EVALUATION OF PROPOSED SEWER CHARGES FOR DOUGLAS COUNTY AT SALMON HARBOR

A Report Prepared For

Douglas County
Winchester Bay Sanitary District

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INTRODUCTION AND SUMMARY

This paper presents an evaluation of the dispute between Douglas County and the Winchester Bay Sanitary District concerning the charges to be paid by the County for sewerage collection and treatment service at its Salmon Harbor moorage and campground facilities. The County-District dispute is treated as a cost-sharing problem of the type often encountered by partners in a cooperative venture. The cost analysis presents estimates of costs directly and fairly attributed to County and District as a result of their cooperative efforts to construct and operate a sewer system to serve Winchester Bay and the County's Salmon Harbor facilities. These estimates provide the data needed to set charges for the County in accordance with the principle that those who benefit from a project should contribute to its costs in proportion to the benefits each receives.

The paper demonstrates that the District's proposed charges for Douglas County are too high. It concludes by recommending procedures to determine appropriate charges for the County. Calculations in the paper suggest that Douglas County is presently charged only 30 to 35 percent of its appropriate 1976-77 annual charge; this annual charge would be perhaps as much as $25,000 if the recommendations in the paper were followed.

The paper is divided into five sections. The first section supplies background information concerning the dispute between the County and District. The second section presents the approach applied to the problem, while the third analyzes the capital and operating costs of the Winchester Bay-Salmon Harbor sewerage collection and treatment system. The fourth section evaluates the District's proposed charges to be paid by Douglas County. The fifth section states my recommendations.

BACKGROUND

Exhibit A reproduces the September 24, 1973 agreement between the Douglas County Board of Commissioners and the Winchester Bay Sanitary District. The current dispute over connection and annual charges has occurred because the County and District interpret paragraphs (1) and (4) of their agreement differently.

With respect to connection or hook-up charges, the County contends that its payment of $138,000 towards the construction of the Winchester Bay-Salmon Harbor sewerage system constituted the connection charge for all County restrooms serving the public in the Salmon Harbor area. The District, however, argues that the County's payment was a connection charge for only those restrooms connected during and immediately following the construction of the system. The District now proposes that the County pay a fee of $4,200 per restroom to connect the County's newest restroom facilities to the system.[1]

Douglas County presently pays $7,584 annual usage fees for its connected public restrooms in the Salmon Harbor area.[2] The District proposes an annual usage fee of $3,600 per restroom, an amount equal to an average usage of 100 units per restroom X $36.00 per unit per year.[3] (The District seeks to avoid measuring actual usage by instead applying an assumed average usage value for each restroom.) Under the proposed fee Douglas County would pay the District $25,200 for seven connected restrooms, or almost $18,000 more per year than the County now pays.

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[1]Letter dated March 31, 1976 from Mr. Gary D. Rossi, attorney for the Winchester Bay Sanitary District, to Mr. Paul Nolte, Deputy District Attorney, Douglas County.

[2]Letter dated May 25, 1976 from Mr. Paul Nolte to R. Charles Vars.

[3]Letter dated March 31, 1976 from Mr. Rossi to Mr. Nolte.

EXHIBIT A

AGREEMENT BETWEEN

DOUGLAS COUNTY BOARD OF COMMISSIONERS

and

WINCHESTER BAY SANITARY DISTRICT

1. Douglas County agrees to pay One Hundred Thirty-eight Thousand dollars ($138,000) towards the sewer construction project as payment in full for all initial connection charges for Douglas County.

2. Douglas County agrees to pay an additional One Hundred Two Thousand Dollars ($102,000) towards the construction cost representing prepaid monthly service charges by the District to Douglas County and any additional connection fees.

3. The Sanitary District agrees to pay Douglas County all payments on local connection charges in excess of Thirty-six Thousand Dollars ($36,000), said payment to be made on a monthly basis in cash. Any such payments will apply on reduction of the One Hundred Two Thousand Dollar ($102,000) prepaid item in Section 2.

4. The District agrees that all future monthly sewage charges to Douglas County will be charged on exactly the same basis as the charges to other entities in the District.

Edward Keefe, Chairman
Winchester Bay Sanitary District

BOARD OF COUNTY COMMISSIONERS
OF DOUGLAS COUNTY, OREGON

Al Flegel, Chairman

Ray E. Boerner, Commissioner

L. W. Mitchaels, Commissioner

Dated this 24th day of September, 1973.

APPROACH

This paper presents an independent appraisal of the connection and annual charges proposed by the District. The dispute concerning charges for the County is viewed here as a cost-sharing problem of the sort typically faced by partners in a cooperative venture. The analysis and recommendations are based on value judgements and cost estimates similar to those often employed to resolve such problems.

The analysis rests on two value judgements and the connection-annual charge relationship they imply. The first judgement is that each party to a cooperative venture should be responsible for the costs associated with its participation in the venture. The second value judgement is that each party to a cooperative venture should contribute to the venture's joint costs (i.e., those costs not directly attributable to any particular party) in proportion to its share of the benefits generated by the venture for all participants. The financial identity implied by these value judgements is that in present value terms the sum of each party's payments should equal the sum of all costs directly and fairly attributed to it.

Although other value judgements could be made, the preceding judgements are applied here because they allocate the costs of a cooperative venture among its participants in accordance with the benefits-received principle of taxation. Such cost allocations are commonly regarded as fair and non-exploitive because one party is not favored at the expense of another.

The cost allocation principles implicit in the value judgements may be expressed more precisely in the following equations. Equation (1) indicates the capital cost specifically attributable to the inclusion of the County or District

in the system, or what is often called incremental capital cost,

$$IKC_i = TKC - TKC_{xi} \qquad (1)$$

where IKC_i = incremental capital cost for County or District,

TKC = total capital cost net of EPA grant for single system to serve both County and District, and

TKC_{xi} = total capital cost net of EPA grant for separate system to serve only County or District.

Since the sum of incremental capital costs will be less than total capital costs, the remaining joint costs

$$JKC = TKC - \sum_i IKC_i \qquad (2)$$

would be shared according to the benefits the County or District could receive after paying their respective incremental costs,

$$JKC_i = (B_i/\Sigma B_i)\ JKC \qquad (3)$$

where JKC_i = joint capital costs allocated to County or District, and

$B_i = TKX_{xi} - IKC_i$

The logic behind this measurement of benefits is simple: the cooperative construction of a single system has meant that the County and District have avoided the construction of separate systems. Total capital cost allocated to the County or District, TKC_i, is obtained by combining (1) and (3):

$$TKC_i = IKC_i + JKC_i \qquad (4)$$

The first term of (4) expresses the first value judgement above, while the second term expresses the second judgement.

Operating and maintenance costs would be allocated similarly. Those costs that vary directly with flow (e.g., chemicals, power) would be charged against each party according to the flows they respectively generate:

$$IOC_{it} = c_t f_{it} = (f_{it}/\sum_i f_{it})FOC_t \qquad (5)$$

where IOC_{it} = incremental operating costs for County or District in year t,

c_t = average flow-related costs per unit of flow in year t,

f_{it} = volume of County or District flow in year t, and

FOC_t = total flow-related operating costs in year t.

Other operating and maintenance costs do not vary with flow and, therefore, may be regarded as joint costs, $NFOC_t$, to be shared again according to benefits received (i.e., costs avoided)

$$JOC_{it} = (O_{it}/\Sigma O_{it})NFOC_t \qquad (6)$$

where JOC_{it} = joint operating and maintenance costs allocated to County or District in year t, and

O_{it} = total non-flow-related operating and maintenance costs of separate systems to serve only County or District in year t.

Total operating and maintenance costs allocated to the County or District, TOC_{it}, is the sum of *(5) and (6)*:

$$TOC_{it} = IOC_{it} + JOC_{it} \qquad (7)$$

As before, the first term implements the first value judgement above, the second term the second.

With appropriate data equations *(4)* and *(7)* provide the basis for allocating capital and operating costs between the County and District. In turn, these cost allocations establish the time streams of experditures that County and District yearly payments of connection and annual (monthly) charges (CC_{it} and AC_{it}, respectively) must generate to satisfy the value judgements made above. The various sets of connection and annual charges that meet these requirements can be determined by (1) converting the time streams of charges and costs over the relevant time horizon, h, to present values through use of a discount rate, r, and (2) obtaining alternative solutions to the following formula:

$$\sum_{t=0}^{h} \frac{CC_{it}}{(1+r)^t} + \sum_{t=0}^{h} \frac{AC_{it}}{(1+r)^t} = TKC_i + \sum_{t=0}^{h} \frac{TOC_{it}}{(1+r)^t} \qquad (8)$$

Of course, both the County and District must use the same time horizon and discount rate to insure that (a) system cash-flow requirements are met and (b) neither party's payments diverge from those needed to satisfy the stated value judgements.

Certain implications of equation *(8)* deserve special comment. Since the righthand side of *(8)* is a constant, the equation establishes an inverse relationship between connection and annual (monthly) charges -- that is, the higher one, the lower the other. As a consequence, if the present value of either party's actual and expected connection charges exceeds (falls short of) the total capital costs allocated to it, then that party's annual (monthly) charges must be less (greater) than the total operating and maintenance costs attributed to it, and vice versa.

Of course, equation *(8)* is only appropriate to establish the relationship between connection and annual charges for implementation at $t=o$. However, where a system is in operation and its participants wish to pay charges beginning in period $t=n$ that are consistent with the value judgements made here, equation *(8)* must be rewritten as follows:

$$\sum_{t=n}^{h} \frac{CC_{it}}{(1+r)^t} + \sum_{t=n}^{h} \frac{AC_{it}}{(1+r)^t} = \left[TKC_i - \sum_{t=o}^{n-1} CC_{it}/(1+r)^t\right](1+r)^{n-1} + \sum_{t=o}^{n-1} (TOC_{it} - AC_{it} - rU_{it})(1+r)^{n-1} + \sum_{t=n}^{h} \frac{TOC_{it} - rU_{it}}{(1+r)^t} \qquad (9)$$

where U_{it} = unpaid balance of an advance or loar to system by party i in year t. Interest on the unpaid balance of an advance or loan is treated as a credit against operating costs; a credit which, of course, diminishes as the principal

of the advance or loan is repaid. Equation *(9)* rather than equation *(8)* sets forth the connection/annual charge relationship that is relevant for the situation considered in this paper.

COST ANALYSIS

Capital and operating cost data require analysis before appropriate connection and annual charges for the County can be determined with equation *(9)*. Actual and estimated capital cost data are based on construction cost schedules kindly provided and explained by Mr. Dale A. Cannon, project manager, CH_2M-Hill, for the construction of the Winchester Bay sewer system. Operating cost information comes from the Annual Financial Report of the Winchester Bay Sanitary District for the fiscal year July 1, 1974 to June 30, 1975.

Capital Costs

Table 1 presents actual and estimated capital costs of alternative sewer systems to serve the residents of the Winchester Bay Sanitary District and users of Douglas County's Salmon Harbor beach, campground, and moorage facilities. The actual construction cost of the single system to serve the County and District was $900,000. The $900,000 includes the expenditure of $95,000 by Douglas County to construct a lateral collection line (with pump station) to the first breakwater to serve the public restrooms at its Salmon Harbor moorage facility.

The actual cost of the treatment plant, harbor interceptor, and pump station was $580,000, or $75,000 more than the estimated cost of these units if they had been sized to handle the design sewage volumes of Winchester Bay or the County's Salmon Harbor facilities alone. The justification for the identical capital cost

TABLE 1: Actual and Estimated Capital Cost of, and EPA Grants for, Sewer Systems to Serve Douglas County's Salmon Harbor Facilities and the Winchester Bay Sanitary District.

System Components	Separate Systems		Single County-District System
	Douglas County	Winchester Bay Sanitary District	
Treatment Plant, Harbor Interceptor, and Pump Stations	$505,000[a]	$505,000[a]	$580,000[b]
Collection Laterals	105,000[b,c]	215,000[b]	320,000[b,c]
TOTAL COST	$610,000	$720,000	$900,000
EPA Grant	-	366,000[a]	422,000[b]
TOTAL COST NET OF GRANT	$610,000	$354,000	$478,000

Source: Construction cost schedules provided by Mr. Dale A. Cannon, project manager, CH_2M-Hill for the Winchester Bay Sanitary District sewer system.

[a]Estimate

[b]Actual

[c]Includes $95,000 capital investment by Douglas County to construct lateral to first breakwater.

estimates for separate plant, interceptor, and pump facilities is that the difference in County and District design populations is too small to affect their scale and, hence, their cost.[4] The capital costs of collection laterals, however, are actual costs incurred, and they are the same for single and separate systems because a reduction in system size would not affect their layout or size. As a consequence, the total capital cost of the single system ($900,000) is less than the combined total cost of separate systems ($1,330,000).

Under present EPA eligibility rules, the Winchester Bay Sanitary District could qualify for a construction grant even if Douglas County's Salmon Harbor moorage and campground facilities did not exist. Of course, the estimated grant of $366,000 is smaller than the actual grant of $422,000 because grant-eligible facilities (for example, treatment plant, harbor interceptor) could be smaller with no flows from County properties. In contrast, the County alone would be ineligible for an EPA grant. The total capital cost net of grants for the single system ($478,000) is therefore less than half the combined total cost net of grants for separate systems ($964,000).

Total capital costs for the single system are allocated in Table 2. Incremental, joint, and total capital costs are calculated by inserting data from Table 1 into equations *(1)*, *(3)*, and *(4)*, respectively. Total net capital costs allocated to the County and District, TKC_i, are $367,000 and $111,000 respectively.

Operating and Maintenance Costs

Operating and maintenance costs have two important features in the present context. First, they change from year to year as changes occur in the prices

[4]The design populations for the County and District are 700 and 800, respectively. See CH_2M, Sewage Collection and Treatment Facilities-Winchester Bay Sanitary District, Douglas County, Oregon (April 1969), Table 4, p. 19.

TABLE 2: The Allocation of Single System Capital Cost Between Douglas County and Winchester Bay Sanitary District.

Type of Cost	Douglas County	Winchester Bay Sanitary District
Incremental Cost[a]	$124,000	$(132,000)
Joint Cost[b]	243,000	243,000
TOTAL COST[c]	$367,000	$ 111,000

Source: Table 1.

[a]Calculated according to equation (1).

[b]Calculated according to equation (3).

[c]Calculated according to equation (4).

paid and quantities purchased of materials and services. Second, some operating costs vary directly with sewage flow, while other costs are unrelated to flow. As a consequence, both incremental and joint operating costs, IOC_{it} and JOC_{it}, may be expected to change from year to year as prices and sewage flows change: incremental costs changing as both prices and flows change, and joint costs changing with prices and non-flow-related events that affect the system.

Three types of data are required in order to use equations *(5)*, *(6)* and *(7)* to determine total operating and maintenance costs for the County and District, TOC_{it}. First, expense data reported on the District's Annual Statement of Revenue and Expense must be appropriately classified and aggregated to obtain total flow-related and non-flow-related costs, FOC_t and $NFOC_t$, respectively. An analysis of Exhibit B in the Annual Financial Report for fiscal 1974-75 indicates that District expenses should be classified as follows to obtain the required cost figures:

Flow-Related Costs	Non-Flow-Related Costs
Lights and water	Wages - Plant operators
Plant supplies	Wages - Secretarial
	Payroll taxes
	Telephone and office supplies
	Printing and advertising
	Repairs and maintenance
	Insurance
	Legal
	Audit fees
	Automotive expense
	Operator training
	Bank charges
	Commissions

Interest expense and depreciation are excluded from this listing of operating costs because they are costs of acquiring and financing (as opposed to operating) the system.

Second, data are needed on the annual volumes of County and District sewage flows, f_{it}. These flows must be estimated at present, but they could be measured by meter in the future.

Third, estimates are needed for the total non-flow-related operating and maintenance costs of separate systems, O_{it}. In this instance, however, no special estimation effort is required because these costs would be the same for similar-sized sewer systems operated separately by the County and District. Therefore, $O_{it}/\Sigma O_{it}$ must necessarily equal one-half.

EVALUATION OF PROPOSED CHARGES

The preceding analyses provide the basis for an examination and appraisal of the County-District dispute over connection and annual charges to be paid by the County. Equation *(9)* establishes a framework for evaluating the District's proposed connection charge of $4,200 per restroom and annual charge of $3,600 per restroom. Exhibit A, the cost analysis above, and the District financial report for 1974-75 supply the data used in this evaluation.

When actual and estimated cost, charge, and flow data for 1974-76 are inserted in equation *(9)* the following equatior is obtained for the County:

$$AC_{it} \approx TOC_{it} - rU_{it} + a(\$150,000) - a \sum_{t=n}^{h} \frac{CC_{it}}{(1+r)} \qquad (9a)$$

where $\approx$ means approximately equal, and

$$a = r(1+r)^{h-n}/(1+r)^{h-n} - 1.$$

Equation *(9a)* provides the connection-annual charge relationship needed to determine the alternative sets of charges, 1976-77 to $t=h$, that will satisfy

the value judgements and financial constraints postulated earlier.

Three features of equation *(9a)* deserve comment. First, given the number and timing of expected connections, the annual charge varies inversely with the connection charge. Second, given the connection charge, the annual charge must be adjusted each year to reflect changes in operating costs and/or the unpaid balance on the County advance to the District. Third, by substituting equations *(5)* and *(6)* into *(7)*, and then substituting the result into *(9a)*, information from the District's annual financial report and sewage flow data for the system can be used each year to determine the appropriate annual charge for the County. As a consequence, equation *(9a)* has desirable operational characteristics.

In the present context, however, equation *(9a)* is most important because it can be used to evaluate the District's proposed charges for the County. The District's position concerning these charges is clearly stated in the March 31, 1976 letter from Mr. Rossi to Mr. Nolte:

> The District considers that there are eight restrooms on the premises at the present time, six of which were paid for in the original contract payment with two additional ones to be hooked up. For these two additional restroom hookups and all restrooms that will be hooked up hereafter, the charge will be $4,200.00 for each restroom as a hook-up fee. The District proposes that the annual usage fee per restroom will be $3,600.00.

If the District's proposed charges are accepted, County payments to the District are easily calculated for 1976-77. County connection charges would equal $8,400(= 2 × $4,200), while the annual charge would be $28,000(= 8 × $3,600).

In contrast, the annual charge for 1976-77 calculated from equation *(9a)* is substantially less than $28,800 when reasonable predictions of 1976-77 operating costs and sewage flows are combined with different future streams of connection charges. With the connection charge set at $4,200 per restroom, Table 3 shows that the 1976-77 annual charge calculated from *(9a)* lies between $23,600 and

TABLE 3: The 1976-77 Annual Charge for Douglas County as Calculated from Equation (9a), by Number and Year of Connections

Number of Connections, By Year			Appropriate Annual Charge, 1976-77
1976-77	1978-79	1981-82	
2	-	-	$24,250
2	1	-	23,950
2	-	1	23,900
2	1	1	23,600

NOTE: The annual charges have been calculated from equation (9a) on the following assumptions: (a) the connection charge is $4,200 per restroom; (b) my predictions of 1976-77 operating costs and sewage flows are accurate; (c) h= 1992-93, the year in which the last general obligation bonds issued October 1, 1974 will be retired; and (d) r=effective rate of interest on the general obligation bonds issued to finance construction of the system.

$24,250, or 15 to 18 percent below the annual charge proposed by the District. Moreover, if there were no connection charge, the appropriate 1976-77 charge calculated from *(9a)* is $25,000, or $3,800 less than the proposed charge by the District.

These findings suggest three conclusions. (1) The annual charges now paid by Douglas County to the Winchester Bay Sanitary District are too low. Douglas County is presently charged $7,584 or approximately 30 to 35 percent of the appropriate 1976-77 annual charge. (2) The proposed annual charges for the County are too high. With no connection charge, the appropriate 1976-77 annual charge would be about$3,000 per restroom rather than $3,600 as proposed by the District. (3) The proposed connection charge of $4,200 per restroom is set so low that it only reduces the appropriate 1976-77 charge to the County by about five percent, or very little indeed.

RECOMMENDATIONS

I recommend that Douglas County and the Winchester Bay Sanitary District formally agree that:

1. The annual charge for the County will be set each year on the basis of equation *(9)* above;
2. There will be no connection charges paid by the County;
3. County and District sewage flows will be either metered or estimated according to some mutually acceptable procedure; and
4. Data from the Annual Financial Report of the Winchester Bay Sanitary District will be used each year to set the annual charge for the County in the same fashion as that data has been used in this paper.

The first, third, and fourth recommendations follow directly from the materials presented in the paper. The second recommendation, however, requires some explanation. I recommend no connection charge for two reasons. First, the cash-flow position of the District will be strong if the annual charge is set according to equation *(9)*. Second, connection charges set at $10,000 or less will reduce the annual charges to be paid by the County very little. Therefore, I conclude that no connection charge is required.