REPORT UPON

SEPARATION OF SEWERS

IN THE

VILLAGE OF MONSANTO

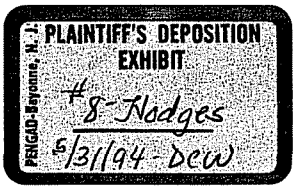
MONSANTO, ILLINOIS

FOR

MONSANTO CHEMICAL COMPANY

March 15, 1962

Jos. W. Goldenberg
Consulting Engineer
East St. Louis, Illinois



JOSEPH W. GOLDENBERG

CONSULTING ENGINEER PHONE BRidge 1-4337

INDUSTRIAL — STRUCTURAL
MUNICIPAL

March 15, 1962

Monsanto Chemical Company
Engineering Department
Organic Chemicals Division
1700 South Second Street
St. Louis 77, Missouri

Attention: Mr. R. O. Nellums, Assistant Director

Gentlemen:

Subject: Engineering Investigation of
Monsanto Village Sewer System.

In accordance with our proposal of November 30, 1961 and your letter of authorization of December 1, 1961, we are submitting herewith the copies of our report on the Proposed Dual Sewer System in the Village of Monsanto.

Very truly yours,

Jos. W. Goldenberg

Jos. W. Goldenberg

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J OSEPH W. GOLDENBERG

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PHONE BRidge 1-4337

INDUSTRIAL — STRUCTURAL
MUNICIPAL

EAST ST. LOUIS, ILLINOIS

March 15, 1962

Monsanto Chemical Company
Engineering Department
Organic Chemicals Division
St. Louis 77, Missouri

Attention: Mr. R. C. Nellums, Assistant Director

Gentlemen:

In accordance with our decussion, we have made a cost analysis of a minimum program of sewer construction which would only alleviate flooding conditions in the plant areas of both Lewin-Mathes Company and Mobil Oil Company. This program has been under consideration for several years but has been deferred pending possible integration into the overall Village of Monsanto Pollution Abatement Project.

Location M. H. to M. H.	Estimated Construction Cost
9 - 7 - 3 - 19	$ 279,000
28D - 23A	22,000
28C - 24	92,500
Conn. to U.S.C.E. Station	51,500
Total Estimated Construction Cost	$ 445,000
Engineering and Contingencies	89,000
Financing, Legal & Admin. Costs	16,000
Total Estimated Capital Cost	$ 550,000

Very truly yours,

Jos. W. Goldenberg

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CONCLUSIONS AND RECOMMENDATIONS

The objective of this report is the determination of methods and costs for converting the existing Village of Monsanto Sewer System to a dual system which would permit the separate collection of segregated wastes.

The nature of existing sewage facilities outside and within the respective industrial plant areas make it apparent that stormwater runoff will constitute a major factor in any recommended plan elected. Accordingly, various studies were made and several plans submitted together with the overall effects of an estimated 5 year frequency rainfall compared with the effects of an intermediate, less-intense rainfall.

As a result of this study, it appears that the present Village of Monsanto sewers can feasibly be converted into a dual system of sewers. With the exception of Plan "A", any of the remaining plans submitted may be adopted to achieve this result.

Unless extensive in-plant sewer changes are made, stormwater will materially affect the design of the sewers and treatment facilities. This is particularly true of the sewers serving Lewin-Mathes Co., Mobil Oil Co., and Monsanto Chemical Co., who are major contributors of treatable wastes. This can be observed by comparing the tables containing dry weather flows with those containing dry weather flows plus stormwater runoff. In general, sewers will flow part full during dry weather, but will be surcharged during periods of rainfall - varying with the intensity.

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The plan to be adopted depends upon the individual economy and willingness to accept certain inconveniences on the part of each industry.

Plan "B". This plan, while more costly than other plans submitted, seems more desirable for long range planning. The plus values include: Lower percentages of stormwater entering the treatable waste sewers; newer construction available for the more corrosive treatable wastes; Dead Creek not required for emergency ponding of treatable wastes during periods of heavy rainfall. The minus values include: Greater capital expenditure; construction and operation of a new pumping station for treatable wastes; difficult segregation of treatable waste laterals in Monsanto Chemical Company main plant area.

The adoption of Alternate No. 1 would be a desirable variation to Plan "B". This alternate involves a change in location of the treatable waste sewer serving Mobil Oil Co. and a probable reduction in capital expenditure.

The adoption of Alternate No. 2 would also be a desirable variation to Plan "B". This alternate involves a change in location of the clear water sewer serving Mobil Oil Co. - similar to Alternate No. 1 above.

Plan "B-1A". This plan is based on a rainfall of 1" per hour as compared to 1.8" per hour in Plan "B", other than this the plan is quite similar to Plan "B" except that only one new 36" treatable waste sewer is proposed through the Main Plant area of Monsanto Chemical Co., rather than two. The clear water systems are the same in both plans mentioned above.

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While this plan involves less treatable waste sewer construction to achieve a dual system, its capacity for stormwater is greatly reduced and will result in periodic flooding of the areas served by the sewer - which include Monsanto Chemical Co. and Lewin-Mathes Co..

We do not feel that the saving to be realized in this plan is warranted, and do not recommend its consideration.

Plan "C". A basic difference between Plan "C" and Plan "B" lies in the designation of existing sewers for treatable wastes under this plan, and the construction of new sewers for clear water; this is contrary to Plan "B".

This plan, while requiring a lower capital expenditure than Plan "B", does not appear to be as desirable for long range planning. The plus values include; lower capital expenditure; no pumping station for treatable wastes required - as in Plan "B"; simpler reconnections of existing sewers in Monsanto Chemical Co. main plant area. The minus values include: Use of Dead Creek as an emergency pond for treatable wastes plus stormwater; larger percentages of stormwater would enter the treatable waste sewers.

The effect of greater quantities of stormwater in the treatable waste sewers would have to be investigated in the treatment plant study.

Plan "C-1". This plan is based on a rainfall of 1" per hour - as compared to 1.8" per hour in Plan "C"; accordingly, fewer and smaller

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sewers are required. This is particularly true in the clear water system - which in this plan constitute the sewers to be constructed.

The additional sewers along Monsanto Avenue for clear water have not been proposed in this plan because the basis for runoff has been taken at 1" per hour. However, it may be desirable to construct these sewers to improve the flooding condition which would occur during varying periods of rainfall.

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PURPOSE AND SCOPE OF STUDY

Purpose of Study. The purpose of this study is to determine the feasibility and estimated cost for providing a dual sewer system to serve the industries in the Village of Monsanto. One portion of this system would be designated for the collection of foul water wastes and would convey these to a new Village Treatment Plant; the other portion would collect such clean water wastes not requiring treatment and convey these to a new pumping station proposed by the U.S. Corps of Engineers.

The new pumping station would also receive the effluent from the Village Treatment Plant and discharge the combined wastes to the Mississippi River.

Scope of Study. The study covers an investigation of the present Village of Monsanto sewer system which serves the entire developed area of the Village including the industries and will determine:

(a) Additional sewers required to establish a dual system where the present system is not suitable or adequate for this purpose.

(b) Changes required to convert the present combined single system to a dual system.

The original criteria for this study were supplied by Mr. C. N. Stutz of Monsanto Chemical Company and contained estimated flows of both foul water wastes and clean water wastes from each of the Industries within the Village.

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SUMMARY OF PLANS

Report. This report was prepared to submit several plans for accomplishing the dual system of sewers and indicate the factors, both physical and economic, related to each plan. The following plans and alternates were investigated and reported:

Plan "A" This plan entails the separation of existing multiple sewers with the addition of a minimum of new construction, as required to create a dual system.

Plan "B" This plan in general designates a major portion of the existing sewers for clean water wastes and includes the construction of new sewers for foul water wastes. This plan takes into account the effect of a 5 year frequency rainfall or $4\frac{1}{4}$ inches per hour for 15 minute duration which is comparable to a rainfall intensity of 1.8 inches per hour. There are two alternates to this plan - Alternate No. 1 & Alternate No. 2.

Plan "B-1A" This plan is the same as Plan "B" except that the rainfall effect is arbitrarily based on an intensity of 1.0 inches per hour, and Alternate No. 1 having been adopted.

Plan "C" This plan designates the existing trunk sewers in the south plant area of Monsanto Chemical Company for foul water wastes, taking into account the effect of a rainfall intensity of 1.8 inches per hour - as in Plan "B".

Plan "C-1" This plan is the same as Plan "C" except that the rainfall effect is arbitrarily based on an intensity of 1.0 inches per hour.

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LIST OF ABBREVIATIONS

M.H.	Manhole or Interceptor
In.	Inches
Hr.	Hour
F.L.	Flow line
Elev.	Elevation
cfs	Cubic feet per second
Vel.	Velocity
fps	Feet per second
FT^2	Square feet
R.O.	Runoff
Coef.	Coefficient
gpm	Gallons per minute
gph	Gallons per hour
mgd	Million gallons per day
gpd	Gallons per day

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BASIC INFORMATION & DATA

Initially a review was made of all existing plans and reports to correlate any possible discrepancies between the Village maps, Metcalf & Eddy Report of 1960 and the Horner & Shifrin Report of 1952. Some questions were resolved by actual field checking - including the location of certain inlet structures not heretofore indicated. Conferences were held with representatives of industry for the purpose of determining the following:

1. The extent of in-plant change and any quantitative change in the sewage flow.
2. The extent of in-plant separation of wastes completed and/or contemplated.
3. Projected future expansion.
4. Stormwater drainage facilities and relationship to the sewer system.

Following are the conditions and information tabulated for each of the industries:

American Zinc Co.: According to the 1960 M&E Report the average daily flow from American Zinc Plant into the Village sewers is about 5.42 mgd. However, American Zinc Company is planning a separation of wastes inside the plant, and the future flow into the sewers would be sanitary flow, approximated at 20,000 gpd. (to obtain peak hourly flow for sewer design this is multiplied by 1.35), the remaining waste would be clear water which could by-pass the proposed treatment facilities.

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The amount of clear waste as given by Mr. C. N. Stutz of Monsanto Chemical Company is 5.4 mgd., but according to Mr. R. K. Carpenter of American Zinc Company the figure after the separation would be 4.5 mgd.. However, the planned expansions within the next 3 to 5 years would bring this figure back up to about 5.4 mgd. - so the latter figure is used in this report. Since this flow is constant, the maximum hourly flow is assumed equal to the average hourly flow for sewer design.

According to Mr. Carpenter all storm water inside the American Zinc Plant flows northward and is ponded in an area North of the Plant and East of Route 3 - (see Ponding Map). There are no stormwater connections to the Village sewers, and none are contemplated.

It should be mentioned that, since the sewer connections from American Zinc are about $2\frac{1}{2}$ ft. above the Village sewers, the plant has not experienced any difficulty due to surcharge of sewers during heavy rainfall.

Darling Fertilizer Co.: The status of sewers at Darling remains the same as previously reported in the 1960 M&E Report and no changes are contemplated. The wastes are essentially sanitary and the quantity is given as 42,000 gpd. The maximum hourly rate used in design is 34 gpm in north sewer and 11 gpm from east sewer - these figures are based on M&E Report.

According to Mr. H. L. Stangel of Darling, all storm water is ponded west of the buildings as shown on the Ponding Map. The parking lot adjacent to Route 3 has a yard drain, which may drain into the sewers, accordingly a nominal amount of runoff has been added for this area.

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Lewin-Mathes Co.: The total sewage flow from Lewin-Mathes Co. is given as 2.98 mgd. However, they are planning water conservation and separation inside the plant which would reduce the average sewage flow to about 2 mgd.

Approximately 1.0 mgd. of this would go through their present lift station, thence to the Route 3 sewers; this flow to Route 3 would ultimately be clear water even though at the present time there are some sanitary sewers connected to this line. These will be disconnected and directed to the treatable waste sewer inside the plant. There is a fluctuation of flow in this line. The maximum hourly flow of 96,500 gph is the figure used as the basis for design.

Approximately 300,000 gpd of clear waste will be discharged into the 24" sewer going to Dead Creek and the flow is expected to remain constant.

Approximately 700,000 gpd of treatable waste from Lewin will be discharged toward Dead Creek. The 15" sewer (called Control Building Sewer in M&E Report) will have a maximum hourly flow of approximately 43,100 gph and the 15" sewer designated as Village Lift Station sewer in the M&E Report will have a maximum hourly flow of approximately 73,400 gph. These maximum values are used in this study. Information relative to flows was supplied by Mr. K. Guth of the Lewin-Mathes Company.

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The stormwater drainage at Lewin presents a problem. Each of their sewers carries a certain amount of runoff water. The separation of inlets and drains from the treatable waste sewers inside the plant is not feasible. Since the potential amount of stormwater in the treatable waste sewer is substantial, the size of sewers serving Lewin is governed by stormwater flow. The areas and runoff tributary to each sewer are shown on a separate sheet.

A large area of the plant drains into a ponding area as shown on Ponding Map. The strictly storm sewers from Lewin along Dead Creek are not interrupted and Dead Creek is presumed to act as drainage ditch and/or ponding reservoir.

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Lewin-Mathes Company

Stormwater Distribution and Runoff into the Sewers
(From data supplied by K. Guth)

Line	Size	Area in Ac.	I(R.O.Coef)	R(In/hr)	Q(cfs)	R(In/hr)	Q(cfs)
Mississippi Ave.	24"	5.0	0.7	1.8	6.2	1.0	3.4
Control Building	15"	4.6	0.7	1.8	5.8	1.0	3.2
Village Pump Sta.	15"	2.5	0.7	1.8	3.1	1.0	1.7
South of Plant Road to Dead Creek	30" & 8"	2.3	0.7	1.8	2.9 *	1.0	1.6*
Dead Creek	8" & 18"	0.9	0.7	1.8	1.1 *	1.0	0.6*
Dead Creek	24"	3.1	0.7	1.8	3.9 *	1.0	2.2*
Dead Creek	12"	1.2	0.3	1.8	0.8 *	1.0	0.5*

Q = AIR (Basic runoff formula)

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* Denotes discharge of stormwater into Dead Creek - not included in sewer design.

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Midwest Rubber Co.: According to the 1960 M&E Report the average flow of sewage from Midwest is about 3.6 mgd. and according to the information given by Mr. Stutz of Monsanto Chemical Company this flow would be reduced to 0.6 mgd. clear waste and 20,000 gpd of sanitary waste. However, in conference with Messres. H. R. Erwin and C. D. Smith of Midwest Rubber, it was established that so far the flow has been reduced by 40 percent which would decrease the flow to about 2.1 mgd. (this is constant and maximum is equal to average) and there are no plans for further reduction. This quantity would be clear waste which could by-pass the Treatment Plant. In addition there would be a flow of 15,000 gpd of sanitary waste, and the possibility that 60,000 gpd of treatable waste would be added. This total of 75,000 gpd is assumed to enter the treatable waste line to obtain maximum hourly flow for sewer design - a factor of 1.35 was used.

Much of the stormwater from Midwest goes to the ponding area west of the Darling Plant as shown on the Ponding Map, however an estimated area of 5 acres of roof and paved areas is assumed tributary to the existing sewers. The storm runoff is computed as follows (Using Q = Air):

	A(Area in Acres)		I (R.O. Coefficient)		Rainfall (Inch/hr)		Q(cfs)
1.8"/hr	5	x	0.7	x	1.8	=	6.3
1.0"/hr	5	x	0.7	x	1.0	=	3.5

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Mobil Oil Company: Mobil Oil Company sewer conditions remain the same as reported in the 1960 M&E Report and the company does not plan any appreciable changes. Most of the sewage is collected in Plant Sump No. 4 which is equipped with 1-1500 gpm pump and 1-5000 gpm pump. The smaller pump is apparently adequate for dry weather flow - and both pumps discharge through the A.P.I. separators into the Village sewers. Another 200 gpm from lime sludge, cooling tower and steam blow downs which is considered clean by-passes the pump and the separators and is discharged directly to the sewers. During periods of rainfall the 5,000 gpm pump supplements the smaller pump. In addition to this approximately 800 gpm of storm-water can by-pass the sump to the discharge side of the pumps. Areas tributary to the sewers in the Mobil Refinery are appreciable and estimated at 65 acres of roof and paved areas by the Plant engineers. A slight rainfall will result in a runoff equal to the capacity of the larger pump. Since Mobil Oil does not plan to increase the pumping capacity for stormwater runoff the sewer design is based on 6000 gpm of clear waste.

Plant conditions do not allow the separation of storm water run-off from treatable waste. Sump No. 4 is arranged so that 1-1500 gpm pump will operate at all times and will discharge to the treatable waste system; as the quantity of wastes exceed the smaller pump capacity because of stormwater runoff, the 5000 gpm pump will start operating and discharge into the proposed clear water system. It is believed that the treatable waste will be diluted to the point that the portion

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going through clear water system can by-pass the treatment plant. This will be explored further by Metcalf & Eddy. It should be stated that the present sewer proposal is based on a flow of 6000 gpm in clear water system and 2000 gpm in treatable waste which is the maximum expected in the future. Should future qualitative study show that additional pumps for treatable wastes must be installed to insure sufficient dilution, the proposed sewers will have to be modified to provide adequate capacity.

Monsanto Chemical Co.: Monsanto Chemical Co. plans substantial revisions in their internal plant sewer system which will result in a separation of treatable from clear wastes within their plant. The quantity and nature of waste flow at each point is given in the accompanying table. All values for process wastes were provided by Mr. C. N. Stutz and R. H. Young of Monsanto Chemical Co.. The values given are average values and apparently do not vary appreciably from maximum - so they were used in the sewer design. Most of the sewer outlets carry storm water as well as clear or treatable wastes. According to the information available from Monsanto Chemical Co. engineers, complete separation is not feasible; as a result, the storm-water flow governs the design of most of the sewers - as indicated in the tables. There are substantial areas in North Plant from which the stormwater does not enter the sewers but flows northward to the ponding area as shown on the Ponding Map.

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Monsanto Chemical Company

Stormwater Distribution and Runoff into the Sewers
(From data supplied by R. H. Young)

Location	Pipe Size	Area (Acres)	I(R.O.Coef.)	R(In/hr)	Q(cfs)	R(In/hr)	Q(cfs)
M.H. 4-A	18"	1.0	0.7	1.8)	1.4	1.0)	0.8
		0.46	0.15	1.8)		1.0)	
M.H. 5	24"	0.18	0.7	1.8)	0.3	1.0)	0.2
		0.23	0.15	1.8)		1.0)	
M.H. 5	18"	1.68	0.7	1.8)	3.4	1.0)	1.9 *
		4.60	0.15	1.8)		1.0)	
M.H. 6	18"	1.3	0.7	1.8)	2.2	1.0)	1.2
		2.3	0.15	1.8)		1.0)	
M.H. 8	2-12"	4.48	0.7	1.8	5.7	1.0	3.2
M.H. 20	15" & 18"	2.06	0.7	1.8)	2.9	1.0)	1.6
		0.92	0.15	1.8)		1.0)	
M.H. 21	15" & 24"	2.13	0.7	1.8)	3.1	1.0)	1.7
		1.38	0.15	1.8)		1.0)	
M.H. 22	24"	0.35	0.7	1.8)	0.7	1.0)	0.4
		1.15	0.15	1.8)		1.0)	
M.H. 23	18"	0.69	0.15	1.8	0.2	1.0	0.1
M.H. 23-A	18"	0.02	0.7	1.8	0.02	1.0	-
M.H. 24	8"	0.01	0.7	1.8	0.01	1.0	-
M.H. 26	24"	9.4	0.7	1.8)	13.3	1.0)	7.4
		5.18	0.15	1.8)		1.0)	
M.H. 26-A	30"	2.8	0.7	1.8)	4.5	1.0)	2.5
		3.45	0.15	1.8)		1.0)	

Q = AIR (Basic runoff formula)

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Monsanto Chemical Company

Distribution of Treatable and Clear Water Wastes in Various Areas
Derived from data furnished by Monsanto Chemical Company

Location	Pipe Size	Clean Waste (cfs)	Treatable Waste (cfs)	Runoff (cfs) 1.8 In/h	1.0 In/h
M.H. 4-A	18"	0.22	-	1.4	0.8
M.H. 5	24"	-	0.95	0.3	0.2
M.H. 5	18"	-	-	3.4	1.9 *
M.H. 6	24"	-	1.34	-	-
M.H. 6	18"	2.01	-	2.2	1.2
M.H. 8	2-12"	-	-	5.7	3.2
M.H. 20	15"&18"	-	1.73	2.9	1.6
M.H. 21	15"&24"	-	1.0	3.1	1.7
M.H. 22	24"	3.8	-	0.7	0.4
M.H. 23	18"	-	0.11	0.2	0.1
M.H. 23-A	18"	4.0	-	0.02	-
M.H. 24	8"	-	0.22	0.01	-
M.H. 26	24"	-	9.80	13.3	7.4
M.H. 26-A	30"	11.5	-	4.5	2.5

The above data is used as the basis for design in Plan "B". In Plan "C" the clear waste flow from manholes 22, 23-A and 26-A is diverted Northward by Monsanto Chemical Company and intercepted at manholes 38, 37 and 36 respectively.

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* As this report was being completed, we were informed by Mr. R. H. Young of Monsanto Chemical Company that the 18" sewer from the North Area entering M.H. #5 carries treatable waste as well as stormwater - not just stormwater as we were originally informed. Accordingly, this line must be intercepted and brought into the treatable waste system, as indicated on the Plans - but not carried into the tables. Proper flow adjustment must be made in the tables to correct the hydraulic gradients for this revision.

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T. J. Moss Tie Co.: Moss Tie Co. has no sewer connection at this time, and none is planned in the foreseeable future. There is an extention of the Village sewer into the Company's yard but there have been no connections made. All the sanitary and process wastes as well as stormwater are ponded inside the Plant Area as shown on the Ponding Map.

Sterling Steel Co.: The status of sewers at Sterling Steel Co. is the same as described in Metcalf & Eddy Report of 1960. There are no contemplated changes which would materially affect the maximum sewer flow of 100,000 gpd. This consists of sanitary wastes and some cooling water. There is an area approximately 0.57 Acre of roof and paved area which drains into the Treatable Sewer System.

	A (Area in Acres)		I(R.O. Coefficient)		R.O. (In/h)		Q(cfs)
1.8 In/hr	0.57	x	0.7	x	1.8	=	0.73
1.0 In/hr	0.57	x	0.7	x	1.0	=	0.4

The remainder of the stormwater from Sterling Steel Co. plant is ponded inside the plant in the areas shown on the map. There are no plans for future stormwater connections to the sewer system.

Q = AIR (Basic runoff formula)

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Village Residential Area - School & Village Hall: There is a flow of sanitary waste from this area into the existing sewer system which will discharge into the treatable waste system. The population of this area is estimated at 240. Based on 100 gpd/Capita, the sanitary waste will amount to approximately 0.05 cfs.

There are stormwater inlets on Little Avenue, Queeny Avenue and Nickle Street. In addition, the Village Hall parking area is paved and a portion drains into the sewer system. Total runoff from this area is estimated at 7.0 cfs. No storm sewers are proposed for this area since the amount of runoff is small compared to the overall figure for the entire village. The cost of new sewers and the separation of stormwater runoff from sanitary waste would not be feasible at this time.

Monsanto Avenue: There are a number of street inlets along Monsanto Avenue connected to the existing sewer. The total runoff between 19th Street and Route 3 is estimated at 4.2 cfs. This amount is divided between about 15 inlets.

Manchester Subdivision: Estimating the population of this area at 110 - and a per capita flow of 100 gpd - the sanitary wastes will amount to approximately 0.02 cfs. Stormwater runoff is estimated to be 2.0 cfs and will enter the sanitary sewer.

The existing connection to the sewer is quite low - accordingly a portion of sewer will be replaced to provide a connection to the proposed treatable waste sewer as indicated in the tables.

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General Information Related to All Plans

All plans include the utilization of the existing Village Pumping Station as a lift station for wastes to be treated in the proposed new treatment plant and the construction of a new pumping station by the U. S. Corp. of Engineers of sufficient capacity to handle both the effluent from the treatment plant and the clear water wastes. The proposed location of U.S.C.E. Pump Station is to the North and the treatment plant to the South of existing pumping station.

Source	Treatable Waste (cfs)	Clear Waste (cfs)	Runoff 1.8 in/hr	Runoff 1.0 in/hr
American Zinc Co.	0.03 (0.04 Max.)	8.4	-	-
Darling Fertilizer Co.	0.06 (0.1 Max.)	-	1.8	1.0
Lewin-Mathes Co.	1.1 (4.3 ± Max.)	2.0 (4.0 Max.)	15.9 *	8.8 *
Midwest Rubber Co.	0.12 (0.16 Max.)	3.3	6.3	3.4
Mobil Oil Co.	4.5	-	13.4	13.4 (+)
Monsanto Chemical Co.	15.2	21.5	37.6	21.0
Sterling Steel Co.	0.16	-	0.7	0.4
Village Residential Area	0.04	-	7.0	3.9
Monsanto Ave.	-	-	4.2	2.3
Manchester Subdivision	0.02	-	2.0	1.1
Total	24.5	37.2	89.0	55.3

* Not including 7.9 cfs for 1.8 inch per hour or 4.4 cfs for 1.0 inch per hour draining intc Dead Creek.

(±) Approximately

(+) See page 29

All discharge values for process waste are average unless noted otherwise.

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PLAN "A"

(Tables No. 1 and 2)

This plan consists of converting the existing system of sewers into a dual system with a minimum of new sewer construction. The dual system would provide separate collection of wastes to be treated at the new Village Treatment Plant and those clear water wastes which could by-pass treatment and be discharged directly into the river.

Revisions at junction box (2) can be made to separate flows entering and leaving - designating the northerly sewers for clear wastes and connecting into the new U.S.C.E. Pumping Station, while the southerly sewers would convey the wastes to be treated into the present Village Pumping Station - thence into the new treatment plant.

It will be necessary to construct certain new sewers along Monsanto Avenue between State Route 3 and the main plant entrance of Monsanto Chemical Company - as indicated on the plan (due to the fact that a single line serves this area now). Since there are a number of street inlets connected into the existing sewers, and the wastes to be treated are appreciably less than the clear water wastes, it is more feasible to designate the new sewer for wastes to be treated - making the necessary reconnections indicated on the Plan. (As may be seen in the tables, the new sewer is at higher elevation and the connection can cross over the existing sewer).

It will also be necessary to construct: A new 36" sewer between (2) and (10) for treatable wastes; an inverted siphon in the clear water line around interceptor (10); two new sewers along Dead Creek to provide

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both a clear water and a treatable waste outlet for Lewin-Mathes Company.

Certain existing sewers have been designated for use based on geographic location rather than size, to facilitate separation of wastes without the construction of inverted siphons or complex structures.

In referring to Tables No. 1 and 2 it will be apparent that this minimum plan will result in a system subject to substantial surcharges in the treatable waste sewers - and to a lesser extent in the clear water sewers. Since this plan is inadequate for dry weather flows it doesn't seem prudent to investigate the effect of stormwater and no cost study was made.

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PLAN "B"

(Tables 3, 4, 5 and 6)

This plan consists of designating a major part of the existing sewers for clear water collection and constructing the necessary new sewers for the collection of wastes to be treated. This plan concept was investigated for the following reasons:

1. The existing sewers and structures have been in use for a number of years and their overall condition relative to corrosion resistance - particularly in the structures - is not well known.
2. This system is not dependent upon Dead Creek as an emergency ponding reservoir of combined runoff and wastes to be treated during a 5 year frequency storm. (Emergency ponding in Dead Creek during heavy rainfall is essential to Plans "C" and "C-1"). Dead Creek will have to be available as a drainage ditch for Lewin-Mathes Company in all plans.
3. Approximately 44 percent of total stormwater runoff will enter the treatable waste system compared with 50% in Plan "C" (see Tables 4, 6, 9 and 11 - Col. 12).

Treatable Waste System: Junction box (2) can be revised to separate flows entering and leaving - designating the existing 4 - 36" sewers for clear water wastes and constructing 2 - 36" sewers between (2) and the pumping station for treatable wastes - (see Plan).

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To avoid crossing interference, the two new sewers through the main plant area of Monsanto Chemical Company have been indicated at a lower elevation than the existing sewers. This necessitates construction of a Lift Station near (10). The sewers from Sterling Steel Company and the residential area of the Village as well as a new sewer for treatable wastes from Lewin-Mathes Co. would be re-directed into these new sewers.

New sewers are to be constructed to both Midwest Rubber Co. and the northern Village area which includes Manchester Subdivision, American Zinc Company, Monsanto Chemical Company's - North Area, and Mobil Oil Company. This new sewer is at a higher elevation than the existing sewer to permit reconnecting without interference. The 12" sewer to Midwest Rubber is necessary due to reduced amount of treatable waste and low velocity; which is also true for the subsequent plans with lower rainfall intensities.

Clear Water System: The 4 - 36" sewers between (2) and the pumping station are designated for clear water wastes. Actually only 3 lines are required, but it is felt that the cost of diverting one of those multiple lines to the treatable waste system would offset any saving which might be realized by constructing only one new treatable waste sewer between (2) and the pumping station.

From (2) to (9) all existing sewers are designated for clear water wastes. The hydraulic gradient shown in Table 6 (See lines 4 to 13 of Table 6) is hypothetical - since the sewer between (2) and (9) has little additional capacity available for stormwater - (see Table 5, Lines 4 and 5).

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Any appreciable rainfall results in ponding due to inadequate sewer capacity. Heavy rainfall results in flooding on the North side of Monsanto Avenue in the Monsanto Chemical Co. parking area, to some extent in the North Plant Area of Monsanto Chemical Company and in the Mobil Oil Company ditch along 19th Street. This last is a condition with which the affected industries are familiar. Some relief will be realized by the construction of the new sewer for wastes to be treated. To provide a system adequate for a 5 year frequency rainfall, optional Alternate No. 2 is submitted.

A box will be provided at the 12" clear water sewer along Dead Creek to divert the stormwater from the Lewin 24" outfall into Dead Creek. A total of approximately 8 cfs of stormwater may be discharged from the Lewin-Mathes Company plant area storm sewersdue to a 5 year frequency storm into Dead Creek. This will not enter the sewer system and should flow south in Dead Creek.

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PLAN "B-A1" - ALTERNATE NO. 1

(Table 4-A)

This plan is identical with Plan "B" - Treatable Waste System, with the following exceptions:

1. The North branch stops at M.H. (6) and the pipe size is reduced between (6) and (10).
2. For the treatable waste from Mobil Oil Co. a new treatable waste line has been added along State Aid Route 10 connecting into the proposed treatable waste system through the southern portion of Monsanto Chemical Company main plant area.
3. See Table 4-A - Change in hydraulic gradient.

Should Plan "B" be adopted, Alternate No. 1 would definitely be economically desirable and should also be incorporated into the plan.

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PLAN "B-A2" - ALTERNATE NO. 2

(Table 6-A)

This optional plan may be adopted to provide relief in the north branch of the clear water system during periods of storm runoff.

The plan is identical with Plan "B" - clear water system except for the construction of 1 - 30" line to divert most of the stormwater from Mobil Oil Co. along State Aid Route 10 into the designated clear water system through the southern portion of Monsanto Chemical Company main plant area.

By referring to Table 6-A - hydraulic gradient it is apparent that this flow can be accommodated without surcharging the sewers.

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PLAN "B-1A"

(Table 7 - For 1" Rainfall)

This plan is similar to Plan "B" except that investigations were made on the basis of a rainfall of 1" per hour.

The change in the treatable waste system involves the deletion of 1 - 36" sewer through the Main Plant area of Monsanto Chemical Company. The adoption of Alternate No. 1 would be desirable and should be included in this plan.

The clear water system is the same as for Plan "B" which was found to be generally adequate for a rainfall of 1.8" per hour.

The conditions in the north branch would be somewhat improved over Plan "B" being based on a rainfall of 1" per hour rather than 1.8" per hour. However, to make this branch completely adequate, it would be desirable to adopt an alternate similar to Alternate No. 2 (Plan "B-A2").

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PLAN "C"

(Tables 8, 9, 10 and 11)

This plan is basically different from the other plans in that the existing sewers in the main plant area of Monsanto Chemical Co. are designated for treatable wastes and the new sewers to be constructed through the approximate center of this area would collect clear water wastes. According to information supplied regarding the in-plant sewers, it does not seem to be economical to divert the treatable wastes from the existing trunk sewers into a new sewer - regardless of location and alignment.

Treatable Waste System. All existing sewers extending eastward from the present Village Pumping Station through interceptor (2) and junction box (10), thence through the main plant area of Monsanto Chemical Co., are designated as treatable waste sewers (see Plan).

As indicated in Plan "B", the following new treatable waste sewers are required: A 12" sewer southward from (10) to Midwest Rubber Co.; a 24" sewer northward from interceptor (19); and a 30" sewer along Dead Creek to serve Lewin-Mathes Co. The treatable wastes from the southern residential area and from Sterling Steel Co. will continue in the present sewers.

Referring to Table 9 - (lines 23 to 30), it is apparent that the two existing sewers through the Monsanto Chemical Co. main plant area are inadequate for both the treatable wastes and the tributary runoff from a 5 year frequency storm unless emergency ponding is

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provided in Dead Creek. The tabulated hydraulic gradient is hypothetical in that any substantial stormwater runoff will result in overflow through the 36" C.I. under the Alton & Southern R.R. right-of-way into Dead Creek.

Dead Creek serves as a drainage ditch for Lewin-Mathes Co. in that area. It is also essential to this plan as an emergency ponding reservoir for the treatable waste system mentioned above during periods of heavy rainfall. A certain amount of stormwater from Lewin-Mathes Co. storm sewers will undoubtedly enter the treatable sewer system (unlike Plan "B" where this stormwater is assumed to be flowing south). However, this was not taken into account in computing the hydraulic gradient, since the stormwater can enter the sewers only after the flow has subsided and not at the time of peak flow.

Because of surcharge conditions in the existing trunk sewers in the Monsanto Chemical Co. main plant area, it is impossible to consider Alternate No. 1 in this plan.

Clear Water System. Two new 36" sewers are proposed from the eastern side of State Route 3 to the new U.S.C.E. pumping station. The existing 30" sewer serving the north area of the Village is designated for clear water and would be intercepted around junction box (2). It would be possible to utilize one of the 36" sewers between (2) and the pumping station, but, it is felt that the new structures required to achieve this would offset any saving to be realized.

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Since the capacity of the sewers between (2) and the pumping station has been somewhat reduced, new sewers will be required in the North area as shown on the plan.

An inverted siphon around junction box (10) will be required to permit crossing existing sewers in that area - (see Plan). The 30" sewer extending eastward from (39) through the Monsanto Chemical Co. main plant area will in all probability be engineered and constructed by that company. The collection of clear wastes from Lewin-Mathes Co. - amounting to 300,000 gpd - will be provided for by the installation of a small pumping station and a 6" pressure line discharging into an existing sewer as indicated on the plan.

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PLAN "C-1"

(Tables 12 and 13)

This plan is similar to Plan "C" except for the following:

Treatable Waste System. Fewer treatable waste sewers are required due to lower storm runoff and the situation at Dead Creek is less critical during periods of intense rainfall.

Clear Water System. Most of the new sewers indicated are smaller than those in Plan "C" due to a smaller amount of rainfall. The addition of new sewers to make the North area sewers double does not seem to be essential, although they may be desirable.

The stormwater from Mobil Oil Co. is the same in this case as in Plan "C" due to the factor of pump capacity as described in Basic Informations and Data.

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GENERAL INFORMATION

RELATED TO TABLES

1. Numbers for existing manholes are in general those shown in the Horner & Shifrin report of 1952 - plus new designations for manholes to be constructed. A number refers to an area rather than a single manhole and usually refers to more than one manhole.

2. Elevations at top of manholes were taken from the Horner & Shifrin sewer profiles; others designated as (±) were taken from topographic maps and may be subject to variation.

3. Lengths of sewers are shown in Col. 6 of the tables. When followed by a plus (+) sign these lengths were taken from the Horner & Shifrin report - others were scaled from the maps.

4. Discharge values shown in Col. 11 are actual values given by the respective industries. The values shown are based on average daily flow with the exception of those indicated for Darling Fertilizer Company, Lewin-Mathes Company, Sterling Steel Casting Company and sanitary waste from residential areas - which are maximum values.

5. Where the flow is indicated as "Part Full", capacities are shown as maximum with sewers flowing full - designated with the suffix (+).

6. In dry weather flow tables the velocities are shown only when suspected of being low.

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7. These tables should not be used for final design without certain field checking and adjustments.

8. No infiltration is assumed since all sewers are to be encased in concrete.

9. Sewer discharge was obtained as shown in Basic Information & Data. Time of flow in sewers was disregarded in this study because of trunk line branching.

10. Kutter's "n" for new sewers is assumed as 0.013 - for existing sewers assumed as 0.015. This should be reasonable unless there has been build-up, in which case the sewer can be cleaned.

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LIST OF TABLES

Table No.		Description
1	Plan "A"	Treatable Waste System Without Stormwater
2	Plan "A"	Clear Water System Without Stormwater
3	Plan "B"	Treatable Waste System Without Stormwater
4	Plan "B"	Treatable Waste System With Stormwater (1.8 inch per hour)
4-A	Plan "B-A1"	Treatable Waste System With Stormwater Alternate No. 1 (1.8 inch per hour)
5	Plan "B"	Clear Water System Without Stormwater
6	Plan "B"	Clear Water System With Stormwater (1.8 inch per hour)
6-A	Plan "B-A2"	Clear Water System With Stormwater Alternate No. 2 (1.8 inch per hour)
7	Plan "B-1A"	Treatable Waste System With Stormwater (1 inch per hour)
8	Plan "C"	Treatable Waste System Without Stormwater
9	Plan "C"	Treatable Waste System With Stormwater (1.8 inch per hour)
10	Plan "C"	Clear Water System Without Stormwater
11	Plan "C"	Clear Water System With Stormwater (1.8 inch per hour)
12	Plan "C-1"	Treatable Waste System With Stormwater (1 inch per hour)
13	Plan "C-1"	Clear Water System with Stormwater (1 inch per hour)

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TABLE NO. I

PLAN "A" TREATABLE WASTE SYSTEM WITHOUT STORM WATER

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q(CFS) INDUSTRY	KUTTER "n"	Q(CFS) MAXIMUM CAPACITY	Q(CFS) MAXIMUM TOTAL	VEL. (FPS.)	$\frac{V^2}{2g}$ (FT.)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	2	1	425	417	963 +	2-36	397.30	396.30	0.0010	24.5	0.015	19	36 +	—	—	—	PART	FULL	
2	2-A	2	425	425	160	36	400.28	397.30	0.00187	]	0.013	26	]	—	—	—	PART	FULL	PROPOSED
3	10	2-A	416	425	1100	36	401.36	400.28	0.0010	] 24.5	0.015	19	61 +	—	—	—	PART	FULL	
4	10	2	416	425	1260	36	401.36	397.30	0.00327	]	0.013	35	]	—	—	—	PART	FULL	PROPOSED
5	11	10	423	416	893+	21	406.47	402.66	0.00425	0.3	0.015	9	9 +	1.6	0.05	—	PART	FULL	
6	12	11	424	423	350	21	407.84	406.47	0.00425	0.3	0.015	9	9 +	1.6	0.05	—	PART	FULL	
7	13	12	421	424	780	21	411.25	407.84	0.00425	0.3	0.015	9	9 +	1.6	0.05	—	PART	FULL	
8	19	10	420	416	118 +	24	402.88	402.43	0.00147	24.2	0.015	24	24	8.7	1.17	0.018	406.55	404.43	
9	39	19	415±	420	900	24	406.84	405.20	0.00049	6.9	0.013	7	7	1.9	0.05	0.00095	407.40	406.55	PROPOSED
10	3	39	419	415±	1000	24	406.13	406.84	0.00049	6.9	0.013	7	7	1.9	0.05	0.00095	408.35	407.40	PROPOSED
11	4	3	413	419	105	24	406.19	406.13	0.0006	6.9	0.013	7	7	1.9	0.05	0.00095	408.45	408.35	PROPOSED
12	4-A	4	416	413	200	24	406.50	406.19	0.0015	6.9	0.013	7	7	1.9	0.05	0.00095	408.64	408.45	PROPOSED
13	5	4-A	417	416	405	24	406.76	406.50	0.00064	6.8	0.013	7	7	1.9	0.05	0.00095	409.03	408.64	PROPOSED
14	6	5	413	417	440	24	407.04	406.76	0.00064	5.6	0.013	6	6	1.7	0.04	0.00070	409.34	409.03	PROPOSED
15	7	8	416	413	360	24	408.12	408.65	0.0041	4.5	0.013	12	12 +	4.0	0.25	—	PART	FULL	PROPOSED
16	9	7	417	416	1632 +	24	409.50	408.65	0.00175	4.5	0.015	8	8 +	2.8	0.10	—	PART	FULL	
17	4-B	4	416	413	120	24	406.55	406.19	0.0030	0.1	0.013	2	2 +	1.0	0.02	—	PART	FULL	PROPOSED TO REPLACE EXIST LINE
18	21	19	418	420	754 +	24	403.71	402.60	0.00147	17.3	0.015	17	17	5.8	0.52	0.0085	412.05	406.55	
19	23	21	417	416	329 +	24	404.18	403.67	0.00095	14.8	0.015	15	15	4.8	0.33	0.0055	413.66	412.05	
20	24	23	415	417	231 +	24	404.40	404.18	0.00095	14.5	0.015	15	15	4.8	0.33	0.0055	415.13	413.66	
21	25	24	414	415	64 +	24	404.91	404.44	0.007	10.0	0.015	10	10	3.2	0.16	0.0026	415.30	415.13	
22	27	25	417	414	80	24	405.12	405.15	0.00037	9.8	0.015	10	10	3.2	0.16	0.0026	415.81	415.30	
23	28	25	416	414	144 +	18	405.75	405.50	0.00174	0.2	0.015	0.2	0.2	0.5	—	—	415.30	415.30	
24	28-A	24	416±	415	300	24	405.18	404.40	0.0026	4.3	0.013	4.3	4.3	1.5	0.03	0.0005	416.28	415.13	PROPOSED
25	28-B	28-A	416±	416±	450	24	405.58	405.18	0.0009	1.8	0.013	1.8	1.8	1.0	0.02	—	415.28	415.28	PROPOSED
26	28-C	28-B	416±	416±	600	24	406.12	405.58	0.0009	1.8	0.013	1.8	1.8	1.0	0.02	—	415.28	415.28	PROPOSED

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TABLE NO. 2

PLAN "A" CLEAR WATER SYSTEM WITHOUT STORM WATER

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q(CFS) INDUSTRY	KUTTER "n"	Q(CFS) MAXIMUM CAPACITY	Q(CFS) MAXIMUM TOTAL	VEL. (FPS.)	$\frac{v^2}{2g}$ (FT.)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	2	1	425	417	998±	36	400.00	397.52	0.0025	37.2	0.015	29	46+	—	—	—	PART	FULL	
2	2	1	425	417	995±	36	397.40	396.40	0.0010		0.015	19		—	—	—	PART	FULL	
3	3	2	419	425	1537±	30	402.55	400.60	0.00125	11.1	0.015	13	13+	—	—	—	PART	FULL	
4	4	3	413	419	105 ±	30	402.68	402.55	0.00125	11.1	0.015	13	13+	—	—	—	PART	FULL	
5	4-A	4	416	413	200	30	402.93	402.68	0.00125	11.1	0.015	13	13+	—	—	—	PART	FULL	
6	5	4-A	417	416	405	30	403.43	402.93	0.00125	10.9	0.015	13	13+	—	—	—	PART	FULL	
7	6	5	413	417	440	2-24	404.77	404.00	0.00175	2.5	0.015	8	16+	1.9	0.05	—	PART	FULL	
8	7	6	418	413	360±	24	405.40	404.77	0.00175	0.5	0.015	8	8+	1.3	0.03	—	PART	FULL	
9	8	7	415	418	400	18	406.58	405.90	0.00165	0.5	0.015	4	4+	1.4	0.04	—	PART	FULL	
10	8-A	8	417	415	660	18	406.82	406.56	VARIES	0.5	0.015	4	4+	1.4	0.04	—	PART	FULL	
11	9	8	417	415	350	15	410.00	408.82	0.00337	0.5	0.015	6	6+	1.7	0.05	—	PART	FULL	
12	10	2	416	425	1260±	2-36	401.26	400.00	0.0010	26.1	0.015	19	36+	—	—	—	PART	FULL	
13	10-A	10	416	416	100	12	402.40	401.26	—	6.6	0.013	3.4	6.8	4.5	0.31	0.011	403.63	402.53	PROPOSED
14	10-A	10	416	416	100	12	402.40	401.26	—		0.013	3.4		4.5	0.31	0.011	403.63	402.53	INVERTED SIPHON
15	11	10-A	423	416	930	24	406.49	402.40	0.00447	6.8	0.015	13	13+	4.3	0.29	—	PART	FULL	
16	12	11	424	423	350	24	406.06	406.49	0.00447	6.8	0.015	13	13+	4.3	0.29	—	PART	FULL	
17	13	12	421	424	730	24	411.45	406.06	0.00447	3.3	0.015	13	13+	3.5	0.19	—	PART	FULL	
18	19	10	420	416	140±	36	401.83	401.58	0.0010	19.3	0.015	19	19	2.6	0.10	0.0010	404.83	404.58	
19	20	19	420	420	458±	30	402.83	402.02	0.0018	19.3	0.015	19	19	4.0	0.25	0.0030	410.21	408.83	
20	21	20	416	420	285±	30	403.12	402.66	0.00064	19.3	0.015	19	19	4.0	0.25	0.0030	411.07	410.21	
21	22	21	417	416	251±	36	403.26	403.03	0.00099	19.3	0.015	19	19	2.6	0.10	0.0010	411.32	411.07	
22	23-A	22	417	417	180±	36	403.64	403.36	0.00155	16.0	0.015	16	16	2.0	0.06	0.00075	411.46	411.32	
23	26	23-A	417	417	285±	36	403.92	403.64	0.00090	11.5	0.015	11.5	11.5	1.7	0.05	0.00040	411.56	411.46	
24	28-D	23-A	416±	417	1000	12	410.00	405.00	0.0050	0.5	0.013	0.5	0.5	1.3	0.03	0.00010	411.56	411.46	PROPOSED

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TABLE NO 3

PLAN "B" TREATABLE WASTE SYSTEM WITHOUT STORM WATER

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH FT.	SIZE IN.	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q (CFS) INDUSTRY	KUTTER "n"	Q (CFS) MAXIMUM CAPACITY TOTAL	VEL. FPS	$V^2/2g$ (FT)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	2	1	425	417	850	2-36	397.50	396.30	0.00118	24.5	0.013	23	46 +	—	—	—	PART	FULL	PROPOSED
2	2-A	2	425	425	180	36	400.28	397.30	0.0187		0.013	29		—	—	—	PART	FULL	PROPOSED
3	10	2-A	416	425	100	36	401.38	400.28	0.0010	24.5	0.015	21 + 60	66 +	—	—	—	PART	FULL	
4	10	2	416	425	1250	36	401.38	397.30	0.00327		0.013	39		—	—	—	PART	FULL	PROPOSED
5	11	10	423	416	950	12	407.05	404.95	0.0021	0.3	0.013	18	18 +	1.3	0.03	—	PART	FULL	PROPOSED
6	12-A	11	420	423	1080	12	—	407.05	0.00408	0.3	0.013	20	20 +	1.9	0.06	—	PART	FULL	PROPOSED
7	13	12-A	421	420		12	411.45	—		0.3	0.013	20	20 +	1.9	0.06	—	PART	FULL	PROPOSED
8	19	10	420	416	250	2-36	399.40	399.00	0.0016	17.3	0.013	27	54 +	—	—	—	PART	FULL	PROPOSED
	(PROPOSED PUMPING STATION AT M.H. 10 TO PUMP THE SEWAGE IN LINE 8 INTO LINES 3 & 4)																		
9	19	10	420	416	250	24	404.99	404.70	0.00116	8.9	0.013	8.5	8.5 +	—	—	—	PART	FULL	PROPOSED
	(LINE 9 CONNECTS TO THE DISCHARGE SIDE OF LIFT STATION)																		
10	20	19	420	420	460	2-36	399.95	399.40	0.0012	17.3	0.013	24	48 +	—	—	—	PART	FULL	PROPOSED
11	21	20	416	420	290	2-36	400.30	399.95	0.0012	15.6	0.013	24	48 +	—	—	—	PART	FULL	PROPOSED
12	23	21	417	416	330	2-30	400.89	400.42	0.0012	14.6	0.013	14	28 +	—	—	—	PART	FULL	PROPOSED
13	24	23	415	417	230	2-30	400.97	400.89	0.0012	14.5	0.013	14	28 +	—	—	—	PART	FULL	PROPOSED
14	28-A	24	416	415	250	24	404.74	400.97	0.0151	4.3	0.013	27	27 +	6.5	0.65	—	PART	FULL	PROPOSED
15	28-B	28-A	416	416	450	24	405.24	404.74	0.0011	1.6	0.013	8	8 +	2.0	0.06	—	PART	FULL	PROPOSED
16	28-C	28-B	416	416	800	24	406.12	405.24	0.0011	1.6	0.013	8	8 +	2.0	0.06	—	PART	FULL	PROPOSED
17	25	24	414	415	100	2-24	401.27	401.10	0.00174	10.0	0.013	9.5	19 +	—	—	—	PART	FULL	PROPOSED
18	27	25	417	414	130	2-24	401.50	401.27	0.00174	9.6	0.013	9.5	19 +	—	—	—	PART	FULL	PROPOSED
19	26	24	416	415	144	18	407.75	402.00	0.0400	0.2	0.013	20	20 +	3.9	0.23	—	PART	FULL	PROPOSED
20	3	19	419	420	1900	24	406.13	404.99	0.0006	8.9	0.013	5.5	5.5 +	2.2	0.07	0.00090	408.71	408.99	PROPOSED
21	4	3	413	419	105	24	406.19	406.13	0.0006	8.9	0.013	5.5	5.5 +	2.2	0.07	0.00090	408.80	408.71	PROPOSED
22	4-A	4	416	413	200	24	406.50	406.19	0.0015	8.9	0.013	8.5	8.5 +	2.2	0.07	0.00090	408.98	408.80	PROPOSED
23	5	4-A	417	416	405	24	407.76	406.50	0.00064	8.8	0.013	6	6 +	2.2	0.07	0.00090	409.36	408.98	PROPOSED
24	6	5	413	417	440	24	407.04	406.76	0.00064	5.6	0.013	6	6 +	1.9	0.06	—	PART	FULL	PROPOSED
25	7	6	416	413	360	21	408.12	407.12	0.0036	4.5	0.013	9.5	9.5 +	1.9	0.06	—	PART	FULL	PROPOSED
26	9	7	417	418	1630	21	409.50	408.12	0.00085	4.5	0.013	4.5	4.5 +	1.9	0.06	—	PART	FULL	PROPOSED
27	4-B	4	415	413	120	24	408.55	406.19	0.0030	0.1	0.013	2.0	2.0 +	1.0	0.02	—	PART	FULL	PROPOSED TO REPLACE EXIST. LINE

HARTOLDMON0007072

TABLE NO. 4

PLAN "B" TREATABLE WASTE SYSTEM WITH STORM WATER (1.6 INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q (CFS) TREAT	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "n"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL. (FPS.)	$V^2/2g$ (FT.)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	2	1	425	417	650	2-36	397.30	396.30	0.00118	24.5	39.2	63.7	0.013	32	64	4.4	0.30	0.0022	401.17	399.30	PROPOSED
2	2-A	2	425	428	180	36	400.28	397.30	0.0167				0.013	29.7		4.2	0.27	0.0019	401.48	401.17	PROPOSED
3	10	2-A	416	425	1100	36	401.38	400.28	0.0010	24.5	39.2	63.7	0.015	29.7	63.7	4.1	0.26	0.0025	404.23	401.48	
4	10	2	416	425	1250	36	401.38	397.30	0.00327				0.013	34.0		4.8	0.35	0.0025	404.40	401.17	PROPOSED
5	11	10	423	416	950	12	407.05	404.95	0.0021	0.3	—	0.3	0.013	1.8	1.8 +	1.3	0.03	—	PART	FULL	PROPOSED
6	12-A	11	420	423	1080	12	—	407.05	0.00408	0.3	—	0.3	0.013	2.0	2.0 +	1.9	0.06	—	PART	FULL	PROPOSED
7	13	12-A	421	420		12	411.45	—		0.3	—	0.3	0.013	2.0	2.0 +	1.9	0.06	—	PART	FULL	PROPOSED
8	19	10	420	416	250	2-36	399.40	399.00	0.0016	17.3	36.9	54.2	0.013	27	54	3.7	0.21	0.0015	402.37	402.00	PROPOSED
			(PROPOSED PUMPING STATION AT M.H. 10 TO PUMP THE SEWAGE IN LINE 8 INTO LINES 3 & 4)																		
9	19	10	420	416	250	24	404.99	404.70	0.00116	6.9	2.3	9.2	0.013	9	9	2.8	0.12	0.0017	407.12	406.70	PROPOSED
			(LINE 9 CONNECTS TO THE DISCHARGE SIDE OF LIFT STATION)																		
10	20	19	420	420	480	2-36	399.95	399.40	0.0012	17.3	36.9	54.2	0.013	27	54	3.7	0.21	0.0015	403.08	402.37	PROPOSED
11	21	20	416	420	290	2-36	400.30	399.95	0.0012	15.6	34.0	49.6	0.013	25	50	3.5	0.19	0.0014	403.46	403.08	PROPOSED
12	23	21	417	416	330	2-30	400.69	400.42	0.0012	14.6	30.9	35.5	0.013	18	38	3.7	0.21	0.0018	404.08	403.46	PROPOSED
13	24	23	415	417	230	2-30	400.97	400.69	0.0012	14.5	30.7	35.2	0.013	18	38	3.7	0.21	0.0018	404.47	404.08	PROPOSED
14	28-A	24	416	415	250	24	404.74	400.97	0.0151	4.3	9.7	14.0	0.013	27	27 +	8.8	1.20	—	PART	FULL	PROPOSED
15	28-B	28-A	416	416	450	24	405.24	404.74	0.0011	1.8	6.6	8.2	0.013	8	8 +	2.6	0.11	—	PART	FULL	PROPOSED
16	28-C	28-B	416	416	600	24	406.12	405.24	0.0011	1.8	5.8	7.4	0.013	8	8 +	2.5	0.10	—	PART	FULL	PROPOSED
17	25	24	414	415	100	2-24	401.27	401.10	0.00174	10.0	20.9	30.9	0.013	16	32	5.2	0.42	0.0052	404.99	404.47	PROPOSED
18	27	25	417	414	130	2-24	401.50	401.27	0.00174	9.8	13.3	23.1	0.013	12	24	3.8	0.22	0.0029	405.37	404.99	PROPOSED
19	26	24	418	415	144+	18	407.75	402.00	0.0400	0.2	7.8	7.8	0.013	8	8	4.5	0.31	0.0060	405.85	404.99	PROPOSED
20	3	19	419	420	1900	24	406.13	404.99	0.0006	6.9	2.3	9.2	0.013	9	9	2.8	0.12	0.0017	410.35	407.12	PROPOSED
21	4	3	413	419	105	24	406.19	406.13	0.0006	6.9	2.3	9.2	0.013	9	9	2.8	0.12	0.0017	410.53	410.35	PROPOSED
22	4-A	4	416	413	200	24	406.50	406.19	0.0015	6.9	—	7.0	0.013	7	7	2.3	0.08	0.00095	410.72	410.53	PROPOSED
23	5	4-A	417	416	405	24	407.76	406.50	0.00084	6.8	0.2	7.0	0.013	7	7	2.3	0.08	0.00095	411.10	410.72	PROPOSED
24	6	5	413	417	440	24	407.04	406.76	0.00064	5.8	—	5.8	0.013	8	6	1.9	0.06	0.00070	411.41	411.10	PROPOSED
25	7	6	418	413	360	21	408.12	407.12	0.0038	4.5	—	4.5	0.013	4.5	4.5	1.8	0.04	0.00080	411.70	411.41	PROPOSED
26	9	7	417	416	1830	21	409.50	408.12	0.00085	4.5	—	4.5	0.013	4.5	4.5	1.8	0.04	0.00080	413.00	411.70	PROPOSED
27	4-B	4	415	413	120+	24	406.55	406.19	0.0030	0.1	2.0	2.1	0.013	2.0	2.0	1.0	0.02	0.00070	410.54	410.53	PROPOSED TO REPLACE EXIST. LINE

MEMPHIS DATUM

JOS. W. GOLDENBERG

HARTOLDMON0007073

TABLE NO. 4-A

PLAN "B-A1" TREATABLE WASTE SYSTEM WITH STORM WATER (ALTERNATE NO. 1) (1.8 INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q (CFS) TREAT	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "n"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL. (F.P.S.)	$\frac{V^2}{2g}$ (FT)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1																					
2	SEE		TABLE		NO.	4															
3																					
4																					
5																					
6	SEE		TABLE		NO.	4															
7																					
8	19	10	420	416	250	2-36	399.40	399.00	0.0016	21.8	36.9	58.7	0.013	30	60	4.3	0.29	0.0020	402.50	402.00	PROPOSED
	(PROPOSED PUMPING STATION AT M.H. 10 TO PUMP THE SEWAGE IN LINE 8 INTO LINES 3&4)																				
9	19	10	420	416	250	18	405.10	404.85	0.0010	2.4	2.3	4.7	0.013	5	5	2.8	0.12	0.0023	407.17	406.35	PROPOSED
	(LINE 9 CONNECTS TO THE DISCHARGE SIDE OF LIFT STATION)																				
10	20	19	420	420	460	2-36	399.95	399.40	0.0012	21.8	36.9	58.7	0.013	30	60	4.3	0.29	0.0019	403.37	402.50	PROPOSED
11	21	20	416	420	290	2-36	400.30	399.95	0.0012	20.1	34.0	54.1	0.013	27	54	3.8	0.20	0.0015	403.80	403.37	PROPOSED
12	23	21	417	416	330	2-30	400.69	400.42	0.0012	19.1	30.9	50.0	0.013	25	50	5.2	0.42	0.00375	405.05	403.80	PROPOSED
13	24	23	415	417	230	2-30	400.97	400.69	0.0012	18.8	30.7	49.5	0.013	25	50	5.2	0.42	0.00375	405.92	405.05	PROPOSED
14																		0.0040	406.92	405.92	PROPOSED
15	SEE TABLE NO. 4.																	0.0012	407.46	406.92	PROPOSED
16																		0.0011	408.34	407.46	PROPOSED
17	28	24	414	415	100	2-24	401.27	401.10	0.00174	14.5	25.4	39.9	0.013	20	40	6.6	0.68	0.0055	406.77	405.92	PROPOSED
18	27	25	417	414	130	2-24	401.60	401.27	0.00174	14.3	13.3	27.6	0.013	14	28	4.5	0.31	0.0040	407.29	406.77	PROPOSED
18-A	9	27	417	417	1700	18	409.50	401.70	0.0046	4.5	—	4.5	0.013	4.5	4.5	2.5	0.09	0.0020	410.69	407.29	PROPOSED
19	SEE		TABLE		NO.	4												0.0060	407.83	406.77	PROPOSED
20	3	19	419	420	1900	18	406.24	405.10	0.0006	2.4	2.3	4.7	0.013	5	5	2.8	0.12	0.0023	411.53	407.17	PROPOSED
21	4	3	413	419	105	18	406.30	406.24	0.0006	2.4	2.3	4.7	0.013	5	5	2.8	0.12	0.0023	411.77	411.53	PROPOSED
22	4-A	4	416	413	200	18	406.80	406.30	0.0010	2.4	—	2.4	0.013	2.5	2.5	1.4	0.03	0.0005	411.87	411.77	PROPOSED
23	5	4-A	417	416	405	18	406.75	406.50	0.00063	2.2	0.2	2.4	0.013	2.5	2.5	1.4	0.03	0.0005	412.10	411.87	PROPOSED
24	6	5	413	417	440	15	407.06	406.75	0.00063	1.3	—	1.3	0.013	1.5	1.5	1.0	0.02	0.0002	412.20	412.10	PROPOSED
25	OMITTED																				
26																					
27	SEE		TABLE		NO.	4												0.00010	411.78	411.77	PROPOSED

HARTOLDMON0007074

TABLE NO. 5

PLAN "B" CLEAR WATER SYSTEM WITHOUT STORM WATER

LINE NO	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q(CFS) INDUSTRY	KUTTER "n"	Q(CFS) MAXIMUM CAPACITY	Q(CFS) MAXIMUM TOTAL	VEL. (FPS.)	$\frac{V^2}{2g}$ (FT)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	2	1	425	417	998 +	36	400.00	397 52	0.0025		0.015	29		—	—	—	PART	FULL	
2	2	1	425	417	995 +	36	397. 40	396.40	0.0010	37.2	0.015	19	86 +	—	—	—	PART	FULL	
3	2	1	425	417	983 +	2-36	397. 30	396.30	0.0010		0.015	38		—	—	—	PART	FULL	
4	3	2	419	425	1537 +	30	402. 55	400 63	0.00125	11.1	0.015	13	13 +	—	—	—	PART	FULL	
5	4	3	413	419	105 +	30	402. 88	402. 55	0.00125	11.1	0.015	13	13 +	—	—	—	PART	FULL	
6	5	4	417	413	605 +	30	403 43	402.88	0 00125	10.9	0.015	13	13 +	—	—	—	PART	FULL	
7	8	5	413	417	440 +	2-24	404. 77	404.00	0.00175	2.5	0.015	8	16 +	2.3	0.08	—	PART	FULL	
8	7	8	418	413	380 +	24	405.40	404 77	0.00165	0.5	0.015	8	8 +	1.3	0.02	—	PART	FULL	
9	8	7	415	418	400	18	407. 22	405 90	0.00175	0 5	0.015	4	12 +	1.4	0.03	—	PART	FULL	ASSUMING FLOW DIVERTED TO THIS LINE
10	8	7	415	418	400	24	407. 35	406.65	0.00175		0.015	8		—	—	—	PART	FULL	
11	8-A	8	417	415	880	18	408.82	407. 35	VARIES		0.015	4	12 +	1.4	0.03	—	PART	FULL	ASSUMING FLOW DIVERTED TO THIS LINE. PROPOSED TO REPLACE EXIST. 15" LINE
12	9	8-A	417	417	350	18	409.50	408.82	0.00337	0 5	0 013	6		2.1	0.07	—	PART	FULL	
13	9	8	417	415	1232 +	24	410. 00	407. 35	0.00178		0.013	8	14 +	—	—	—	PART	FULL	
14	10	2	418	425	1280 +	2-36	401. 28	400.00	0.0010	28 1	0 015	19	38 +	—	—	—	PART	FULL	
15	11	10	423	418	937 +	24	408.49	402.40	0.00447	6 8	0.015	13	22 +	—	—	—	PART	FULL	
16	11	10	423	418	893 +	21	408. 47	402.68	0.00425		0.015	9		—	—	—	PART	FULL	
17	12	11	424	423	350	24	408. 08	408.49	0.00447	5 1	0 015	13	22 +	—	—	—	PART	FULL	
18	12	11	424	423	350	21	407. 84	406 47	0.00425	1 8	0.015	9		2.8	0.12	—	PART	FULL	
19	13	12	421	424	730	24	411. 45	408 06	0 00447	1. 5	0 015	13	22 +	2.8	D. 10	—	PART	FULL	
20	13	12	421	424	780	21	411. 25	407. 84	0.00425	1. 8	0.015	9		2. 8	0. 12	—	PART	FULL	
21	19	10	420	418	140 +	36	401. 63	401. 58	0.00180	19.3	0 015	18	25	—	—	—	PART	FULL	
22	19	10	420	418	118 +	24	402. 80	402.43	0.00147		0-018	7		—	—	—	PART	FULL	
23	21	19	418	420	754 +	24	403. 71	402. 80	0.00147		0.015	9		—	—	—	PART	FULL	
24	20	19	420	420	458 +	30	402. 83	402. 02	0.0018	19.3	0. 015	18	25 +	—	—	—	PART	FULL	
25	21	20	418	420	285 +	30	403. 12	402. 88	0 00084		0.015	16		—	—	—	PART	FULL	
26	22	21	417	416	251 +	36	403. 28	403. 03	0.00099	11. 8	0.015	20		—	—	—	PART	FULL	
27	23-A	22	417	417	180 +	36	403. 64	403. 36	0.00155	8.0	0.015	15	25 +	—	—	—	PART	FULL	
28	28	23-A	417	417	265 +	36	403. 62	403. 64	0.00080	6.0	0.015	11		—	—	—	PART	FULL	
29	27	21	417	418	704 +	24	405. 12	403. 87	VARIES	3.5	0.015	5		—	—	—	PART	FULL	
30	26	27	417	417	100	24	403. 82	405. 12	VARIES	—	0.015	—	—	—	—	—	—	—	NO FLOW WITH DRY WEATHER CONDITION.
31	28-D	24	418	415	1000	12	410. 00	405.00	0.0050	0.5	0.013	2.5	2.5 +	2.3	0.08	—	PART	FULL	PROPOSED

HARTOLDMON0007075

TABLE NO. 8

PLAN "B" CLEAR WATER SYSTEM WITH STORM WATER (1.8 INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q (CFS) IND.	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "n"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL (FPS.)	$\frac{V^2}{2g}$ FT.	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	2	1	425	417	998 +	36	400.00	397.52	0.0025				0.015	22		4.7	0.34	—	PART	FULL	
2	2'	1	425	417	998 +	36	397.40	396.40	0.0010	37.2	49.8	87.0	0.015	22	88	3.0	0.14	0.0013	401.81	400.52	
3	2	1	425	417	983 +	2-36	397.30	396.30	0.0010				0.015	44		3.0	0.14	0.0013	401.81	400.52	
4	3	2	419	425	1537 +	30	402.55	400.63	0.00125	11.1	30.1	41.2	0.015	42	42	6.7	1.17	0.015	426.23	403.13	HYDRALIC GRADIENT ABOVE TOP OF M.H. SEE PAGES 21 & 22 OF REPORT.
5	4	3	413	419	105 +	30	402.68	402.55	0.00125	11.1	29.5	40.6	0.015	41	41	6.5	1.12	0.014	427.70	426.23	
6	5	4	417	413	805 +	30	403.43	402.68	0.00125	10.9	28.5	39.0	0.015	39	39	6.0	0.99	0.0125	435.20	427.70	
7	6	5	413	417	440 +	2-24	404.77	404.00	0.00175	2.5	24.2	26.7	0.015	14	28	4.5	0.31	0.0052	437.49	435.20	
8	7	6	418	413	360 +	24	405.40	404.77	0.00185	0.5	21.4	21.9	0.015	22	22	7.1	0.78	0.0130	442.17	437.49	
9	8	7	415	418	400	18	407.22	405.90	0.00175	0.5	21.4	21.9	0.015	7	22	3.9	0.24	0.0080	444.47	442.17	
10	8	7	415	418	400	24	407.35	406.65	0.00175				0.015	15		4.8	0.35	0.0080	444.47	442.17	
11	8-A	8	417	415	880	18	408.82	407.35	VARIES				0.015	5		3.0	0.14	0.0028	446.93	444.47	
12	9	8-A	417	417	350	18	409.50	408.82	0.00337	0.5	14.6	15.1	0.013	5	15	2.8	0.12	0.0023	447.73	446.93	PROPOSED TO REPLACE EXIST. 15" LINE.
13	9	8	417	415	1232 +	24	410.00	407.35	0.00175				0.015	10		3.1	0.15	0.0025	447.56	444.47	
14	10	2	418	425	1280 +	2-36	401.28	400.00	0.0010	26.1	19.7	45.8	0.015	23	46	3.2	0.18	0.0015	405.05	403.13	
15	11	10	423	418	937 +	24	406.49	402.40	0.00447	6.8	14.4	21.2	0.015	13	22 +	4.2	0.27	—	PART	FULL	
16	11	10	423	418	893 +	21	406.47	402.68	0.00425				0.015	9		3.7	0.21	—	PART	FULL	
17	12	11	424	423	350	24	408.06	406.49	0.00447	5.1	9.5	21.2	0.015	14.8	22 +	4.3	0.29	—	PART	FULL	
18	12	11	424	423	350	21	407.84	406.47	0.00425	1.8	4.7		0.015	6.5		2.7	0.11	—	PART	FULL	
19	13	12	421	424	730	24	411.45	408.06	0.00447	1.5	3.8	11.6	0.015	13	22 +	3.9	0.24	—	PART	FULL	
20	13	12	421	424	780	21	411.25	407.84	0.00425	1.8	4.7		0.015	9		2.7	0.11	—	PART	FULL	
21	19	10	420	418	140 +	36	401.83	401.58	0.00180	19.3	5.3	24.6	0.015	18	25	2.6	0.10	0.00095	405.15	405.05	
22	19	10	420	418	118 +	24	402.60	402.43	0.00147				0.015	7		2.2	0.08	0.00125	405.19	405.05	
23	21	19	418	420	754 +	24	403.71	402.60	0.00147				0.015	9		2.7	0.11	0.0021	406.77	405.19	
24	20	19	420	420	458 +	30	402.83	402.02	0.0018	19.3	5.3	24.6	0.015	16	25	3.2	0.16	0.0021	406.16	405.19	
25	21	20	418	420	285 +	30	403.12	402.88	0.00084				0.015	18		3.2	0.16	0.0021	406.78	406.16	
26	22	21	417	418	251 +	36	403.28	403.03	0.00099	11.8	7.8	19.6	0.015	20		2.6	0.12	0.0012	407.07	406.77	
27	23-A	22	417	417	180 +	36	403.64	403.38	0.00155	8	7	15	0.015	15	25	2.3	0.08	—	PART	FULL	
28	28	23-A	417	417	285 +	36	403.82	403.64	0.00090	8	3	11	0.015	11		1.9	0.05	—	PART	FULL	
29	27	21	417	418	704 +	24	405.12	403.87	VARIES	3.5	1.5	5	0.015	5		1.9	0.05	—	PART	FULL	
30	28	27	417	417	100	24	403.82	405.12	VARIES	—	—	—	0.015	—	—	—	—	—	PART	FULL	
31	28-D	24	418	418	1000	12	410.00	405.00	0.0050	0.5	—	0.5	0.013	2.5	2.5 +	2.3	0.08	—	PART	FULL	PROPOSED

HARTOLDMON0007076

TABLE NO. 6-A

PLAN "B-A2" CLEAR WATER SYSTEM WITH STORM WATER (ALT. NO 2) (1.8 INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F. L. SLOPE	Q (CFS) IND.	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "n"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL (FPS.)	$\frac{V^2}{2g}$ FT.)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	2	1	425	417	998 ±	36	400.00	397.52	0.0025				0.015	22		4.7	0.34	——	PART	FULL	
2	2	1	425	417	995 ±	36	397.40	396.40	0.0010	37.2	49.8	87.0	0.015	22	66	3.0	0.14	0.0013	401.81	400.52	
3	2	1	425	417	983 ±	2-36	397.30	396.30	0.0010				0.015	44		3.0	0.14	0.0013	401.81	400.52	
4	3	2	419	425	1537 ±	30	402.55	400.63	0.00125	10.6	16.6	27.2	0.015	27	27	5.7	0.51	0.0060	412.33	403.13	
5	4	3	413	419	105 ±	30	402.68	402.55	0.00125	10.6	16.0	26.6	0.015	27	27	5.7	0.51	0.0060	412.96	412.33	
6	5	4	417	413	605 ±	30	403.43	402.66	0.00125	10.4	15.0	25.4	0.015	26	26	5.5	0.47	0.0055	416.29	412.96	
7	6	5	413	417	440 ±	2-24	404.77	404.00	0.00175	2.0	10.7	12.7	0.015	6.5	13	2.1	0.07	0.0011	416.77	416.29	
8	7	6	418	413	360 ±	24	405.40	404.77	0.00165	——	7.9	7.9	0.015	6	6	2.5	0.10	0.0016	417.34	416.77	
9	8	7	415	418	400	18	408.62	405.90	0.00175	——	7.9	7.9	0.015	2.5	7.9	1.4	0.03	0.00070	417.62	417.34	
10	6	7	415	418	400	24	407.35	406.65	0.00175	——			0.015	5.4		1.7	0.03	0.00070	417.62	417.34	
11	8-A	8	417	415	680	18	406.82	407.35	VARIES	——	1.2	1.2	0.015	1.2	1.2	1.4	0.03	0.00010	417.71	417.62	
12	9	8-A	417	417	350	18	VACATED														
13	9	8	417	415	1232 ±	24															
14	10	2	416	425	1280 ±	2-36	401.26	400.00	0.0010	26.6	33.2	59.8	0.015	30	60	4.2	0.27	0.0025	406.33	403.13	
15																					
16																					
17																					
18		SEE	TABLE	NO.	6																
19																					
20																					
21	19	10	420	418	140 ±	36	401.63	401.58	0.00160	19.6	18.8	38.8	0.015	26.6	36.6	4.1	0.26	0.0022	408.84	406.33	
22	19	10	420	418	118 ±	24	402.80	402.43	0.00147				0.015	10.0		3.2	0.16	0.0026	406.64	406.33	
23	21	19	418	420	754 ±	24	403.71	402.60	0.00147				0.015	13.8		4.4	0.30	0.0050	410.41	406.64	
24	20	19	420	420	458 ±	30	402.83	402.02	0.0018	19.8	18.8	38.6	0.015	25.0	38.6	5.2	0.42	0.0050	408.93	408.64	
25	21	20	418	420	285 ±	30	403.12	402.88	0.00084				0.015	25.0		5.2	0.42	0.0050	410.37	408.93	
26	22	21	417	418	251 ±	36	403.28	403.03	0.00099	19.3	10.3	29.6	0.015	29.6		4.1	0.28	0.0025	411.02	410.41	
27	23-A	22	417	417	180 ±	36	403.84	403.38	0.00155	15.5	9.5	25.0	0.015	25.0		3.7	0.21	0.0019	411.38	411.02	
28	26	23-A	417	417	285 ±	36	403.82	403.64	0.00090	11.5	9.5	21.0	0.015	21.0	38.6	3.0	0.14	0.0013	411.70	411.38	
29	27	26	417	417	100	24	405.12	403.82	VARIES	——	5	5	0.015	5		1.7	0.03	0.0007	411.77	411.70	
30	27	21	417	416	704 ±	24	405.12	403.87	VARIES	0.5	8.5	9	0.015	9		2.9	0.13	0.0021	411.88	410.41	
30-A	9	27	417	417	1700	30	409.50	403.70	0.0034	0.5	13.5	14	0.013	14.0	14.0	2.8	0.12	0.0012	413.92	411.88	PROPOSED
31	28-0	24	416	415	1000	12	410.00	405.00	0.0050	0.5	——	0.5	0.013	2.5	2.5+	2.3	0.08	——	PART	FULL	PROPOSED

HARTOLDMON0007077

TABLE NO. 7

PLAN "B-IA" TREATABLE WASTE SYSTEM WITH STORM WATER (1 INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF MH. ELEV. UPPER	TOP OF MH. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	FL. ELEVATION UPPER	FL. ELEVATION LOWER	F L. SLOPE	Q (CFS) TREAT	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "n"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL. (FPS.)	$V^2/2g$ (FT.)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	2	1	425	417	850	2-36	397.30	396.30	0.00118	24.5	21.8	46.3	0.013	23	46	3.3	0.17	0.0012	400.32	399.30	PROPOSED
2	2-A	2	426	426	160	36	400.28	397.30	0.0187				0.015	30		4.4	0.30	—	PART	FULL	PROPOSED
3	10	2-A	418	425	1100	36	401.38	400.28	0.0010	24.5	21.8	46.3	0.015	21	70+	3.0	0.140	—	PART	FULL	
4	10	2	418	425	1250	36	401.38	397.30	0.00327				0.013	40		5.0	0.38	—	PART	FULL	PROPOSED
5	11	10	423	418	950	12	407.05	404.95	0.0021	0.3	—	0.3	0.013	18	18+	1.3	0.03	—	PART	FULL	PROPOSED
6	12-A	11	420	423	1080	12	—	407.05	0.00408	0.3	—	0.3	0.013	2.0	2.0+	1.9	0.06	—	PART	FULL	PROPOSED
7	13	12-A	421	420		12	411.45	—		0.3	—	0.3	0.013	2.0	2.0+	1.9	0.06	—	PART	FULL	PROPOSED
8	19	10	420	418	250	36	399.40	399.00	0.0015	21.8	20.0	41.8	0.013	42	42	5.8	0.49	0.0035	402.86	402.00	PROPOSED
	(PROPOSED PUMPING STATION AT M H 10 TO PUMP THE SEWAGE IN LINE 8 INTO LINES 3&4)																				
9	19	10	420	416	250	18	405.10	404.65	0.0010	2.4	1.3	3.7	0.013	4	4	2.2	0.08	0.0014	406.52	406.35	PROPOSED
	(LINE 9 CONNECTS TO THE DISCHARGE SIDE OF LIFT STATION)																				
10	20	19	420	420	460	36	399.95	399.40	0.0012	21.8	20.5	42.3	0.013	42	42	5.8	0.49	0.0035	404.47	402.86	PROPOSED
11	21	20	416	420	290	36	400.30	399.95	0.0012	20.0	18.9	39.0	0.013	39	39	5.5	0.47	0.0033	405.41	404.47	PROPOSED
12	23	21	417	416	330	36	400.57	400.30	0.0012	19.1	17.1	36.2	0.013	36	36	5.0	0.39	0.0027	406.30	405.31	PROPOSED
13	24	23	415	417	220	36	400.85	400.57	0.0012	18.8	17.0	35.8	0.013	36	36	5.0	0.39	0.0027	406.93	406.30	PROPOSED
14	28-A	24	416 ±	415	250	21	404.74	401.10	0.0146	4.3	5.4	9.7	0.013	10	10	4.2	0.27	0.0040	407.93	406.93	PROPOSED
15	28-B	28-A	416 ±	416 ±	450	21	405.24	404.74	0.0011	1.6	3.7	5.3	0.013	5	5	2.1	0.07	0.0010	408.38	407.93	PROPOSED
16	28-C	28-B	416 ±	416 ±	600	21	406.12	405.24	0.0011	1.6	3.2	4.8	0.013	5	5	2.1	0.07	0.0010	409.18	408.38	PROPOSED
17	25	24	414	415	100	2-24	401.27	401.10	0.00174	14.5	14.1	28.6	0.013	14.5	29	4.6	0.33	0.0042	407.35	406.93	PROPOSED
18	27	25	417	414	130	2-24	401.50	401.27	0.00174	14.3	7.4	21.7	0.013	11	22	3.5	0.19	0.0024	407.66	407.35	PROPOSED
18-A	9	27	417	417	1700	18	409.50	401.70	0.0046	4.5	—	4.5	0.013	7+	7+	4.3	0.29	0.0046	—	407.86	PROPOSED
19	25	24	416	415	144	18	407.25	402.00	0.0400	0.2	4.2	4.4	0.013	4.5	4.5	2.5	0.10	0.0019	407.61	407.35	PROPOSED
20	3	19	419	420	1900	18	406.24	405.10	0.0006	2.4	1.3	3.7	0.013	4	4	2.2	0.08	0.0014	409.18	406.52	PROPOSED
21	4	3	413	419	105	18	406.30	406.24	0.0006	2.4	1.3	3.7	0.013	4	4	2.2	0.08	0.0014	409.33	409.18	PROPOSED
22	4-A	4	416	413	200	18	406.50	406.30	0.0010	2.4	—	2.4	0.013	2.5	2.5	1.5	0.03	0.0005	409.43	409.33	PROPOSED
23	5	4-A	417	416	408	18	406.75	406.50	0.00063	2.2	0.1	2.3	0.013	2.5	2.5	1.5	0.03	0.0005	409.63	409.43	PROPOSED
24	6	5	413	417	440	16	407.06	406.75	0.00063	1.3	—	1.3	0.013	1.5	1.5	1.0	0.02	0.0002	409.73	409.63	PROPOSED
25		O M	I T T E	D																	
26		O M	I T T E	D																	
27	4-B	4	415	413	120	24	406.55	405.19	0.0030	0.1	1.2	1.3	0.013	1.5	1.5	1.0	0.02	0.0002	409.36	409.33	PROPOSED TO REPLACE EXISTING LINE

HARTOLDMON0007078

TABLE NO. 8

PLAN "C" TREATABLE WASTE SYSTEM WITHOUT STORM WATER

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF MH ELEV. UPPER	TOP OF MH ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	FL. ELEVATION UPPER	FL. ELEVATION LOWER	F.L. SLOPE	Q(CFS) TREAT.	KUTTER "n"	Q(CFS) MAXIMUM CAPACITY	Q(CFS) MAXIMUM TOTAL	VEL. (FPS.)	$\frac{V^2}{2g}$ (FT.)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	2	1	425	417	996 +	36	400.00	397.52	0.0025		0.015	29		—	—	—	PART	FULL	
2	2	1	425	417	995 +	36	397.40	396.40	0.0010	24.5	0.015	19	88 +	—	—	—	PART	FULL	
3	2	1	425	417	983 +	2 - 36	397.30	396.30	0.0010		0.015	38		—	—	—	PART	FULL	
4	10	2	416	425	1280 +	2 - 36	401.28	400.00	0.0010	24.5	0.015	38	57 +	—	—	—	PART	FULL	
5	10	2	416	425	1282 +	36	401.38	400.12	0.0010		0.015	19		—	—	—	PART	FULL	
6	11	10	423	416	950	12	407.05	404.95	0.0021	0.3	0.013	1.8	1.8 +	1.3	0.03	—	PART	FULL	PROPOSED
7	12-A	11	420	423	1060	12	——	407.05	0.00408	0.3	0.013	2	2 +	1.9	0.06	—	PART	FULL	PROPOSED
8	13	12-A	421	420		12	411.45	——		0.3	0.013	2	2 +	1.9	0.06	—	PART	FULL	PROPOSED
9	19	10	420	416	140 +	36	401.83	401.58	0.0018	24.2	0.015	19	26 +	—	—	—	PART	FULL	
10	19	10	420	416	118 +	24	402.60	402.43	0.00147		0.013	7		—	—	—	PART	FULL	
11	39	19	415 ±	420	900	24	404.73	402.68	0.00228	6.9	0.013	10	10 +	—	—	—	PART	FULL	PROPOSED
12	3	39	419	415 ±	1000	24	406.13	404.73	0.0014	6.9	0.013	9	9 +	—	—	—	PART	FULL	PROPOSED
13	4	3	413	419	105	24	406.19	406.13	0.0006	6.9	0.013	6	6 +	—	—	—	PART	FULL	PROPOSED
14	4-A	4	416	413	200	24	406.50	406.19	0.0015	6.6	0.013	6	6 +	—	—	—	PART	FULL	PROPOSED
15	5	4-A	417	416	405	24	406.78	406.50	0.00064	6.6	0.013	7	7 +	—	—	—	PART	FULL	PROPOSED
16	6	5	413	417	440	24	407.04	406.78	0.00064	5.9	0.013	6	6 +	1.9	0.06	—	PART	FULL	PROPOSED
17	7	6	416	413	360	21	408.12	407.12	0.0027	4.5	0.013	6	6 +	1.9	0.06	—	PART	FULL	PROPOSED
18	9	7	417	416	1630	21	409.50	408.12	0.00085	4.5	0.013	6	8 +	1.9	0.06	—	PART	FULL	PROPOSED
19	4-B	4	415	413	120 +	24	408.55	408.19	0.0030	0.1	0.013	2	2 +	1.8	0.05	—	PART	FULL	PROPOSED TO REPLACE EXIST LINE
20	21	19	416	420	754 +	24	403.71	402.60	0.00147	5.9	0.015	7	22 +	—	—	—	PART	FULL	
21	20	19	420	420	458 +	30	402.63	402.02	0.0016	11.5	0.015	15		—	—	—	PART	FULL	
22	21	20	416	420	285 +	30	403.12	402.88	0.00084	9.8	0.015	10	17+	—	—	—	PART	FULL	
23	26	21	415	418	696 +	36	403.92	403.03	0.00090	9.8	0.015	17	17 +	—	—	—	PART	FULL	
24	23	21	417	418	329 +	24	404.18	403.87	0.00095	4.9	0.015	6	6 +	—	—	—	PART	FULL	
25	24	23	415	417	231 +	24	404.40	404.18	0.00095	4.8	0.015	6	8 +	—	—	—	PART	FULL	
26	25	24	414	415	64 +	24	404.91	404.44	0.0071	4.8	0.015	16	18 +	—	—	—	PART	FULL	
27	28-A	24	416 ±	414	300	30	405.21	404.91	0.0010	4.4	0.013	13	13 +	2.4	0.09	—	PART	FULL	PROPOSED
28	28-B	28-A	416 ±	416 ±	450	30	405.66	405.21	0.0010	1.6	0.013	13	13 +	1.8	0.05	—	PART	FULL	PROPOSED
29	28-C	28-B	416 ±	416 ±	600	30	406.12	405.66	0.00077	1.8	0.013	13	13 +	1.8	0.05	—	PART	FULL	PROPOSED
30	26	25	416	414	144 +	18	405.75	405.50	0.00174	0.2	0.015	4	4 +	1.1	0.02	—	PART	FULL	

MEMPHIS DATUM

JOS. W. GOLDENBERG

HARTOLDMON0007079

TABLE NO. 9

PLAN "C" TREATABLE WASTE SYSTEM WITH STORM WATER (1.8 INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H ELEV. UPPER	TOP OF M.H ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q (CFS) TREAT.	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "N"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL. (FPS)	$V^2/2g$ (FT)	REQ HYD. SLOPE	ELEV. HYD. GRAD UPPER	ELEV. HYD. GRAD LOWER	REMARKS
1	2	1	425	417	998+	36	400.00	397.52	0.0025				0.015	29		—	—	—	PART	FULL	
2	2	1	425	417	995+	36	397.40	396.40	0.0010	24.5	44.3	68.8	0.015	19	88+	—	—	—	PART	FULL	
3	2	1	425	417	983+	2-36	397.30	396.30	0.0010				0.015	38		—	—	—	PART	FULL	
4	10	2	416	425	1280+	2-36	401.28	400.00	0.0010	24.5	44.3	68.8	0.015	46	89	2.7	0.11	0.00142	404.64	403.00	
5	10	2	416	425	1282+	36	401.38	400.12	0.0010				0.015	23		2.7	0.11	0.00142	404.64	403.00	
6	11	10	423	418	950	12	407.05	404.95	0.0021	0.3	—	0.3	0.013	1.8	1.8+	1.3	0.03	—	PART	FULL	PROPOSED
7	12-A	11	420	423	1080	12	—	407.05	0.00408	0.3	—	0.3	0.013	2	2+	1.9	0.06	—	PART	FULL	PROPOSED
8	13	12-A	421	420		12	411.45	—		0.3	—	0.3	0.013	2	2+	1.9	0.06	—	PART	FULL	PROPOSED
9	19	10	420	418	140+	36	401.63	401.58	0.0018	24.2	44.3	68.5	0.015	50	68	3.5	0.19	0.0073	405.68	404.64	
10	19	10	420	418	118+	24	402.60	402.43	0.00147				0.015	18		2.4	0.09	0.0095	405.77	404.64	
11	39	19	415 ±	420	900	24	404.73	402.68	0.00228	6.9	2.3	9.2	0.013	9.2	9.2	3.0	0.14	0.0017	407.30	405.77	PROPOSED
12	3	39	419	415 ±	1000	24	406.13	404.73	0.0014	6.9	2.3	9.2	0.013	9.2	9.2	3.0	0.14	0.0017	409.00	407.30	PROPOSED
13	4	3	413	419	105	24	408.19	406.13	0.0008	6.9	2.3	9.2	0.013	9.2	9.2	3.0	0.14	0.0017	409.18	409.00	PROPOSED
14	4-A	4	416	413	200	24	408.50	406.19	0.0015	6.6	0.3	7.1	0.013	7.1	7.1	2.3	0.08	0.00095	409.37	409.18	PROPOSED
15	5	4-A	417	416	405	24	406.78	406.50	0.00064	6.8	0.3	7.1	0.013	7.1	7.1	2.3	0.08	0.00095	409.75	409.37	PROPOSED
16	6	5	413	417	440	24	407.04	406.78	0.00064	5.9	—	5.9	0.013	5.9	5.9	1.9	0.06	0.0007	410.06	409.75	PROPOSED
17	7	6	416	413	360	21	408.12	407.12	0.0036	4.5	—	5.9	0.013	5.9	5.9	1.9	0.06	0.0014	410.57	410.06	PROPOSED
18	9	7	417	416	1630	21	409.50	408.12	0.00085	4.5	—	5.9	0.013	5.9	5.9	1.9	0.06	0.0014	412.85	410.57	PROPOSED
19	4-B	4	415	413	120	24	408.55	408.19	0.0030	0.1	2.0	2.1	0.013	2.0	2.0	1.0	0.02	0.0001	409.19	409.18	PROPOSED TO REPLACE EXISTING LINE
20	21	19	416	420	754+	24	403.71	402.60	0.00147	5.9	14.2	20.1	0.015	20.1	59.3	6.5	0.65	0.011	414.07	405.77	
21	20	19	420	420	458+	30	402.63	402.02	0.0018	11.5	27.7	39.2	0.015	39.2		8.0	0.99	0.012	411.27	405.77	
22	21	20	416	420	265+	30	403.12	402.66	0.00084	9.8	24.8	34.6	0.915	34.6	54.7	7.1	0.78	0.010	414.12	411.27	
23	26	21	415	416	696+	36	403.92	403.03	0.00090	9.6	25.2	35.0	0.015	35.0	35.0	4.8	0.35	0.0035	416.56	414.12	
24	23	21	417	416	329+	24	404.18	403.87	0.00095	4.9	10.8	15.7	0.015	15.7	15.7	5.0	0.39	0.0075	416.59	414.12	
25	24	23	415	417	231+	24	404.40	404.18	0.00095	4.7	10.6	15.3	0.015	15.3	15.3	4.8	0.35	0.0065	418.09	416.59	
26	25	24	414	415	64+	24	404.91	404.44	0.0071	4.5	10.6	15.1	0.015	15.1	15.1	4.8	0.35	0.0065	418.50	418.09	
27	28-A	26	416 ±	414	300	30	405.21	404.91	0.0010	4.3	9.7	14.0	0.013	14.0	14.0	2.9	0.13	0.0012	416.86	418.50	PROPOSED
28	28-B	28-A	416 ±	416 ±	450	30	405.66	405.21	0.0010	1.6	6.8	8.2	0.013	8.2	8.2	1.8	0.05	0.0004	419.04	416.66	PROPOSED
29	28-C	28-B	416 ±	416 ±	600	30	406.12	405.66	0.0007	1.8	5.8	7.4	0.013	7.4	7.4	1.7	0.04	0.0003	419.22	419.04	PROPOSED
30	26	25	416	414	144+	18	405.75	405.50	0.00174	0.2	7.6	7.8	0.015	7.8	7.8	4.4	0.30	0.0060	418.59	418.50	

HYDRAULIC GRADIENT ABOVE THE TOP OF M.H. SEE PAGES 26 & 27 OF REPORT.

MEMPHIS DATUM

HARTOLDMON0007080

TABLE NO. 10

PLAN "C" CLEAR WATER SYSTEM WITHOUT STORM WATER

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	P.L. ELEVATION UPPER	P.L. ELEVATION LOWER	P.L. SLOPE	Q(CFS) INDUSTRY	KUTTER "n"	Q(CFS) MAXIMUM CAPACITY	Q(CFS) MAXIMUM TOTAL	VEL. (FPS.)	$\frac{V^2}{2g}$ (FT)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	1	425	417	1200	2-36	400.8	396.30	0.0035	37.2	0.013	22	66+	—	—	—	PART	FULL	PROPOSED
2	3	2	419	425	1537 +	30	402.55	400.60	0.00125	7.5	0.015	13	13+	—	—	—	PART	FULL	
3	40	2	415 ±	425	800	2-36	401.38	400.58	0.0010	29.5	0.013	22	44+	—	—	—	PART	FULL	PROPOSED
4	39	40	415 ±	415 ±	200	2-36	401.58	401.38	0.0010	23	0.013	13	26+	—	—	—	PART	FULL	PROPOSED
5	3	39	419	415 ±	1000	36	402.41	401.58	0.00085	6.0	0.013	12	12+	—	—	—	PART	FULL	PROPOSED
6	4	3	413	419	105 +	30	402.68	402.55	0.00125	11.1	0.015	13	27+	—	—	—	PART	FULL	
7	4	3	413	419	105	30	402.68	402.55	0.00125		0.013	14		—	—	—	PART	FULL	PROPOSED
8	4-A	4	416	413	200	30	402.93	402.68	0.00125	11.1	0.015	13	27+	—	—	—	PART	FULL	
9	4-A	4	416	413	200	30	402.93	402.68	0.00125		0.013	14		—	—	—	PART	FULL	PROPOSED
10	5	4-A	417	416	405	30	403.43	402.93	0.00125	10.9	0.015	13	27+	—	—	—	PART	FULL	
11	5	4-A	417	416	405	30	403.43	402.93	0.00125		0.013	14		—	—	—	PART	FULL	PROPOSED
12	6	5	413	417	440 +	2-24	404.77	404.00	0.00175	2.5	0.015	6	18+	2.3	0.08	—	PART	FULL	
13	7	6	418	413	360 +	24	405.40	404.77	0.00175	0.5	0.015	8	17+	1.2	0.02	—	PART	FULL	
14	7	8	416	413	360	24	405.40	404.77	0.00175		0.013	9		1.2	0.02	—	PART	FULL	PROPOSED
15	8	7	415	418	400	18	407.22	405.90	0.00185	0.5	0.015	4	12+	1.4	0.03	—	PART	FULL	ASSUMING FLOW DIVERTED TO THIS LINE
16	8	7	415	418	400	24	407.35	406.65	0.00175		0.015	8		—	—	—	PART	FULL	
17	8-A	8	417	415	880	18	408.82	407.35	VARIES	] 0.5	0.015	4	+] +	1.4	0.03	—	PART	FULL	ASSUMING FLOW DIVERTED TO THIS LINE
18	9	8-A	417	417	350	16	410.00	408.82	0.00337		0.013	6	12	2.1	0.07	—	PART	FULL	PROPOSED
19	9	8	417	415	1232 +	24	409.50	407.35	0.00175	] 0.5	0.015	8	] 14]	—	—	—	PART	FULL	
20	38	39	416 ±	416 ±	1000	30	403.00	401.70	0.0013	19.3	0.013	19	19	4.0	0.25	0.0024	406.60	404.20	PROPOSED
21	37	38	416 ±	416 ±	250	30	403.33	403.00	0.0013	15.5	0.013	10	16	3.3	0.17	0.0015	406.97	406.60	PROPOSED
22	38	37	410 ±	416 ±	250	30	403.66	403.33	0.0013	11.5	0.013	12	12	2.5	0.10	0.0006	407.17	406.97	PROPOSED
23	10-A	40	416	415 ±	880	36	402.30	401.58	0.00084	6.8	0.013	21	21+	2.4	0.09	—	PART	FULL	PROPOSED
24	10	10-A	416	416	120	18	402.40	402.30	——	6.8	0.013	6.7	6.7	4.0	0.25	0.0043	404.82	404.30	PROPOSED
25	10	10-A	416	416	120	24	402.40	402.30	——		0.013	—	—	—	—	—	—	—	INVERTED SIPHON
26	11	10	423	416	920	24	406.49	402.40	0.00447	9.8	0.015	13	22+	—	—	—	PART	FULL	
27	11	10	423	419	870	21	406.87	402.88	0.00425		0.015	9		—	—	—	PART	FULL	
28	12	11	424	423	350	24	408.06	406.49	0.00447	5.1	0.015	13	22+	—	—	—	PART	FULL	
29	12	11	424	423	350	21	407.84	406.47	0.00425	1.8	0.015	9		2.8	0.12	—	PART	FULL	
30	13	12	421	424	730	24	411.45	408.06	0.00447	1.5	0.015	13	22+	2.6	0.10	—	PART	FULL	
31	13	12	421	424	780	21	411.25	407.84	0.00425	1.8	0.015	9		2.8	0.12	—	PART	FULL	
32	28-D		300,000 GPD		INDUSTRIAL WASTE (0.465 CFS) PUMPED IN A 6" PIPE TO LEWIN MATHES 24" SEWER														

MEMPHIS DATUM

JOS. W. GOLDENBERG

HARTOLDMON0007081

TABLE NO. II

PLAN "C" CLEAR WATER SYSTEM WITH STORM WATER (1.8 INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH (FT.)	SIZE (IN.)	FL. ELEVATION UPPER	FL. ELEVATION LOWER	F.L. SLOPE	Q (CFS) IND.	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER 'n'	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL. (FPS.)	$\frac{V^2}{2g}$ (FT)	REQ SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	1	425	417	1200	2-36	400.5	396.30	0.0035	37.2	44.5	81.7	0.013	41	82	5.7	0.50	0.0035	405.50	399.30	PROPOSED
2	3	2	419	425	1537+	30	402.55	400.80	0.00125	7.5	9.0	16.5	0.015	11	11	2.0	0.06	0.0022	406.88	403.50	
3	40	2	415 ±	425	866	2-36	401.36	400.56	0.0010	29.5	35.7	65.2	0.013	31	62	4.3	0.29	0.0023	405.34	403.50	PROPOSED
4	39	40	415 ±	415 ±	200	2-36	401.56	401.36	0.0010	23	21	44	0.013	20	40	2.9	0.13	0.0010	405.54	405.34	PROPOSED
5	3	39	419	415 ±	1000	36	402.41	401.56	0.00085	8.0	16.7	24.7	0.013	11	22	1.8	0.05	0.0013	406.64	405.54	PROPOSED
6	4	3	413	419	105 +	30	402.68	402.55	0.00125	11.1	30.1	41.2	0.015	21	42	4.2	0.27	0.0035	407.24	406.87	
7	4	3	413	419	105	30	402.68	402.55	0.00125				0.013	21		4.3	0.29	0.0026	407.17	406.87	PROPOSED
8	4-A	4	416	413	200	30	402.93	402.68	0.00125	11.1	29.5	40.6	0.015	21	42	4.2	0.27	0.0035	407.94	407.24	
9	4-A	4	416	413	200	30	402.93	402.68	0.00125				0.013	21		4.3	0.29	0.0026	407.94	407.24	PROPOSED
10	5	4-A	417	416	405	30	403.43	402.93	0.00125	10.9	28.1	39.0	0.015	20	40	4.1	0.26	0.0034	409.32	407.94	
11	5	4-A	417	416	405	30	403.43	402.93	0.00125				0.013	20		4.2	0.27	0.0027	409.32	407.94	PROPOSED
12	6	5	413	417	440 +	2-24	404.77	404.00	0.00175	2.5	24.2	26.7	0.015	13	26	4.1	0.26	0.0045	411.30	409.32	
13	7	8	418	413	360 +	24	405.40	404.77	0.00175	0.5	21.4	21.9	0.015	11	22	3.5	0.19	0.0027	412.27	411.30	
14	7	6	418	413	360	24	405.40	404.77	0.00175				0.013	11		6.1	0.58	0.0024	412.27	411.30	PROPOSED
15	8	7	415	418	400	18	407.22	405.90	0.00165	0.5	21.4	21.9	0.015	7	22	3.9	0.24	0.0060	414.67	412.27	
16	8	7	415	418	400	24	407.35	406.65	0.00175				0.015	15		4.8	0.35	0.0060	414.67	412.27	
17	8-A	8	417	415	880	18	408.82	407.35	VARIES				0.015	5		2.8	0.12	0.0026	417.13	414.67	
18	9	8-A	417	417	350	18	410.00	408.82	0.00337	0.5	14.8	15.1	0.013	5	15	2.8	0.12	0.0023	417.93	417.13	PROPOSED TO REPLACE EXISTING 15" LINE
19	9	8	417	415	1232 +	24	409.50	407.35	0.00175				0.015	10		3.8	0.20	0.0025	417.77	414.67	
20	38	39	416 ±	416 ±	1000	30	403.00	401.70	0.0013	19.3	—	19.3	0.013	19	19	4.0	0.25	0.0024	407.94	405.54	PROPOSED
21	37	38	416 ±	416 ±	250	30	403.33	403.00	0.0013	15.5	—	15.5	0.013	16	16	3.3	0.17	0.0014	408.29	407.94	PROPOSED
22	36	37	416 ±	416 ±	250	30	403.66	403.33	0.0013	11.5	—	11.5	0.013	12	12	2.5	0.10	0.0008	408.74	408.29	PROPOSED
23	10-A	40	416	415 ±	880	36	402.30	401.56	0.00084	6.8	14.4	21.2	0.013	21	21	3.0	0.14	0.00095	406.17	405.34	PROPOSED
24	10	10-A	418	416	120	18	402.40	402.30	——	6.8	14.4	21.2	0.013	8.7	21	3.8	0.22	0.0043	406.69	406.17	PROPOSED
25	10	10-A	418	418	120	24	402.40	402.30	——				0.013	14.3		4.6	0.33	0.0043	406.29	406.17	INVERTED SIPHON
26	11	10	423	416	920	24	408.49	402.40	0.00447	6.8	14.4	21.2	0.015	12	21	3.9	0.24	0.0040	410.38	406.69	
27	11	10	423	416	870	21	406.67	402.68	0.00425				0.015	9		3.7	0.21	0.0042	410.34	406.39	
28	12	11	424	423	350	24	408.06	406.49	0.00447	5.1	9.6	21.2	0.015	15	21	4.8	0.35	0.0067	412.38	410.38	
29	12	11	424	423	350	21	407.84	406.47	0.00428	1.8	4.7		0.015	6		2.5	0.09	0.0024	411.22	410.38	
30	13	12	421	424	730	24	411.45	408.06	0.00447	1.5	3.6	11.8	0.015	8	12	2.0	0.06	——	PART	FULL	
31	13	12	421	424	780	21	411.25	407.84	0.00425	1.8	4.7		0.015	8		2.5	0.10	0.0024	413.10	411.22	
32	28-D		300,000	GPD	INDUSTRIAL WASTE (0.465 CFS) PUMPED IN A 8" PIPE TO LEWIN MATHES SEWER																

HARTOLDMON0007082

TABLE NO. 12

PLAN "C-I" TREATABLE WASTE SYSTEM WITH STORM WATER (1-INCH PER HOUR)

LINE NO	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV UPPER	TOP OF M.H. ELEV LOWER	LENGTH (FT.)	SIZE (IN.)	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q (CFS) TREAT	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "n"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL. (FPS.)	$\frac{V^2}{2g}$ (FT)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	2	1	425	417	983 +	2-36	397.30	396.30	0.0010				0.015	19		—	—	—	PART	FULL	
2	2	1	425	417	986 +	36	400.00	397.52	0.0025	24.5	24.6	49.1	0.018	29	57 +	—	—	—	PART	FULL	
3	2	1	425	417	995 +	36	397.40	396.40	0.0010				0.015	19		—	—	—	PART	FULL	
4	10	2	416	425	1280 +	2-36	401.28	400.00	0.0010	24.5	24.6	49.1	0.015	38		—	—	—	PART	FULL	
5	10	2	416	425	1262 +	36	401.38	400.12	0.0010				0.015	19	57 +	—	—	—	PART	FULL	
6	11	10	423	416	950	12	407.05	404.95	0.0021	0.3	—	0.3	0.013	1.8	1.8 +	1.3	0.03		PART	FULL	PROPOSED
7	12-A	11	420	423	1080	12	—	407.05	0.000406	0.3	—	0.3	0.013	2.0	2.0 +	1.9	0.06		PART	FULL	PROPOSED
8	13	12-A	421	420		12	411.45	—		0.3	—	0.3	0.013	2.0	2.0 +	1.9	0.06		PART	FULL	PROPOSED
9	19	10	420	416	140 +	36	401.83	401.58	0.0018	24.2	24.6	48.8	0.015	38	49	5.0	0.39	0.0035	405.07	404.58	
10	19	10	420	416	118 +	24	402.60	402.43	0.00147				0.015	13		4.2	0.27	0.0046	405.12	404.58	
11	39	19	415 ±	420	900	21	404.73	402.75	0.0022	6.9	1.3	8.2	0.013	8	8	3.3	0.17	0.0028	407.46	405.12	PROPOSED
12	3	39	419	415 ±	1000	21	406.13	404.73	0.0014	6.9	1.3	8.2	0.013	8	8	3.3	0.17	0.0028	409.06	407.46	PROPOSED
13	4	3	413	419	105	21	406.19	406.13	0.0006	6.9	1.3	8.2	0.013	8	8	3.3	0.17	0.0028	409.33	409.06	PROPOSED
14	4-A	4	416	413	200	21	406.50	406.19	0.0015	6.8	0.2	7.0	0.013	7	7	2.9	0.13	0.0019	409.71	409.33	PROPOSED
15	5	4-A	417	416	405	21	406.78	406.50	0.00064	6.8	0.2	7.0	0.013	7	7	2.9	0.13	0.0019	410.48	409.71	PROPOSED
16	6	5	413	417	440	21	407.04	406.78	0.00064	5.9	—	5.9	0.013	6	6	2.5	0.09	0.0014	411.09	410.48	PROPOSED
17	7	6	416	413	360	21	408.12	407.04	0.0030	4.5	—	4.5	0.013	4.5	4.5	1.9	0.06	0.0008	411.38	411.09	PROPOSED
18	9	7	417	418	1630	21	409.50	408.12	0.00085	4.5	—	4.5	0.013	4.5	4.5	1.9	0.06	0.0008	414.69	411.38	PROPOSED
19	4-B	4	415	413	120 +	24	408.55	408.19	0.0030	0.1	1.1	1.2	0.013	2	2	1.3	0.03	0.0001	409.34	409.33	PROPOSED TO REPLACE EXISTING LINE
20	21	19	418	420	754 +	24	403.71	402.60	0.00147	5.9	7.6	13.5	0.015	13.5	40.5	4.2	0.27	0.0047	408.87	405.12	
21	20	19	420	420	458 +	30	402.83	402.02	0.0018	11.5	15.5	27.0	0.015	27	37	5.7	0.50	0.0055	407.62	405.12	
22	21	20	418	420	285 +	30	403.12	402.88	0.00084	9.8	13.7	23.5	0.015	23.5		4.8	0.33	0.0036	408.72	407.62	
23	26	21	415	416	696 +	36	403.92	403.03	0.00090	9.8	14.0	23.8	0.015	24	24	3.3	0.17	0.0018	409.97	408.72	
24	23	21	417	416	329 +	24	401.18	403.87	0.00095	4.9	6.0	10.9	0.015	11	11	3.5	0.19	0.0030	409.71	408.72	
25	24	23	415	417	231 +	24	404.40	404.18	0.00095	4.8	5.9	10.7	0.015	11	11	3.5	0.19	0.0030	410.40	409.71	
26	25	24	414	415	84 +	24	404.91	404.44	0.0071	4.6	5.9	10.5	0.015	10.5	10.5	3.4	0.18	0.0028	410.58	410.40	
27	28-A	24	418 ±	414	300	24	405.18	404.91	0.0009	4.4	5.4	9.8	0.013	10	10	3.2	0.18	0.0026	411.38	410.58	PROPOSED
28	28-B	28-A	418 ±	416 ±	450	24	405.58	405.18	0.0009	1.6	3.7	5.3	0.013	5	5	1.6	0.04	0.00085	411.85	411.38	PROPOSED
29	28-C	28-B	416 ±	416 ±	600	24	408.12	405.58	0.0009	1.6	3.2	4.8	0.013	5	5	1.6	0.04	0.00085	412.04	411.85	PROPOSED
30	28	25	416	414	144 +	18	405.75	405.50	0.00174	0.2	4.2	4.4	0.015	4.5	4.5	2.4	0.09	0.0023	410.91	410.58	

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TABLE NO. 13

PLAN "C-1" CLEAR WATER SYSTEM WITH STORM WATER (1 - INCH PER HOUR)

LINE NO.	MANHOLES UPPER	MANHOLES LOWER	TOP OF M.H. ELEV. UPPER	TOP OF M.H. ELEV. LOWER	LENGTH FT.	SIZE IN.	F.L. ELEVATION UPPER	F.L. ELEVATION LOWER	F.L. SLOPE	Q (CFS) IND.	Q (CFS) STORM	Q (CFS) TOTAL	KUTTER "n"	Q (CFS) CAPACITY	Q (CFS) TOTAL	VEL. FPS.	$\frac{V^2}{2g}$ (FT)	REQ. HYD. SLOPE	ELEV. HYD. GRAD. UPPER	ELEV. HYD. GRAD. LOWER	REMARKS
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	2	1	425	417	1200	2 - 36	400.50	396.50	0.0035	37.2	30.0	67.2	0.013	41	82+	—	—	—	PART	FULL	PROPOSED
2	3	2	419	425	1537+	30	402.55	400.60	0.00125	11.1	22.0	33.1	0.015	33	33	7.0	0.76	0.0065	416.60	403.50	
3	4	3	413	419	1054	30	402.68	402.55	0.00125	11.1	21.6	32.7	0.015	33	33	7.0	0.76	0.0065	417.50	416.60	
4	4-A	4	416	413	200	30	402.93	402.68	0.00125	10.9	21.1	32.0	0.015	32	32	6.5	0.65	0.0060	419.10	417.50	
5	5-A	4-A	417	416	405	30	403.43	402.93	0.00125	10.9	21.1	32.0	0.015	32	32	6.5	0.65	0.0060	422.55	419.10	
6	6	5	413	417	440+	2 - 24	404.77	404.00	0.00175	2.5	18.8	21.3	0.015	11	22	3.3	0.17	0.0028	423.76	422.55	
7	7	6	418	413	380	24	405.40	404.77	0.00175	0.5	17.2	17.7	0.015	18	18	5.9	0.54	0.0090	427.02	423.76	
8	8	7	415	416	400	18	407.22	405.90	0.00165	0.5	17.2	17.7	0.015	6	18	3.3	0.17	0.0042	428.70	427.02	
9	8	7	415	416	400	24	407.35	406.85	0.00175				0.015	12		3.9	0.23	0.0042	428.70	427.02	
10	8-A	8	417	415	880	18	408.82	407.35	VARIES				0.015	4.4		2.4	0.09	0.0023	430.73	428.70	
11	9	8-A	417	417	350	18	410.00	408.82	0.00337	0.5	13.4	13.9	0.013	4.4	13.9	2.4	0.09	0.0023	431.54	430.73	
12	9	8	417	415	1232+	24	409.80	407.35	0.00175				0.015	9.3		3.0	0.14	0.0023	431.54	428.70	HYDRAULIC GRADIENT ABOVE THE TOP OF M.H. SEE PAGES 21 & 22
																					PROPOSED TO REPLACE EXISTING 15" LINE
13	40	2	415±	425	800	36	401.30	400.50	0.0010	26.1	8.0	34.1	0.013	34	34	4.7	0.34	0.0025	405.50	403.50	PROPOSED
14	39	40	416±	415±	200	30	401.70	401.44	0.0013	19.3	—	19.3	0.013	19	19	4.0	0.25	0.0024	405.98	405.50	PROPOSED
15	38	39	418±	416±	1000	30	403.00	401.70	0.0013	19.3	—	19.3	0.013	19	19	4.0	0.25	0.0024	407.68	405.48	PROPOSED
16	37	38	418±	416±	250	30	403.33	403.00	0.0013	15.5	—	15.5	0.013	15.5	15.5	3.3	0.17	0.0014	408.06	407.68	PROPOSED
17	36	36	416±	416±	250	30	403.66	403.33	0.0013	11.5	—	11.5	0.013	11.5	11.5	2.5	0.10	0.0008	408.26	408.06	PROPOSED
18	10-A	40	416	415±	880	30	402.30	401.50	0.00091	6.6	8.0	14.6	0.013	15	15	3.1	0.15	0.0014	406.73	405.50	PROPOSED
19	10	10-A	416	416	120	15	402.40	402.30	—				0.013	5.7		4.7	0.34	0.0080	407.69	406.73	PROPOSED
20	10	10-A	416	416	120	18	402.40	402.30	—	6.6	8.0	14.6	0.013	9.3	15	5.4	0.45	0.0080	407.69	406.73	INVERTED SIPHON
21	11	10	423	416	920	24	406.49	402.40	0.00447				0.015	8.5		2.8	0.12	0.0020	411.67	407.69	
22	11	10	423	416	870	21	406.67	402.68	0.00425	6.6	8.0	14.6	0.015	6.5	15	2.7	0.11	0.0023	411.67	407.69	
23	12	11	424	423	350	24	406.06	406.49	0.00447	5.1	5.3	14.6	0.015	10.5	15	3.3	0.17	0.0029	412.70	411.67	
24	12	11	424	423	350	21	407.84	406.47	0.00425	1.6	2.6		0.015	4.4		1.8	0.05	0.0011	412.05	411.67	
25	13	12	421	424	730	24	411.45	406.06	0.00447	1.5	1.9	7.5	0.015	13	22+	1.2	0.02	—	PART	FULL	
26	13	12	421	424	780	21	411.25	407.84	0.00425	1.8	2.6		0.015	9		1.8	0.05	—	PART	FULL	
27	28-D		300,000 GPD INDUSTRIAL WASTE (0.465 CFS)				PUMPED		IN A 6" PIPE TO LEWIN MATHES					24" SEWER							

103 W. GOLDENBERG

HARTOLDMON0007084

LIST OF PLANS

1 - Existing Sewer System

2 - Plan "A"

3 - Plan "B", "B-A1" and "B-A2"

4 - Plan "B-1A"

5 - Plan "C"

6 - Plan "C-1"

7 - Ponding Plan

HARTOLDMON0007085

BASIS OF COST ESTIMATES

The cost estimates used in this report are based on bids submitted for similar construction in the Village of Monsanto in 1953 - adjusted for the differential in labor and material costs to date.

Estimated construction costs include allowances for contractor's overhead and profit.

Total capital costs include allowances for construction contingencies and engineering costs, and financing, legal and administrative costs.

Annual operating costs for the pumping stations include only general maintenance and power.

Debt service has been calculated on the basis of 4% - 20 year General Obligation Bonds in the amount of $ 1,650,000. This amount was established on the premise that $ 600,000 would be forthcoming as a federal grant, and that the proposed project would have a total estimated capital cost of $ 2,250,000. Any variation from these amounts would reflect accordingly in the estimated annual cost. (See Plan "B-A2")

We suggest that the following percentages be used to approximate the annual cost to each of the respective industries (these have been determined from the 1960 valuation as set by the Department of Revenue - total assessed valuation of $ 58,489,497) : -

HARTOLDMON0007086

1.	Monsanto Chemical Company	-	30.40
2.	Union Electric Company	-	43.54
3.	Mobil Oil Company	-	15.22
4.	Midwest Rubber Company	-	1.80
5.	Lewin Mathes Company	-	1.70
6.	Darling Company	-	.64
7.	American Zinc Company	-	1.50
8.	Sterling Steel Casting Company	-	.25
9.	Moss Tie Company	-	.41
10.	Home Owners and Miscellaneous Property owners	-	4.54

HARTOLDMON0007087

Estimated Capital Costs

Plan "A"

Location-M.H. to M.H.	Estimated Construction Cost
Interceptor and Conn. to U.S.C.E. Station	$51,600
2-10	$146,700
Inverted Siphon	$24,000
Reconnections along Rt. 3	$3,000
19-6	$171,000
6-7	$20,700
7-9 (Revise M.Hs.)	$3,000
Replace bad 15" with 18"	$17,000
19-24 Reconnect Plant Sewers w/3 Siphons + 2 M.H.	$72,000
24-28C	$92,500
24-28D	$22,000
Total Estimated Construction Cost	$623,500
Engineering and Contingencies	$124,500
Financing, Legal & Admin. Cost	$22,000
Total Estimated Capital Cost	$770,000

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ESTIMATED CAPITAL COSTS

PLAN "B"

Location - M.H. to M.H.	Estimated Construction Cost
1 - 10	$427,000
10 - 13	66,000
Lift Station - 10	350,000
10 - 19	54,000
10 - 19	24,500
19 - 24	367,000
24 - 28C	92,500
24 - 28D	22,000
24 - 27	44,000
28 - 24	13,500
19 - 3 - 7 - 9	279,000
4B - 4	3,500
Total Estimated Construction Cost	$1,743,000
Engineering and Contingencies	349,000
Financing, Legal & Administrative Cost	63,000
Total Estimated Capital Cost	$2,155,000

ESTIMATED ANNUAL COST

Debt Service - $

Operating Cost - $6,900

HARTOLDMON0007089

ESTIMATED CAPITAL COSTS

PLAN "B-A1"

(Alternate No. 1)

Location - M.H. to M.H.	Estimated Construction Cost
1 - 10	$427,000
10 - 13	66,000
Lift Station - 10	350,000
10 - 19	54,000
10 - 19	22,000
19 - 24	367,000
24 - 28C	92,500
24 - 28D	22,000
24 - 27	44,000
28 - 24	13,500
27 - 9	88,000
19 - 3 - 6	140,500
4B - 4	3,500
Total Estimated Construction Cost	$1,690,000
Engineering and Contingencies	338,000
Financing, Legal and Administrative Costs	61,000
Total Estimated Capital Cost	$2,089,000

ESTIMATED ANNUAL COST

Debt Service - $117,000

Operating Cost - $ 8,600

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ESTIMATED CAPITAL COSTS

PLAN "B-A2"

(Alternate No. 2)

Location - M.H. to M.H.	Estimated Construction Cost
1 - 10	$427,000
10 - 13	66,000
Lift Station - 10	350,000
10 - 19	54,000
10 - 19	22,000
19 - 24	367,000
24 - 28C	92,500
24 - 28D	22,000
24 - 27	44,000
28 - 24	13,500
27 - 9	217,500
19 - 3 - 6	140,500
4B - 4	3,500
Total Estimated Construction Cost	$1,819,500
Engineering and Contingencies	364,000
Financing, Legal and Administrative Costs	65,500
Total Estimated Capital Cost	$2,249,000

ESTIMATED ANNUAL COST

Debt Service -

Operating Cost - $8,600

HARTOLDMON0007091

ESTIMATED CAPITAL COSTS

PLAN "B-1A"

Location - M.H. to M.H.	Estimated Construction Cost
1 - 10	$427,000
10 - 13	66,000
Lift Station - 10	320,000
10 - 19	29,000
10 - 19	22,000
19 - 24	233,000
24 - 28C	81,500
24 - 28D	22,000
24 - 27	44,000
27 - 9	88,000
19 - 3 - 6	140,500
4B - 4	3,500
28 - 24	13,500
Total Estimated Construction Cost	$1,490,000
Engineering & Contingencies	298,000
Financing, Legal & Administrative	53,500
Total Estimated Capital Cost	$1,841,500

ESTIMATED ANNUAL COST

Debt Service -

Operating Cost - $8,400

HARTOLDMON0007092

ESTIMATED CAPITAL COSTS

PLAN "C"

Location - M.H. to M.H.	Estimated Construction Cost
1 - 2	$250,500
2 - 39	227,000
39 - 3	110,000
3 - 5 and 6 - 7	137,000
8A - 9	17,000
19 - 39 - 3 - 5 - 6	171,000
39 - 17M - 6M - 2M	372,000
6 - 7 - 9	84,000
4B - 4	3,500
10 - 13	66,000
24 - 28C	99,500
10A - 40	79,500
Inverted Siphon	26,000
Dead Creek Plumping Station and Force Main	24,000
Total Estimated Construction Cost	$1,667,000
Engineering and Contingencies	333,000
Financing, Legal & Administrative Cost	60,000
Total Estimated Capital Cost	$2,060,000

ESTIMATED ANNUAL COST

Debt Service -

Operating Cost - $540

HARTOLDMON0007093

ESTIMATED CAPITAL COST

PLAN "C-1"

Location - M.H. to M.H.	Estimated Construction Cost
1 - 2	$250,500
2 - 39	151,000
8A - 9	17,000
19 - 39 - 3 - 5 - 6	118,500
39 - 17M - 6M - 2M	372,000
6 - 7 - 9	84,000
4B - 4	3,500
10 - 13	66,000
24 - 28C	92,500
10A - 40	61,000
Inverted Siphon	24,000
Dead Creek Pumping Station and Force Main	24,000
Total Estimated Construction Cost	$1,264,000
Engineering & Contingencies	253,000
Financing, Legal & Administrative Cost	45,000
Total Estimated Capital Cost	$1,562,000

EXTIMATED ANNUAL COST

Debt Service -

Operating Cost - $540

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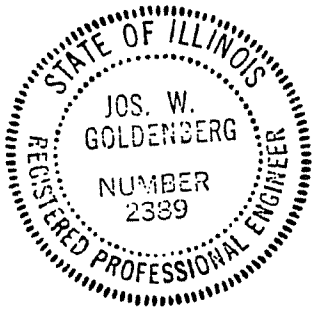
ACKNOWLEDGEMENTS

This report involved the help and cooperation of the Village of Monsanto industries and their representatives. We wish to thank them collectively for their consideration in supplying information related to their individual companies.

We wish to extend special thanks to Mr. C. N. Stutz and Mr. R. H. Young of Monsanto Chemical Company for their helpful suggestions.

We are indebted to the firm of Metcalf & Eddy, Engineers, for their review and advice in the preparation of this report.

Finally, we wish to express our appreciation to Mayor Leo Sauget and the officials of the Village of Monsanto for their cooperation.



Respectfully submitted,

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