality of the land, but elevates the land out of the frequently flooded zone.

To understand the need for thin layer disposal, an understanding of the development of the Yazoo Basin and the importance the land plays in the economic stability of the region is important. Preservation and protection of the land through environmentally sensitive flood control projects are necessary.

The Yazoo Basin is comprised of over 13,000 square miles of drainage area. It is almost equally divided by hills on the east side and alluvial Delta on the west. These areas are hydrologically and topographically very different. The hills are very steep, producing extremely high run-off and are highly erodible. The Delta, which receives the sediment laden run-off from the hills, is a very flat area that provides an outlet for hill run-off but also historically served as a distributary system for overflows from the Mississippi River.

Prior to the Flood Control Act of 1928, the responsibility for flood protection belonged to the local people. After the great flood of 1927, the Federal Government assumed this responsibility. In the late 1800s, there were as many as 105 drainage districts formed in the Mississippi Delta. These districts had expended approximately a half-billion dollars for levee construction and drainage improvements for flood control. However, there was no one central organization that coordinated these flood control activities; therefore, the level of protection provided by the various projects differed considerably. This variation in level of protection caused the entire system to perform poorly.

In 1927, a major flood occurred on the Mississippi River which caused the failure of virtually all of the local protection works that had been built during the 1800s and early 1900s. This was a massive flood, causing $5.3 billion (1993 dollars) in damages and leaving 600,000 people homeless. This flood led Congress to pass the 1928 Flood Control Act, which placed the Corps of Engineers into the levee construction business along the Mississippi River. Since the construction of the mainline Mississippi River levees by the Corps of Engineers, this system has met the test of each flood without failure. With the completion of this levee system, the threat of the Mississippi River overflowing the Delta became nonexistent. The protection provided by the levee system allowed the landowners to live and farm the Delta with assurity that they would not be subject to Mississippi River overflows.

However, in 1932, Mother Nature proved that the Yazoo Delta was still subject to another form of "headwater flooding." Headwater flooding is caused by intensive rainfall that occurs within the Yazoo Basin watershed. As a result of the 1932 headwater flooding, Congress passed the 1936 Flood Control Act which authorized the Corps of Engineers to develop flood control plans for the Yazoo River. These plans included major reservoirs which would be built in the hills, improvements to the river and its tributaries, auxiliary channels, flood gates, and other flood control facilities as necessary. By the late 1950s, four major reservoirs--Grenada, Enid, Sardis, and Arkabutla--had all been completed, along with required channelization downstream of the reservoirs. The first of the auxiliary channels, commonly referred to as the Lower Auxiliary Channel, was under construction by 1960. As the auxiliary channel was being built, it became very evident that it was a very unpopular plan with landowners because of the vast amount of land required for right-of-way. Areas of land approximately one-half mile in width were required to accommodate the wide channel, floodway, and levees. This channel extended from a point east of Satartia to a point near Tchula, Mississippi, which represented about 40 miles of right-of-way across good farm land. Due to the opposition to this plan, construction for the Upper Auxiliary Channel was put on hold. Then, in 1976, the

Yazoo River project was reviewed and a new plan developed. The new plan, called the Upper Yazoo Project, required the enlargement of the existing river in lieu of constructing auxiliary channels.

In 1977, work began on the Upper Yazoo Project. This enlargement plan was to be accomplished, for the most part, by hydraulic dredge. The dredge material pumped from the river was disposed of in containment areas along and near the river. These containment areas ranged in size from 50 to 120 acres and were built very much like catfish pond levees, only the dikes (commonly referred to as levees) were much higher. In some cases, these embankments were as high as 20 feet. The CDFs were designed to store the large amounts of material excavated from the river. Additional volume was provided in the CDFs to accommodate future maintenance dredging when required. The sites selected for disposal area almost always was located in cleared agricultural fields. Landowners would prefer that woodlands or wetland be used instead of their farmland, but for environmental purposes, these areas are considered off limits unless no other alternative is available. The criteria for selecting disposal sites also requires that the disposal sites be located adjacent to or near the river so that the pumping distance from the dredge could be reduced to a minimum. When pumping more than one mile, the pumping cost begins to spiral upward. Again, the Corps of Engineers found themselves in the position of trying to implement a project that was distasteful to the landowners who were actually receiving benefits from the project. Their dissatisfaction stemmed from the fact that lands required for project construction were the very best land that the landowners had.

To understand why this land is the best, an understanding of the hydraulics and sediment transport in the Delta is required. The Mississippi Delta was formed through many centuries of overflows onto this land. As the floods filled the river systems and the rivers spilled over their topbank, the sediments were deposited into the immediate overbank. This deposition takes place when the velocity of the water is reduced at the point of overflow allowing the sediments to deposit along topbank of the stream. Through many years of repeated overflows, these lands along the topbank of the river began to build up due to these sediment deposits. These deposits consisted of a sandy silt which has ideal soil characteristics for cotton production. As this process continued, the lands adjacent to the stream became the most elevated lands, therefore, the least subject to flooding. This land along topbank of the river becoming the least flood prone, as well as agriculturally rich, attracted settlers to build homes and farm headquarters at these locations. These sites also allowed easy access for river traffic to deliver much needed commodities for farm life.

Mother Nature had created the Delta in such a way that natural conflict between flood control and farming would exist. The lands along topbank of the river served as home to the settlers as well as becoming the most desired locations to construct levees and CDFs for flood control. Therefore, the flood control projects, which are designed to provide flood control to the lands, actually required the utilization of some of the very best land in the Delta to construct the project. A built-in conflict existed from the very beginning.

By the mid-1980s, the Corps of Engineers earnestly began trying to modify the projects so that the flood control needs of the Delta could be met in a way that was not so obtrusive to the landowners. The design criteria used to establish the height of levees was reviewed, and it was determined that reductions in height could be made. This change in turn reduced the right-of-way requirements which was a good first step that pleased landowners. It was also realized that if a way could be found to reduce the burden of the disposal on the landowner, then we would really have improved the flood control project from a landowner's point of view.

In reviewing the projects, we found that the disposal sites constructed from the late 1970s to the mid-1980s were designed and built in such a way that the landowners could not utilize the lands after the disposal facility had been filled. These disposal sites were requiring about 70 acres of land per river mile which represents a large taking of land to support the project. Rights to the land were obtained in the form of perpetual easements. These easements were very comprehensive, giving the Corps of Engineers the right to reuse this land at anytime and for almost any purpose. These type easements inherently discouraged landowners from attempting to use the land for any type personal use even though the landowner remained the underlying owner of the property. The philosophy that the Corps of Engineers used for the design and acquisition of the disposal facilities was to pay the landowner essentially appraised value for the property and build the facility, which would remain as unusable "land" forever. The landowners referred to these areas as "the pits." These areas became wastelands that were used only by wildlife and fish. The stringent language in the easement made landowners fearful to invest any of their money to reclaim these areas for agriculture purposes. The land wound up being virtually disregarded for any type of agriculture purpose.

Another reason that no one would attempt to use the disposal areas for agricultural production was because the

visible soil was very sandy. Early dredging efforts made no attempt to keep the sands, silts, and clays from segregating when the soil is disposed into the CDFs. Preventing this segregation is a key component in the success of thin layer disposal. The majority of the land that was visible would discourage any prudent farmer from investing money for reclamation purposes. A visual inspection would indicate that the material in the CDF was so sandy that it would not support crop production. What was not recognized was the fact that in this sandy material were clay balls that formed during the pumping process. These balls provide moisture and nutrients to support crops.

The method used to design and construct these facilities left the areas in such a manner that they all held water year round. Even those portions of the disposal area that was not under water were still subject to a high water table creating a saturated soil conditions. These wet soil conditions prohibited the landowner from placing farm equipment on the land. Even though the surface of the land appeared to be dry, the farmers found that heavy equipment would break through the top dry crust and become buried. Finding a way to remove the trapped water from these areas became a vital point in restoring use of the land for agricultural purposes.

Recognizing how distasteful the disposal sites were to the landowners, the Corps of Engineers set out to design and develop these disposal facilities to be much more pleasing. Since the most fertile land in the Delta was part of the land being excavated for the project, it made sense that there should be a way to salvage these agricultural properties when placing the material in the CDFs. Our goal became finding a way to excavate this material from the river bank, disposing of it onto the land in thin lifts (3-5 feet), and actually improving the land over its previous use. The process of thin layer disposal had now been defined. To accomplish this meant that thin layer disposal sites required almost three times as much land as required for the conventional disposal methods. Due to the increased cost of thin layer, acceptance within the Federal funding system could not be accomplished because of strict adherence to the least cost plan. However, least cost in many cases such as this is not an acceptable alternative to the people.

As the Corps began to change its philosophy, the approval to research and study thin layer disposal became a reality. Funds were made available to research this idea, and the Waterways Experiment Station was employed to assist in this effort. A two phase program was developed. Phase I would be to demonstrate on an existing disposal facility which was filled in the late 1970s that a successful agricultural crop could be produced. Soil tests of material in the disposal area indicated that the soil had excellent characteristics for cotton production. Sampling of materials along the river bank was done to assure ourselves that the material being excavated from the river was good soil for cotton production. Soil samples were taken from the disposal site and used to grow various varieties of cotton in greenhouse testing. This testing ultimately led to a 10-acre cotton crop grown at the disposal site. The first year that cotton was grown at the test site, the harvest produced a yield of 756 pounds of lint per acre. The site was unirrigated and required very little chemical treatment. Results of this test proved that the soil in the disposal area could be used for cotton production. Since the completion of this test in 1990, the landowner has continued to grow cotton at this site. During the 1994 crop year, this site produced 950 pounds of lint per acre. This is an excellent production rate when compared to surrounding farm land. As a result of Phase I of this project, we were able to demonstrate to the public that cotton could be successfully produced on this hydraulically-dredged material from the river banks.

In Phase II of the research, a prototype disposal facility would be built and through a 5-year demonstration program, show how the dredged material would be placed on the site, dried, reformed for agriculture production, and then produce crops. A long history of crop production at the Phase II site would provide a basis for comparison during the 5-year demonstration program. However, the need for this demonstration site actually was overcome by events. The thin layer concept caught on so quickly, we have eliminated Phase II of the research.

We are currently developing plans to complete about 20 miles of river enlargement from near Morgan City, Mississippi, to Greenwood, Mississippi, during the next 2 years. Construction contracts should be awarded by mid-summer of 1996. To obtain sites for disposal, we are seeking willing sellers only. We recommend to these landowners that they volunteer only their heavy land, which is that land normally used for soy bean and rice production. We do not recommend that they volunteer land that is already in cotton production. It is quite interesting that many of the landowners have volunteered land already in use for cotton production because they believe the material being excavated from the river system will improve existing cotton fields. We require that volunteered land be cleared agriculture land and relatively close to the river. The Corps will obtain a 3-year temporary easement on these properties. This means that the Government will only have rights to the land for 3 years. The first year will be used to construct the disposal area and fill it with dredged material. The second year will be used to drain and dry the site, and the last year will be used to reform the land, putting it back in agriculture production. The Government is paying appraised value for this property, less a nominal residual value. The landowner is responsible for all costs

associated with restoring the land after the drying process is complete. This means that the landowner will have to take down the perimeter dikes and reshape the land as desired. This concept has met with great success thus far. Searching for locations where this concept has been previously used indicates that this will be the first thin layer disposal ever used for agricultural purposes.

We are extremely excited because we are having more land volunteered than we have need for. This is a dramatic departure from the process that was followed in the 1970s and 1980s. While we were using the conventional disposal method, litigation was required in many cases to obtain rights to these lands. Now that we are implementing thin layer disposal, it appears that the next litigation will be from landowners that are suing the Corps of Engineers because we have not elected to use their property for disposal.