Howard County
Bureau of Utilities

Sewer Surcharge Study
Phase I

Final Report

Black & Veatch
Enterprise Management Solutions
July 2006

TABLE OF CONTENTS

Executive Summary

BACKGROUND

All recipients of U.S. EPA Construction Grants are required, as a condition of grant acceptance, to implement a User Charge system which, if appropriate, can incorporate a High Strength Surcharge to be applied to dischargers who discharge higher than normal strength effluent. In order to meet that requirement, Howard County developed a methodology for determining the cost of removing BOD, TSS and TP (see Appendix A- acronyms) in the early 1980's. In the mid 1980's this methodology was implemented for Food Service Establishments (FSEs). Appendix B presents a sample calculation. Since that time there have been multiple upgrades to the County's Little Patuxent Water Reclamation Plant (LPWRP) and a dramatic increase in the number of FSE's.

SCOPE OF SERVICES

In recognition of these changes, the County issued an RFP in August 2005 for a Sewer Surcharge Study with the following objectives:

Methodology for Determining Treatment Costs for BOD, TSS, TP, TN and FOG

- Identify alternative methodologies for determining treatment costs for BOD, TSS, TP, TN and FOG
- Discuss advantages and disadvantages for each
- Recommend the best cost allocation methodology for recovering the cost of treating these strength parameters
- Evaluate laboratory analysis and LPWRP data for O&M and capital costs and identify any additional information needed
- Develop an Excel spreadsheet for calculating treatment costs based on the recommended methodology

Methodology for Calculating Surcharges for FSEs

- Identify alternative methodologies for calculating surcharges for FSEs
- Discuss advantages and disadvantages for each
- Recommend the best surcharge methodology
- Develop an Excel spreadsheet for calculating surcharges for FSEs

Final Report

- A final report consisting of a hard copy and a Compact disc shall be submitted at the completion of the study

PROPOSED METHODOLOGY

In October 2005, Black & Veatch Corporation (B&V) was selected to perform the study for Howard County. B&V proposed a six task effort in two phases and one additional optional task:

Phase I

- High Strength Surcharge Rate policy Review and Data Collection
- Develop Methodology to Allocate Treatment Costs to BOD, TSS, TP, TN & FOG

Phase II

- Define average residential strength
- Define protocols for characterization of FSE strengths
- Develop methodology to calculate surcharges for FSE
- Project meetings and administration

Optional Task

- Implementation assistance

During negotiations, Howard County accepted responsibility for determining the allocation of treatment plant costs to strength cost components and laboratory testing protocols for the sampling data.

PROJECT ACTIVITIES

Shortly after selection, B&V was requested to assist Howard County in its dealings with the Dreyer's Corporation (see Appendix D). Specifically, we were asked to:

- Recalculate FY 2005 surcharge amounts billed to Dreyer's using most recent FY 2005 data
- Develop a methodology for calculating a Dreyer's surcharge taking into account the fact that pretreated Dreyer's effluent will be introduced mid-plant and provide some process cost savings.

FINDINGS

Methodology

- There are two primary approaches to meeting the high strength surcharge requirements of the Clean Water Act – 1) the "quantity/quality" approach in which users are charged the actual costs of removing or treating each effluent component (resulting in separate charges for volume, BOD, TSS etc.) and 2) the "surcharge limit" approach in which high strength surcharges are applied only to high strength components above a defined "floor" concentration (some systems use "typical" residential strength concentrations as a basis for establishing the floor concentrations).

- There are two primary approaches to allocating plant costs – the design basis approach (which considers the principal parameter for which each part of the plant is designed) and the functional approach (which considers what strength constituents are removed in each part of the plant)
- The user charge regulations define only the minimum annual amount that must be recovered through user charges applicable to high strength dischargers. Each user must be charged on a cost recovery basis for operations, maintenance and equipment replacement cost. Equipment replacement costs are those expenditures needed on short lived equipment to allow a plant to function for up to its original full useful life. For example, assume that a 30-year life plant includes pumps which have a ten-year life. The equipment replacement cost to be recognized in the user charges would be an annual amount that would be sufficient to fund two replacements of those pumps.
- Howard County utilizes the "surcharge limit" approach and allocates plant costs using the functional approach. Howard County has chosen to meet the cost recovery requirements of the regulations (i.e., operations, maintenance and equipment replacement, along with including applicable annual capital costs associated with principal and interest on applicable debt).
- The historic approach utilized by Howard County uses a definition of floor concentration for surcharge rates that is compatible with the range of floor concentrations reported by other large wastewater systems in the National Association of Clean Water Agencies (NACWA) survey (see Table 1). (Note: In 2005 the Association of Metropolitan Sewerage Agencies, or AMSA, changed its name to NACWA.)

Table 1 – Comparison of Howard County Surcharge Limits to Industry Data

Component	TSS	BOD	FOG	TP	TKN
Howard County Value (FY05)	300	300	-	12	-
AMSA Median Value (mg/l)	275	250	100	12	40
AMSA Average Value (mg/l)	315	261	126	12	113
Utilities reporting	61	51	9	1	6

Methodology for Determining Treatment Costs for High Strength Components

The County's current approach for allocating cost to high strength components is based on the percentage of wastewater loadings removed at each major stage in the wastewater treatment process. It also comprised these components:

- Three high strength components – BOD, TSS and TP
- Five stages within the LPWRP at which high strength components are removed

Cost of Service

Two methods are commonly used for determining the total annual cost of providing utility service: (1) the cash basis, and (2) the utility basis. The total cost of service for both methods is the same and is based on the total revenue requirements net of miscellaneous revenue sources.

The cash basis is used by most public utilities which do not provide service outside their corporate limits since it relies on traditional cash-oriented budgeting and is easy to apply and understand. The cash basis approach to cost of service includes the revenue requirement elements of O&M expense, debt service, and normal annual renewals and replacements financed with annual sewer service revenues.

The utility basis is often used by private utilities and public utilities which provide service outside their corporate limits. The utility basis approach to cost of service includes the revenue requirement elements of O&M expense, depreciation, and return on rate base. Return on rate base is derived by the application of an appropriate percentage rate of return on rate base usually consisting of the value of facilities used or useful in providing service.

After reviewing the options with County and reviewing its available data, B&V determined that calculating the surcharge rates on the cash basis would best serve the County's needs. It accommodates the data the County has at its disposal and more closely follows its governmental accounting.

Design Basis Cost Components

Costs are typically allocated based on design or functional considerations. After some discussion with County staff at LPWRP, it was decided that the design basis would be the best approach. This basis would also allow the County to better incorporate the impact of costs associated with recent plant expansions. For example, under the design basis of cost allocation, very little cost associated with primary and secondary sedimentation is allocated to strength components, since the basis of design for these facilities is primarily the annual average daily influent flow to the treatment plant. Under the functional allocation methodology, primary sedimentation costs are allocated almost entirely to TSS, while secondary sedimentation costs are allocated almost entirely to BOD. Thus, there is a short in the overall cost recovery away from strength related costs to volume related costs. Similarly, under the design basis, preliminary treatment is generally allocated to annual volume or peak volume, while under the functional basis, such costs are largely allocated to TSS. The design basis cost components at LPWRP are:

- Headworks
- Primary Treatment
- BNR
- Filtration
- Disinfection
- Solids Train

Costs allocated to the cost components of the plant are then allocated to Volume/Capacity, BOD, TSS, TP and TN. Only the costs allocated to the strength cost components are determinants in the calculated surcharge rates.

Allocation of Operation and Maintenance Expense (O&M). O&M is grouped into five primary categories – power, chemicals, sludge/process, personnel and vehicles. The O&M consists of the projected Bureau of Utilities budget and a portion of overhead from the Department of Public Works. The factors used to allocate O&M to the functional components were obtained from County employees. Table 2 below presents the allocation of O&M to the cost components.

Table 2 – Allocation of Operation and Maintenance Expense

Line No.	Description	Total	Vol./Cap.	Wastewater Strength			
				BOD	TSS	TP	TN
		$	$	$	$	$	$
1	Headworks	1,033,000	981,000		52,000		
2	Primary Treatment	291,000	204,000	29,000	58,000		
3	BNR	1,344,000	269,000	538,000		134,000	403,000
4	Filtration	269,000	216,000		40,000	13,000	
5	Disinfection	457,000	457,000				
6	Solids Train	2,435,000	1,035,000	645,000	219,000	134,000	402,000
7	Total Treatment Plant	5,829,000	3,162,000	1,212,000	369,000	281,000	805,000

Allocation of Capital Costs. The capital costs consist of equipment replacement at the plant. The equipment replacement costs are estimated by multiplying the original cost of the treatment plant of $127,911,556 (see the Allocation of Plant Additions to Unit Processes worksheet in Appendix D) by 0.4 as an estimate of plant equipment costs and annualizing the result over 10 years. The County may want to consider more sophisticated approaches for future calculations of equipment replacement costs, such as projecting actual equipment replacement over time. The design basis allocation factors, developed jointly between a design engineer familiar with the treatment plant and the County wastewater treatment plant engineer, were applied to Net Plant Investment. The distribution of Net Plant Investment to the strength cost components is applied to capital costs. Table 3 presents the allocation of capital costs to the strength cost components.

Table 3 – Allocation of Net Plant Investment and Capital Costs

Line No.	Description	Total $	Vol./Cap. $	Wastewater Strength BOD $	TSS $	TP $	TN $
1	Headworks	5,132,000	4,875,000		257,000		
2	Primary Treatment	5,453,000	3,817,000	545,000	1,091,000		
3	BNR	16,216,000	3,243,000	6,486,000		1,622,000	4,865,000
4	Filtration	4,396,000	3,517,000		659,000	220,000	
5	Disinfection	2,674,000	2,674,000				
6	Solids Train	10,940,000	4,650,000	2,899,000	985,000	602,000	1,805,000
7	General	10,805,000	5,492,000	2,394,000	721,000	589,000	1,608,000
8	Total Treatment Plant Investment	55,616,000	28,268,000	12,324,000	3,713,000	3,033,000	8,278,000
9	Distribution of Net Plant Investment	100.00%	50.83%	22.16%	6.68%	5.45%	14.88%
	Net Capital Costs[1]						
10	Equipment Replacement[2]	5,116,000	2,600,000	1,134,000	342,000	279,000	761,000
11	Total Net Capital Costs	5,116,000	2,600,000	1,134,000	342,000	279,000	761,000

Notes: [1] The distribution of Net Plant Investment to the cost components is the basis for the allocation Net Capital Costs. For example, the Net Plant Investment costs for BOD represent 22.16% of the total. The 22.16% is multiplied by the Equipment Replacement figure of $5,116,000 to produce $1,134,000 (rounded) in costs associated with removing BOD. The same approach applies to other strength categories.

[2] Equipment Replacement is the recovery of the funds necessary to replace equipment inside of the plant. FY 2007 equipment replacement costs based on the estimated cost of plant equipment to be replaced annualized over a 10-year period.

Sewer Surcharge Calculations

The future surcharge calculations represent Fiscal Year 2007 rates. Using data provided by the County, B&V developed a model to assist the County in calculating high strength sewer surcharges. Although the rate to be calculated by the County is for FY 2007, the model is populated with projected and budgeted FY 2006 data because that was most current data that could be provided during the study. Table 4 presents the calculation of the sewer surcharge rates. The model essentially sums the O&M and capital costs allocated to each surcharge category and divides it by the pounds of loading for each category to calculate the surcharge rate. The model printouts are provided in Appendix C.

Table 4 – Calculation of Sewer Surcharge Rates

Factor	BOD	TSS	TP	TN	Total
O&M Costs	1,212,000	369,000	281,000	805,000	2,667,000
Capital Costs	1,134,000	342,000	279,000	761,000	2,516,000
Total Cost	2,346,000	711,000	560,000	1,566,000	5,183,000
Units of Service (lbs.)	14,000,000	12,500,000	375,000	975,000	
Sewer Surcharge Rate	$0.168/lb.	$0.057/lb.	$1.493/lb.	$1.606/lb.	

Table 5 presents the County's surcharge rates under the new methodology compared to 2005 NACWA averages. While FOG was considered as a separate surcharge, biodegradable FOG is essentially included in BOD. FOG which is not biodegradable has no biological affect on activated sludge systems, although it can contribute to the physical problems in those systems. However, the model still provides the capability of having a FOG-based surcharge rate if the County determines that it is needed in the future.

Table 5 – Howard County's New Calculated Surcharge Rate vs. NACWA Medians

Factor	BOD	TSS	TP	TN
Howard County	$0.168	$0.057	$1.493	$1.606
NACWA Median	$0.197	$0.171	$1.913	$0.368

We pointed out to County staff that the implementation of the calculated rates will result in reduced revenue from surcharge rates. County staff indicated that they anticipated that the new surcharge rates would reduce revenue.

RECOMMENDATIONS

Our Phase I recommendations are listed below:

- The County should continue to use the "surcharge limit" approach.
- The County should calculate costs utilizing a cash basis
- The County should perform plant allocations using a design basis approach
- The County should conduct regular reviews of plant influent strengths to verify that it is using an appropriate value for its "surcharge limit"
- The County should revisit plant allocations whenever design changes and/or plant modifications are made.

In conducting our analyses and in forming an opinion of the projection of future operations summarized in this report, Black & Veatch has made certain assumptions with respect to conditions, events, and circumstances that may occur in the future. The methodology utilized by Black & Veatch in performing the analysis follows generally accepted practices for such projections. Such assumptions and methodologies are summarized in this report and are reasonable and appropriate for the purpose for which they are used. While Black & Veatch believes the assumptions are reasonable and the projection methodology valid, actual results may differ materially from those projected, as influenced by conditions, events, and circumstances that actually occur. Normally, these types of calculations are developed as part of a comprehensive sewer cost of service study, rather than separately on their own.

APPENDIX

Appendix A - Acronyms

BNR – Biological nutrient removal

BOD – Biochemical oxygen demand

FOG – Fats, oils & grease

OCLD – Original cost less depreciation

TN – Total nitrogen

TP – Total phosphorous

TSS – Total suspended solids

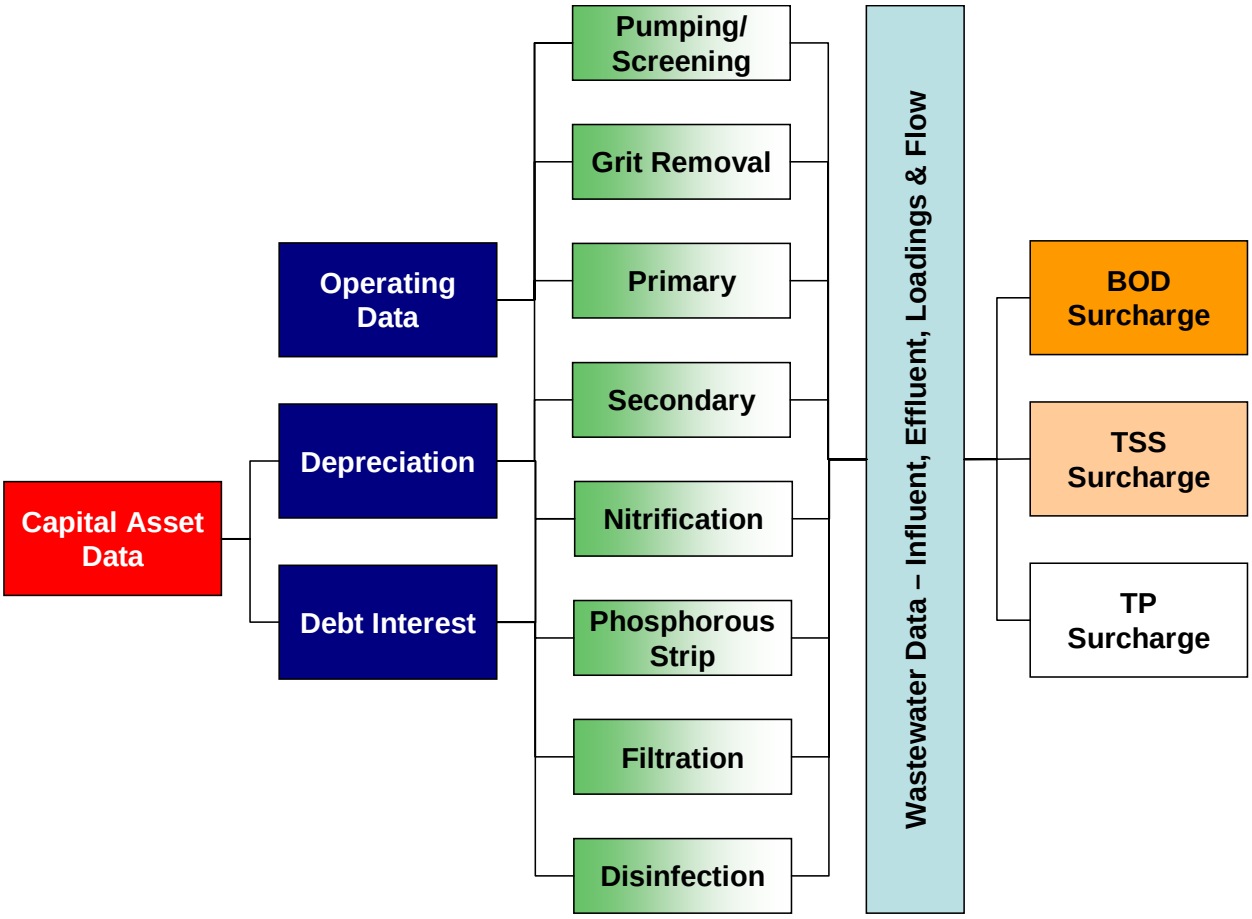
WEF – Water Environment Federation

Appendix B – Historical Sewer Surcharge Methodology

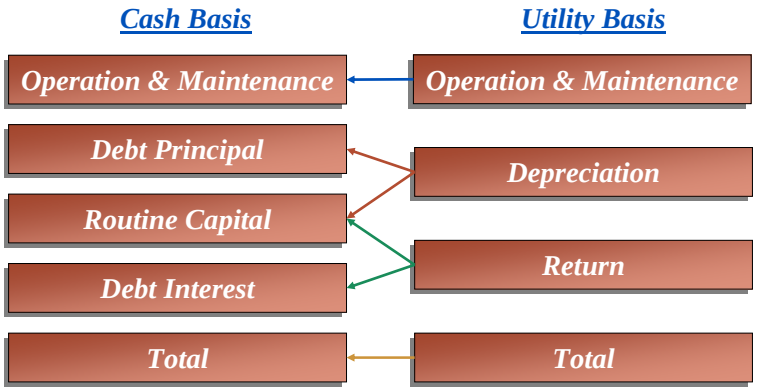
The sewer surcharge rates that the County had been charging historically were based upon a methodology utilized by an engineering firm that approximates the utility basis with a functional cost allocation.

The historical approach used the best information available at the time, which consisted primarily of estimated costs. The estimated capital-related costs were allocated to various unit processes at the plant. Personnel and supplies/materials were allocated evenly to each unit process. Power and O&M costs, however, appeared to be allocated proportional to their use.

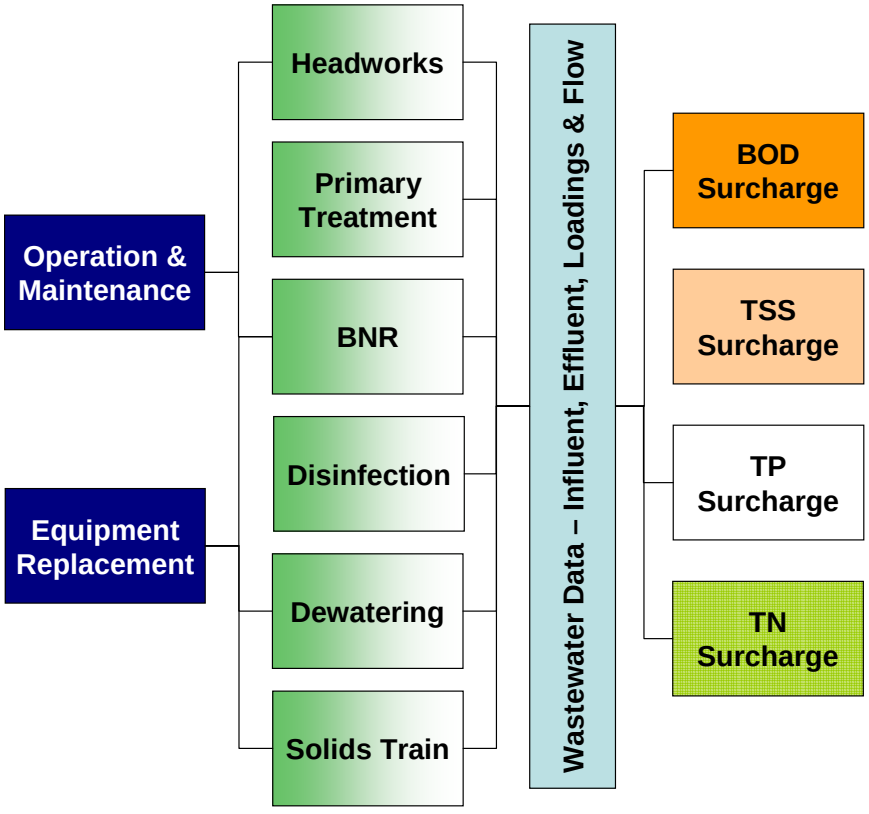
Each unit process at the plant then had a total cost, consisting of capital and O&M costs. The costs were then allocated to BOD, TSS and TP using allocation factors based on the percent of removal of wastewater loading at each step in the treatment process. While sufficient at the time of development, this approach, today, would be considered unusual. A general diagram of the historical process is presented below (the process is utilized in the Dreyer's calculations in Appendix D).



The new surcharge methodology that Black & Veatch utilized is a cash cost basis allocated on a design allocation basis to facilitate future surcharge calculations. The figure below demonstrates how the cash basis compares to the utility basis for cost recovery.



The new methodology moves away from the historical approach to be more consistent with industry-recognized (WEF) approached (Manual of Practice No. 27 - *Financing and Charges for Wastewater Systems*). Instead of estimating depreciation and debt interest (or return), the model uses equipment replacement costs. The distribution of OCLD value of plant to various unit processes is the allocation basis for equipment replacement and O&M. Under the design basis, it is the design of the plant that drives how the costs are allocated solely than just how the plant is used. The diagram below illustrates how the new methodology is applied.



Howard County Bureau of Utilities
Sewer Surcharge Rate Model

Surcharge Rate Year	*2007*

Estimated FY 2007
Total Plant Influent Loading

Factor	Amount
	lbs.
BOD	*14,000,000*
TSS	*12,500,000*
TP	*375,000*
TN	*975,000*
FOG	*500,000*

Source: Estimated based on FY 2005 data.

Little Patuxent Water Reclamation Plant Operating & Maintenance Budget (0720)

Description				FY 2006 Approved Budget	Power	Chemicals	Sludge/ Process	Personnel	Vehicle	General - Allocable	Non-Allocable	Total
DEPARTMENTAL EXPENSES												
Salaries, Wages & Fringe Benefits												0
0101	1000	Salaries and Wages	Administration	*1,922,110*				1,922,110			0	1,922,110
0102	1000	Social Security	Administration	*147,024*				147,024			0	147,024
0103	1000	Retirement	Administration	*267,546*				267,546			0	267,546
0104	1000	Employee Insurance	Administration	*303,840*				303,840			0	303,840
0106	5070	Overtime Premium	Reclamation Maintenance	*106,000*							106,000	106,000
0106	5080	Overtime Premium	Reclamation Operations	*25,000*						25,000	0	25,000
0106	5260	Overtime Premium	Process Protection Control	*3,520*			3,520				0	3,520
0109	5070	Accrued Salaries	Reclamation Maintenance	*0*							0	0
Total Salaries Water & Fringe Benefits				**2,775,040**								
Contractual Services												0
0201	5070	Rentals	Reclamation Maintenance	*21,400*							21,400	21,400
0201	5240	Rentals	Administration	*3,960*						3,960	0	3,960
0202	5070	Utilities	Reclamation Maintenance	*750,000*							750,000	750,000
0202	5240	Utilities	Administration	*1,100,000*	1,100,000						0	1,100,000
0203	5070	Telephone	Reclamation Maintenance	*60,000*							60,000	60,000
0203	5240	Telephone	Administration	*23,022*						23,022	0	23,022
0204	5240	Advertising	Administration	*500*						500	0	500
0206	5260	Professional Services	Process Protection Control	*75,000*			75,000				0	75,000
0207	1000	Service & Maintenance Contracts	Administration	*0*						0	0	0
0207	5070	Service & Maintenance Contracts	Reclamation Maintenance	*24,000*							24,000	24,000
0207	5080	Service & Maintenance Contracts	Reclamation Operations	*8,500*						8,500	0	8,500
0207	5260	Service & Maintenance Contracts	Process Protection Control	*12,150*			12,150				0	12,150
0210	1000	Sludge Hauling	Administration	*0*			0				0	0
0210	5080	Sludge Hauling	Reclamation Operations	*1,258,309*			1,258,309				0	1,258,309
0214	5240	Uniform Rental	Administration	*16,200*						16,200	0	16,200
0230	5240	Radio Maintenance	Administration	*26,140*						26,140	0	26,140
0233	5070	Electrical Power Maintenance	Reclamation Maintenance	*35,500*							35,500	35,500
0235	5070	Fire Extinguisher Maintenance	Reclamation Maintenance	*1,500*							1,500	1,500
0236	1000	Water Purification	Administration	*0*						0	0	0
0237	5240	Pest Control	Administration	*270*						270	0	270
0239	5070	Electronic Maintenance	Reclamation Maintenance	*26,000*							26,000	26,000
0243	1000	Grounds Maintenance Service	Administration	*0*						0	0	0
0243	5070	Grounds Maintenance Service	Reclamation Maintenance	*33,000*							33,000	33,000
0245	5240	Janitorial Service	Administration	*22,300*						22,300	0	22,300
Total Contractual Services				**3,497,751**								
Supplies and Materials												0
0301	5240	Printing	Administration	*1,450*						1,450	0	1,450
0302	1000	Postage	Administration	*0*						0	0	0
0303	5070	Janitorial Supplies	Reclamation Maintenance	*5,000*							5,000	5,000
0304	5240	Food	Administration	*4,200*						4,200	0	4,200
0305	5240	Office Supplies & Stationery	Administration	*3,200*						3,200	0	3,200
0307	5070	Small Tools & Parts	Reclamation Maintenance	*7,500*							7,500	7,500
0307	5080	Small Tools & Parts	Reclamation Operations	*500*						500	0	500
0308	1000	General Supplies, Materials, Hardware	Administration	*0*						0	0	0
0308	5070	General Supplies, Materials, Hardware	Reclamation Maintenance	*70,000*							70,000	70,000
0308	5080	General Supplies, Materials, Hardware	Reclamation Operations	*7,000*						7,000	0	7,000
0308	5260	General Supplies, Materials, Hardware	Process Protection Control	*2,000*			2,000				0	2,000
0317	5070	Pipe & Drainage Supplies	Reclamation Maintenance	*5,000*							5,000	5,000
0318	5070	Landscape & Soil Retention	Reclamation Maintenance	*1,000*							1,000	1,000
0331	1000	Water & Sewer Supply Items	Administration	*0*						0	0	0

Little Patuxent Water Reclamation Plant Operating & Maintenance Budget (0720)

Description				FY 2006 Approved Budget	Power	Chemicals	Sludge/ Process	Personnel	Vehicle	General - Allocable	Non-Allocable	Total
0331	5070	Water & Sewer Supply Items	Reclamation Maintenance	*380,000*							380,000	380,000
0331	5080	Water & Sewer Supply Items	Reclamation Operations	*2,500*						2,500	0	2,500
0332	5080	Waste Treatment Laboratory Supplies	Reclamation Operations	*2,000*			2,000				0	2,000
0332	5260	Waste Treatment Laboratory Supplies	Process Protection Control	*25,000*			25,000				0	25,000
0333	1000	Waste Treatment Chemicals	Administration	*0*		0					0	0
0333	5070	Waste Treatment Chemicals	Reclamation Maintenance	*50,000*							50,000	50,000
0333	5080	Waste Treatment Chemicals	Reclamation Operations	*260,000*		260,000					0	260,000
0334	5070	Lubricants/Machinery	Reclamation Maintenance	*4,000*							4,000	4,000
0343	5070	Protective Equipment	Reclamation Maintenance	*4,000*							4,000	4,000
0343	5240	Protective Equipment	Administration	*5,400*						5,400	0	5,400
0343	1000	Computer Supplies	Administration	*0*						0	0	0
0343	5070	Computer Supplies	Reclamation Maintenance	*1,000*							1,000	1,000
0373	5070	Vehicle Maintenance - Normal	Reclamation Maintenance	*2,000*							2,000	2,000
0379	5070	Lumber	Reclamation Maintenance	*1,000*							1,000	1,000
0382	5070	Electrical Supplies	Reclamation Maintenance	*35,000*							35,000	35,000
Total Supplies and Materials				**878,750**								
Business & Education Expenses												0
0410	5070	Vehicle Fuels	Reclamation Maintenance	*10,000*							10,000	10,000
0411	1000	County Vehicle Charges	Administration	*0*							0	0
0411	5240	County Vehicle Charges	Administration	*288,361*					288,361		0	288,361
0412	5240	Private Vehicle Expenses	Administration	*0*						0	0	0
0413	5080	Commercial Transportation	Reclamation Operations	*900*						900	0	900
0413	5260	Commercial Transportation	Process Protection Control	*900*			900				0	900
0414	1000	Meals & Lodging	Administration	*0*						0	0	0
0414	5070	Meals & Lodging	Reclamation Maintenance	*300*							300	300
0414	5080	Meals & Lodging	Reclamation Operations	*2,350*						2,350	0	2,350
0414	5260	Meals & Lodging	Process Protection Control	*5,100*			5,100				0	5,100
0415	5240	Subscriptions	Administration	*5,800*						5,800	0	5,800
0416	5240	Membership Dues	Administration	*1,200*						1,200	0	1,200
0417	5240	Tuition Reimbursement Program	Administration	*0*						0	0	0
0418	5070	Seminars & Meetings	Reclamation Maintenance	*3,000*							3,000	3,000
0418	5080	Seminars & Meetings	Reclamation Operations	*2,560*						2,560	0	2,560
0418	5240	Seminars & Meetings	Administration	*0*						0	0	0
0418	5260	Seminars & Meetings	Process Protection Control	*2,440*			2,440				0	2,440
Total Business & Education Expenses				**322,911**								
Capital Outlay		Operational & Construction Equipment										0
0505	1000	Operational & Construction Equipment	Administration	*0*						0	0	0
0505	5070	Operational & Construction Equipment	Reclamation Maintenance	*0*							0	0
0505	5240	Operational & Construction Equipment	Administration	*2,800*						2,800	0	2,800
Total Capital Outlay				**2,800**								
Other Expenses		Outside Sewage Treatment Fees										0
0704	5240	Outside Sewage Treatment Fees	Administration	*3,900,000*							3,900,000	3,900,000
0706	5240	Depreciation	Administration	*31,100*						31,100	0	31,100
0706	5080	Sludge Fees	Reclamation Operations	*13,265*			13,265				0	13,265
Total Other Expenses				**3,944,365**								
TOTAL DEPARTMENTAL EXPENSES (0090720)				**11,421,617**	1,100,000	260,000	1,399,684	2,640,520	288,361	196,852	5,536,200	11,421,617
Reallocaiton of General					19,291	4,560	24,547	46,308	5,057	(196,852)	97,089	0
TOTAL DEPARTMENTAL EXPENSES (0090720)					**1,119,291**	**264,560**	**1,424,231**	**2,686,828**	**293,418**	**0**	**5,633,289**	**11,421,617**

Little Patuxent Water Reclamation Plant Operating & Maintenance Budget (0720)

Description			FY 2006 Approved Budget	Power	Chemicals	Sludge/ Process	Personnel	Vehicle	General - Allocable	Non-Allocable	Total
NON-DEPARTMENTAL EXPENSES (0090715)											
0670	7020	Bureau Overhead Admin Allocation[1]	*80,000*	7,840	1,853	9,976	18,819	2,055	0	39,457	80,000
TOTAL NON-DEPARTMENTAL EXPENSES (0090715)			**80,000**	7,840	1,853	9,976	18,819	2,055	0	39,457	80,000
TOTAL			**11,501,617**	1,127,131	266,413	1,434,207	2,705,647	295,473	0	5,672,746	11,501,617
Total O&M Allocable to Surcharge Costs				1,127,131	266,413	1,434,207	2,705,647	295,473			**5,828,871**

Notes: [1] Eight percent (8%) of DPW overhead admin allocation for the bureau is applicable to the treatment plant per Bob Beringer (11/28/2005).

Howard County Bureau of Utilities
Little Patuxent Water Reclamation Plant
Net Plant Investment Summary
(as of June 30, 2005)

Asset ID	Description	Original Cost Less Depreciation
Headworks		
22478	Greenwood Place - North Pipe Gallery Building	*891,000*
22489	Greenwood Place - Grit Bldg	*392,000*
22499	Greenwood Place - Headworks Bldg	*1,944,000*
22503	Greenwood Place - Auxiliary Pump Station Bldg.	*1,362,000*
22522	Greenwood Place - South Pump Station Bldg	*272,000*
22523	Greenwood Place - North Pump Station Bldg	*271,000*
Total Headworks		**5,132,000**
Primary Treatment		
22506	Greenwood Place - Primary Clarifer #4	*1,309,000*
22508	Greenwood Place - Primary Clarifer #1	*1,036,000*
22509	Greenwood Place - Primary Clarifer #2	*1,036,000*
22510	Greenwood Place - Primary Clarifer #3	*1,036,000*
22511	Greenwood Place - Primary Clarifer #5	*1,036,000*
Total Primary Treatment		**5,453,000**
BNR		
22481	Greenwood Place - North Process Reactors	*750,000*
22484	Greenwood Place - Final Clarifier #10 (Retrofitted)	*518,000*
22485	Greenwood Place - Final Clarifier #11 (Retrofitted)	*518,000*
22486	Greenwood Place - Final Clarifier #12	*518,000*
22500	Greenwood Place - Aeration Building	*1,913,000*
22505	Greenwood Place - Floculation Basins	*1,346,000*
22507	Greenwood Place - North Blower Building	*1,156,000*
22512	Greenwood Place - Final Clarifer #2	*1,012,000*
22513	Greenwood Place - Final Clarifer #3	*1,012,000*
22514	Greenwood Place - Final Clarifer #4	*1,012,000*
22515	Greenwood Place - Final Clarifer #5	*1,012,000*
22516	Greenwood Place - Final Clarifer #6	*1,012,000*
22517	Greenwood Place - Final Clarifer #7	*1,012,000*
22518	Greenwood Place - Final Clarifer #8	*1,012,000*
22519	Greenwood Place - Final Clarifer #9	*1,012,000*
22524	Greenwood Place - Secondary Building	*268,000*
22480	Greenwood Place - Alum & East Pipe Gallery Building	*782,000*
22491	Greenwood Place - Blower Gallery Building	*351,000*
Total BNR		**16,216,000**
Filtration		
22495	Greenwood Place - Filter Building	*2,550,000*
22504	Greenwood Place - Filters	*1,346,000*
22525	Fermenter Tank #1 (2000 sq.ft)	*250,000*
22526	Fermenter Tank #2 (2000 sq ft)	*250,000*
Total Filtration		**4,396,000**

Howard County Bureau of Utilities
Little Patuxent Water Reclamation Plant
Net Plant Investment Summary
(as of June 30, 2005)

Asset ID	Description	Original Cost Less Depreciation
Disinfection		
22502	Greenwood Place - Contact Tanks	*1,723,000*
22520	Greenwood Place - Chlorine Building	*951,000*
Total Disinfection		**2,674,000**
Solids Train		
22479	Greenwood Place - Lime Bldg	*887,000*
22487	Greenwood Place - Sludge Oxidation Building	*510,000*
22492	Greenwood Place - Dewatering Building	*5,700,000*
22493	Greenwood Place - Sludge Holding Tanks	*3,843,000*
Total Solids Train		**10,940,000**
General Plant		
22482	Greenwood Place - Flow Equalization Tank #1	*518,000*
22490	Greenwood Place - Flow Equalization Tank #3	*381,000*
22494	Greenwood Place - Land Improvements, infrastructure	*2,870,000*
22496	Greenwood Place - Maint Bldg	*2,150,000*
22497	Greenwood Place - Admin Bldg	*2,000,000*
22498	Greenwood Place - Electrical Equipment Including 2 major substations	*2,000,000*
22521	Greenwood Place - Main Switch Bldg	*299,000*
22528	Greenwood Place - Scale House	*69,000*
	Greenwood Place - Flow Equalization Tank #2	*518,000*
Total General Plant		**10,805,000**
Net Plant Investment		**55,616,000**

Notes:

Input O&M Budget Allocation Factors[1]

		Allocation Factors					
	O&M	Headworks	Primary Treatment	BNR	Filtration	Disinfection	Solids Train
Power	1,127,131	*0.138*	*0.138*	*0.418*	*0.059*	*0.059*	*0.188*
Chemicals	266,413			*0.044*		*0.670*	*0.286*
Sludge/Process	1,434,207						*1.000*
Personnel	2,705,647	*0.250*	*0.050*	*0.300*	*0.075*	*0.075*	*0.250*
Vehicles	295,473	*0.680*		*0.167*		*0.030*	*0.123*
Total O&M	5,828,871						

Functional Cost Allocation Factors[2]

	Allocation Factors					
	Vol./Cap.	BOD	TSS	TP	TN	FOG
Headworks	0.950		0.050			
Primary Treatment	0.700	0.100	0.200			
BNR	0.200	0.400		0.100	0.300	
Filtration	0.800		0.150	0.050		
Disinfection	1.000					
Solids Train	0.425	0.265	0.090	0.055	0.165	

Howard County Bureau of Utilities
Little Patuxend Water Reclamation Plant
Allocation of Operation and Maintenance Costs
FY 2007

				Wastewater Strength				
Line No.	Description	Total[3]	Vol./Cap.	BOD	TSS	TP	TN	FOG
		$	$	$	$	$	$	$
1	Headworks	1,033,000	981,000		52,000			
2	Primary Treatment	291,000	204,000	29,000	58,000			
3	BNR	1,344,000	269,000	538,000		134,000	403,000	
4	Filtration	269,000	216,000		40,000	13,000		
5	Disinfection	457,000	457,000					
6	Solids Train	2,435,000	1,035,000	645,000	219,000	134,000	402,000	
7	Total Treatment Plant	5,829,000	3,162,000	1,212,000	369,000	281,000	805,000	

Notes: [1] O&M budget allocation factors were provided by County staff and are used to allocate the O&M by budget item to plant functions.

[2] Design basis allocation factors were jointly developed between Black & Veatch (Bob Rectanus) and County staff (Dan Ward, Rene Javier). The design basis factors are used to allocate functional costs to volume and strength components.

[3] Allocated functional O&M costs are calculated by summing the products of the allocated budgted O&M times the appropriate allocation factor. For example the Headworks funtional O&M figure is the sum of the products of the budgeted O&M times the headworks allocation factors: [(1,127,131 x 0.138) + (266,413 x 0) + (1,434,207 x 0) + (2,705,647 x 0.25) + (295,473 x 0.680)] = 1,033,000 (rounded).

Input Allocation Factors

	Allocation Factors				
	Vol./Cap.	BOD	TSS	TP	TN
Headworks	*0.950*		*0.050*		
Primary Treatment	*0.700*	*0.100*	*0.200*		
BNR	*0.200*	*0.400*		*0.100*	*0.300*
Filtration	*0.800*		*0.150*	*0.050*	
Disinfection	*1.000*				
Solids Train	0.425	0.265	0.090	0.055	0.165

Howard County Bureau of Utilities
Little Patuxend Water Reclamation Plant
Allocation of Net Plant Investment and Capital Costs
FY 2007

Line No.	Description	Total	Vol./Cap.	Wastewater Strength BOD	TSS	TP	TN
		$	$	$	$	$	$
1	Headworks	5,132,000	4,875,000		257,000		
2	Primary Treatment	5,453,000	3,817,000	545,000	1,091,000		
3	BNR	16,216,000	3,243,000	6,486,000		1,622,000	4,865,000
4	Filtration	4,396,000	3,517,000		659,000	220,000	
5	Disinfection	2,674,000	2,674,000				
6	Solids Train	10,940,000	4,650,000	2,899,000	985,000	602,000	1,805,000
7	General	10,805,000	5,492,000	2,394,000	721,000	589,000	1,608,000
8	Total Treatment Plant Investment	55,616,000	28,268,000	12,324,000	3,713,000	3,033,000	8,278,000
9	Distribution of Net Plant Investment	100.00%	50.83%	22.16%	6.68%	5.45%	14.88%
	Net Capital Costs[1]						
10	Equipment Replacement[2]	*5,116,000*	2,600,000	1,134,000	342,000	279,000	761,000
11	Total Net Capital Costs	5,116,000	2,600,000	1,134,000	342,000	279,000	761,000

Notes: [1] The distribution of Net Plant Investment to the cost components is the basis for the allocation Net Capital Costs. For example, the Net Plant Investment costs for BOD represent 22.16% of the total. The 22.16% is multiplied by the Equipment Replacement figure of $5,116,000 to produce $1,134,000 (rounded) in costs associated with removing BOD. The same approach applies to other strength categories.

[2] Equipment Replacement is the recovery of the funds necessary to replace equipment inside of the plant. FY 2007 equipment replacement costs based on the estimated cost of plant equipment to be replaced annualized over a 10-year period.

Sewer Surcharge Rate Calculations for FY 2007
Little Patuxent Water Reclamation Plant

Factor	BOD	TSS	TP	TN	Total
O&M Costs	1,212,000	369,000	281,000	805,000	2,667,000
Capital Costs	1,134,000	342,000	279,000	761,000	2,516,000
Total Cost	2,346,000	711,000	560,000	1,566,000	5,183,000
Units of Service (lbs.)	14,000,000	12,500,000	375,000	975,000	
Sewer Surcharge Rate	$0.168/lb.	$0.057/lb.	$1.493/lb.	$1.606/lb.	

In FY 2005, Dreyer's was billed surcharges using rates calculated in 2002. The 2002 rates were $0.248 per pound of BOD, $0.285 per pound of TSS and $1.391 per pound of TP. The total high strength surcharges billed to Dreyer's by Howard County in FY 2005 was $435,942 as shown on the next page.

A surcharge rate calculation was performed by Black & Veatch using the same methodology that has been in place since the early 1980s, but using FY 2005 cost and strength removal data. Table D-1 presents the calculated total cost of removal (using the historical methodology and the FY 2005 budget), the net annual removal of each high strength component in FY 2005 and the resulting unit surcharge rate:

Table D-1 – Calculated Surcharge Rate for Dreyer's

Component	BOD	TSS	TP
Allocated Annual Cost ($)	3,356,909	3,199,576	2,600,138
Net Annual removal (lb)	14,000,492	12,508,402	377,310
Surcharge Rate ($/lb)	0.240	0.256	6.891

The calculated surcharge rates differed from the 2002 rates as shown in Table D-2:

Table D-2 – Comparison of Surcharge Rates

Component	BOD	TSS	TP
Howard County 2002 Rates	$0.248	$0.285	$1.391
Recalculation 2005	$0.240	$0.256	$6.891

Table D-3 shows on the following page, by quarter, the lbs of BOD, TSS and TP contributed to the plant by Dreyer's, the amount billed by quarter for each high strength component, and the amount calculated (as detailed above using FY 2005 data). The difference between the amounts billed to Dreyer's using 2002 rates and the amounts that would have been billed using FY 2005 data is shown on the following page in Table D-4.

Table D-3 – Comparison of Dreyer's Charges

Quarter	BOD (lbs.)	Billed ($)	Calc'd ($)	TSS (lbs.)	Billed ($)	Calc'd ($)	TP (lbs.)	Billed ($)	Calc'd ($)
1	124,964	30,991	29,991	9,007	2,567	2,306	35	49	241
2	145,956	36,197	35,029	24,144	6,881	6,181	0	0	0
3	467,643	115,975	112,234	108,135	30,818	27,683	334	464	2,302
4	666,048	165,180	159,852	161,088	45,910	41,239	671	934	4,624
Total	1,404,611	348,343	337,106	302,374	86,176	77,409	1,040	1,447	7,167

Table D-4 summarizes the high strength surcharge amounts billed to Dreyer's in FY 2005 (the sums of the third, sixth and ninth columns in the above table), the amounts calculated using FY 2005 removals and the FY2005 budget (the sums of the fourth, seventh and tenth columns in the above table) and the difference between the two:

Table D-4 – Charge Difference Between Existing and Calculated Surcharge Rates

Total High Strength Surcharge	Amount
Billed	$435,966
Calculated	$421,681
Difference	$14,285

Most Recent Twelve Months of Lab Data[1]

	BOD		TSS		TP		TN	Flow
	PCI	FE	PCI	FE	PCI	FE	(FE)	(mgd)
Oct-04	239	1.7	230	1.0	6.3	0.5	4.80	17.62
Nov-04	228	1.9	214	0.9	5.8	0.1	4.19	18.01
Dec-04	260	2.1	209	0.8	6.6	0.1	4.48	18.95
Jan-05			218	2.3	7.1	0.3	5.42	19.43
Feb-05	281	3.6	244	1.5	6.1	0.1	5.19	19.02
Mar-05	274	3.4	215	1.3	5.8	0.1	5.35	20.25
Apr-05	282	3.1	212	1.6	6.9	0.1	4.56	21.35
May-05	269	2.2	210	1.2	6.4	0.1	4.17	19.13
Jun-05	221	1.5	205	0.8	6.8	0.1	3.88	18.36
Jul-05	179	1.4	215	0.8	8.4	0.1	4.02	18.45
Aug-05	227	1.3	207	0.7	6.7	0.2	4.05	17.8
Sep-05	263	1.3	247	0.8	8.3	0.2	4.28	16.76
Oct-05	244	1.3	234	1.4	7.2	0.3	3.95	18.97
Average	**247**	**2.1**	**220**	**1.2**	**6.8**	**0.2**	**4.49**	**18.78**

FY02 - FY03 Effluent Concentration Data[2]

Unit Process	Sampling Location	BOD	TSS	TP	TN
Headworks	PCI	235	212	5.7	32
Primary Clarifiers	PCE	141	74	4.9	26
BNR	FI	5	5	0.55	6.97
Disinfection	FE	3	2	0.3	6.7
Removal (%)					
Headworks	PCI	100.0%	100.0%	100.0%	100.0%
Primary Clarifiers	PCE	60.0%	34.9%	86.0%	81.3%
BNR	FI	2.1%	2.4%	9.6%	21.8%
Disinfection	FE	1.3%	0.9%	5.3%	20.9%

FY05 - FY06 Effluent Concentration Data

Unit Process	Sampling Location[3]	BOD	TSS	TP	TN[4]
Headworks	PCI	247	220	6.8	21.5
Primary Clarifiers	PCE	148	77	5.8	17.5
BNR	FI	5	5	0.7	4.7
Disinfection	FE	2.1	1.2	0.2	4.5

Notes:
1. Data from Howard County file LPWRP Lab Data FY04-FY05.xls.
2. Data source - Treatment Costs fy02-03.xls.
3. Estimated PCE and FI removal figures based on FY02-FY03.xls data.
4. Estimated PCI, PCE & FI removal figures based on FY02-FY03.xls data.

Allocation of O&M to Unit Processes

FY02 - FY03 O&M Cost Allocation to Unit Processes[1]

Unit Process	Power[4]	Chemicals	Personnel	Supplies & Materials	Total
Headworks			285,459	46,914	332,373
Primary Clarifiers			230,459	12,914	243,373
BNR		10,163	250,459	24,914	285,536
Disinfection		153,903	254,459	26,914	435,276
Dewatering[2]		65,570	244,459	20,914	330,943
TOTAL	0	229,636	1,265,295	132,570	**1,627,501**

FY02 - FY03 Allocation Percentages					
Headworks	15.0%		22.6%	35.4%	20.4%
Primary Clarifiers	10.0%		18.2%	9.7%	15.0%
BNR	30.0%	4.4%	19.8%	18.8%	17.5%
Disinfection	10.0%	67.0%	20.1%	20.3%	26.7%
Dewatering	35.0%	28.6%	19.3%	15.8%	20.3%

FY05 O&M Budget[3]	1,852,500	310,000	2,845,819	537,760	285,536
FY05 Sludge O&M[3]				1,258,309	285,536
Total	1,852,500	310,000	2,845,819	1,796,069	571,072

FY06 Allocation Percentages					
Headworks	277,875	-	643,155	190,367	1,111,397
Primary Clarifiers	185,250	-	517,939	52,163	755,352
BNR	555,750	13,640	563,472	101,099	1,233,961
Disinfection	185,250	207,700	572,010	109,165	1,074,125
Dewatering	648,375	88,660	549,243	1,343,275	2,629,553
TOTAL	1,852,500	310,000	2,845,819	1,796,069	**6,804,388**

Notes:
1. Data from Howard County file Treatment Costs FY02-FY03.xls.
2. Excludes direct sludge allocation to dewatering of 1,394,277.
3. Data from Howard County file LPWRP O&M FY2006 - DATA.xls.

Allocation of Plant Additions to Unit Processes

Description	Cost	Headworks	Primary Clarifiers	BNR	Disinfection	Dewatering	General
4th Addition [1]							
Raw sewage PS, primary clarifier, activated sludge aeration, secondary clarifier, nitrification aeration basins & nitrification clarifiers [2]	8,599,700	1,433,300	1,433,300	5,733,100			
Solids handling	6,812,000					6,812,000	
Filtration and disinfection	5,854,300				5,854,300		
Adminstration and maintenance buildings	1,930,000						1,930,000
Initial roadways	1,275,800						1,275,800
Computer and master control	1,093,400						1,093,400
Phoshorous removal	3,239,100			3,239,100			
Site works	4,236,000						4,236,000
Grit removal	1,913,300	1,913,300					
Screening and flow equalization	3,963,500	3,963,500					
Engineering design, E&I and CM	12,082,900						12,082,900
Total Cost	51,000,000	7,310,100	1,433,300	8,972,200	5,854,300	6,812,000	20,618,100
General Allocation	-	4,960,900	972,700	6,088,800	3,972,900	4,622,800	(20,618,100)
Final Allocation	51,000,000	12,271,000	2,406,000	15,061,000	9,827,200	11,434,800	0
5th Addition [3]	21,000,000	5,052,800	990,700	6,201,600	4,046,500	4,708,400	
6th Addition [4]							
BNR Expansion	14,922,186			14,922,186			
Solids	14,288,820					14,288,820	
Primary Treatment [5]	6,862,761	5,423,864	1,438,897				
BNR Upgrade	8,219,052			8,219,052			
Lab	491,997						491,997
Control Systems	1,408,763						1,408,763
On-call contractor	37,643						37,643
Engineering design and primary CM	9,680,334						9,680,334
Total Cost	55,911,556	5,423,864	1,438,897	23,141,238	0	14,288,820	11,618,737
General Allocation	-	1,422,800	377,400	6,070,300	0	3,748,200	(11,618,737)
Final Allocation	55,911,556	6,846,664	1,816,297	29,211,538	0	18,037,020	0
TOTAL	**127,911,556**	**24,170,464**	**5,212,997**	**50,474,138**	**13,873,700**	**34,180,220**	**0**
Grant Financed [6]	45,135,000	10,859,835	2,129,310	13,328,985	8,697,072	10,119,798	0
Other	82,776,556	13,310,629	3,083,687	37,145,153	5,176,628	24,060,422	
TOTAL	127,911,556	24,170,464	5,212,997	50,474,138	13,873,700	34,180,220	0

Notes:
1. 4th addition data provided by Howard County in fax sent by Dan Ward, November 17, 2005.
2. Each item is assigned an equal construction value with last four being assigned to BNR.
3. 5th addition's $21M cost from the fax sent by Dan Ward (11/17/05) allocated based on the 4th addition.
4. 6th addition data provided by B&V engineers, Bob Rectanus and Peter Schauer.
5. Detailed data provided from Final Probable Cost for LPWRP 6th Addition Preliminary & Primary Treatment Improvements.pdf file.

Annual Cost by Unit Process

FY 2005

Unit Process	Original Cost[1] (Estimated)	Capital & Depreciation			Power	Chemicals	Personnel	Supplies & Materials	Total
		Depreciation[2]	Interest[3]	Total					
Headworks	24,170,464	604,262	399,319	1,003,581	277,875	-	643,155	190,367	2,114,978
Primary Clarifiers	5,212,997	130,325	92,511	222,836	185,250	-	517,939	52,163	978,188
BNR	50,474,138	1,261,853	1,114,355	2,376,208	555,750	13,640	563,472	101,099	3,610,169
Disinfection	13,873,700	346,843	155,299	502,142	185,250	207,700	572,010	109,165	1,576,267
Dewatering	34,180,220	854,506	721,813	1,576,319	648,375	88,660	549,243	1,343,275	4,205,872
Total	127,911,519	3,197,789	2,483,297	5,681,086	1,852,500	310,000	2,845,819	1,796,069	**12,485,474**

Notes:
1. Original cost figures include engineering design, inspection and construction management costs for the 4th and 6th additions.
2. Depreciation based on estimated average service life of 40 years.
3. Assumed interest rate of 3.0% based on rate of MD Water Quality Bonds in 2005 CAFR excluding grant-financed costs.
4. Based on FY02 - FY03 cost estimates.

Annual Unit Process Cost Allocation by Load Factor

Unit Process	Sampling Location	BOD	TSS	TP	TN
Effluent Concentration (mg/l) [1]					
Headworks	PCI	247	220	6.8	21.5
Primary Clarifiers	PCE	148	77	5.8	17.5
BNR	FI	5	5	0.7	4.7
Disinfection	FE	2.1	1.2	0.2	4.5
Dewatering					
Nutrient Removal					
Headworks					
Primary Clarifiers		40.1%	65.0%	14.7%	18.6%
BNR		57.9%	32.7%	75.0%	59.5%
Disinfection		1.2%	1.7%	7.4%	0.9%
Dewatering					
Annual Cost Allocation Factors					
Headworks		-	-	-	-
Primary Clarifiers		29.0%	47.0%	10.6%	13.4%
BNR		25.7%	14.5%	33.3%	26.4%
Disinfection		10.7%	15.2%	66.1%	8.0%
Dewatering[2]		47.0%	47.0%	6.0%	-
Annual Cost Allocation					
Headworks	2,114,978	-	-	-	-
Primary Clarifiers	978,188	283,675	459,748	103,688	131,077
BNR	3,610,169	927,813	523,475	1,202,186	953,085
Disinfection	1,576,267	168,661	239,593	1,041,912	126,101
Dewatering	4,205,872	1,976,760	1,976,760	252,352	-
TOTAL	12,485,474	**3,356,909**	**3,199,576**	**2,600,138**	**1,210,263**

Notes: 1. FY02-FY03 effluent data provided by Howard County.
2. Estimate based on 1981 calculation provided in RFP.

Dreyer's Surcharge Rate Update

Little Patuxent Water Reclamation Plant

Factor	BOD	TSS	TP	TN
Total Annual Cost *($)*	3,356,909	3,199,576	2,600,138	1,210,263
Net Annual Removal *(lb.)*	14,000,492	12,508,402	377,310	971,859
Surcharge	$0.240/lb.	$0.256/lb.	$6.891/lb.	$1.245/lb.