RESOURCE MANAGEMENT ISSUES IN REGIONAL WASTEWATER PLANNING

Ken Hall[1] and Kip Duchon[2]

AUTHORS: [1]P.E., Water Resources Engineer; and [2]P.E., Senior Environmental Engineer, CH2M HILL, 115 Perimeter Center Place, N.E., Suite 700, Atlanta, Georgia 30346-1278.
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Abstract. This presentation describes a regional wastewater planning effort involving four counties, three regional planning agencies, and a study area about 510 square miles in size. The study focused on consensus development, coordination of short- and long-term solutions, and equitable sharing of financial and administrative burdens.

BACKGROUND

The 510-square-mile study area (Figure 1) lies in the Etowah River basin and includes the tributary area of Pumpkinvine Creek. Pumpkinvine Creek originates in Paulding County and flows into Bartow County prior to joining the Etowah River.

Historically, wastewater planning in the study area has not been coordinated on a regional basis. Most of the population is served by on-site septage systems; however, some small treatment facilities serve limited service areas. In 1990 the four counties (Bartow, Cherokee, Cobb, and Paulding) each petitioned the Georgia Environmental Protection Division (EPD) of the Department of Natural Resources for additional wastewater discharge capacity in anticipation of projected growth. EPD recognized the need for a coordinated approach to wastewater management in the basin and responded with a request for a coordinated plan.

To address the common resource management issues, the counties developed a Technical Advisory Committee (TAC) composed of the leaders of each county's wastewater utility. The TAC was charged with developing a coordinated wastewater plan for a short-term (year 2011) and a long-term (year 2050) horizon. CH2M HILL and Welker & Associates were retained to facilitate the planning effort and provide technical support in the planning process.

METHODOLOGY

The methodology of the study followed five basic steps:
1) Review existing systems,
2) Project flows and loads,
3) Develop alternatives,
4) Evaluate alternatives, and
5) Develop consensus.

Each step was accomplished through one or more tasks and workshops.

Review Existing Systems. The review of existing systems provided the study with a snapshot of existing conditions in the basin and allowed identification of strategic facilities which would ultimately be incorporated in the long-range plan.

Table 1. 2011 Wastewater Flow Projections Pumkinvine Creek/Etowah River Wastewater Managment Plan

LOTUS 123 -	2011R.WK1	Last Updated:	10/15/92
ALLWAYS -	2011R.ALL	K. Hall/CH2M HILL/ATL	ATL33483.A1.04

Subbasin	Area (sq mi)	Projected Population	% Population Sewered	Population Sewered	Estimated Sewer Flow (mgd)
Co 1	2.1	3,126	70	2,188	0.20
Co 2	1.2	1,786	75	1,340	0.12
Co 3	29.5	44,284	98	43,398	4.19
Co 4	11.2	17,656	99	.17,479	1.93
Co 5	15.7	22,263	99	22,040	2.37
Cobb Summary	59.7	89,114	97	86,445	8.8
Ch 1	18.7	34,556	60	20,734	1.87
Ch 2	6.1	6,661	91	6,061	0.55
Ch 3	12.9	17,085	50	8,543	0.77
Ch 4	5.9	10,731	80	8,584	0.77
Ch 5	36.3	48,939	50	24,470	2.20
Ch 6	37.2	25,097	50	12,548	1.13
Ch 7	8.5	8,968	61	5,471	0.49
Ch 8	5.6	5,890	55	3,239	0.29
Ch 9	13.7	8,671	55	4,769	0.43
Ch 10	21.4	5,992	70	4,194	0.38
Ch 11	15.4	1,673	44	736	0.07
Cherokee Summary	181.7	174,261	57	99,349	8.9
Ba 1	14.7	9,341	85	7,939	0.71
Ba 2	4.8	2,534	60	1,520	0.14
Ba 3	12.4	5,735	70	4,015	0.36
Ba 4	3.3	1,527	55	840	0.08
Ba 5	5.8	2,043	55	1,124	0.10
Ba 6	4.8	1,289	55	709	0.06
Ba 7	5.8	889	55	489	0.04
Ba 8	35.4	2,705	17	460	0.04
Bartow Summary	87.0	26,062	66	17,095	1.5
Pa 1	10.3	1,267	44	558	0.05
Pa 2	21.8	7,486	55	4,118	0.37
Pa 3	5.5	673	33	222	0.02
Pa 4	1.2	147	33	49	0.00
Pa 5	12.5	4,674	80	3,740	0.34
Pa 6	2.4	769	75	577	0.05
Pa 7	3.7	2,641	85	2,245	0.20
Pa 8	5.6	1,632	44	718	0.06
Pa 9	38.6	3,734	17	616	0.06
Pa 10	4.8	766	44	337	0.03
Pa 11	4	952	44	419	0.04
Pa 12	17.4	1,874	33	618	0.06
Pa 13	46.6	4,608	17	760	0.07
Pa 14	3.1	313	17	52	0.00
Pa 15	3.7	374	17	62	0.01
Paulding Summary	181.2	31,910	47	15,089	1.4

Basin Summary	Population	Area (sq mi)	% Population Sewered	Sewered Population	Est Flow (mgd)
	321,000	510	68	218,000	21

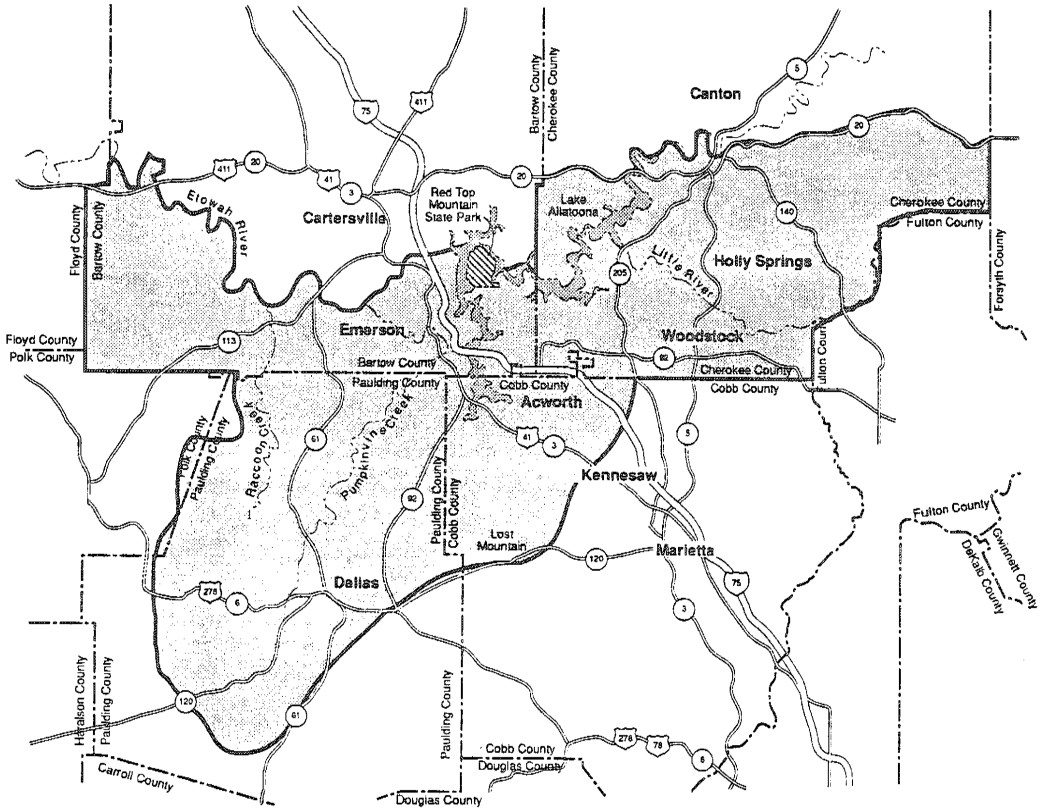


Figure 1. Study Area

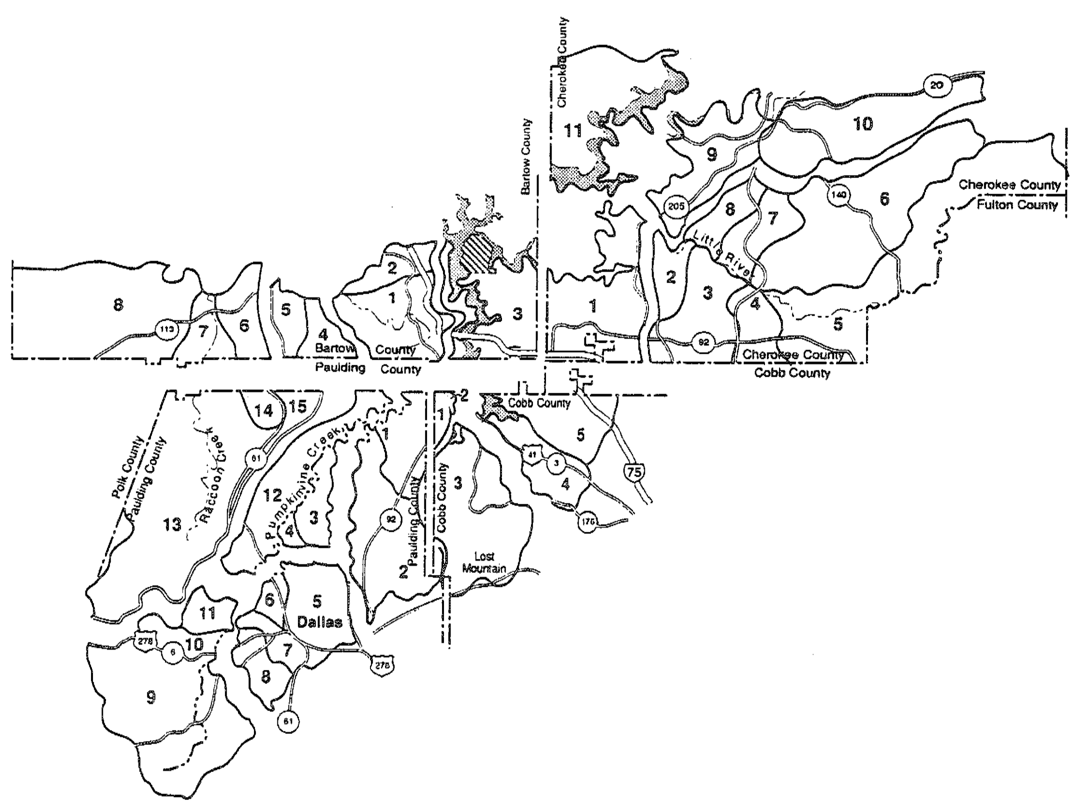


Figure 2. Study Subbasins and Subareas

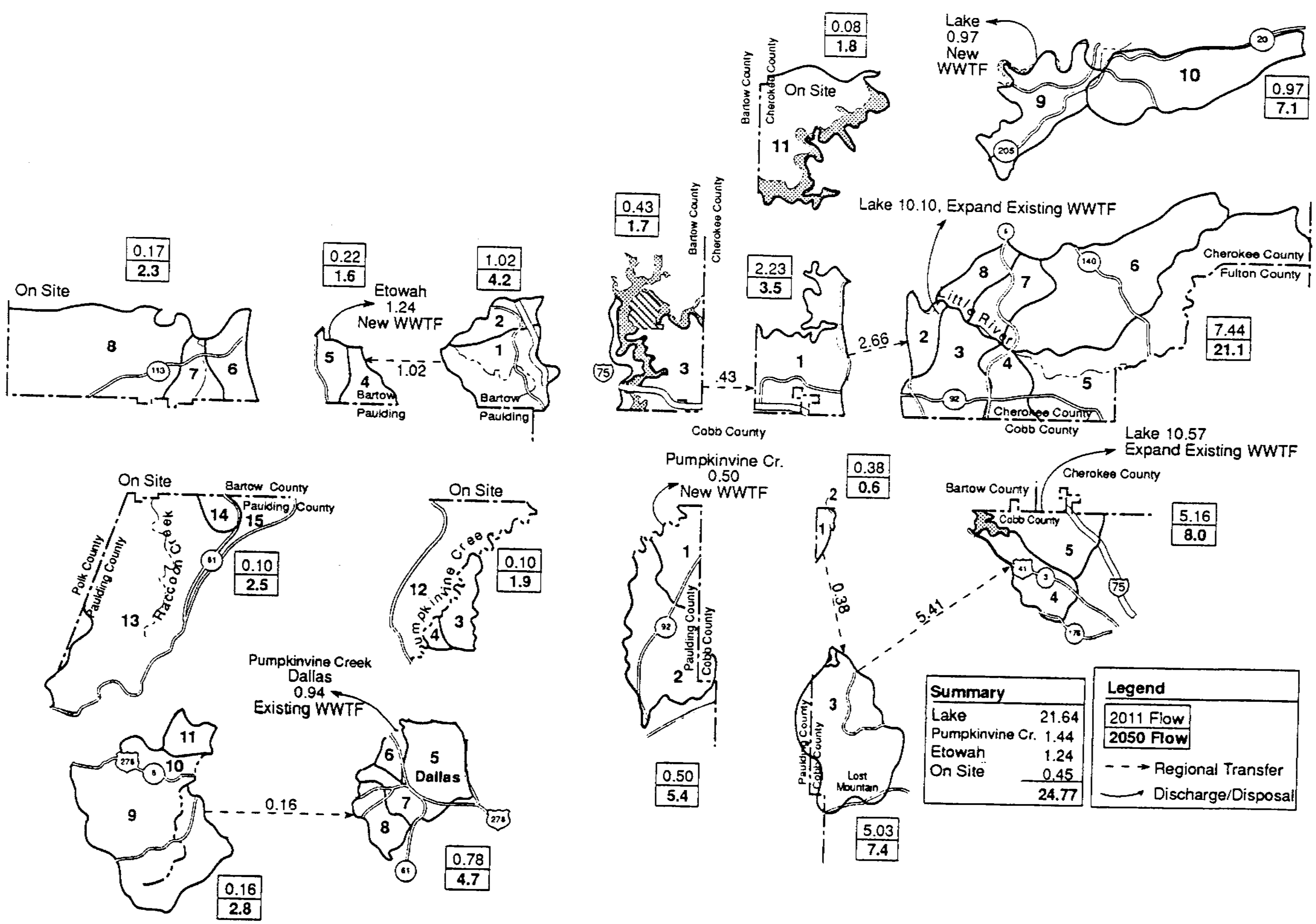
Table 2. 2050 Wastewater Flow Projections
Pumpkinvine Creek/Etowah River Wastewater Management Plan

LOTUS 123 - 2050.WK1 Last Updated: 02/25/92
ALLWAYS - 2050.ALL K. Hall/CH2M HILL/ATL ATL33483.A1.04

Subbasin	Area (sq mi)	% Development Density					% Area Sewered	Estimated Population	% Population Sewered	Estimated Sewer Flow (mgd)
		High	Med	Low	M-Lo	Exurb				
Co 1	2.1	10	20	60	10	0	97	3,843	97	0.3
Co 2	1.2	10	30	50	10	0	97	2,280	98	0.2
Co 3	29.5	20	60	15	5	0	98	65,785	99	6.2
Co 4	11.2	30	60	10	0	0	100	26,320	100	2.8
Co 5	15.7	30	65	5	0	0	100	37,445	100	3.9
Cobb Summary	59.7	24	59	14	3	0	99	135,673	99	13.4
Ch 1	18.7	15	30	35	20	0	86	36,185	89	2.9
Ch 2	6.1	5	50	30	15	0	91	12,048	93	1.0
Ch 3	12.9	20	50	10	20	0	96	27,477	97	2.4
Ch 4	5.9	10	50	25	15	0	94	11,977	95	1.0
Ch 5	36.3	10	40	40	10	0	80	71,511	84	5.3
Ch 6	37.2	5	40	55	0	0	77	71,982	81	5.1
Ch 7	8.5	35	55	10	0	0	99	20,145	99	1.9
Ch 8	5.6	15	40	30	15	0	91	11,284	93	0.9
Ch 9	13.7	10	30	35	25	0	88	25,619	90	2.0
Ch 10	21.4	20	50	30	0	0	90	46,438	92	3.9
Ch 11	15.4	0	20	70	10	0	62	26,488	65	1.5
Cherokee Summary	181.7	12	40	39	10	0	84	361,153	88	27.9
Ba 1	14.7	20	40	35	5	0	92	30,723	94	2.6
Ba 2	4.8	40	15	45	0	0	91	10,296	93	0.9
Ba 3	12.4	5	20	60	15	0	70	21,886	73	1.4
Ba 4	3.3	0	50	50	0	0	90	6,435	92	0.5
Ba 5	5.8	0	45	30	25	0	86	10,817	89	0.8
Ba 6	4.8	0	45	30	25	0	86	8,952	89	0.7
Ba 7	5.8	0	45	30	25	0	86	10,817	89	0.8
Ba 8	35.4	0	0	0	0	100	20	24,780	20	0.4
Bartow Summary	87.0	6	21	25	8	41	60	124,706	76	8.1
Pa 1	10.3	5	20	70	5	0	70	18,386	73	1.2
Pa 2	21.8	5	45	40	10	0	85	42,510	88	3.3
Pa 3	5.5	0	0	90	10	0	50	8,690	50	0.3
Pa 4	1.2	0	0	90	10	0	50	1,896	50	0.1
Pa 5	12.5	10	60	30	0	0	94	26,625	95	2.3
Pa 6	2.4	0	50	50	0	0	85	4,680	88	0.4
Pa 7	3.7	5	60	35	0	0	90	7,678	92	0.6
Pa 8	5.6	0	30	70	0	0	72	10,136	75	0.6
Pa 9	38.6	0	0	0	50	50	36	40,530	42	1.4
Pa 10	4.8	0	20	80	0	0	62	8,352	65	0.5
Pa 11	4	0	20	80	0	0	62	6,960	65	0.4
Pa 12	17.4	0	0	90	10	0	53	27,492	53	1.2
Pa 13	46.6	0	0	0	50	50	45	48,930	53	2.1
Pa 14	3.1	0	0	0	0	100	20	2,170	20	0.0
Pa 15	3.7	0	0	0	0	100	20	2,590	20	0.0
Paulding Summary	181.2	2	14	30	26	27	57	257,624	67	14.3

Basin Summary	Population	Area (sq mi)	Est % Sewered		Est Flow (mgd)
			Population	Area	
	879,000	510	82	72	64

Figure 3. Regional Alternative 1 - Year 2011
Maximum Lake Discharge, No Regional Facilities



Project Flows and Loads. Flow and load projections were developed from corresponding population projections. The study area was divided into 39 distinct subbasins representing relatively homogeneous land use, topography, and geography (Figure 2). Area planning agencies provided the basic population information from which 1991 populations were estimated, and the year 2011 population estimates were projected for each subbasin. Population estimates for the year 2050 projections were based on estimates of ultimate development densities (i.e., High, Medium, Low, Managed Low, Exurban) in each basin (Duchon et al., 1991). The percentage of the population that was sewered was estimated for each subbasin for 1991, 2011, and 2050.

The corresponding wastewater flows were computed on a per capita basis, which varied according to development density to account for employment (Tables 1 and 2). The per capita flows also included an infiltration/inflow component (EPA, 1991). Loads were then estimated using representative wastewater concentrations from metro Atlanta utilities.

Develop Alternatives. Alternatives were developed by first outlining the feasible options for serving each of 16 subareas (created by grouping similar subbasins). Five basic options were considered for each subarea.

1) Interceptor sewers and a publicly owned treatment facility discharging to surface waters.

2) Interceptor sewers and a publicly owned treatment facility using land application of effluent for disposal.

3) Interceptor sewers to transport wastewater to another subarea.

4) Force mains and pump stations pumping effluent to another subarea.

5) No interceptors or publicly owned treatment facilities; all wastewater handled using on-site septage systems or small private land application systems.

Alternatives were composed of a combination of these options for each subarea, each with its own central strategy. Examples of strategies include maximizing the use of land application, maximizing lake discharge, and developing a regional plant. Five detailed alternatives were developed for the year 2011 conditions. Seven alternatives were developed, evolving from the initial five, for the year 2050 conditions. Figure 3 is a schematic of Alternative 1 for the year 2011.

Evaluate Alternatives. The evaluation of alternatives involved developing and weighting evaluation criteria, scoring alternatives, and computing numerical composite scores weighted by criterion. The evaluation criteria, and the corresponding weights assigned by the TAC, are shown below:

- Political/Public Acceptance 1.00
- Environmental Effects 0.59
- Cost 0.40
- Operational Reliability 0.15

A weight of 1.00 represents the most important criterion in the TAC's estimation. The weights were determined by allowing each member of the TAC to judge the importance of each criterion to the successful completion of the project on an absolute scale of 1 to 10 (1 representing the most important). The median value was determined for each criterion, and the lowest median was assigned a weight of 1.00. The remaining weights are linear transitions of the medians.

After discussing the issues related to each alternative, the TAC independently scored (on a scale of 1 to 10) each alternative relative to each criterion except Cost. Cost scores were assigned based on the relative present worth costs, including annual costs and salvage value, of each alternative.

The composite score of each alternative was computed using the weights for each criterion. Thus an alternative scoring poorly on the Political/Public Acceptance criterion was penalized more in the scoring than an alternative scoring poorly on Operational Reliability.

Develop Consensus. The TAC met in a workshop to discuss the results and develop a consensus on a recommended wastewater management alternative for the study area. The results of the numerical evaluation indicated that a decentralized treatment facility configuration was more favorable for the year 2011 conditions than one or two large regional facilities.

Alternative 1 received the best overall score in the numerical evaluation; based on the evaluation results and the TAC's collective judgment, it was identified as the preferred alternative. In addition, the selection of Alternative 1 allows the option of implementing any of several favorable year 2050 alternatives. These include two alternatives evolving directly from Alternative 1, and another alternative characterized by decentralized facilities and pumping of effluent to a discharge point on the Etowah River downstream of Lake Allatoona.

CONCLUSIONS

Providing appropriate information to the TAC for the selection process, and periodically discussing the issues critical to each county in the workshops, helped develop a consensus on the recommended alternative. Consideration of short-term alternatives that were compatible with long-term solutions increased the efficiency and flexibility of the recommended alternative. In addition, the costs of the plan were equitably distributed between the counties because of the project's long-term perspective.

The final recommendations included a list of action items and an implementation schedule for each county.

Also identified were environmental issues to be addressed in implementing the recommended alternative.

ACKNOWLEDGMENTS

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