Appendix O
DCR Control Measure Effectiveness

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Introduction

Because operator capability and equipment capability, either on board cargo ships or at loading ports, determines in part the amount of dry cargo residue (DCR) produced during operations, a review of historical DCR data was conducted to determine if patterns exist that would indicate certain ships and, therefore, loading and unloading equipment on those ships, could be the cause of noticeably higher DCR quantities. Similarly, a review of ports was conducted to determine if equipment and loading practices at certain ports may be contributing to higher DCR discharges than other ports. If a pattern is determined, this may assist in determining which types of equipment or practices are more effective in reducing DCR quantities. The analysis relied on historical data and did not include an inspection of individual loading processes at ports or on ships. Results for ships are presented first, followed by results for ports.

Ships

The offloading equipment and best management practices (BMPs) on each ship may be partially responsible for the amount of DCR that is spilled during bulk cargo vessels offloading operations and then later swept or discharged from the ship.

Table 1 lists 10 ships that were built under Title XI of the Merchant Marine Act of 1970, which allowed U.S. shipping companies to construct new vessels or to modernize their existing fleet by government-guaranteed financing and tax-deferred benefits. The total cost of these 10 ships was more than $250 million. Ships constructed following passage of the Act have some of the lowest DCR discharges.

TABLE 1
Ships Constructed Following Passage of the Merchant Marine Act of 1970

Ship	Year Built
Roger Keyes	1973
Charles E. Wilson	1973
H. Lee White	1974
Sam Laud	1975
St. Clair	1976
Belle River	1977
Buffalo	1978
Indiana Harbor	1979
American Mariner	1980
American Republic	1981

DCR discharge data (U.S. Coast Guard, 2005) for ships were used to determine the mass of DCR discharged per washdown for each ship. The data are from ship logs and document location, material type, and quantity estimate of DCR events. The DCR quantities given are estimates, and therefore there is some uncertainty associated with the reported amount.

The five ships with the least DCR per discharge and the five ships with the most DCR per discharge are shown in Table 2 as pounds of discharge per washdown. Table 3 shows the five highest- and five lowest-discharging ships in terms of DCR discharge as a ratio of total cargo hauled. Both tables indicate that newer ships (built in the 1970s) perform better (in terms of DCR spillage) than the older ships (built in the 1950s). More information on the equipment and practices on each of these ships would be required to determine why older ships seem to produce more DCR than newer ships.

TABLE 2
Highest and Lowest DCR-Discharging Ships per Washdown

Ship (Company)	Year Built	Washdowns Recorded in Database	Mass DCR per Washdown Event (lbs)	Material as Percent of Total DCR		
				Coal	**Stone**	**Iron**
Five Lowest-Discharging Ships						
Buffalo (ASC)[a]	1978	94	69	19	33	13
Paul R. Tregurtha (ISC)	1981	110	128	99	0	0
John J. Boland (ASC)	1973	63	136	23	13	61
Adam E. Cornelius (ASC)[a]	1973	80	137	24	57	15
Walter J. McCarthy (ASC)[a]	1977	46	143	75	0	25
Five Highest-Discharging Ships						
John G. Munson (GLF)	1952	69	849	36	51	8
Reserve (ON)	1953	121	378	3	13	82
Charles M. Beeghly (ISC)	1959	121	355	18	1	49
Buckeye (ON)	1952	27	345	0	9	82
Armco (ON)	1953	66	338	0	6	68

[a]Built as a result of the 1970 Merchant Marine Act, which provided subsidies to build and operate ships to revitalize the American shipping industry.

TABLE 3
Lowest and Highest DCR-Discharging Ships as Ratio of Total Cargo Hauled

Ship (Company)	Year Built	DCR Discharge per 1,000 Tons of Cargo Hauled (lbs)
Five Lowest-Discharging Ships		
Walter J. McCarthy (ASC)[a]	1977	1.1
Paul R. Tregurtha (ISC)	1981	1.6
Buffalo (ASC)[a]	1978	1.7
John J. Boland (ASC)	1973	2.0
American Mariner (ASC)[a]	1979	2.1

TABLE 3
Lowest and Highest DCR-Discharging Ships as Ratio of Total Cargo Hauled

Ship (Company)	Year Built	DCR Discharge per 1,000 Tons of Cargo Hauled (lbs)
Five Highest-Discharging Ships		
Reserve (ON)	1953	17.4
Buckeye (ON)	1952	14.0
John G. Munson (GLF)	1952	13.9
E.W. Oglebay (ON)	1973	9.9
Charles M. Beeghly (ISC)	1959	9.3

[a]Built as a result of the 1970 Merchant Marine Act, which provided subsidies to build and operate ships to revitalize the American shipping industry.

Ports

Loading ports may be partially responsible for the amount of DCR that is discharged from bulk cargo vessels on the Great Lakes because some of the cargo material is spilled during loading operations.

The U.S. Coast Guard (2005) data provide loading port information for each haul segment and DCR discharge. However, it is difficult to link loading ports to the proper DCR discharge data because some ships wash down only after several haul segments; therefore, the mass of DCR discharged may have been deposited during a loading operation at a previous port and not the loading port that is indicated in the data. For example, the *Arthur M. Anderson* hauled a load of coal on August 24, 2004, from Sandusky, Ohio, to Green Bay, Wis. During this haul, the ship discharged 50 lbs of limestone DCR, indicating that the DCR was not caused by the Sandusky loading operation but had been deposited by a previous loading operation at a different port. Therefore, it is difficult to determine which loading ports are responsible for which DCR discharges; and thus it is difficult to determine which loading ports have the best loading operations in terms of minimizing DCR. As a result, using the U.S. Coast Guard database is not conducive to analyzing individual port performance.

References

U.S. Coast Guard. 2002. A Study of Dry Cargo Residue Discharges in the Great Lakes.

U.S. Coast Guard. 2005. Interim Check Draft Environmental Assessment of Incidental Dry Cargo Residue Discharges in the Great Lakes. U.S. Coast Guard. October.