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Introduction

This is the fourth and final report to the Onondaga Lake Management Conference about the economic and fiscal implications for Onondaga County of court-mandated expenditures for sewer-related remediation of Onondaga Lake. Exactly how much remediation will cost and what, precisely, will be the technical specifications of the plan that is finally approved by the court are both still to be decided. Yet, there is little doubt that an undertaking of the dollar magnitude contemplated for lake remediation has the potential to affect the fiscal condition of the county and the future health of the local economy.

The fundamental objective of this and the three previous reports is to present a detailed analysis of the likely economic and fiscal consequences of Onondaga County's lake remediation efforts. As we demonstrate here and in the other reports, there is a close linkage between the health of the local economy and the fiscal condition of the local government. Thus, an undertaking such as lake remediation will have effects on economic and demographic variables such as personal income, employment, and population just as it will influence county government expenditures, debt levels, and sewer use fees. Our research aims to make the connection between the local economy and the fiscal condition of county government as we forecast the economic and fiscal consequences of spending on sewer-related lake remediation.

The research design for this project had three major components:

Analysis and Baseline Forecast of the Syracuse Metropolitan Area Economy: These issues are addressed in the first two reports: William Duncombe and Wilson Wong, "Onondaga County's Economic Performance Since 1980 and Prospects for the Next Decade," and Shannon Felt, James R. Follain, and Suzanne McCoskey, "A Review and Forecast of the Onondaga County Economy." The first of these reports examines trends in population and demographic changes, including migration patterns and characteristics of migrants into and from the county; trends in

employment and unemployment and in the competitiveness of local industries in the Syracuse MSA; and, finally, the effects of economic and demographic changes on the income of Onondaga County residents. The picture that emerges from this analysis is one of slow growth for the county in the years immediately ahead.

Using a highly-regarded regional econometric model known as REMI, the authors of "A Review and Forecast of the Onondaga County Economy" provide a review of the local economy over the past 25 years and a long-run forecast of the Syracuse MSA. The report documents and discusses the trend toward less manufacturing employment and more service employment. Migration patterns of the population are also examined. The short-run forecast calls for improvement in the economy in the late 1990s relative to the earlier years of the decade, but the longer-run forecast is less rosy. Population growth will be positive but below the national growth rate. Employment growth rates are forecast to decline gradually from about 1 percent per year in the late 1990s to lower levels over the remainder of the forecast period.

Analysis and Baseline Forecast of Onondaga County's Fiscal Condition: In the third report, "The Outlook for Onondaga County's Finances: Baseline Scenario," William Duncombe and Bernard Jump, Jr. (1997) offer their assessment of Onondaga County's current financial condition and its likely ability in the years ahead to bear the fiscal burden associated with financing a sewer-related lake remediation undertaking. The authors conclude that the county remains in reasonably good shape financially despite a decade that has not been financially friendly to most local governments. It continues to retain its highly coveted Aa bond rating, it has held spending in close check during the first half of the 1990s, and it has reduced the number of employees on the county payroll. But Onondaga County's tax burdens are high by most measures, spending in relation to personal income is high for a central city county, and the county's debt burden exceeds

the norms for jurisdictions of its size. Perhaps most worrisome are the authors' conclusions regarding sewer rates. Notably, the county's sewer rates, which are already high in comparison to rates in other metropolitan areas, could increase significantly when remediation spending begins. Even without remediation spending, sewer rates might increase sharply if nonremediation O&M and capital spending grows as rapidly as the most pessimistic scenarios assume.

Policy Simulations and Analysis of Sewer-Related Lake Remediation Proposals: The analysis described in this final report is the culmination of the research project. The goal is to present policymakers with information about the impact of various lake remediation scenarios upon the Onondaga County economy and the fiscal health of the county government. Since a final remediation plan has not been adopted, we analyze a substantial number of variations of the most recently and publicly available remediation plan—the January 1996 Municipal Compliance Plan (MCP) submitted by the county. This plan calls for a variety of expenditures and improvements to the Combined Sewer Overflow (CSO) system and to the METRO wastewater treatment plant beginning in 1997 and continuing to the year 2020. The details of the plan and its goals are summarized in *Preliminary Municipal Compliance Plan: Public Information Summary*, which was published on January 11, 1996.

Given the choice of a remediation strategy, the analysis follows a standard and well-accepted principle of public policy analysis of this type. Namely, the analysis focuses upon the marginal or additional impacts of a lake remediation plan relative to a baseline forecast about the performance of the local economy and the fiscal condition of the county government in a situation where there is no mandated remediation spending. The analysis does allow for a rich array of responses to the implementation of the plan. For example, the higher fees associated with the plan increase the cost of business and have a negative impact upon the demand for labor and the

relative attractiveness of the area as a place to do business. Also, the potential environmental benefits of the plan are incorporated into the analysis and offset to some extent the negative impacts of the higher fees. Many other economic interactions of this type are incorporated. Some other kinds of potential responses to the plan are not incorporated. For example, the county may choose to make major changes in its budget if lake remediation proves to be particularly onerous. Changes such as these are not included because they are beyond the scope of our particular mandate and, in our view, because such analysis is premature. Analysis of the many possible ways in which the county might choose to adjust its baseline budget is a separate and complex task that ought to be led by the county after it has good information about the impact of lake remediation, holding its baseline policies and fiscal plans unchanged, which is what this report seeks to do.

The next section of this report presents our analysis of the economic impact of lake remediation. Then, we turn to an examination of the impact of remediation spending on sewer fees and on the fiscal health of the county. The final section summarizes the main conclusions of the report and offers several important caveats.

Assessment of the Economic Impact of Lake Remediation and Other Capital Investment on Onondaga County

The primary purpose of this section is to present the results of an economic analysis of various lake remediation scenarios. The analysis focuses on the impact of various remediation scenarios *relative* to a baseline forecast of the Onondaga County economy for the period 1996 to 2035. The central analytical tool used in the analysis is the REMI model, which is a large scale simulation model of a regional economy (Treyz 1993). The REMI model has been widely used for many years to analyze various economic and environmental plans. The particular version used

in this analysis is calibrated to the Onondaga County economy. A previous report examines the REMI forecast of the local economy and provides a fuller explanation of the elements of the model most relevant to this particular application (Felt, Follain, and McCoskey 1997).

The section consists of three parts. The first discusses five questions that are critical to any economic analysis of lake remediation plans; the answers we provide to these questions serve as the key assumptions underlying the analysis. The main results of the analysis are presented in the second part; in particular, the results of seven different lake remediation scenarios are presented and discussed. The final part summarizes the major conclusions of the analysis and highlights several important caveats that accompany the analysis.

Key Issues

Any analysis of the long-run economic impact of a policy as complex as lake remediation is based upon a number of assumptions. If the assumptions prove to be wrong, the predictions of the model will not be realized. As a consequence, it is always wise to highlight the assumptions thought to be both important and difficult to substantiate fully. This is especially important in this report given the complexity of lake remediation, the length of the forecast, and the controversial legacy associated with efforts to improve the quality of Onondaga Lake.

We choose to discuss five issues or questions that are most important to the analysis. Which remediation plan is analyzed? What criteria are employed to analyze remediation? What are the marginal costs of remediation? What are the potential environmental benefits of remediation? How will remediation be financed? Each is discussed in turn.

Which Remediation Plan is Analyzed?

As noted above, our analysis examines the Municipal Compliance Plan (MCP) presented by the county in January 1996.[1] This particular plan addresses water quality problems related to sewer treatment by the county. The bulk of this plan seeks to improve the Metro Waste Treatment plant and the quality of water it discharges into Onondaga Lake. Another key element of the plan is the mitigation of water quality problems related to combined sewer overflow facilities (CSOs). The analysis does not address any of the other plans that have been discussed over the years such as the diversion of the water discharge from the Metro plant to the Seneca River. Neither does the analysis address remediation of Onondaga Lake pollution related to Allied Chemical. Analysis of this particular issue is outside the scope of this project.

The final plan will surely deviate from the preliminary plan in some respects. Indeed, negotiations about the exact nature of the plan continued throughout the period of our analysis; however, we were not privy to those negotiations. Nonetheless, analysis such as ours is intended to aid in the development of the final plan; as a consequence, our analysis focused on what we consider to be the variations in the plan most likely to affect conclusions regarding the economic and fiscal impact of the final plan. These include the assumptions regarding the environmental benefits of the plan, the cost of other waste treatment expenditures, the amount of external financing, and the various ways of financing the plan. Clearly, research based on details from the final plan would provide a more precise estimate of the effects of lake remediation; however, we believe this research strategy provides the policymakers with a clear picture of the likely impact of various lake remediation plans and a good sense of the assumptions most critical to our analysis.

What Criteria are Employed to Evaluate the Remediation Plan?

The economist's ideal criterion for a project of this type is the ratio of benefits to costs. If the ratio exceeds unity, the economist typically recommends adoption of the project. Unfortunately, this criterion is not adopted in this report because the project does not include the explicit measurement of the benefits of remediation. Such measurement is expensive and subject to numerous assumptions and, in any event, outside the scope of our mandate. As such, the criterion adopted in this study is the impact of lake remediation upon several measures of aggregate economic activity. Three measures are emphasized, although many more are actually generated by the REMI model. These three are total private nonfarm employment, total population, and real disposable income (1996 dollars). The larger the negative impact of lake remediation upon these three measures, the more severe will be the economic consequences of remediation. Although movements in these variables over time are not perfectly correlated, our previous report shows that they have moved closely together in the recent past (Felt, Follain, McCoskey 1997).

What are the Marginal Costs of Remediation?

The question relates to a particularly important point: expenditures directly related to lake remediation are only part of the additional waste treatment expenditures the county will incur in the coming years. Our primary assignment pertains to lake remediation expenditures, but given the potential size of these other expenditures, we pay close attention to them. A separate scenario is examined that relates only to these additional expenditures; we also examine a scenario that includes both remediation and these additional waste treatment expenditures. A fuller discussion of these other expenditures and the forecasting methods used to estimate them is contained in the

next section of the paper which addresses sewer rates; this section reports on their likely impact upon the local economy.

What are the Environmental Benefits Associated with Remediation?

A study of this type would usually include the estimation of the benefits of lake remediation. The benefits are of two types: tangible and intangible. The tangible benefits usually include the increased recreational benefits that may be associated with the environmental project; in this case, the benefits would stem from the expectation that Onondaga Lake will be swimmable by the year 2020. The environmental benefits of lake remediation may also take a different form; some people may simply be willing to pay some amount of money to make Onondaga Lake cleaner even if they have no desire to use it for recreation. These benefits are referred to in the literature as intangible or nonuse benefits.

Measurement of either type of benefit is expensive and difficult, although the literature contains numerous examples of projects that include such measurement.[2] Furthermore, and most importantly, in contracting for the work we report on here, the Onondaga Lake Management Conference explicitly ruled out any effort on our part to measure these benefits. Nonetheless, any study of lake remediation ought to at least consider the possibility of some benefits, which is what we try to do. Our aim is not to offer a precise estimate of these benefits but rather to show the sensitivity of the overall analysis to various benefit scenarios. It is up to the policy makers and their constituents to judge which is the most likely scenario and the importance of the environmental benefits to the ultimate policy decision.

Our base case estimate of the benefits draws upon both the large literature that looks at various ways to measure the value of recreational trips and a previous Lake Management Conference sponsored report by Apogee. The Apogee report suggests that households will make

one additional trip to the lake per year for recreation (Apogee 1993). The recreation literature suggests that the value of an additional trip for swimming, boating, and fishing is worth about $20 per trip in 1987 dollars (Walsh, Johnson, and McKean 1988). This amounts to about $26 per trip in 1996 dollars. We further assume that this additional trip would replace some other activity worth 60 percent of the additional recreational trip, which implies a value of $10 for an additional recreational trip to the lake per household in 1996 dollars. We increase this value by the projected rate of the inflation of the general price level and begin including these benefits in the model in 2020, the year in which the lake is expected to be swimmable according to the January 1996 MCP.

How Will Remediation Be Financed?

Lake remediation is assumed to be financed entirely by higher sewer fees. That is, we assume for the base case that the county will receive no state or federal aid toward the cost of remediation. These additional sewer fees are split between the residential sector and the business sector: the residential sector pays 75 percent of the fees and the business sector the rest. In terms of the REMI model, higher sewer fees represent reductions in real disposable income to the residential sector and increases in the cost of business to the business sector. The cost of business is increased for all sectors in proportion to their share of total employment in 1994.[3]

Although sewer fees are the ultimate source of the payment for remediation, in fact, the county is assumed in the base case to rely upon the capital markets for initial financing of the capital component of remediation. Each year in which a substantial capital expenditure is undertaken, the county is assumed to obtain a 20 year loan for 85 percent of the expenditures. Sewer fees are used to pay the debt service costs along with operating and maintenance costs and the portion of capital costs not financed with long-term municipal debt. More information about

the financing mechanism is provided in the previous report by Duncombe and Jump (1997) and in the next section.

The possibility of some external funding of the lake remediation project exists. New York's Environmental Bond Act of 1996 is expected to provide $75 million to Onondaga County for Onondaga Lake remediation. Apparently, some additional support from the federal government is a possibility as well. Although the precise amount and timing of such aid has not been announced, two scenarios are considered that include differing amounts and patterns of external financing. These provide useful comparisons to our scenarios that do not include any external funding.

Analysis of Various Scenarios

Seven scenarios are considered. Scenario 1 serves as the base case scenario and focuses upon the January 1996 MCP. Scenario 2 examines the economic impact of the additional waste treatment expenditures that are unrelated to remediation; Scenario 3 is a combination of both 1 and 2. Scenarios 4 and 5 both incorporate external funding (i.e., state or federal aid) for a portion of remediation costs. The final two scenarios make allowances for different levels of benefits as partial offsets to the costs of remediation. As noted above, these scenarios are likely to encompass the most salient features of the final plan.

Scenario 1: Lake Remediation Only. Scenario 1 seeks to identify the impact of the implementation of the January 1996 MCP on several aggregate measures of the Onondaga County economy. The impact is measured relative to a baseline economic forecast of the economy generated by the REMI model. The expenditures that would be made have both positive and negative impacts upon the economy. The obvious negative impacts stem from the increase in sewer fees needed to pay for the project. These represent reductions in household

income and increases in the cost of business, both of which make Onondaga County a less attractive place to live and a less profitable place to do business, all else equal. The positive impacts are of two types. There are short-term stimulative effects during the years in which the construction expenditures are greatest. In addition, any environmental benefits generated by the lake remediation improve the quality of life in Onondaga County. This improvement in the quality of life leads to reductions in out-migration of population, lower wages, and higher demand for labor relative to the baseline forecast.[4] We seek to determine whether the negative effects of higher sewer fees dominate the positive effects of additional construction expenditures and improvements in the quality of life.

The specific assumptions underlying Scenario 1 are made more explicit in Table 1. The left portion of the table indicates the information relevant to the calculation of the benefits of lake remediation for selected years between 1996 and 2035.[5] The first column represents the operating and maintenance expenses (O&M) in the January 1996 MCP. These are assumed to grow at the rate of inflation forecast by the REMI model, which is about 2.5 percent per year. The next column represents the capital expenditures for improvements to the Metro facility and to reduce the CSO problem. The MCP plan indicates the cost of these expenditures if they were to be incurred in 1996 ($296 million); they are based upon a capital plan produced by the county. We simply take these expenditures and allocate them over time according to the information provided in the MCP. These expenditures are also assumed to grow at the REMI rate of inflation. The present value of both the capital and O&M expenditures is about $250 million at a discount rate of 6 percent.

Only construction and O&M spending done locally have a positive impact on the local economy; purchasing chemicals and building materials from vendors outside the area does not

contribute to the local economy. Therefore, it is necessary to estimate the fraction of these expenditures to be spent locally. We use assumptions consistent with previous studies of this type and those used by the county in their previous analysis of the issue. These vary by the components of the O&M and the construction expenditures. Roughly, about 40 percent of the expenditures are expected to be spent locally; that is, the regional purchasing coefficient (RPC) averages about 0.40 among all components of the project during the forecast period.[6] The RPC adjusted expenditures are fed into the REMI model and, all else equal, generate positive economic impacts on the economy.[7]

The final component of the benefits equals the potential environmental benefits associated with a cleaner lake. The specific assumptions underlying these calculations are discussed above; the specific amounts of dollars represented by these benefits are in the fifth column of Table 1. They are zero until 2020 and then total $8.1 million. Recall that these assume one additional recreational trip per household and the net value of each additional trip is about $10 in 1996 dollars. These environmental benefits grow at the REMI rate of inflation beyond 2020. The present value of these benefits through 2035 is about $25 million.

The right portion of Table 1 contains information about the costs of lake remediation. The far right hand column indicates the net tax associated with lake remediation; sewer fees will have to be increased by this amount in each year. Seventy five percent of the sewer fees are assigned to the residential sector and 25 percent to the business sector. The other columns indicate the uses of the net tax: debt service payments; capital expenditures financed out of current revenues (cash capital); O&M expenses, which are assumed to be financed out of current revenues; and the outside contribution, which is assumed to be zero in Scenario 1.

Analysis of this scenario with the REMI model provides information about the changes in hundreds of different measures of the local economy. Information about several of these variables for selected years is provided in Table 2. Information about the subset on which this analysis focuses—private employment, population, and real disposable income—is contained in Table 3 and Figures 1A and 1B.

Focus, first, on the effect of remediation upon private nonfarm employment. The economy produces fewer jobs with remediation than without. The trough in terms of job loss occurs during the period 2010-2020, which is the peak period of activity surrounding lake remediation in terms of construction and increased sewer fees. The predicted number of jobs during this period is about 800 less than would be predicted without remediation. The loss in jobs rises steadily until 2016 and then steadily declines. By the year 2035 job losses are below 400. Similar patterns are observed for both population and real disposable income. The maximum population loss is above 1,800 in the period 2015-2020; the maximum loss in real disposable income approaches $25 million during this period as well.

Information is also provided in Table 3 and Figure 1B about the relative impacts of lake remediation. The job losses represent about 0.3 of 1 percent of total private employment during the years of peak losses. In most other years, job losses are less than 0.2 of 1 percent of total jobs. Population losses represent a slightly larger share of the base; the peak years see population declines around 0.35 of 1 percent. Percentage losses in real disposable income are the smallest in relative terms; they never exceed 0.2 of 1 percent.

Scenarios 2 and 3: Incorporating Other Waste Treatment Spending. These two scenarios focus on the other waste treatment spending projected for the county. Scenario 2 models the impact of these expenditures without any remediation related expenditures; Scenario 3

includes both remediation and these other expenditures. The benefits of remediation are excluded from Scenario 2; both scenarios, like Scenario 1, exclude any outside funding. Also, as in Scenario 1, sewer fees are ultimately used to finance these expenditures. Assumptions regarding the distribution of these fees between business and the residential sector and the use of bonds are the same as in Scenario 1.

The critical component of these two scenarios is the amount of other capital and O&M expenditures. Unfortunately, a capital plan for other waste treatment expenditures is not available; as a result, these have to be estimated. Briefly, these additional O&M and capital expenditures are based upon recent historical experiences for O&M, and upon the county's 1996 to 2001 Capital Improvement Plan for capital. For the economic analysis, baseline expenditures are assumed to grow at 2 percent above the rate of inflation of the general price level (which averages approximately 2.5 percent). More information is provided about the methodology and the fiscal forecasts in the next section and in the previous paper by Duncombe and Jump (1997). The essential elements of Scenario 2 are presented in Table 4; those for Scenario 3 are in Table 5.

Two important points should be noted about the distribution of these other expenditures and the sewer use fee burden associated with them. First, the expenditures increase throughout the forecast period. This follows directly from the assumptions underlying them; they are forecast to grow at 2 percent above the rate of inflation. Second, they eventually become much larger than the expenditures related to remediation. This is not true until about 2010, but beyond 2020 these other expenditures continue to grow and remediation expenditures drop off rather rapidly. In 2035, these other expenditures are over ten times the size of remediation expenditures.

Given the sharp differences in the patterns of the two expenditure scenarios, differences in the economic impacts of the scenarios are not surprising. Employment losses increase throughout

the forecasting period and reach a maximum loss of over 1,500 jobs in 2035 in Scenario 2 (see Figure 2). Population losses exceed 3,500 by the end of the 2035 and real disposable income losses exceed $50 million.

The negative economic impacts of the combined scenario (Scenario 3) are even more striking. As shown in Figure 3, job losses steadily decline over the forecast period. They are roughly twice the amount in the remediation only scenario and total about 2,000 in 2035, which represents about 0.75 of 1 percent of total employment in that year. The declines in population and real disposable income relative to their baselines are also much larger than in Scenario 1. Population losses reach 4,500 people or about 1 percent of the total population of Onondaga County.

Scenarios 4 and 5: External Funding. For illustrative purposes, Scenario 4 assumes that half the cost of remediation comes from state or federal aid. While 50 percent external funding is far in excess of any proposals known to us, the results of the scenario provide the reader with a basis for estimating the impact of lower or higher proportions of remediation costs that might be financed from external sources. Scenario 5 incorporates the $75 million of funding that, presumably, will be provided by New York State as a result of the passage of the Environmental Bond Act. In the absence of any information about the rate at which the $75 million will be dispensed by the state to the county, we have assumed that payment is made in 10 equal installments of $7.5 million each during the period 2001-2010. In all other respects, these two scenarios are identical to Scenario 1.

Predictably, in Scenario 4 the negative impact of remediation is only half as large during the period 2010-2020 as it is in Scenario 1. Job losses are less than 400, population declines by less than 900, and real disposable income also drops by half during this period (see Figure 4).

Note, however, that the losses beyond 2020 are less than 50 percent of those in Scenario 1; this follows because the benefits of remediation begin to have their positive impact at this stage. So while it is true that 50 percent external financing reduces the negative impact of remediation by 50 percent during the peak years of construction and sewer fees, the overall impact of 50 percent external financing is to lessen the negative impact of remediation by more than 50 percent.

This is an important point to make because it demonstrates how the analysis of the scenarios in the report sheds light on other possible scenarios that may ultimately be adopted. For example, external financing equal to 25 percent of the total cost would reduce the negative impact of the plan by about 25 percent during 2010 to 2020 and by even more in years beyond 2020. In this sense, the linearity or proportionality of the REMI model allows inferences to be drawn about many other scenarios not directly considered in the report.

The impact of scenario 5 follows much more closely the pattern in Scenario 1. However, the $75 million dollars from the state both postpones the arrival of these negative impacts and dampens their effects (see Figure 5). Job losses are below those in Scenario 1 throughout the period in which the funds are provided; for example, employment losses in Scenario 5 are 178 in 2005 compared to 396 in the scenario without external support. A similar pattern exists with regard to population and real disposable income, although the external financing does reduce their maximum losses by a modest amount during the peak years as well.

Scenarios 6 and 7: Incorporating More Environmental Benefits. As noted above, our estimates of the environmental benefits associated with remediation are based upon limited information. Furthermore, the benefits embedded in Scenario 1 have a small effect in reducing the negative economic impact of Scenario 1; these benefits are simply too small and occur too late in the process to offset the negative effects of the higher sewer fees. The purpose

of Scenarios 6 and 7 is to investigate how large these environmental benefits would have to be to offset the negative impacts of remediation spending.

Scenario 6 increases environmental benefits by a substantial amount. This scenario includes intangible or nonuse benefits. These represent the amount households in Onondaga County may be willing to pay merely to improve the quality of Onondaga Lake over and above any tangible recreational benefits associated with remediation. Specifically, we assume that the amount of intangible benefits equals the amount of tangible benefits but they are realized or enjoyed by households immediately. This is one of many possible assumptions which could be made about the size and timing of remediation.

The critical result in Scenario 6 is that these extra environmental benefits do not alter the results of Scenario 1 very much regarding job losses (see Figure 6). Job losses in 2035 have been reduced by about 100, and the decline in the economy is a bit slower in Scenario 6, but the overall patterns of the effects of Scenario 1 and 6 are quite similar. The maximum job loss during the period 2010-2020 is about 750 or 93 percent of the maximum loss in Scenario 1. The loss in real disposable income is slightly smaller. The differential impacts on population are more substantial; the maximum population loss in Scenario 6 is 83 percent of that in Scenario 1. In sum, the main conclusion of Scenario 6 is that the environmental benefits associated with lake remediation would have to be substantially larger than we assumed in the base case in order to reverse our fundamental conclusion: lake remediation will have a negative impact on the local economy.

The final scenario addresses the question: what would the level of environmental benefits have to be in order for the lake remediation project to have an economically neutral impact? In other words, we want to measure what the average household in Onondaga County must be willing to pay for the environmental benefits generated by the project in order for the level of

employment, income, and population within the county to be essentially unaffected by the lake remediation project. The answer to this question serves as a low cost alternative to a comprehensive study of the environmental benefits of lake remediation, which we do not undertake in this study. It is hoped that the answer will help stimulate additional discussion among decision-makers and citizens about the benefits of lake remediation and highlight the need for additional research on the subject.

Our definition of economically neutral is akin to what would be produced in a comprehensive benefit-cost study. According to this definition, the economically neutral outcome is one in which the present value of the benefits just equals the present value of the costs of the project. These costs represent the annual differences between the level of disposable (or after-tax) income within the county if the project is undertaken and the level of disposable or after-tax income if the project is not undertaken. Part of the change in income is simply the reduction in disposable income due to the higher sewer fees associated with the project. The other part is calculated by the REMI model and measures the various ripple or multiplier effects generated by the project; as such, it takes into account the impact of the project upon local wages, prices, employment, exports, migration and all of the other economic variables forecast in the REMI model. The period over which these benefits and costs are calculated is the forecast period of the model: 1996 to 2035.

We estimate the level of environmental benefits per household needed to generate an economically neutral outcome to be about $120 per household in 1996 dollars. That is, if each household values, on average, the improvement in the quality of the lake to be about $120 per year in 1996 dollars, the impact of the lake project upon the local economy will be negligible. Economists like to refer to this number as the willingness to pay for environmental benefits. If

households are willing to pay less than $120 per year for the improvements in the lake, the project will reduce the level of employment, population, and disposable income within the county; if households are willing to pay more than $120 per year, the project will increase the size of the economy.

Recall that the first scenario includes estimates of the net environmental benefits of only $10 per household per year and these benefits begin in 2020. This estimate is based upon a number of conjectures on our part and is not based upon a comprehensive study of the environmental benefits of remediation. As we demonstrate, the assumed level of benefits in scenario one is insufficient to generate an economically neutral outcome; employment, population, and real disposable income are all predicted to decline within the forecast period if the lake remediation project is undertaken. This means that the estimates of the environmental benefits embedded in our first scenario would have to be well off the mark in order to negate our conclusion that the lake remediation will have a negative impact upon the economy. Nonetheless, a comprehensive study of the dollar value households in Onondaga County place upon the improvements in Onondaga Lake would be valuable input into the decision-making process surrounding court-mandated lake remediation.

The Impact of Lake Remediation and Other Wastewater System Costs on Sewer Fees and the Fiscal Health of Onondaga County.

Our report on the outlook for Onondaga County's finances found them to be in reasonably good shape at present. Yet, our examination of actual spending on wastewater system plant improvements versus the levels of planned improvements contained in the county's CIP suggests that the county might be facing a large backlog of needed capital improvements. Because of the lack of long-range planning about future sewer system needs, the required future capital

investments are very uncertain. Also, the sanitary system's O&M spending has been growing much more rapidly over the last 15 years than the overall county budget. We demonstrated in our forecasts of sewer rates what might happen to rates if there is a large backlog that must be reduced and if O&M spending cannot be held in check.

In this section we expand our previous analysis by including the impact of sewer-related remediation spending. First, consideration is given to the potential impact of remediation spending on sewer rates over the next 40 years. We then turn to an examination of the impact of remediation and other wastewater-related spending on the fiscal health of the county. Specifically, forecasts are generated of key revenue and expenditure categories for the county, using economic forecasts from REMI. Finally, we estimate what various potential levels of capital spending for wastewater facilities could mean for the county's debt burden in the future.

Sewer Rate Projections and Future Rate Burdens in the County

Key Assumptions and Methodology. Sewer rate projections are based on the methodology employed in the third report. Growth in capital expenditures and O&M expenditures is projected for four different baseline cases (Table 6). Projections are based on four alternative real growth rates ranging from 6 percent above inflation to growth at the inflation rate (0 percent real growth). The two medium scenarios, upon which we will focus most of our attention, assume real growth rates of 2 percent and 4 percent, respectively.

Capital expenditure projections are based on the Onondaga County 1996-2001 CIP. The assumption is that capital spending in the year 2002 will equal annual average capital spending from 1996 to 2001; after 2002, expenditures are increased by the assumed real growth rate. Since Onondaga County has seldom come close to fully funding its CIP over the last decade, we look at three different funding levels for the CIP. To calculate cash outflows for capital, we assume that

15 percent of capital expenditures is funded by current revenue for the nonremediation capital expenditures. The remaining 85 percent of the amount of the required capital expenditure every year is assumed to be funded by 20 year GO bonds (cash flow financing). Given the significant increase in outstanding debt accompanying most of the baseline cases, we assume that the county's bond rating will be downgraded to A for the medium-low scenario and Baa for the two high scenarios. Interest rates are based on rates prevailing in mid-1997 with the range between Aa and Baa rated bonds estimated to be 25 basis points. Following past county practice, we assume that 85 percent of capital spending on remediation is financed with 20-year GO bonds at an interest rate of 6.25 percent. The remainder of capital spending is financed out of the operating budget.

Estimation of future sewer fees required a forecast of some socio-economic variables as well. The growth for units and households is tied directly to the forecast for population in REMI. To be conservative, units are assumed to grow at the same rate as population despite the fact that historically they have grown faster. Households are assumed to grow faster than population based on recent trends toward smaller households. Median household income is assumed to grow at 82.5 percent of the rate for per capita personal income based on the historical relationship between them from 1979 to 1989. Per capita personal income is forecast using REMI.

User Fee Projections. As indicated in the report by Duncombe and Jump (1997), it would be preferable to base forecasts of sewer rates on a comprehensive long-range plan of the sanitation district that identifies future capital needs and the potential impact on O&M costs of events such as changing environmental regulations. Because the uncertainties surrounding future O&M and capital costs are so great, we have developed a range of rate forecasts for the baseline scenario. As noted above, the county's estimated expenditure patterns reported in the January

1996 MCP are utilized for the remediation scenario; these are presented in Table 1. However, the impact of several external financing options for remediation are examined.

Tables 7 to 9 breakdown future rate growth into several components; 1) continuation of past spending trends with rates increasing due to inflation only, 2) the additional rate burdens which will result from remediation spending, and 3) rate increases needed to fund additional capital and O&M spending in the district. As discussed previously, four baseline scenarios are considered. Sewer rates are presented in nominal dollars (Table 7), real 1993 dollars (Table 8) and relative to median income (Table 9).

With inflationary growth only, nominal sewer rates will more than double over the next 40 years. Sewer rates relative to median income would actually drop since income is projected to grow slightly faster than inflation. Remediation expenditures reach their peak between 2010 and 2020 according to the January 1996 MCP. The peak impact on rates from remediation will be in 2015 with an increase in nominal rates of $157 and in real rates of $95.[8] At this peak, remediation would add 34 percent to the rates that existed in 1995 and 0.24 percentage points to the rate burden relative to median income.[9] The rate burdens with remediation added to the inflation only base would still be classified as low using the EPA criteria. The impact of remediation decreases significantly after 2020 and by 2035 is inconsequential.

The cost of other capital expenditures that will be required in the sanitation district is the source of the greatest uncertainty in developing rate forecasts. We present four different cases for these baseline forecasts which vary enormously in their impact. If 50 percent of the 1996-2001 CIP is funded and future capital and O&M expenditures grow at the inflation rate (low estimate), then the increment to nominal rates would be $66 in 2000, would decline to $43 by 2010 and would increase to $71 in 2035. During the 2010 to 2020 period the baseline rate increment

under the low scenario would be about one-third that of remediation. With both the increments from remediation and the low baseline, the total rate burden is still projected to be below 1 percent of median income.

Under the two medium scenarios, the increment to nominal rates would range from $140 to $314 in 2010 and from $275 to $720 in 2020. In real terms, the rates in 2010 under the medium-low scenario would be approximately one-third higher than they were in 1995 and 85 percent higher by 2035. The medium-high estimate would lead to a 75 percent increase over 1995 rates by 2010 and close to a tripling of rates by 2035. During most years, the increment in the rates under the two medium scenarios is greater than that of remediation. Total rate burdens (with remediation) relative to median income under the medium-low estimate move from a low burden in 2000 (0.94 percent) to a medium burden in 2020 (1.15 percent). Rate burdens under the medium high estimate are in the medium range (1 to 2 percent) until 2030 when they exceed 2 percent.

Not surprisingly, the impact of the high estimate on rates would be particularly severe. Real rates would double by the year 2005, triple by 2015 and would increase eight-fold by 2035. These baseline increments would dwarf the impact of remediation even during the peak years for remediation. Total rate burdens with the high scenario would reach the high range by 2013 (2 percent of median income) and would exceed 5 percent of median income by 2035. Needless to say, continuing expenditure growth of 6 percent above the rate of inflation and rate burdens of 5 percent of medium income is highly unlikely.

Alternative Remediation Financing Scenarios. Given the uncertainty surrounding the type of financing that will be used for remediation and the extent of external assistance, we developed rate estimates under several alternative scenarios (Table 10). The

interest rates employed in our "base case" for remediation are those that exist presently for GO municipal bonds since the REMI model projects continuation of low inflation rates. If instead, nominal interest rates rise to levels similar to the average of rates over the last ten years—approximately 1 percentage point above present rates—the sewer rate increment from remediation will rise in most years between 2000 and 2020 by 4 to 6 percent above those in the base case (in nominal dollars). The impacts of higher interest rates on real sewer rates and sewer rates as a percent of median income are much smaller.

An alternative form of debt financing would involve the use of revenue bonds backed by the pledge of revenues from sewer rates. Revenue bonds are typically 30 years in duration and require a slightly higher interest rate to market; 6.40 percent was used in our analysis. In addition, underwriters commonly require a series of reserve funds to be established for revenue bonds as protection against default.[10] The use of revenue bonds has little impact on sewer rates until 2015, but adds considerably to rates in later years since the loan is paid off at a slower rate. The chief advantage of a revenue bond is that it avoids a significant increase in GO debt obligations which may adversely affect the county's GO bond rating.

Several external sources of support may become available to the county to assist in financing remediation. The New York Environmental Facilities Corporation (EFC) manages New York's state revolving loan fund (SRF) which provides grants and low interest loans for water pollution control projects. While the remediation plan will have to be approved by the EFC for a SRF loan, this plan certainly fits the types of projects that are commonly financed. We assume that the county is provided SRF loans for 100 percent of remediation expenditures with a 50 percent rate subsidy (rate of 3 percent).[11] SRF financing would reduce the sewer rate increment

below the base case by approximately 20 percent from 2000 through 2010 and approximately 10 percent from 2010 to 2020.

As discussed in the economic section of the paper, the county may also receive a substantial grant ($75 million) from the state as a result of the Environmental Bond Act. We assumed that distribution of the funds would be in 10 equal payments of 7.5 million from 2001 to 2010. The benefits of such a grant are substantial reductions in the remediation rate increment (over 10 percent) from 2005 to 2015, with a peak reduction in 2010 of 22 percent. If the county could obtain both SRF financing and a $75 grant from the state, then the increase in sewer rates from remediation will be dampened substantially. Between 2010 and 2020, the increment in sewer rates due to remediation is projected to drop approximately 30 percent.

The rate increases associated with remediation reported in Tables 7 to 9 are substantially lower than those reported in the January 1996 MCP. We estimate an increment of $157 in 2015 and $139 in 2020 compared to $434 and $451 in the MCP. While we do not have sufficient information to replicate the county's rate estimates, we can estimate the rate impact of several different assumptions used in their calculations (Table 11). First, the county assumed that the remediation expenditures would be financed by 20-year revenue bonds which have an interest rate of 7.25 percent. As discussed above, this interest rate is close to the 10-year average for municipal bonds, and is almost a percentage point above present rates. Revenue bonds require that several reserve funds be created to protect the bond holders. One of these reserves is the debt service reserve which requires the borrower to set sewer rates at a level that will generate net revenues (gross revenues less O&M costs) equal to 125 percent of debt service costs. We assume that once this reserve is set up, rates are raised (or lowered) in each year to assure 125 percent coverage, and reserve funds earn an interest rate of 6 percent. The county appears to have

assumed that an additional 25 percent of debt service payments are collected every year, and that the reserve for the present year is used to reduce nonremediation capital spending in subsequent years. While this might be how the county intends to finance, it leads to an overestimate of the effects of remediation (and underestimate of the rate increment for nonremediation expenditures). All of these financing assumptions add between $50 and $70 to nominal sewer rates during the peak construction years.

Second, the county assumed that the number of sewer fee billing units would stay at their level for 1995 (177,300) because higher rates were assumed to dampen economic growth in the county. Compared to our assumption that units grow at the population growth rate, their assumption adds between $8 to $14 to nominal rates during 2010 to 2020. Third, the county's assumptions for annual growth rates for capital costs (5.6 percent) and additional O&M costs (5 percent) are significantly higher than our assumption, namely that costs go up at the rate of inflation (between 2 and 3 percent). This last assumption increases rates the most among the differences we examined, adding $55 to rates in 2010 and $99 in 2020. When we combine all of these assumptions, our rate estimates are much closer to those made by the county.[12] Our rates estimates are higher from 2000 to 2010 and below those of the county in 2015 and 2020. While the rate increments from remediation will undoubtedly be different from our estimates, it seems very unlikely that they will be as high during peak construction years (2015 to 2020) as those estimated by the county in the January 1996 MCP. In short, based on our analysis, the county's estimates of sewer rates increases attributable to remediation alone are too high, particularly during peak construction years.

Distribution of Rate Burdens in the District. The rate burdens presented so far are based on the projected median income for the county as a whole. The sanitation district

covers a wide range of geographic areas in the county which have different levels of income and wealth. For example, the median income in Manlius in 1989 was $45,682, over twice the income in Syracuse, $21,242. Syracuse has by far the lowest income in the district, almost one-third less than Geddes which has the next lowest income (approximately $31,000).[13] We assume, to keep the analysis simple, that income growth in each area will follow the growth rate for the county as a whole. To the extent that actual growth rates are slower in lower income areas of the county, our analysis probably will understate the variation within the county.

Differences in rate burdens relative to median income are presented by geographic areas in Figures 7 through Figure 9.[14] The first bar in each figure represents present expenditures adjusted for inflation only. Adding remediation to this base case is presented in the second bar. The third and fourth bars add either the medium-low or medium-high baseline estimates for other (nonremediation) O&M and capital spending to remediation spending. Since sewer rates are uniform across all areas of the county, the variation in rate burdens is due entirely to differences in median income. Basing the comparison on median incomes clearly understates the variation in the county between low income households (primarily in the city) and higher income households (primarily in the suburbs).

Even so, the differences in rate burdens within the county are striking. Rate burdens are twice as high in Syracuse as in Manlius and are almost 50 percent higher than any other part of the district. In 2010, rate burdens in Manlius are below 1 percent even under the medium-high estimate. By contrast, rate burdens in Syracuse exceed 1 percent with remediation only and are almost 2 percent with the medium-high estimate. Rate burdens in 2010 are projected to exceed the 1 percent threshold under the medium-low case only in Syracuse and Geddes.

By 2020, rate burdens in Syracuse exceed 1.5 percent under the medium-low case and reach 2.5 percent with the medium-high case (Figure 8). Under the medium-low estimate, rate burdens exceed 1 percent only in Syracuse, Van Buren and Geddes. However, if the medium-high estimate applies then rate burdens will exceed 1 percent in all parts of the county in 2020 and 1.5 percent in 2035. Rate burdens in 2035 reach a prohibitive level in Syracuse, almost 3.5 percent, under the medium-high scenario (Figure 9).

Given the levels and disparity of potential rate burdens in the county, it is important for the county to evaluate the impact of sewer system upgrades on households, particularly households in the City of Syracuse. By choosing to finance expenditures in the sewer system entirely with sewer fees, the county has selected a regressive form of financing. The current sewer fees do not adjust for household income, wealth, size or special needs. These problems are exacerbated by the use of several flat rates instead of tying rates to some measure of system usage, such as water consumption. While single family houses are assigned one unit and apartments are assigned 0.75 units, it is quite likely that higher income suburban homeowners pay less per gallon consumed than do apartment dwelling city residents. Were it to tie sewer fees to usage, the county might encourage conservation and reduce the regressivity of sewer rate financing.

Fiscal Health Impacts of Remediation

Expenditures for remediation and other facilities in the sanitation district will not occur in a vacuum. Increases in sewer expenditures and fees will cause changes in the county economy which will affect other sources of revenues and categories of expenditures. Both the property tax and sales tax are sensitive to changes in the underlying economic base. The majority of county spending is in areas such as economic assistance which are sensitive to changes in socio-economic conditions in the county. Although the county's current fiscal situation is good if not robust, it is

at risk because of high tax and debt burdens. The objective of this section is to forecast changes in the county's revenues and expenditures and in its tax and debt burdens over the next several decades.

Key Assumptions and Methodology. A key assumption behind almost any forecast is that the past is a good guide to the future. This implies that the county will maintain its present level of services in the future. As discussed previously, while the county is likely to respond to remediation by making changes in its budget, we have no basis for speculating about the nature of such budgetary changes.

We utilize fiscal and socio-economic information from 1977 to 1994 to develop our forecasting models. Fiscal data employed in the analysis is from the New York State Comptroller's *Municipal Affairs* data series. We assume that operating and capital expenditures grow by the same rate as the broad expenditure categories we look at. To make forecasting manageable, we collapse expenditures into four categories—economic assistance and health, transportation, public safety and other. Own-source revenues are grouped into three categories—property taxes, sales taxes and other revenue. Revenues from sewer fees and expenditures on the sewer system are excluded from the forecasts since they are projected directly.[15]

For most revenue and expenditure categories, the forecasts are based on the estimates of a time-series regression. Per capita fiscal variables are regressed on socio-economic factors hypothesized to affect them. (All monetary variables are expressed in constant dollars.) Socio-economic variables included represent factors either affecting the costs of providing the service (e.g., wages and poverty) or the demand for the service (e.g., income and population). Given the short duration of the time-series, 15 years, only a few variables could be included in each model.

Table 12 presents the list of variables used to forecast revenues and expenditures.[16] For example, economic assistance expenditures are forecast using information on per capita transfer payments, population and the unemployment rate. Other factors affecting fiscal forecasts include income, the average manufacturing wage, percent of earnings in wholesale and retail trade and per capita nonwage income.

A number of regression models were examined. The principal grounds for selecting a particular model was its forecasting accuracy. To determine forecasting accuracy, the years 1993 and 1994 were not used in developing the regression models. Forecasts were developed for these years and compared to actual values. Where two or more forecasting models produced similar levels of accuracy, the model was selected which produced the most reasonable long-term predictions since the forecasts go 40 years into the future. Once the regression models were estimated, the predicted values for each socio-economic variable in REMI were multiplied by the appropriate regression coefficient to produce predictions of annual per capita values (in 1993 dollars). The per capita values were multiplied by the population forecasted by REMI and by the PCE deflator to produce nominal revenues and expenditures.

A different methodology was used for property taxes. Since property taxes are the balancing revenue item in the annual operating budget, we forecast the level of property values in the county using a model from the housing and real estate literature. In this model, property values in the current year are equal to depreciated values plus the level of new residential and nonresidential investment the year before. Property value estimates came from the New York State Board of Equalization and Assessment and the new investment values were produced in REMI.

Finally, forecasts of federal and state aid were needed to determine the demands on local resources. While recent changes in economic assistance programs at the federal level (i.e., welfare reform) are likely to have far-reaching effects on counties, particularly those in New York State, it is too early to be able to predict what these impacts might be. Instead, we made the simple assumption that federal and state aid will be a constant share of projected expenditures for economic assistance, transportation and other expenditures.[17]

Fiscal Health Forecasts. Table 13 summarizes forecasted changes in revenue and expenditure levels from 1990 to 2035 expressed in both per capita terms and as a percent of personal income[18] (see also Figures 10 and 11). Real expenditures are forecast to grow by 56 percent from 1996 to 2035, with an annual growth rate of 1.1 percent. This growth rate is similar to that from 1990 to 1994 and is only slightly lower than the rate from 1980 to 1990. Expenditures in relation to personal income are forecast to increase from 6.3 percent in 1996 to 7.3 percent in 2035.

Following trends of the previous decade, the largest and one of the fastest growing expenditure categories is economic assistance and health. Real expenditures are projected to grow by 63 percent with annual growth rates of 1.2 percent per year. Economic assistance expenditures are projected to equal 50 percent of total expenditures by 2035. This forecasted growth is much slower than that of the last five years. It may understate future growth if New York State shifts much more of the welfare responsibility down to the county level.

Our forecasts suggest that the fastest growing expenditure category will be public safety, with 69 percent overall growth, 1.3 percent per year. This is less that the 3 percent annual growth from 1990 to 1994 which was fueled by jail construction. Expenditures for transportation and for other (primarily parks and recreation and community development) are projected to grow by

under 1 percent per year and will go from 43 percent of total expenditures in 1990 to 36 percent by 2035.

On the revenue side, sales taxes are projected to continue their slow growth during the coming decades with a real growth rate of only 0.9 percent per year. Relative to personal income, sales tax burdens are forecast to fall from 0.5 percent in 1996 to 0.4 percent in 2035. The slow growth in sales taxes mirrors the anticipated stagnation in real consumption and earnings in retail trade in the county during this time period. Other sources of revenue include departmental fees, other tax revenues, other charges, fines and interest earnings. In 1996, these sources combined represented 21 percent of total revenue. While the growth in these revenue sources was rapid from 1990 to 1996, growth is projected to slow down considerably in the future since many of these sources of revenue require discretionary rate or fee increases.

By definition, growth in federal and state aid will track closely with expenditure growth, especially growth in economic assistance. We project overall real growth in aid at 42 percent over the 1996-2035 time period. Projecting federal and state aid is very uncertain in the present volatile environment of welfare and health care reform. A substantial decrease in assistance for Medicaid, in particular, without a commensurate reduction in service responsibilities could have devastating effects on the county budget.

Property taxes are treated in our forecasts in much the same way they are in actual budget determination: they are the revenue source used to balance the budget.[19] Given the slow growth in other own-source revenues, property taxes will have to grow more rapidly to make up the difference. Real per capita property taxes are projected to almost double over the 40 year forecast period; relative to personal income property taxes are projected to grow by 46 percent. The effective tax rates (county government property taxes divided by estimated full market value

in the county) are expected to climb from 1.24 percent in 1996 to 1.5 percent by 2035. If economic assistance expenditures grow by 2 percent per year instead of 1.2 percent and other own-sources of revenue don't respond, property taxes will have to grow by over 2 percent per year and the effective tax rate will reach 1.74 percent.[20] Given the already high property tax burdens in the county, such an increase could have a detrimental impact on residential and business location decisions.

Future Debt Burdens. Depending on the amount of state or federal aid that might be provided to assist with remediation financing, remediation could require a significant increase in the county's outstanding debt. And if our speculations about past under provision of other wastewater-related capital improvements are correct, the county will face still additional requirements for debt financing. Then, too, inevitably there will be other occasions when the county will be obliged to issue debt of more than nominal amounts to finance capital outlays for general government purposes, highways, etc. With the county's debt burden already above national norms, the matter of potential future debt levels and the county's ability to service future debt deserves close scrutiny.

Table 14 presents the projected levels of new outstanding debt attributable to remediation and to each of the four baseline scenarios. In real dollars, remediation will add over $107 million of debt outstanding in 2010. As a percent of full property value, remediation debt alone is almost half a percent. Debt burdens from remediation start to drop in 2020 and become inconsequential by 2035. In contrast with the remediation case, the debt burdens under all but the low baseline scenario continue to mount during the whole period. Under the low scenario, debt burdens reach $81 million by 2020 and then stabilize. Relative to property values they reach 0.35 percent in 2010. Combined with remediation, the low baseline estimates would result in a growth in debt

burdens relative to property values of 0.83 percentage points. Under the two medium baseline estimates, new debt outstanding (in 1993 dollars) ranges from $104 to $202 million in 2020 and $140 to $359 million in 2035. Under the medium-high scenario and remediation, the debt outstanding would double by 2021 and increase by 140 percent by 2035. The high scenario would lead to implausibly high debt burdens.

Conclusions and Caveats

The purpose of this report is to shed light on impact of a court-ordered lake remediation plan for Onondaga Lake on the economic and fiscal health of the county. Although a formal remediation plan has not yet been adopted and the extent of external funding is not yet decided, the analysis focuses upon the January 1996 MCP. The actual remediation plan that will eventually be approved by the court and implemented by the county will surely differ from the January 1996 MCP with respect to the aggregate size and timing of county remediation expenditures. But we are confident that estimates of the economic and fiscal impact of any plausible plan can be imputed by reference to one or more of the scenarios presented in this report. Similarly, the effects on debt service costs and sewer fees that would result from a financing plan that differs from the several analyzed in this report can also be imputed from information contained in this analysis.

Our primary objective is to analyze court-mandated plans to remedy problems associated with the county's METRO waste treatment plant and its combined sewer overflow (CSOs) system. However, the county has also identified a substantial amount of other waste treatment expenditures deemed necessary in order to maintain the quality of waste treatment facilities and processes at their current level of benefits. Because of the size of these other expenditures and

and their potential impact upon future sewer fees, both the remediation expenditures and these other waste treatment expenditures are analyzed in the report. The analysis does not include consideration of possible remediation plans and expenditures related to water quality problems associated with Allied Chemical's operations along the lake. Such analysis would be potentially relevant to a comprehensive study of lake remediation. However, this was deemed beyond the scope of the current study by the Onondaga Lake Management Conference.

Several major conclusions emerge from the analysis. First, implementation of court-ordered lake remediation will likely have a small negative impact on the local economy assuming the annual environmental benefits are relatively small ($10 per household per year). The most severe impact occurs during the years 2010-2020 when the bulk of the construction work is scheduled and the burden on sewer fees is likely to be the greatest. Job losses reach 800 and population declines are over 1,800. These losses represent about 0.25 of 1 percent of the total number of jobs and 0.35 of 1 percent of the total population.

Second, it is critical to distinguish between the cost of lake remediation and the cost of other sewer system expenditures. Estimates of these "other" waste treatment expenditures exceed the amount needed for lake remediation and grow throughout the forecast period. As a consequence, the negative economic impact associated with the financing of these other expenditures exceeds the impact associated with remediation only, especially in the period beyond 2020. Job losses and population declines attributed to these other expenditures accelerate throughout the forecast period and reach 1,500 and 3,500, respectively (Figure 2).[21] A scenario that includes both remediation and these other expenditures has an even larger negative impact upon the local economy (Figure 3).

Third, external support can have a positive impact on the local economy; especially after 2020, the impact of the outside support is roughly proportional to the amount of the aid. For example, external support equal to 50 percent of the capital and O&M expenditures associated with lake remediation reduces the negative impact by slightly more than 50 percent. The maximum size of employment and job losses is cut in half, but these losses in the years beyond 2020 are reduced by more than 50 percent because these are the years in which the benefits of remediation begin to have a positive impact on the economy. Another more realistic scenario for outside funding distributes the $75 million expected from the 1996 Environmental Bond Act evenly over the period 2001-2010. Although the net effect of remediation with this external support from the state is still negative, the performance of the economy is much better than it would be without the external support until 2010. Beyond 2010 the pattern of the economic impact is quite similar to that without any outside support.

Fourth, the recreational and other less tangible benefits associated with lake remediation would have to be substantial to produce a neutral economic impact if no external aid is obtained. Annual environmental benefits equal to $120 per household per year would generate what we label as an economically neutral impact. That is, if the average value placed upon the environmental benefits of lake remediation equal $120 per household per year in 1996 dollars, than the level of employment, population, and income in the county will be largely unaffected by lake remediation.

Fifth, remediation will significantly increase county sewer rates during peak construction years, but the impact of nonremediation expenditures on sewer rates could be more important especially after 2020. At the point of its maximum impact in 2015, the cost of remediation spending is estimated to amount to the equivalent of 34 percent of the sewer rates that existed in

1995 and it will add 0.24 percentage points to the sewer rate burden (relative to median family income). Under the two medium scenarios for nonremediation expenditures, the rate impact of nonremediation spending is greater than that of remediation in almost all years. In essence, while remediation's effects on sewer rates for the next couple of decades won't be trivial (without substantial external funding), they pale in comparison with the effects that would result if the county has to bear large increases in other O&M and capital spending for its wastewater system.

It is important to recognize that rate burdens vary among the one city (Syracuse) and nine towns in Onondaga County because the median income levels for those jurisdictions vary. Thus, for example, total rate burdens on homeowners in Manlius, the highest income jurisdiction in the county, will be less than 50 percent of the burden on homeowners in Syracuse because Manlius' current and projected median income is more than double Syracuse's. If nothing else, the combination of wide disparity in income levels across jurisdictions and potentially large increases in wastewater system costs should lead, in our judgement, to reconsideration of the county's current practice of using flat rates. If the objective is to improve equity and promote water use conservation, ideally rates should be tied to usage.

Sixth, the outlook for Onondaga County's fiscal condition is not especially robust. With a local economy that is likely to grow slowly and no reason to expect any letup in the pressures that propel the county budget upward, it will be difficult for Onondaga County to avoid a growing tax burden. Similarly, the county will face a growing debt burden if it chooses to continue using general obligation debt to finance wastewater infrastructure and if it fails to obtain state aid to cover an appreciable portion of remediation costs. If the county also has to finance a substantial volume of other capital expenditures, its credit rating could deteriorate and its borrowing costs increase as a consequence. Fortunately, these effects can probably be mitigated to some degree if

the county were to use revenue bonds in place of general obligation bonds and to seek subsidized financing from the state's revolving loan fund.

Finally, the results of this analysis are subject to a number of critical caveats and assumptions. These include:

- The remediation at the center of our analysis—the January 1996 MCP—is not the plan likely to be adopted. Our hope is that the differences between the ultimate plan adopted and the January 1996 MCP will pertain principally to the timing of the expenditures and the extent of the outside support. Presumably, the environmental benefits will be the same. If so, then the various scenarios generated in this report ought to provide important insights about the economic impact of the remediation plans being considered.

- Another caveat accompanies our discussion of the other waste treatment expenditures. These are shown to be important, but the methods used to estimate them are quite simplistic; a carefully developed capital plan is needed to provide a more accurate assessment of other capital needs and the cost of operating and maintaining this new capital. Without such a plan the uncertainty surrounding the economic impact of these other expenditures is substantial.

- Like all models, the REMI model has both strengths and weaknesses. In this case it tends to overestimate responses in jobs and population and underestimates changes in the value of land and property. Furthermore, it does not permit households and firms to anticipate or react to the possibility of future events like a long-term remediation plan; households and firms in this model tend to be quite myopic. As such, the possible negative effects of an announcement of higher expected user fees due to remediation are not considered and the timing of any negative effects that may arise are tied closely to the years in which the higher fees are actually collected.

- The financing schemes considered in this analysis are largely limited to varying degrees and types of external aid and debt financing. Little attention is given to alternatives to the use of sewer fees. Although other financing alternatives would likely affect our major conclusions, some alternatives may affect the distribution of the costs among residents and areas within the county. Some alternatives may also affect the need for additional waste treatment expenditures if they lead to greater conservation of water usage and less waste to be treated by the waste treatment system. Although the development of alternative rate structures is beyond the scope of this project, more can and probably ought to be done to investigate the possibility of reducing the generation of wastes by the business sector.

- Lastly, and perhaps most importantly, our study focuses primarily on the costs associated with lake remediation. Missing from the information available to us are

> credible, comprehensive estimates of the value of benefits to be realized from a cleaner Onondaga Lake by the residents of Onondaga County. We believe such estimates should be developed. Although studies of these benefits are complex to conduct, expensive, and often controversial, their value must be compared to the current alternative: little or no firm, statistically-based information about the preferences of the residents of Onondaga Lake for a major effort to clean Onondaga Lake.

Despite these caveats, we believe the results of our analysis can be of value to those who must resolve the remediation issue. Our results are consistent with the claim that remediation is likely to have a small negative impact on the economy. In fact, absent the inclusion of a substantial amount of potential environmental benefits, a lake remediation plan that is largely financed by Onondaga County residents and businesses via increased sewer fees will have a negative impact on the county's income, population and employment. However, these negative impacts never (even in peak construction years) exceed one-half of 1 percent of the county's economy. Our economic analysis offers a range of estimates of the size of the negative impact of remediation spending. What we cannot estimate with the currently available information is how much Onondaga County residents would be willing to pay for the lake quality improvements that would be produced by remediation of the kind now being contemplated. While we have estimated that benefits of $120 or more per household per year would be necessary to offset the costs of remediation, our study sheds no light on the question whether county residents would be willing to pay this much for a cleaner lake. We believe a better answer to the question needs to be provided before the economic and fiscal impact of lake remediation can be fully assessed.

Endnotes

1. A summary of the plan is available in *Municipal Compliance Plan: Public Information Summary*, January 11, 1996, Onondaga County, New York Department of Drainage and Sanitation.

2. An overview of the methods and some of the controversy surrounding them is provided in Portney (1994). Tietenberg (1994) also discusses the concept and offers an interesting discussion related to the debate about the spotted owl.

3. We would have liked to distribute costs to sectors in proportion to the share of water usage, but this information was unavailable.

4. The second report (Felt, Follain, and McCoskey 1997) examines in more detail the mechanism within the REMI model used to estimate the impact of improvements in the quality of life and the specific parameters associated with Onondaga County.

5. The January 1996 MCP assumed some work would be done in 1996, which we assume as well. Although we know now that this will not happen, postponing the start of the project by a few years has virtually no impact upon our conclusions about the economic impact of lake remediation.

6. The regional purchase coefficients used in this study are rough estimates based upon information given to us by the consultant who worked on this project previously and on estimates used in other similar cases. For each type of project, METRO, CSOs or operating and maintenance, we first determine what are the major categories of spending. For METRO and the CSO projects they are: equipment, buildings and labor, with labor being divided into engineering labor and construction labor. Operating and maintenance costs are broken down into the following categories: equipment, labor and utilities. We then estimate what percentage of the budget would be spent in these areas, and the amount of each dollar spent on each type of expenditure that would be spent locally. The percentage of the budget spent in each area multiplied by the percentage estimated to be spent within the county yields the RPC for METRO, CSOs and operating and maintenance expenditures. These are: 0.36, 0.39, and 0.88, respectively.

7. The REMI translator variable for new sewer and water treatment expenditures is used to capture the impacts of these expenditures.

8. See Appendix Tables A-1 to A-6 for debt service schedules for remediation and Appendix Tables A-7 to A-15 for calculations of annual rates and rate burdens for the different scenarios presented in Tables 7 to 10.

9. In their estimates of rates the county added a $60/unit local retail charge. We have also added this charge which is assumed to grow at the inflation rate forecast in REMI.

10. While the magnitude and management of these reserve funds can vary, we employed assumptions similar to those used by the county in the January 1996 MCP. Reserve funds

include a debt service reserve fund (10 percent of bond principal), and renewal and replacement reserve fund (2 percent of principal), which are financed as part of the loan. In addition, a rate covenant and O&M reserve fund are assumed established which are equal to 25 percent of the debt service payments and projected O&M costs associated with remediation. Reserve funds are assumed to accrue interest at an annual rate of 6 percent and decline over time as the principal is paid off.

11. SRF long-term loans are for 20 years and can either have a 50 percent or 33 percent interest rate subsidy. We assume a 3 percent loan fee is required to process these loans. The EFC also provides interest free short-term construction loans. Since we have ignored construction financing for simplicity, we do not consider these short-term loans.

12. The rate increment associated with each assumption will not add up the rate increment with all county assumptions because the higher financing costs (first assumption) assumed by the county are applied to the higher capital costs (third assumption).

13. We used towns or cities as the geographic areas to be compared. There is likely to be significant variation in income within these areas.

14. Detailed information on rate burdens by geographic area and year are presented in Appendix Tables A-8 to A-11.

15. Specifically, we removed department revenue for the sewer department and utility expenditures since the majority of utility spending is for the sanitation district.

16. See Appendix Table B-1 for the actual regression models. The models were estimated with a linear regression method with auto-correlation correction.

17. Specifically, we calculated the percent of expenditures on economic assistance, transportation and other categories funded by state and federal aid since 1977. We took the average of these percentages from 1986 to 1994, and used this percent for aid projections.

18. See Appendix Tables B-2 to B-7 for annual forecasts for all expenditure and revenue categories both in per capita terms and relative to personal income.

19. Subtracting expenditures from revenues produces a substantial "deficit" using the accounting categories in the *Municipal Affairs* database of the New York State Comptroller. This is partially due to the fact that expenditures include capital expenditures which are financed in future years with debt. We keep this artificial deficit at a fixed percent of expenditures—15 percent—based on historical levels over the last decade.

20. This effective tax rate is for county expenditure only. It does not include property taxes by other general purpose local governments or school districts.

21. We assume in our analysis that there are no additional benefits derived from these other sewer expenditures, for example, for improved water quality.

Please see author for tables and figures.

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