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The South Brooklyn Grain Terminal

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Summary

The New York City Department of Ports and Terminals believes that the changing economics of bulk transportation will force grain bound for export to move along the most economical route. Many U.S. export grain moves through the inland waterway system to a variety of Gulf ports. Many of these facilities are old and inefficient. The inland waterway system and the Gulf ports will become a high-cost transportation system with the imposition of user-fees to fund the U.S. Army Corps of Engineers' dredging projects and lock and dam work. Ports such as New Orleans are five days further away from Europe than New York. The Port of New York has several major economic advantages over other East and Gulf coast ports in the movement of grain to Europe which are outlined in this article.

1. Introduction

In 1981 the Port of New York and New Jersey handled over 45.3 million long tons of general and bulk cargo. The total value of the cargo was over $ 45 billion (see Table 1) [1].

Table 1: Cargo Movements in the Port of New York and New Jersey (millions of long tons)

Oceanborne	1981	1980	1979
Total bulk cargo	33.7	34.6	39.9
Total general cargo	13.8	15.0	16.2
Total oceanborne cargo	47.5	49.7	56.1
Millions of Dollars	45.3	45.0	40.6

Source: The Port Authority of New York and New Jersey, Annual Reports, 1980 and 1981.

Many of the characteristics that make the Port of New York and New Jersey one of the world's leading container ports will also enable the port to become a major bulk export handling port. Some of the factors that make the port ideal for bulk export handling include: a natural harbor close to major markets in Western Europe, access to inland commodity supply centers, and foreseen ability to handle deep draft large volume vessels.

New York City's Department of Ports and Terminals believes that the changing economics of bulk transportation will force commodities such as coal and grain to move along the most economical route. The Department has identified coal and grain as two bulk commodities which can be efficiently and competitively shipped through the Port of New York.

The study investigating the feasibility of exporting coal from New York utilizing coal-slurry pipeline technology has already been completed by the Department in collaboration with private engineering and development firms. A similar effort is presently under way for a grain export terminal on the New York side of the harbor.

This paper deal with the feasibility of a grain export terminal in New York harbor, and many of the transportation issues that make grain a leading bulk export. The paper will concentrate on grain using the popular definition: wheat, corn (maize), soybeans, barley, oats, rye and sorghum. Grain is grown throughout the United States and exported all over the world. However, rather than discuss in detail all the major grain producing and importing areas I will limit my discussion to areas close to New York and which New York can competitively serve.

2. The Grain Transportation System

Export demand for United States grain depends upon an efficient transportation system in order for the U.S. to remain competitive with other grain producing countries like Canada and Argentina. Grain travels by rail, barge and truck to export elevators and by bulk carriers to its final destination abroad. Efficiency and competitive transportation cost advantages dictate the mode and route by which grain travels to the export market. The seasonal nature of grain and the inability to predict accurately foreign demand and vessel arrival time make grain export a risky business.

Typically, after the grain is harvested, the first storage point is the country elevator, a local facility to which grain is brought by truck. The country elevator is owned by the farmer, a farm cooperative or a large grain handling firm. From the country elevator, grain travels by rail or truck to a terminal elevator or directly by rail or barge to an export

facility. Transportation costs are one of the most important factors in the cost of grain. Inland transportation costs are approximately ten percent of the cost of grain, and ocean freight rates usually add on another ten to fifteen percent to the cost.

Theoretically, the U.S. transportation system could handle up to seven billion bushels of grain (current exports are slightly over five billion bushels). However, at times the nation's rail and barge systems are stretched to the limit by the export demand for grain, often in competition with other bulk commodities such as coal. As a result, scheduling is often more important than actual handling capacity. Scheduling the arrival of the grain at the port with the quantities and time required by ocean vessel arrival, and matching this with foreign buyer's demand is a major logistical undertaking. This is one reason that a few large grain handling firms dominate the grain transportation system, and they do so with minimal delays on equipment they own or lease. It is crucial for the grain transportation system to minimize delay in order to avoid costly demurrage fees. For example, demurrage rates for a large bulk vessel depending on size can range anywhere from $ 9,000 to $ 15,000 a day.

Most export grain originating in the United States Midwest and Great Plains travels by barge or unit train to the Gulf of Mexico port range. The development of the world's most efficient and relatively inexpensive inland waterway systems has been one of the contributing factors in making the U.S. Gulf Coast the leading grain export center in the world. Barges, holding upwards to 1,600 tons and offering considerable fuel savings, travel along the Ohio, Illinois, Tennessee and Mississippi Rivers to the Gulf. However, backups sometimes of 20 hours at some of the locks on the rivers, and the possibility of increased cost recovery fees for dredging and maintenance may place barges at a cost disadvantage with regard to other modes of transport. Barges are already losing their relative cost advantage over rail as a result of the Inland Waterways Revenue Act, which has increased fuel taxes on the waterways up to ten cents per gallon by 1985 to fund construction and maintenance of the inland system.

The rail system also carries a significant portion of U.S. export grain. Rail movements should continue to rise as more grain shippers switch from barges to utilize cheaper unit train rates. Unit trains in the export trade, typically consisting of 55—125 hopper cars and holding 3,400 bushels, carry the grain from the point of origin (a country or terminal elevator) to its final destination at the port, and offer economical rates and efficiency. Unit trains offer quick turnaround time and increased car utilization. In addition, with the advent of rail deregulation under the Staggers Deregulation Act of 1980, railroads can now set rates to cover costs and even arrange lucrative contract rates with grain shippers, which guarantee service and volume at an equitable price for both the shipper and the carrier.

Predictions for future international seaborne trade in grain are difficult to make because of the volatile nature of the export grain market. Supply of grain varies depending on weather and economic and political considerations. Demand for grain continues to rise based on population increases, but demand by region varies depending on the availability of foreign exchange to purchase the grain, and on the general worldwide economic climate.

Seaborn grain continues to grow. Wheat (used mainly as a food grain) makes up a third of all grain shipments, but wheat's dominance is declining. Corn and soybean trade are increasing due to the world's increased demand for feed grain (used as livestock feed to meet increased demand for meat). The trans-Atlantic eastbound route from North America (Canada and the United States) to Western Europe (Amsterdam-Rotterdam-Antwerp and Hamburg port range) remains one of the most lucrative routes in the seaborne grain trade. The trans-Atlantic route accounted for 35% and the trans-Pacific route accounted for 24% of all tonnage movements in 1981 [2].

Freight rates for bulk shipping are at an all time low, compared to high ocean-freight rates in 1980. The per ton rate for trans-Atlantic grain shipments reached a peak of $ 23 in 1980 due to huge U.S. grain exports that year. Today rates are quoted as low as $ 6.00 per ton — or barely enough to cover variable costs (see Table 2) [3]. The situation is compounded by a continuing increase in ocean-freight capacity. Large fleet increases are attributed to projections of large increases in U.S. coal exports, thereby expanding the combination carrier fleet.

Table 2: Exports by port area (millions of bushels)

	1979	%	1980	%	1981	%
Corn						
Pacific	249	11	366	15	271	13
Great Lakes	280	12	235	9	155	7
Atlantic	253	19	370	15	399	15
Gulf	1,355	58	1,453	59	1,363	63
Wheat						
Pacific	394	33	461	35	503	31
Great Lakes	150	12	135	10	128	8
Atlantic	24	2	64	5	101	6
Gulf	641	53	638	49	863	54
Soybeans						
Pacific	.1	1	.3	1	11	1 1/2
Great Lakes	62	8	60	75	66	8
Atlantic	104	14	92	11	81	10 1/2
Gulf	592	78	637	79	610	79

Source: The United States Department of Agriculture

In today's glutted freight market grain is often sought as a back haul commodity or as an alternate commodity for large Panamax vessels (vessels in the 60,000 to 80,000 DWT size range able to fit through the Panama Canal) serving the U.S. Gulf of Mexico ports. A similar situation exists in the Great Lakes and St. Lawrence Seaway system where grain is often carried by a small vessel to one of the East Coast ports in Canada, unloaded and reloaded with iron ore for a back haul. However, most back hauls are not perfectly matched. Matching grain exports with iron ore or other commodity imports in today's depressed commodity market is very difficult. New York harbor does not foresee any back haul activity through its port. Instead, New York harbor visualizes a liner service of some sort, served by large bulk vessels over 80,000 DWT, shuttling between New York and the Western European port range.

The United States to Western Europe route is largely limited to Panamax vessels in the 60,000 to 80,000 DWT

size range due to loading draft limitations. According to Fearly and Egers' *World Bulk Trades*, bulk vessels in excess of 40,000 DWT now carry some 34% of seaborne grain compared with 11% in 1970. It is predicted that by 1985 vessels of over 60,000 DWT will account for 37% of total grain shipments, and vessels over 100,000 DWT also should expand their share of the market. The large vessels offer considerable savings, especially in fuel compared with smaller general cargo vessels. The larger the vessel the lower the transportation costs per ton and per ton mile. In real terms, fuel costs have quadrupled in the last decade. As a result, shippers are searching for large bulk carriers that can offer fuel savings, since fuel consumption per ton of cargo varies inversely to vessel size and fuel accounts for 40% of the operating costs of a vessel.

Worldwide there are presently 146 grain loading and receiving facilities that are capable of handling vessels in excess of 35,000 DWT. But only 30 grain loading facilities are capable of handling carriers over 50,000 DWT, and eight over 100,000 DWT. Most of the facilities are able to handle Panamax size vessels in the 60,000 to 80,000 DTWT size range and are located in the U.S., Canada and Australia on the load side, and Western Europe and Japan on the discharge side. However, no U.S. Gulf or East Coast port can handle a fully-laden vessel over 80,000 DWT, although predictions for seaborne grain trade foresee a shift from smaller vessels to larger bulk vessels over 80,000 DWT [4].

Grain leaves the United States from a multitude of port locations. Most grain export elevators in the U.S. are privately owned or leased facilities operated by the large integrated grain handling firms, port authorities, and to a lesser extent farmers's cooperatives. The predominant grain exporting area in the U.S. is the Gulf of Mexico port range which handles close to half of U.S. grain exports. Other U.S. grain exporting areas include the South Atlantic ports, the Pacific Coast ports, the Great Lakes ports and the North Atlantic ports (see Table 3). The Atlantic ports handle mostly corn, approximately 15% of U.S. total exports of corn in 1981. That percentage should increase as the demand expands for deeper draft ports offering savings to shippers through increased economies of scale. New York harbor intends to be that port.

Table 3: Single Voyage Grain — Cargo Freight Rates 1979—1982 (Dollars per metric ton)

Year	U.S. Gulf to Rotterdam	to Japan
1979	14.20	21.05
1980	18.15	28.65
1981	13.20	24.60
Jan '82	10.00	17.95
Aug '82	6.00	13.00

Source: Cargill Bulletin, September 1982, p. 8.

3. The U.S. User-Fee Issue, Meeting Increased Vessel Size Demand

Changes in transportation policy create shifts in volume, destination, and the location of physical facilities for bulk commodities. Price and efficiency control the grain pipeline. A large price increase in one segment of the transportation system will tend to cause grain to shift from one destination to another or from one mode to another if the increase represents a higher net cost to the shipper. The City of New York feels that the pending U.S. user-fee legislation will cause shifts in the grain transportation flow.

Channel improvement projects are presently funded by the federal government and can take up to 24 years to complete. The U.S. Army Corps of Engineers is in charge of all federal channel deepening and maintenance projects in the U.S. The Army Corps operates under a set of procedures that have become increasingly more time consuming. Laws, regulations, and rules have been enacted over the years, causing the situation to become critical. In order to change this situation, New York and a coalition of larger ports support legislation that would facilitate the dredging of deep water ports. The Reagan administration, as part of its efforts to reduce federal budget deficits and transfer federal functions to the state, has proposed to authorize the local collection of user fees to pay for the cost of operating and deepening the nation's port and inland waterways.

Several approaches have been suggested by the Administration and the House and Senate to recover the cost of maintaining navigation channels. They range from 100% local funding to various federal/private cost sharing proposals. The nation's ports are currently divided on the user-fee issue. Larger ports, for the most part, support the Reagan administration's local user-fee concept because they are in a better position to pay. Smaller ports want a national user-fee system based on a uniform fee levied on all import-export cargo assessed on value or tonnage. New York supports the local user-fee proposal because the port does not want to subsidize ports with higher dredging costs and/or lower tonnage. New York harbor can be dredged deeper and cheaper than other ports, and the amount of tonnage handled by the port will be more than adequate to support a modest user-fee. For example, dredging the main entrance channel to the Port of New York and New Jersey from its present depth of 45 ft Mean Low Water (MLW) to its proposed depth of 68 ft will cost approximately $ 150 million, and to dredge an adjacent channel for the proposed grain terminal will cost about another $ 20 million, compared with the Port of Baltimore's plan to go from a present depth of 42 ft to 50 ft at a cost of over $ 420 million (see Table 4).

Table 4: Proposed Channel Deepening Projects in the United States

	Existing channel depth (ft)	Proposed channel depth (ft)	Quantity of dredged material (Mill. cu. yds.)	Cost ($ Mill.)
Baltimore	42	50	2	$ 420
Hampton Roads	45	55	100	$ 400
Mobile	40	55	142	$ 392
New Orleans	40	55	133	$ 450
New York (Stapleton)	45	68	50	$ 150

Source: Port Authority of New York and New Jersey, 1980; *Journal of Commerce*, October 1981; *Coal Week International*, February 3, 1982.

4. Origin and Destination of U.S. Export Grain

The proposed grain export elevator in New York harbor would marshall the grain from the "cornbelt" states in the U.S. Midwest. The three important grains for export would be corn, soybeans and wheat (soft red winter wheat). Of the three grains, corn has been the most important for East Coast ports from a volume standpoint, with total exports almost twice those for soybeans and wheat. Corn production is concentrated in the six states of Illinois, Iowa, Indiana, Nebraska, Minnesota and Ohio and accounts for close to 70% of U.S. corn production. The peak demand on the transportation system for corn occurs during harvest in November and December.

There is no way to confirm the ultimate destination of the export grain despite the economic and political importance of the information. When grain is exported, shippers fill out government customs forms designating the destination of their cargo, but this information does not always coincide with final delivery. For example, during the 1980 U.S.-led grain export embargo to the Soviet Union, large portions of embargoed grain ended up in the Soviet Union via transshipments through West European ports. In spite of unreliable data on the ultimate destination of U.S. grain, large portions of U.S. food and feed grains end up in Western Europe, Eastern Europe (including the Soviet Union), the Far East, Latin America and Africa.

The U.S., on average, exports 50% of its wheat, 60% of its soybeans and one-third of its corn. Other competitors, Canada followed by Argentina and Australia, do not come close to U.S. production and export of grains. However, combined geo-political situations, such as grain export embargoes, have contributed to export gains by U.S. competitors.

5. Grain Handling

The grain market and world economic conditions have combined of late to limit new building of grain export facilities. The U.S. is expecting another ample harvest this year; according to the United States Department of Agriculture, the 1982—83 crop of corn could exceed 211 million metric tons (mmt), soybeans could top 62.4 mmt and wheat should yield a crop of 75.4 mmt. In addition to the bountiful U.S. harvest, other grain producing countries such as Canada and Argentina are also expecting bumper crops. As a result, the U.S. is once again left with a large surplus grain crop causing farm prices to be the lowest in years. In order for the U.S. export grain situation to improve a number of factors must change. First, the U.S. must discontinue its use of selective grain export embargoes that reduce the U.S. share of the export grain market and call into question the reliability of the U.S. as a stable grain supplier. Second, the U.S. must provide some sort of short term financing to help many of the less-developed and eastern bloc countries, currently strapped for foreign exchange, buy U.S. grain. Finally, the world economic situation must improve, especially high interest rates which limit the building of new grain export/import handling facilities.

The grain industry in the U.S. is currently experiencing overcapacity in grain exporting facilities. Yet, New York City feels the grain industry can cope with ambitious plans for expansion of grain export terminals in order to accomodate larger, deeper draft vessels. Temporary overcapacity in 1982 could soon give way to undercapacity in 1985.

A portion of the existing grain port capacity consits of old, inefficient and environmentally unacceptable facilities. These facilities will gradually have to be upgraded or replaced in order to remain efficient and environmentally safe. The current recession is holding back investment in technology and improvements for older facilities. Eventually, the large grain handling firms will face a series of site selection decisions for all new export terminals. The key decision will be based on total transportation costs from farm to foreign port. With the advent of user-fees on the inland waterways and the nation's ports, and with the resurgence of a competitive rail system, New York harbor stands an excellent change of capturing a portion of the continuously expanding grain export market.

The emphasis will also be on increased elevator efficiency. In today's competitive market, with high interest rates and storage costs and high demurrage rates, the grain export elevator must have high throughput, a minimum of at least 100,000 bushels an hour. The only way to recover the high cost of building a new facility is through increased throughput. Too much storage capacity increases the fixed cost which the elevator must bear for years, but inadequate storage capacity can result in delays.

Automation has increases export elevator efficiency. Computers control all aspects of exporting grain: unloading unit trains, directing grain to its designated silo, loading large bulk vessels and sampling the grain. As grain travels through the export system it is graded and weighed. At the export elevator grade is determined and the price is established. Buyers and bankers want ensurance that the terms of their contracts are being met.

Apart from grain dust and storage problems, the handling characteristics are good. Grain is a free flowing granular commodity which facilitates loading and discharge. Most grain is dried on the farm to reduce moisture content. Many large grain export terminals, however, still retain drying capacity for cases where contracts or circumstances demand drying. Large dryers can handle rates of 300 t/h and more, and remove up to 2—3% of the moisture [5]. Grain also has to be cleaned, especially when it is to be stored for a long period of time. Grain, as a living organism, is subject to deterioration, insects, mites, fungus, etc., all of which can cause the grain to degenerate. Most modern cleaners today can handle two types of grain simultaneously, at a rate of up to 1,500 t/h [6].

The same factors that cause grain to deteriorate, such as moisture content and dust, also cause a potential environmental hazard. The most serious environmental hazard involves grain's propensity to explode under certain conditions. Grain dust is composed of small particles of grain, defined as 250 to 500 microns in size, depending on the source (some grains generate more grain dust than others). Grain is an extremely abrasive substance with characteristics similar to gunpowder. It is also an air pollutant subject to Federal environmental regulations.

Dust explosions tend to occur in older, less ventilated plants, but despite precautions, explosions can occur anywhere. Three elements are necessary: dust which is the fuel, oxygen and a source of ignition. Most accidents are caused by negligence or the result of ignorance. Grain elevator explosions usually occur in bucket elevator legs.

The technology and know-how exist to control grain elevator explosions, and if a fire should break out, there are measures used to localize and contain the fire from detonating into an explosion. It is generally accepted that the most effective way to limit the hazards created by grain dust is to remove it. There are various air suction fabric filters and vacuum cleaners used to gather the dust. Once the dust is collected it can be sold off as feed, fertilizer or fuel, but it should not be returned to the grain. If an explosion should occur, there are ways to contain or vent the explosion, and alarm systems to warn the employees. The most effective way to avoid any environmental hazards are by good housekeeping and maintenance.

The Department believes that environmental concerns can be addressed without sacrificing efficiency. The proposed grain export terminal in New York will incorporate the latest "state-of-the-art" in grain handling, safety and environmental technology. The Department will insist upon every precaution before we proceed with building the facility.

The cost of building a modern grain export elevator can run from $ 25 million to $ 200 million depending on the size and location of the facility. The Department is planning a facility with holding capacity of four to seven million bushels. Cost estimates are around $ 100 million (1982 dollars) for a facility of that size, and the full cost of operating an export elevator can range from three cents to ten cents per bushel, again depending on the elevator's efficiency and its annual grain throughput.

The City of New York will not finance the construction of a grain export terminal out of its capital budget. The private sector has the profit motive to move any project quickly and guarantee its success. The City's resources are more properly spent on dredging, landfill and, possibly, infrastructure improvements. The City is presenting its proposal to the large integrated grain handling firms, farmer-owned cooperatives, Japanese-owned-or-affiliated firms and other non-grain developers in the hopes of attracting private investment and development to the City.

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