

**Research Report from
The Bureau of Business Research, University of Nebraska—Lincoln
And Labor Market Information, Nebraska Department of Labor**

Report

Special Multiplier Study for Wastewater Systems Infrastructure

Prepared for
the Northern Great Plains and Rocky Mountain Consortium Study

by

Eric Thompson, Director, UNL Bureau of Business Research
Trevor Nelson, Research Analysis, Nebraska Department of Labor

September 15, 2010
Bureau of Business Research
Department of Economics
College of Business Administration
University of Nebraska—Lincoln
Dr. Eric Thompson, Director

Introduction

Consortia states and states throughout the nation received substantial ARRA funding from the U.S. Environmental Protection Agency for wastewater systems infrastructure. These funds in turn are distributed by states for a variety of local projects to improve wastewater system infrastructure such as retention lagoons, variable frequency pumps, sewer lines, lift stations, and enhancements of treatment stations. Funds even went to support water meter installation in a few selected cases. Funding is distributed to the largest cities within states, mid-sized communities, and even small towns and villages. In Nebraska, the largest cities used funding for ongoing efforts to expand the sewer line system in the case of Lincoln and sewer separation efforts in the case of Omaha.

In Nebraska, ARRA funds were combined with annual funding the state receives to fund local projects. Nebraska ARRA funding of \$20,045,000 were combined with a similar amount of annual funding for projects to support a total of \$41,447,466 of planned spending. We note that \$4,864,463 of ARRA funding is listed as “Green Infrastructure;” however, all funding went to projects that ultimately contribute to a safer, cleaner water system.

This study only considers the economic impact of the \$20,045,000 in ARRA funding, and to identify the appropriate economic multipliers for EPA funding for wastewater systems infrastructure. Our assumption is that the addition \$20 million in ARRA funding allowed additional projects to be funded. Thus, it is appropriate to assume that all \$20,045,000 in funding leads to a gross increase in economic activity within states. It is true that some of the \$41 million in projects funded with a combination of ARRA and regular annual funding would have taken place without the ARRA funding. However, it is unknown which projects would have been funded. Therefore, it is our strategy to consider all projects that received some ARRA funding.

Methods of ARRA funding also support the consideration of all \$20,045,000 in ARRA funds. In Nebraska, roughly half of ARRA funds are provided for “principal relief.” These projects were essentially grants to support funded projects. The remainder of funds was given as zero interest loans. These funds will eventually be repaid to state and become part of the state’s revolving loan fund to support future projects. Thus, even though the loans are not grants, the loan portion of ARRA funding still permanently brings new funding into the state of Nebraska to support wastewater systems infrastructure projects. Therefore, the impact of these funds should be counted just as with grants, and analysis will consider the economic impact of all \$20,045,000 in funding.

Selecting a Sector

A naïve analysis of the economic impact of ARRA spending on wastewater systems infrastructure would place all ARRA spending into Sector 36 of the IMPLAN model. IMPLAN Sector 36 is entitled Construction of Other New Nonresidential Structures. The primary components of this sector include spending on construction of water, sewer, or other systems and spending on construction of roads, bridges, and highways. As a result, IMPLAN Sector 36 represents a broader set of construction expenditures that includes wastewater systems but encompasses a variety of activities. Each of these activities, however, includes significant activities in moving earth and soil but also significant activity in building earthen and concrete (or asphalt) structures.

The choice of IMPLAN Sector 36 would be appropriate for a significant share of the U.S. Environmental Protection Agencies ARRA funding for state wastewater systems infrastructure. But, the choice of Sector 36 would not be appropriate for all of the spending. This is because not all of the funding is spent with firms engaged in the construction activities encompassed by IMPLAN Sector 36. For example, a portion of the spending would go to the basic engineering activities required to plan and scope out specific wastewater infrastructure projects. Other spending could go towards purchasing of equipment for water treatment plants rather than infrastructure construction. Such spending would occur in the wholesale sector rather than the construction sector.

Our analysis allocated the ARRA wastewater infrastructure funds for the case of Nebraska into IMPLAN Sector 36, but also into architecture and engineering sector and other impacted sectors. To allocate spending into sectors, we obtained a complete Summary Project List for the 16 wastewater projects (Clean Water projects in the Nebraska nomenclature) that received partial or full funding for ARRA projects. The data was obtained from personnel at the Nebraska Department of Environmental Quality (NDEQ). Five of the 16 projects received full funding from ARRA, and the other 11 received partial funding. The NDEQ also provided descriptions of the purpose of each project and list of firms that received the funding.

Table 1 below shows the IMPLAN sectors and activities for firms that received ARRA funding for wastewater infrastructure projects. The largest share did go to excavating firms and wastewater facility construction firms. These are part of IMPLAN Sector 36. Excavating and wastewater construction firms received an estimated 72.9% of ARRA wastewater funding in Nebraska. But clearly, it would not be appropriate to naively assign all spending to this category given that more than a quarter of ARRA funds were passed through to firms in other industries. Engineering firms also received 13.1% of funding, while wholesale trade businesses earned 11.5% of sales. These firms designed the projects or provided

equipment installed at wastewater facilities. Remaining funds went to support firms that rent or lease heavy construction machinery, install water meters, or even the land application of sewage.

Table 1
Sectors Where ARRA Wastewater Funds were Spent

IMPLAN Sectors			
Number	Description	Spending	Percent Spending
19	Support Activities for agriculture and forestry	\$166,345	0.8%
36	Construction of other new nonresidential structures	\$14,614,535	72.9%
40	Maintenance and repair of residential structures	\$223,973	1.1%
319	Wholesale Trade	\$2,302,465	11.5%
365	Commercial & Industrial Equipment Rental & Leasing	\$103,509	0.5%
369	Architecture, Engineering, and Related Services	\$2,634,173	13.1%
Total		\$20,045,000	100.0%

Input-Output Model Results

We used the percentages calculated in Table 1 to calculate an aggregate set of economic multipliers for ARRA Wastewater Funds. The multipliers show the direct and total output, direct and total employee compensation, and direct and total employment impacts per \$1,000,000 in funding in ARRA wastewater funds. Total impacts are the sum of the direct, indirect, and induced impacts. Multiplier estimates reflect that while three-quarters of direct spending occurs in IMPLAN sector 36, the remaining spending is split among other sectors. Importantly, approximately one-eighth of spending occurs in architecture, engineering, and related services, while a similar amount goes for the direct purchase of equipment, and is captured in the wholesale trade sector. This wholesale trade component has important implications for the aggregate multipliers since only the markup portion of the wholesale spending is pertinent for state economic impacts. This is why the direct multiplier for output is below 1. The result for the wholesale trade sector also points out an important distinction between a national and state economic impact. It would be unusual that specialized manufactured goods would be manufactured in the state where it is utilized, particularly for a smaller state like Nebraska. However, unless the good was imported from overseas, it would be manufactured within the United States, so the national economic impact would incorporate the manufacturing activity as well as the wholesale component, yielding a much larger impact.

Results indicate that each \$1,000,000 in spending on wastewater projects leads to 6.4 jobs in direct spending in the projects directly funded. This is lower than the 7.1 jobs per million dollars of spending in Nebraska for industry 36. Thus, our careful analysis of spending patterns for ARRA

wastewater funds, as opposed to assuming all spending occurred in IMPLAN sector 36, yielded a direct impact that was 10% lower. The total statewide economic impact included in the indirect and induced spending at businesses throughout the economy is 11.6 jobs per \$1,000,000 in spending. This total employment impact is also approximately 10% less than the 12.6 jobs per \$1,000,000 in spending that prevails in IMPLAN sector 36.

Table 2
Economic Multipliers for ARRA Wastewater Spending in Nebraska

	Output	Labor Income	Employment
Spending	\$1,000,000	\$1,000,000	\$1,000,000
Direct Impact	\$898,546	\$341,202	6.4
Indirect and Induced	\$625,323	\$209,660	5.2
Total Impact	\$1,523,869	\$550,862	11.6
Multipliers Per Dollar of Spending			
Direct Multiplier	0.90	0.34	0.0000064
Indirect and Induced	0.63	0.21	0.0000052
Total Multiplier	1.52	0.55	0.0000116

Economic Impacts of Nebraska’s ARRA Wastewater Projects

Economic impact estimates for ARRA Wastewater spending are presented in Table 3. In other words, the table shows the total economic impact in Nebraska for the \$20.045 million in ARRA funds that the United States Environmental Protection Agency provided to the State of Nebraska for distribution to priority wastewater projects in the state. The total impact on the state economy was \$30.5 million in economic activity. The total employment impact was 231.7 jobs *for a period of one-year*. It is possible, of course, that fewer jobs could have been supported for more than one year or that a much larger number of jobs could have been supported during a 4 to 6 month construction period. Of these, 127.8 jobs were created directly at the projects funded by U.S. Environmental Protection Agency spending. The remaining 103.9 jobs were generated at businesses throughout the Nebraska economy including retail businesses, service businesses, and others.

The jobs generated \$11.0 million in labor income in Nebraska, including \$6.8 million in direct labor income spread over the 127.8 direct jobs created at the projects funded by ARRA funding from the U.S. EPA. This is the equivalent of \$53,500 in labor income per jobs, reflecting the relatively high pay of the construction jobs created in projects to improve wastewater systems. There also was \$4.2 million indirect and induced labor income spread over the 103.9 induced and indirect jobs created by the ARRA

funding from the U.S. EPA. These jobs paid an average of \$40,500 jobs, which is also higher wage employment. These findings indicate that the ARRA wastewater funding not only created several hundred jobs in the State of Nebraska but that the funded also supported higher wage employment in terms of both direct employment and indirect and induced employment.

Table 3
Economic Impact of ARRA Wastewater Spending in Nebraska

	Output	Labor Income	Employment
Spending	\$20,045,000	\$20,045,000	\$20,045,000
Direct Impact	\$18,011,356	\$6,839,402	127.8
Indirect and Induced	\$12,534,602	\$4,202,633	103.9
Total Impact	\$30,545,959	\$11,042,035	231.7

Summary

An in-depth analysis was conducted into the projects supported by U.S. Environmental Protection Agency ARRA funding for the State of Nebraska. This funding is used by the Nebraska Department of Environmental Quality (NDEQ) to support priority capital investments in local wastewater systems in towns and cities around the state. The research team examined the specific investment projects funded by the NDEQ and the specific firms that received funding for those investment projects. Around three-quarters of the funding went to excavation and other wastewater system construction firms. These firms are part of IMPLAN Sector 36 (Construction of other new nonresidential structures). But around one-quarter of funds went to businesses in other industries. Around one-eighth of funding went to engineering and design firms (IMPLAN sector 369) while a similar share of funding went to purchase wastewater system components from wholesale trade businesses (IMPLAN sector 319). These findings show that it is inappropriate to assume that 100% U.S. Environmental Protection Agency funding for wastewater system improvement projects will ultimately allocated to firms in IMPLAN Sector 36. Our results show that a better approximation for states would be to precisely follow the shares we report in Table 1, or to assume 75% would be allocated to firms in IMPLAN sector 36, 12.5% to firms in IMPLAN sector 369, and 12.5% to firms in IMPLAN sector 319. Doing so will yield estimated economic multipliers and economic impacts that are 10% lower than those obtained by naively assuming all funding goes to IMPLAN sector 36.

This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership. This solution is copyrighted by the institution that created it. Internal use by an organization and/or personal use by an individual for non-commercial purposes is permissible. All other uses require the prior authorization of the copyright owner.