APPENDIX A

DESIGN CRITERIA AND CALCULATIONS

- **Figure 2 - Wellhead Protection Zone Delineation Map**
- **Letter Regarding Fire Demands dated May 22, 2002**
- **Letter Regarding Fire Demands dated September 5, 2002**
- **Letter Regarding Wastewater Collection Evaluations dated May 7, 1999**
- **City of Lancaster Department of Engineering Sanitary Sewer Design Manual, Pages 3, 4, 5, 6 and 16**
- **Table A-1 - Sanitary Sewer Minimum Sizing Criteria Calculations**
- **Table A-2 - Projected Development Acreages, Populations, and Average Flows**
- **Table A-3 - Projected Sewershed Flows**
- **Figure 1 - Ratio of Peak Hourly Flow to Design Average Flow**
- **Table A-4 - Sanitary Sewer Sizing Per Ten States Standards**
- **Resolution 03-04.08.g – Adoption of the Fairfield County Development Strategy and Land Use Plan**
- **Wastewater Treatment Map of Fairfield County**
- **Fairfield County Centralized Water Systems Service Boundaries Map**
- **Contract between the City of Lancaster and the Greenfield Township Water and Sewer District**

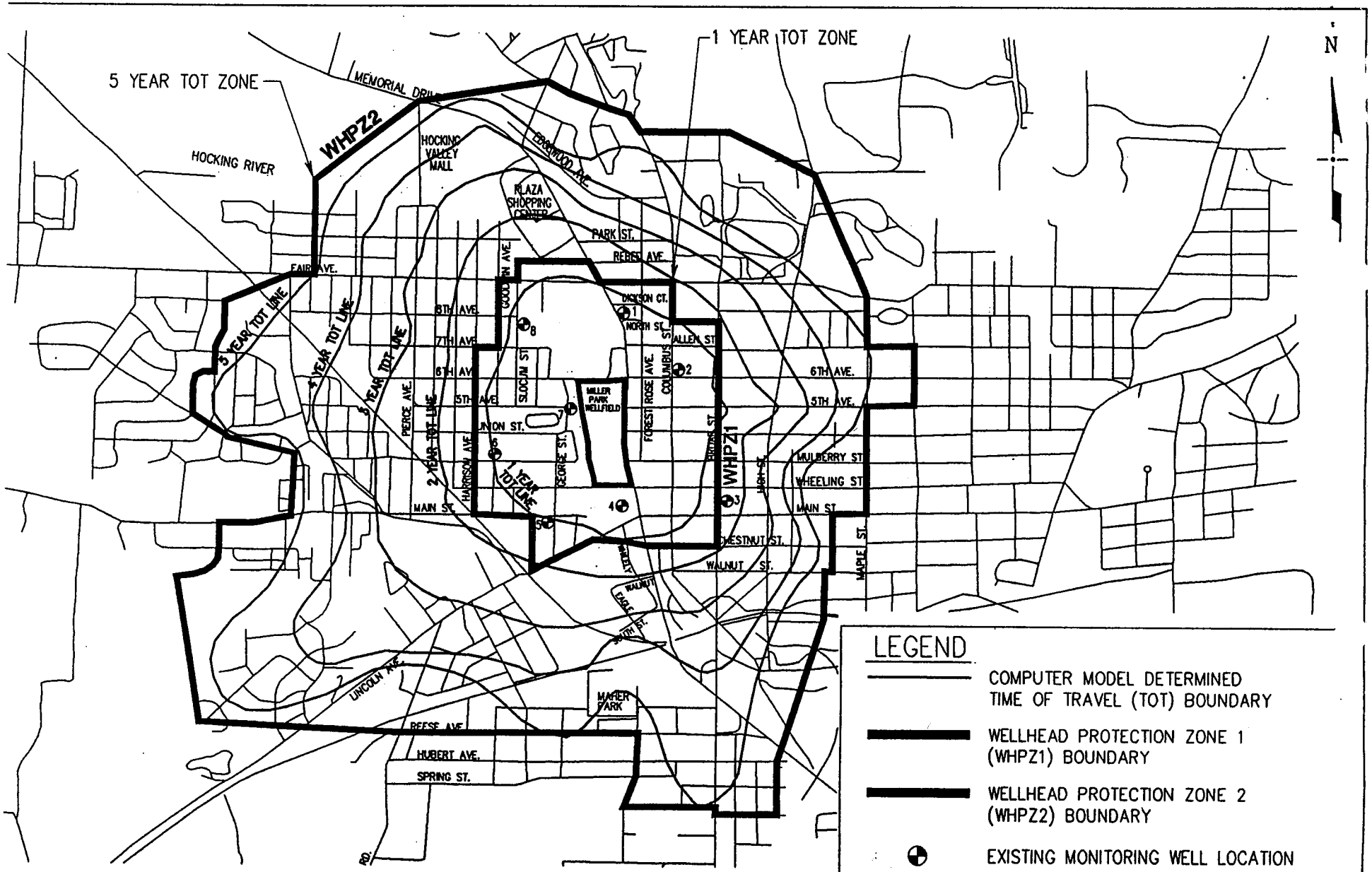


FIGURE 2
WELLHEAD
PROTECTION PROGRAM

CITY OF LANCASTER, OHIO
DIVISION OF WATER

WELLHEAD PROTECTION ZONE
DELINEATION MAP
SCALE: 1"=2000'

MALCOLM PIRNIE

MALCOLM PIRNIE, INC
INDEPENDENT ENVIRONMENTAL ENGINEERS, SCIENTISTS & CONSULTAN

May 22, 2002

Denise L. Crews, P.E.
Engineer II
City of Lancaster Department of Engineering
Municipal Building
104 East Main Street
Lancaster, OH 43130

Re: Master Plan for Water and Wastewater Improvements
U.S. 33 Bypass / Rock Mill Corporate Park Area
Fire Demands for Master Planning

Dear Ms. Crews:

The purpose of this letter is to address estimated fire flow demands that are required to forecast Lancaster's water infrastructure improvements. We have attached the 1995 Insurance Services Office (ISO) Hydrant Flow Data Summary that we received from Mr. Steve Sells of the Lancaster Fire Department. Also attached are guidelines from the American Water Works Association (AWWA) Distribution System Requirements for Fire Protection Manual (M31) for reference.

Based on the above information, we recommend using the following fire flows and durations to adequately account for fire protection in the water distribution system model:

Building Type	Fire Flow (gallons per minute)	Fire Flow Duration[1] (hours)
Residential – Single Family	1,500[2]	2
Residential – Multiple Family	2,500	2
Commercial	3,500	3
Industrial	5,000	4

1. Table 1-1, AWWA Manual M31
2. Table 1-5, AWWA Manual M31

1900 POLARIS PARKWAY SUITE 200 COLUMBUS, OH 43240-2020 614-888-4953 fax: 614-888-6295 http://www.pirnie.com

As stated in the AWWA Manual M31, the ISO classification of a community's water system for insurance purposes is based on the available rates of flow for locations with a needed fire flow of 3,500 gallons per minute (gpm) or less. Properties with needed fire flows greater than 3,500 gpm are evaluated separate of the City's ISO classification. Please review the enclosed information as soon as possible and let us know if you have any questions, comments or suggested changes. Upon arrival at consensus for the fire flow criteria, we can proceed to evaluate the water distribution system alternatives.

If you have any questions regarding the enclosed information, please contact me directly at 614-430-2613.

Very truly yours,

MALCOLM PIRNIE, INC.

Nancy J. Corbin

Nancy J. Corbin, P.E.
Deputy Project Manager

Fire Demand.doc/njc

Enclosures

c: David Bornino, City of Lancaster DOW
Steve Sells, City of Lancaster Fire Department
Tom Bulcher, Malcolm Pirnie, Inc.
Tarlochan Bhullar, Malcolm Pirnie, Inc.
Dax Blake, Malcolm Pirnie, Inc.
Gary Trachtman, Malcolm Pirnie, Inc.

0491-038

CITY OF LANCASTER
DEPARTMENT OF ENGINEERING
104 EAST MAIN STREET
LANCASTER, OHIO 43130-3726
OFFICE (740) 687-6614 - FAX (740) 681-5030

September 5, 2002

Mr. Tom Bulcher, P.E.
Malcolm Pirnie, Inc.
1900 Polaris Parkway
Suite 200
Columbus, OH 43240-2020

RE: Master Utility Plan 6.0136

Dear Tom:

Dave Bornino and I have re-evaluated the system requirements for fire flows. We have reviewed previous insurance reports for various areas as well as ISO requirements. It appears the minimum requirement is 3500 gpm for 4 hours. After this point, the fire protection rating is not increased.

However, as you are aware, industrial fire flow needs are evaluated on a case by case basis depending on the industry, the building and other factors. There does not appear to be any across the board requirement. Dave and I are both comfortable that a flow of 5000 gpm for 4 hours is acceptable based on previous insurance reports for industries in the City. Industries that require additional flow may need to augment their own fire system with additional storage, sprinklers, or architectural design. We will work with these industries as they occur.

If you have any questions, please call me at (740) 687-6614.

Thanks

Denise L. Crews P.E.

Denise L. Crews, P.E.
Engineer II

Cc: Dave Bornino, DoW

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

May 7, 1999

Mr. Kerry S. Hogan, P.E.
Directory of Utilities/Sanitary Engineer
Fairfield County Utilities
210 E. Main Street, Room 302
Lancaster, Ohio 43130-3854

Re: Fairfield County Utilities
Lancaster Service Area
Wastewater Collection Evaluation

Dear Mr. Hogan:

The purpose of this letter report is to summarize the findings of the Fairfield County Utilities Wastewater Collection Evaluation for the Lancaster Service Area. The purpose of this study was to evaluate the ability of the City of Lancaster wastewater collection system to accept sanitary flow from six areas within Fairfield County, two of which are served by package plants. The other areas are served by individual on-site systems. This letter report includes information pertaining to the project background, computer model development, estimated wastewater flow rates, impacts from future development, and a report summary.

Project Background

Fairfield County hired Malcolm Pirnie to determine the impact of connecting customers from six County developments to the existing Lancaster wastewater collection system. In order to aid in this evaluation, Malcolm Pirnie utilized the City of Lancaster's Stormwater Management Model (SWMM) of their collection system. The model was used to determine potential sewer system impacts such as sewer surcharging or increased combined sewer overflow (CSO) volume that would result during dry weather or wet weather as a result of the additional wastewater flow.

Computer Model Development

As part of the City's 1996 Sewer System Characterization, a wastewater collection system model was developed and calibrated using software from CAICE Software, Inc. (formally XP-SWMM Software Inc.). During the system characterization, the flows at many sewer system locations and at all CSOs were monitored during both dry and wet weather situations. In addition, rainfall was measured throughout the City to aid in model calibration.

As part of the system characterization, four typical annual storms were developed from historical rainfall records. These storms were then modeled and the results were used to determine the sewer system response to rainfall and to estimate the impact on the annual CSO volume. For each typical storm, the model was used to determine the impact of the additional flow from the Fairfield County service areas on the Lancaster wastewater collection system.

Wastewater Flow Rates

The County is investigating connection of six service areas, all of which are located outside of the City of Lancaster corporation limits, to the City of Lancaster wastewater collection system. The general location of the proposed connections to the Lancaster wastewater collection system are shown on Figure 1. The specific location of each connection to the existing Lancaster collection system is shown on Figures 2, 3, 4, and 5. The following is a brief description of each of the proposed areas:

Knox Acres Subdivision - Knox Acres Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster. This subdivision is fully developed at 29 connections and is currently served by on-site systems.

Carpico Drive Subdivision - Carpico Drive Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster. This subdivision is currently developed with 26 connections served by on-site systems. Of the three remaining undeveloped lots, it is assumed that only one is developed due to the size and location of the lots.

Peters Subdivision - Peters Subdivision is an existing residential development located in Fairfield County outside the City of Lancaster, but which is currently served by the City of Lancaster. A proposed expansion would increase the subdivision from 122 connections to 139 total connections.

Lakeside Subdivision - Lakeside Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster and is currently served by a package plant. This subdivision is fully developed at 30 connections. In order to connect to the Lancaster system, a sewer line would be extended through an unincorporated area adjacent to homes currently served by individual on-site systems. Wastewater from the adjacent homes is not specifically included with the Fairfield County projected flows, but is included in the overall Lancaster service area flows for the year 2020.

Pleasant Lea Subdivision - Pleasant Lea Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster and is currently served by a package plant. This subdivision is fully developed at 84 connections. In order to connect to the Lancaster system, a sewer line would be extended through an unincorporated area adjacent to homes currently served by on-site systems. Wastewater from the adjacent homes is not specifically included with the Fairfield County projected flows, but is included in the overall Lancaster service area flows for the year 2020.

Keister Manor Subdivision - Keister Manor Subdivision is an existing residential development within Fairfield County but outside the City of Lancaster. This subdivision is fully developed at 54 connections and is currently served by on-site systems.

Dry and wet weather flow projections for each area were made to represent the impact of the additional flow on the collection system during dry weather and typical annual rainfall events. Dry and wet weather flowrates were developed for each of the areas using the number of developed lots, sanitary flows per lot, infiltration allowances, and previous flow monitoring data. The calculation of the estimated average dry weather flowrates (DWF) and peak wet weather flowrates (WWF) from each of the six areas are provided in Table 1 and are summarized below.

Subdivision	Projected Ave. DWF	Projected Peak WWF	Connection Point
Knox Acres	11,600 gpd	12,539 gpd	Barr Dr. & Wittenburg
Carpico	10,800 gpd	11,861 gpd	Granville Pike & Creekside Drive
Peters	6,800 gpd	7,467 gpd	Hillbrook Dr. & Midway Blvd.
Lakeside	12,000 gpd	29,700 gpd	Last Manhole on Rainbow Dr. East
Pleasant Lea	16,800 gpd	67,700 gpd	Last Manhole on Rainbow Dr. East
Keister Manor	21,600 gpd	24,509 gpd	Ewing Trunk sewer at Rainbow Dr.
Total	79,600 gpd	153,776 gpd	

Using the number of developed lots for each subdivision in Table 1, the projected average dry weather flows appear to be reasonable and slightly conservative.

Impacts From Future Development

As part of the City of Lancaster's 1997 National Pollutant Discharge Elimination System (NPDES) Permit, the City is required to complete a sewer system extension evaluation. Through this evaluation, the impact of future development on the collection system during both dry and wet weather will be determined and addressed in Lancaster's CSO Long Term

Control Plan. Although Lancaster's Long Term Control Plan is not yet completed, it is anticipated that there will be no allowable increase in CSO volume as a result of the increase in flow from new development or connections. Therefore, the City is obligated to prevent any increase in CSO volume as a result of new development or connections through implementation of sewer system and treatment system modifications or improvements.

Impacts From Projected Development Throughout The Entire Lancaster Service Area - The Lancaster collection system is being modeled and evaluated for the development and connections projected for the year 2020. In order to estimate future flowrates, areas of future industrial and residential/commercial development were projected. Based on the projected development areas, industrial and residential/commercial flows were estimated. These projected development areas include the above referenced Fairfield County service areas. The diurnal flow pattern from similarly developed areas of the City was used to develop the diurnal flow pattern for each new area of development. These diurnal flows were then input into SWMM at the appropriate locations in order to model the projected flow increases.

Model simulations were performed in order to determine the impact of the projected year 2020 wastewater flow rates on the collection system during dry weather. Based on the model output, the projected increase in flows should not cause any surcharging or flooding problems. However, as a result of the dry weather flow increase for the year 2020, modification to CSOs in the lower portion of the collection system are required in order to prevent dry weather overflows.

The model was also used to estimate the impact of the increase in system connections on the collection system during wet weather. Using data from the existing separated sewer areas of the collection system, wet weather infiltration allowances were made for all future development or connection areas.

The results from model simulations for an average annual year of precipitation were compared for the existing and projected future 2020 conditions. Based on the model output, there should not be any significant hydraulic changes associated with the additional flow during typical yearly storms. However, as a result of the projected increase in flow, the annual CSO volume will increase. Therefore, the City is planning collection system modifications in order to prevent increased CSO discharges.

Impacts From New Fairfield County Connections - Model simulations were performed to determine the impact of the increase in dry weather flow from the County subdivisions on the Lancaster collection system prior to 2020. Based on the

results of these simulations, the Fairfield County wastewater flows can be added to the City of Lancaster collection system . However, it is recommended that the City of Lancaster complete CSO modifications associated with raising weir levels at CSO 1019 and CSO 1031 prior to accepting the additional flow in order to prevent increases in annual CSO discharge volumes.

Report Summary

The City of Lancaster has projected future industrial and residential/commercial development areas and wastewater flow rates through the year 2020. The estimated 2020 flows have been modeled to determine the impact of these flows during dry and wet weather. Based on model results, modifications to the collection system by the City of Lancaster will enable all of the projected flow to be added to the collection system without increasing CSO discharge volume or surcharging sewers. Specifically, the additional flow from the six Fairfield County service areas will not impact the City of Lancaster collection system during dry or wet weather after the modifications at CSO 1019 and 1031 are completed. It is recommended that these modifications be made by the City of Lancaster prior to connection of the Fairfield County service areas with the exception of Knox Acres. Knox Acres could be added at any time. It is anticipated that the CSO modifications will be completed by mid 2000.

Very truly yours,

MALCOLM PIRNIE, INC.

Thomas J. Bulcher

Thomas J. Bulcher, P.E.
Associate

sewer2.wpd/mdw

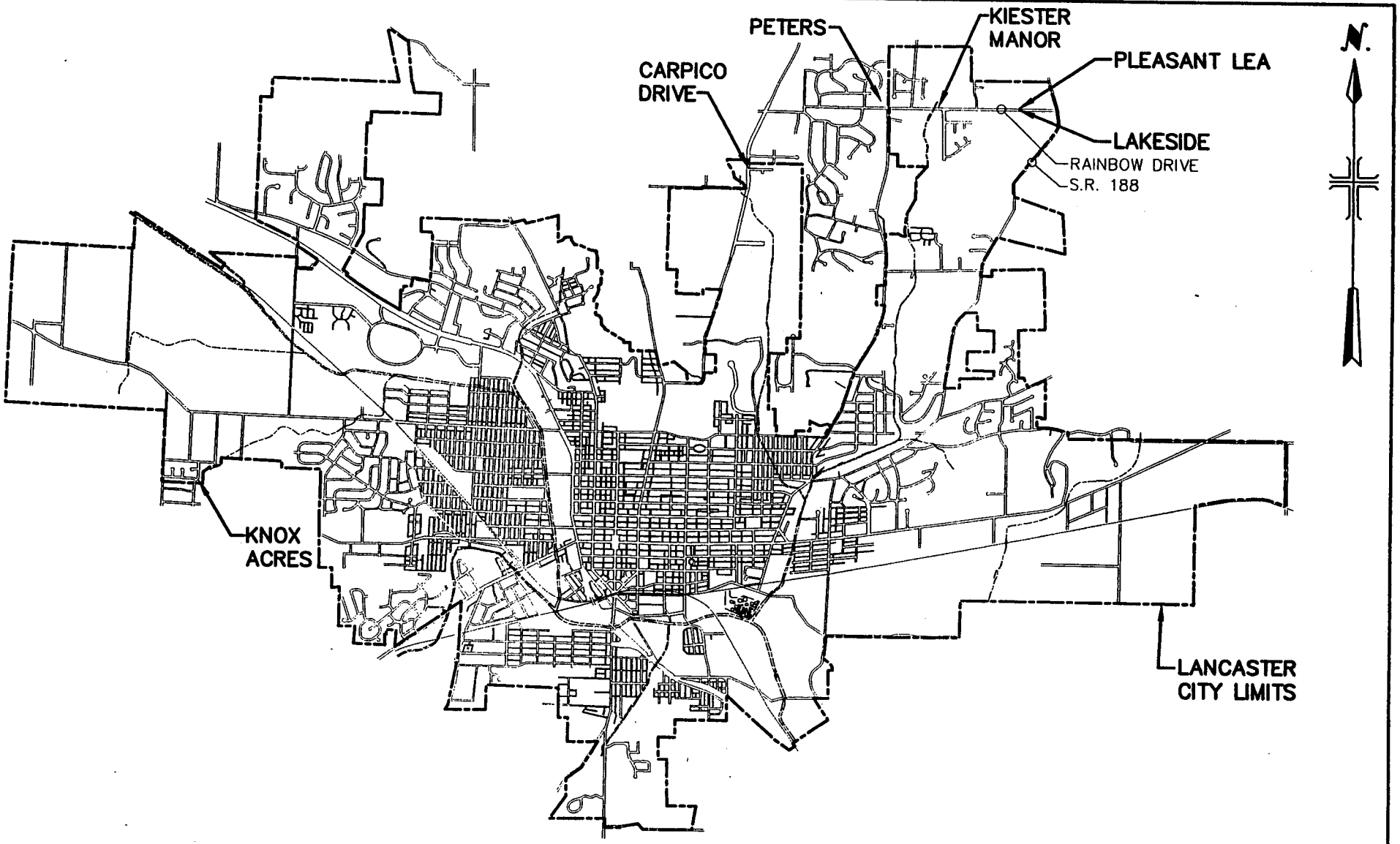
c: Mike Nixon, City of Lancaster, WPCD Superintendent
L. Kent Huston P.E., City of Lancaster, City Engineer
Mitch Altier, Sieco, Inc.

0665-021

Table 1
Fairfield County
Subdivision Flows

	Knox Acres	Carpico Drive	Peters	Lakeside	Pleasant Lea	Keister Mannor
No. of homes projected	29	27	17	30	84	54
Dry Weather Baseflow/home (gpd)(1)	NM	NM	377 (12)	353	150	NM
Wet Weather I/I/home (gpd) (1)	NM	NM	85 (12)	84	35	NM
Peak WWF (2)	NM	NM	7,854	13,110	15,540	NM
Maximum Flow (3)	NM	NM	NA	29,700	67,700	NM
Adj. Baseflow/home (gpd) (4)	400	400	400	400	200	400
Infil./Inflow (gpd/in-mi) (5)	200	200	200	NA	NA	200
8" Sewer Length (ft) (6)	3,100	3,500	2,200	NA	NA	9,600
Ave. DWF (gpd) (7)	11,600	10,800	6,800	12,000	16,800	21,600
Peak WWF (gpd) (8)	12,539	11,861	7,467	29,700 (9)	67,700 (9)	24,509
Peak Diurnal DWF (gpd) (10)	15,080	14,040	8,840	15,600	21,840	28,080
Peak Diurnal WWF (gpd) (11)	39,208	36,504	22,984	40,560	67,700 (13)	73,008

1. Flows from Fairfield County package plants October 1, 1998 through December 31, 1998. Flow/home calculations by Sieco Inc.
2. Peak Wet Weather Flow (WWF) calculated using No. of homes times the toal of the baseflow/home plus infil/inflow per home.
3. Maximum flow from Infiltration/Inflow Study Report by Sieco Inc., September 1980, revised January 1981.
4. Actual dry weather baseflow rates adjusted up for conservative flow projection.
5. Infiltration allowed by 10 State Standards.
6. Length of sewer from Seico Inc.
7. Average Dry Weather Flow (DWF) = # of homes times adjusted dry weather baseflow/home.
8. Peak WWF = average DWF plus infiltration/inflow.
9. Actual peak Wet Weather Flow measured as part of Infiltration/Inflow Study Report, Rev. January 1981.
10. Diurnal peaking factor is 1.3 times the average DWF based on existing City of Lancaster flow monitoring. The flow monitoring area was a 15-inch line near Union & SR33.
11. Peak diurnal WWF is 2.6 times the peak diurnal DWF based on existing flow monitoring data of existing City of Lancaster separated sewer areas.
12. Based on existing Peters Subdivision of 122 homes.
13. Actual flow monitoring data was used since the calculated peak wet weather flow was less than the actual measurement.
14. N/A - Not Applicable; N/M - Not Measured; I/I - Infiltration/Inflow



SCALE: NOT TO SCALE

MALCOLM PIRNIE

FAIRFIELD COUNTY UTILITIES
LANCASTER SERVICE AREA
WASTEWATER COLLECTION EVALUATION

FIGURE 1

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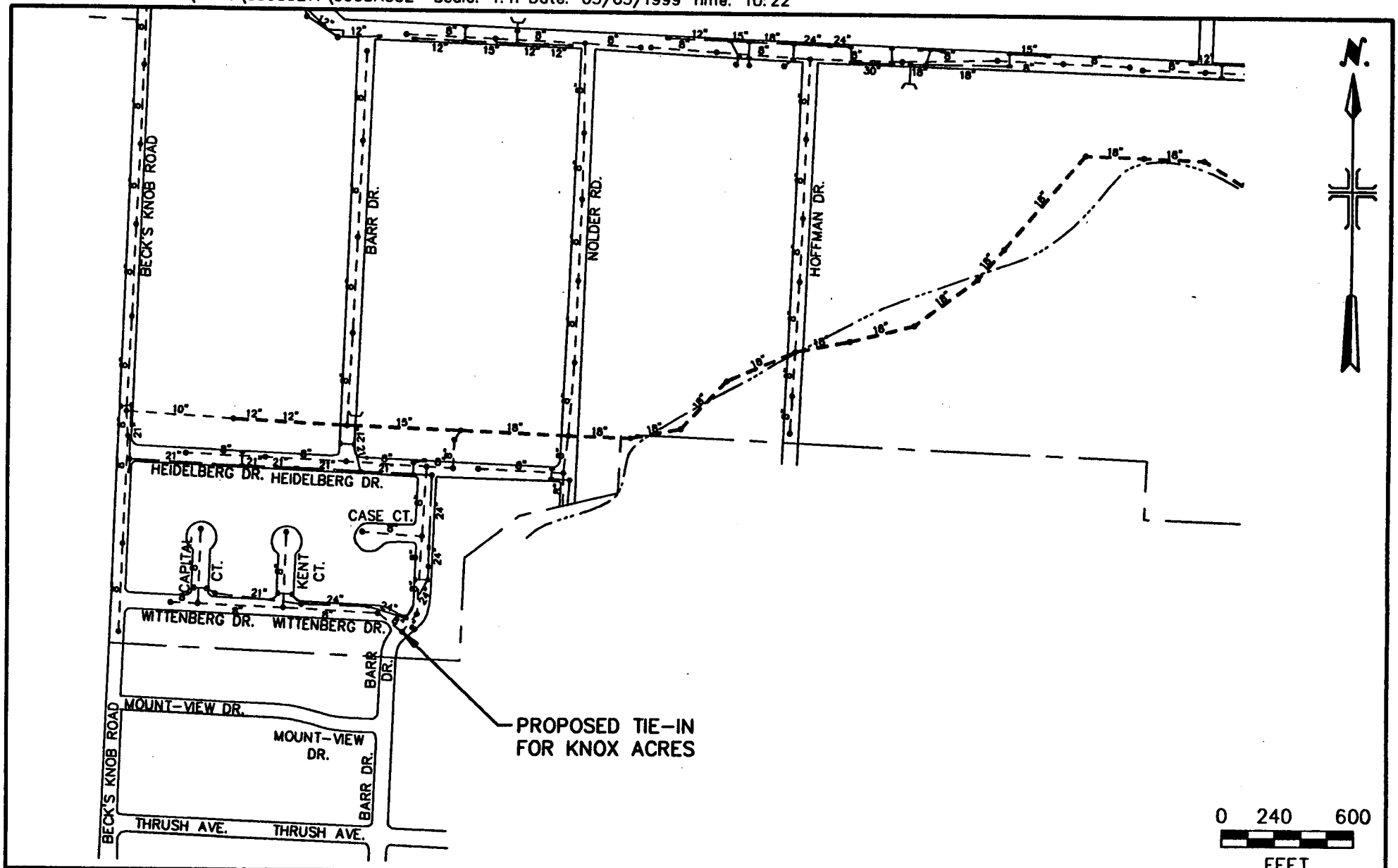

MALCOLM PIRNIE

FAIRFIELD COUNTY UTILITIES
LANCASTER SERVICE AREA
WASTEWATER COLLECTION EVALUATION

FIGURE 2

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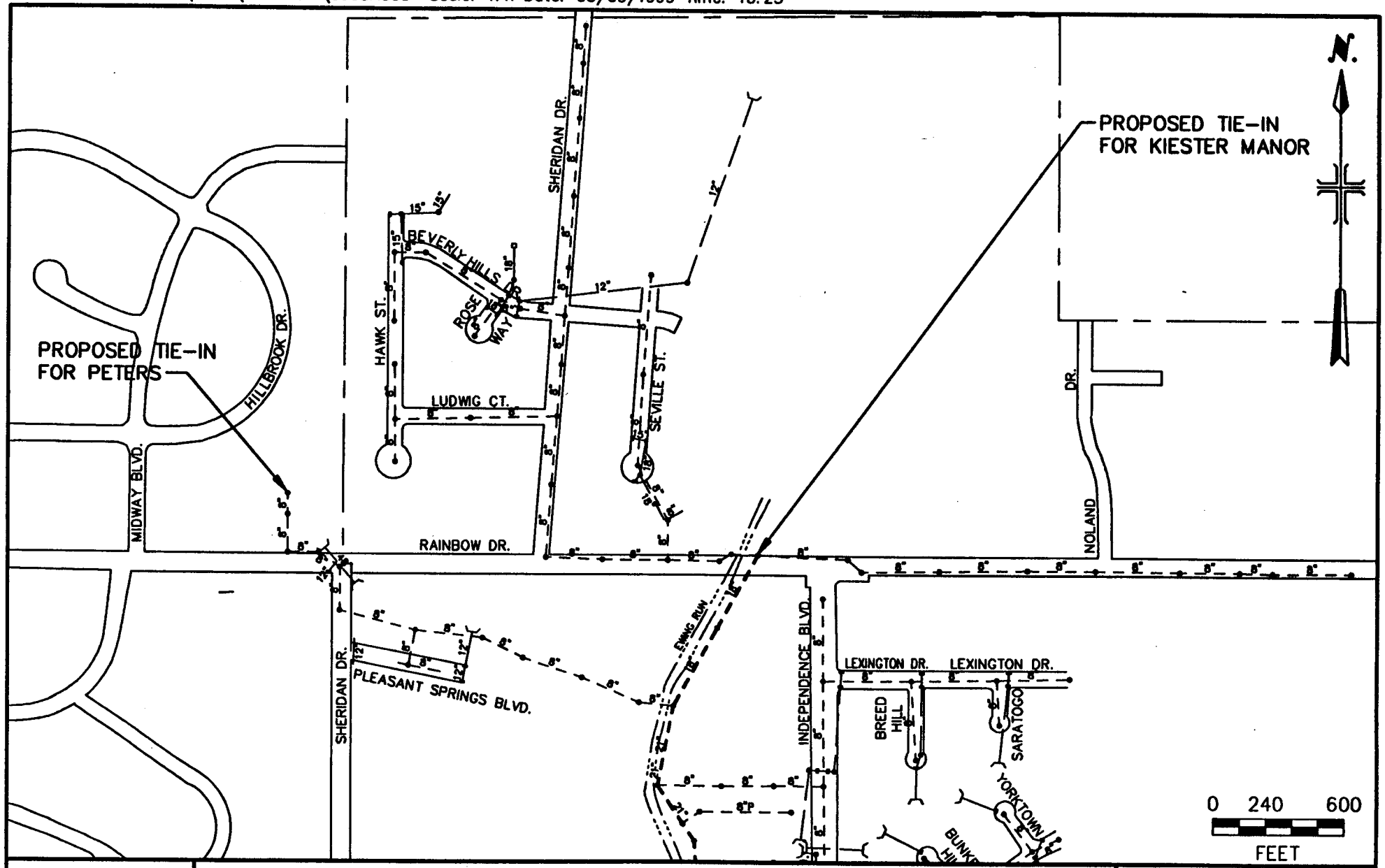

MALCOLM PIRNIE

FAIRFIELD COUNTY UTILITIES
LANCASTER SERVICE AREA
WASTEWATER COLLECTION EVALUATION

FIGURE 3

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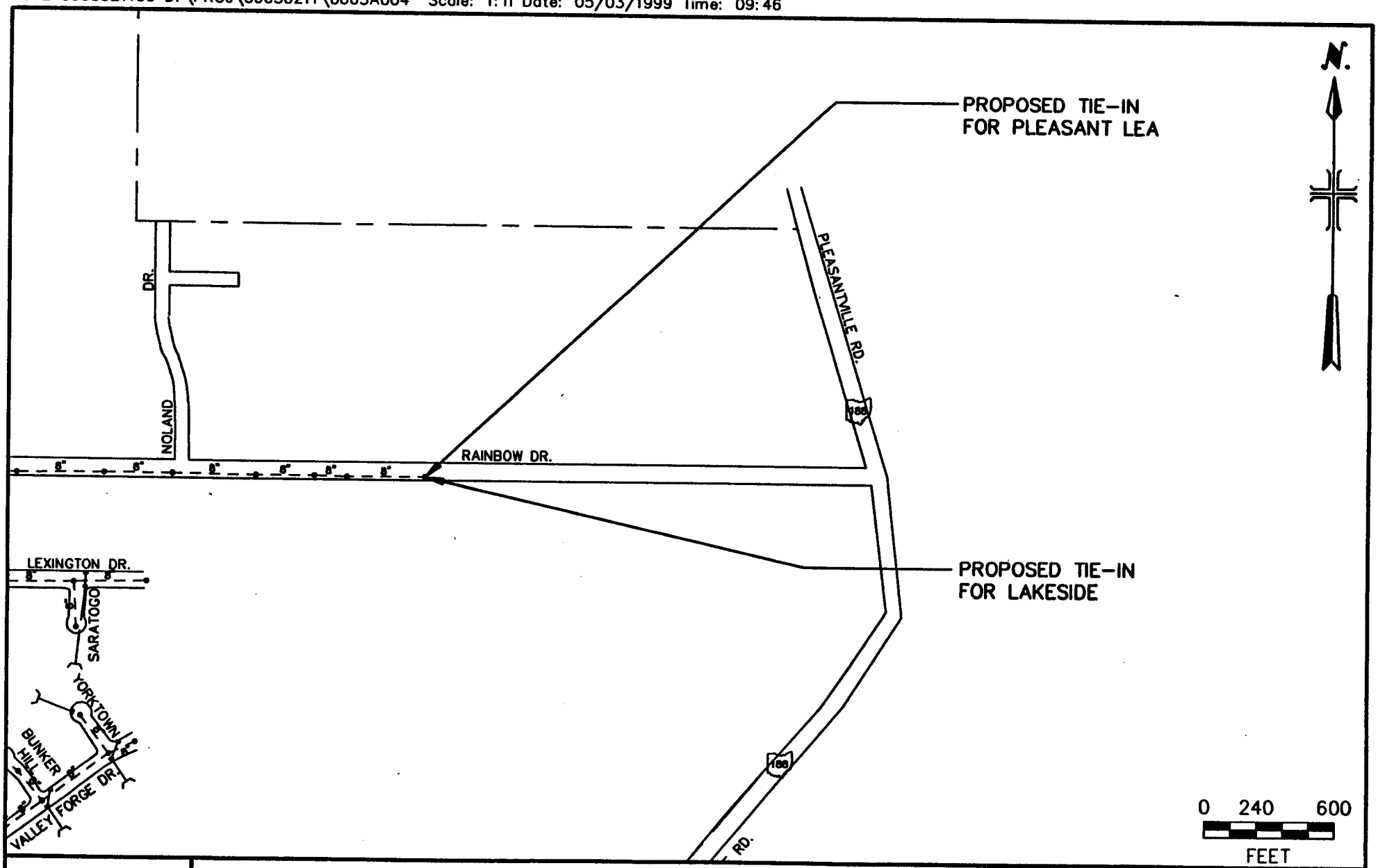

MALCOLM PIRNIE

FAIRFIELD COUNTY UTILITIES
LANCASTER SERVICE AREA
WASTEWATER COLLECTION EVALUATION

FIGURE 4

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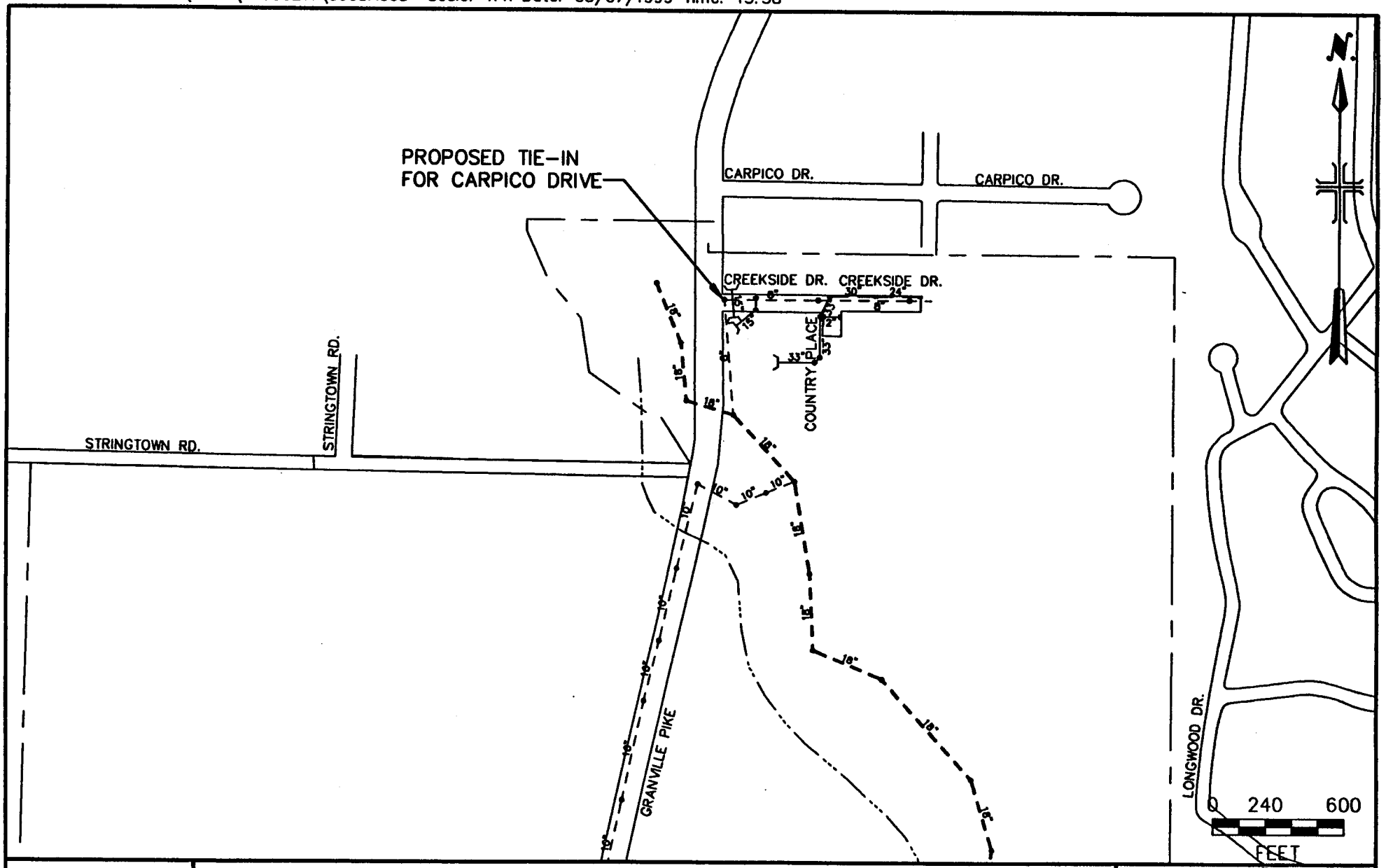

MALCOLM PIRNIE

FAIRFIELD COUNTY UTILITIES
LANCASTER SERVICE AREA
WASTEWATER COLLECTION EVALUATION

FIGURE 5

PURPOSE

This manual is to provide awareness to the designer of new development in the City of Lancaster of acceptable local design standards. It is a supplement to standard design procedures. This manual is meant to be a guideline for development in the City and as a supplement to the Subdivision Regulations. The City understands that not all projects will conform to these standards and may require unique solutions suited for the individual site. These situations should be addressed early in the planning stages of the development. The latest edition of the City Zoning Ordinances, Subdivision Regulations, Construction and Materials Specifications (CMSL), Standard Drawings and General Notes shall be followed in planning and designing the project.

References to 10 States Standards shall refer to Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers publication Recommended Standards for Wastewater Facilities, 1990 Edition. References to the Ohio EPA Green Book shall refer to the Ohio Environmental Protection Agency publication Sewage Collection, Treatment & Disposal Where Public Sewers Are Not Available, 1993 Edition.

POLICY

TRIBUTARY AREA DETERMINATIONS

Tributary Boundaries

The tributary area for a proposed mainline sanitary sewer shall be clearly defined and shown on the tributary area map. The designer shall research the existing sewer to which a connection is being made and review contour maps and any prior sanitary sewer design information of the area to determine the correct tributary boundary for the proposed mainline sewer.

Changes in sanitary sewer tributary design boundaries may be approved by the City Engineer. Calculations and tributary maps shall be submitted to document the sanitary sewer system capacity to a point downstream determined by the City Engineer.

Development Densities

Development densities have been provided based on local zoning densities and can be found in Appendix A.

Alternate Calculations

Alternate calculations for sanitary sewer flows may be approved on a case-by-case situation by the City Engineer. These cases will generally involve unusual development types or development that in-fills existing service areas beyond the original plan.

DESIGN FLOWS

Flow Calculations

Sanitary sewers shall be designed to handle the flow from the entire tributary area under peak conditions. Flow shall be calculated as the average sanitary flow multiplied by a peak factor and added to the infiltration allowance as follows:

$$Q=(Q_{avg}P)PF+IA$$

Where

Q=Sanitary Flow
Q_{avg}=Average Sanitary Flow=0.0002 cfs/capita
P=Population of Tributary Area based on design density
PF=Peak Factor=3.5
I=Infiltration allowance=0.003 cfs/acre
A=Tributary Area

Alternate Calculations

In special cases, such as industrial or institutional developments, conditions may require alternate methods of calculating sanitary flow. In these cases flow may be calculated based on water use records, sanitary flow records or other means acceptable to the City Engineer.

SANITARY SEWERS

Design Criteria

Sanitary sewers shall be designed to receive sanitary waste from the entire tributary area. Sanitary sewers shall be a minimum of 10 feet deep at the farthest point of the tributary area and shall be designed to serve the basements of all developments unless approved by the City Engineer. Sanitary sewers shall be extended through the property to a point no less than ten-feet from the property line at a location approved by the City Engineer. This shall become the connection point for all upstream tributary areas.

Trench backfill shall be as per the requirements of the City of Lancaster. The maximum cover shall be determined based on the supporting strength of the conduit, as installed, divided by a suitable factor of safety, and must equal or exceed the loads imposed upon it by the weight of earth plus any superimposed loads. Trench dams shall be provided at a point midway between each sanitary manhole and shown on the plans.

Concrete encasement shall be used when required for the sanitary sewer to withstand trench loadings, when rock is encountered in the trench bottom, when cover is less than 30-inches or when such sewer line crosses a stream with a year-round flow.

The design procedure recommended for use in structural design of sewers is the Design Manual Concrete Pipe (available from American Concrete Pipe Association), wide trench installation.

The minimum sanitary sewer size is 8-inches for all mainline sanitary sewers and 6-inches for sanitary service lines. Downstream sewers shall be greater than or equal to the upstream size unless approved by the City Engineer. All new sanitary sewers shall be constructed of vitrified clay pipe for sewers 24-inches and under or concrete pipe for sewer over 24-inches. Sanitary sewers shall be sized using the Manning's equation:

$$V=1.486/n\ R^{2/3}\ S^{1/2}$$

Where

V=average velocity (ft/s)
n=Manning's roughness coefficient=0.013
R=hydraulic radius (ft)
S=channel slope (ft/ft)

A Manning's "n" of 0.013 shall be used.

The sanitary sewer shall be designed to insure self-cleaning. The minimum velocity shall be 2 fps. The maximum velocity shall be 15 fps. The size of the sewer must be adequate based on the tributary area to provide the following capacities:

8" through 15" flowing 50% full
18" through 27" flowing 75% full
30" and larger flowing 90% full

In dead end lines not projected to be extended, the slope of the last run of sanitary sewer shall be increased to provide a velocity of 3 fps.

The flow line of pipes should be set such that the invert of the pipes, at junctions have a minimum drop of 0.10 feet; if the outlet elevation permits, the crown of the outlet pipe may be lower. The flow line elevations of sewers should be set to avoid using concrete encasement.

A minimum vertical separation of 18 inches shall be maintained between the sanitary sewer and all water and storm sewer lines. A 10-foot horizontal separation shall be maintained between sanitary sewer and water lines. A 12-inch vertical separation shall be maintained between the sanitary sewer and all other buried utilities. It is the responsibility of the designers to locate all buried utilities to the best of their abilities.

Temporary bulkheads shall be provided at all sanitary sewer stubs for future phases or extensions. Bulkheads shall also be provided on new sanitary sewer lines at the connection to existing sanitary sewers until such time as the lines are inspected, tested and accepted for use. All bulkheads shall be shown on the plans.

Pipe Standards

All sewers shall be constructed of vitrified clay pipe for sewers 24-inches and under or concrete pipe for sewers over 24-inches meeting the requirements of CMSL 901. Alternate materials may be approved by the City Engineer under special design conditions.

Manholes

Manholes shall be designed to meet the standards of the City of Lancaster and/or the Ohio Department of Transportation and located in such a way as to be accessible to City crews. All manholes on new sewers shall be precast type 1, 2 or 3. Manholes constructed on existing sewers shall be cast-in-place type 4.

Drop manholes shall be required where there is more than two-feet difference in the incoming and outgoing sewer. Outside drop connections shall be used on all new manholes. No more than one inside drop connection will be allowed in each manhole. Where the difference in elevation between the incoming sewer and the outgoing sewer is less than 24-inches, the invert shall be filleted to prevent solids deposition.

Precast concrete modular units shall be in accordance with the applicable standard drawing or as approved by the City Engineer. Precast bases shall be placed on a foundation as noted on the standard drawings, a minimum of 3-inches of compacted sand, or as approved by the City Engineer. The compacted foundation shall be leveled to provide a uniform support for the entire area of the base.

All joints between modules shall be in conformance with ASTM C443, 706.10 or 706.11. Sanitary manholes shall be watertight. Manholes shall be vacuum tested in accordance with ASTM C1244 prior to backfilling. Manholes that fail the vacuum test shall be repaired or replaced by the developer. After the manhole is backfilled, the City Engineer may require additional testing if there is an indication that the water tightness has been compromised.

Pipe entrances to the precast modular sections shall be in accordance with 706.15 or neatly grouted in place.

All lift holes and other openings in the structure shall be thoroughly and neatly grouted with cement mortar or other suitable material approved by the City Engineer, after all pipes are placed into the structures.

Where corrosive conditions due to septicity, industrial wastes or other causes are anticipated, consideration shall be given to providing corrosion protection on the interior of the manholes.

Frames and castings shall be in accordance with the applicable standard drawing or as approved by the City Engineer and shall be set in a mortar bed at the locations and elevations specified.

City of Lancaster
Sanitary Sewer Density

Existing Zoning Code

Zoning	Use	Units/Acre	People/Unit	People/Acre
A	Single Family	4	3	12
A	Single Family	2	3	6
A	Single Family	1	3	3
B-1	Multi-Family	26	2.5	65
B-2	Multi-Family	10	2.5	25
B-3	Multi-Family	10	2.5	25
C-1	Commercial	12	1.5	18
C-2	Commercial	12	1.5	18
C-3	Commercial-Filling Stations			16
D	Light Industrial			*
E	Heavy Industrial			*
F	Mobile Home	6	2.5	15

* Flow to be determined based on Individual Site. Where no information is available use 1000 gal/ac/day for Light Industrial and 3000 gal/ac/day for Heavy Industrial.

Enacted Zoning Code

Zoning	Use	Units/Acre	People/Unit	People/Acre
AG	Agricultural	0.5	3	1.5
RE	Residential Estate	2	3	6
RS-1	Residential Low Density	3	3	9
RS-2	Residential Medium Density	5	3	15
RS-3	Residential High Density	6	3	18
RS-4	Residential Highest Density	9	3	27
RD	Residential Duplex	7	3	21
RM-0	Residential Multifamily Lowest Density	15	2.5	37.5
RM-1	Residential Multifamily Low Density	25	2.5	62.5
RM-2	Residential Multifamily Medium Density	25	2.5	62.5
RM-3	Residential Multifamily High Density	45	2.5	112.5
RMH	Residential Manufactured Home	8	2.5	20
OL	Office Low Density			10
OM	Office Medium Density			10
OMH	Office Medium High Density			10
OH	Office High Density	8	2.5	20
CN	Commercial Neighborhood			10
CG	Commercial General			10
CH	Commercial High Intensity			10
CBD	Central Business District			10
SR	Scientific Research & Development			*
IL	Industrial Low Density			*
IM	Industrial Medium Density			*
IH	Industrial High Density			*
PUD	Planned Unit Development	8	3	24

* Flow to be determined based on Individual Site. Where no information is available use 1000 gal/ac/day for Scientific Research and Low Density Industial, 1500 gal/ac/day for Medium Density Industrial, and 3000 gal/ac/day for High Density Industrial.

TABLE A-1

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER MINIMUM SIZING CRITERIA CALCULATIONS

Manning's Equation :

V = 1.49 / n * R —u2/3˜ * S —u1/2˜
V = velocity (feet / second)
n = friction coefficient
R = hydraulic radius (square feet / foot)
S = slope (feet / foot)

Q = A * V * 7.48 * 60
Q = flow (gpm)
A = area (square feet)

Pipe Diameter (inches)	Water Depth Ratio	Total Pipe Area (ft^2)	Partial Pipe Area (ft^2)	Area Ratio (ft^2/ft^2)	Total Pipe Perimeter (ft)	Wetted Perimeter (ft)	Wet Per Ratio (ft/ft)	Hydraulic Radius (f^{t2}/ft)	Pipe Slope (ft/ft)	Friction Factor (C)	Velocity (ft/sec)	Flow Rate (cfs)	Flow Rate (mgd)	Flow Rate (gpm)
D	f	A	a	a/A	P	p								
6	0.500	0.196	0.098	0.500	1.571	0.785	0.500	0.125	0.004873	0.013	2.000	0.196	0.127	88
8	0.500	0.349	0.175	0.500	2.094	1.047	0.500	0.167	0.003320	0.013	2.000	0.349	0.226	157
10	0.500	0.545	0.273	0.500	2.618	1.309	0.500	0.208	0.002466	0.013	2.000	0.545	0.352	245
12	0.500	0.785	0.393	0.500	3.142	1.571	0.500	0.250	0.001934	0.013	2.000	0.785	0.508	352
15	0.500	1.227	0.614	0.500	3.927	1.963	0.500	0.313	0.001436	0.013	2.000	1.227	0.793	551
18	0.750	1.767	1.422	0.804	4.712	3.142	0.667	0.453	0.000876	0.013	2.000	2.843	1.838	1,276
21	0.750	2.405	1.935	0.804	5.498	3.665	0.667	0.528	0.000714	0.013	2.000	3.870	2.501	1,737
24	0.750	3.142	2.527	0.804	6.283	4.189	0.667	0.603	0.000597	0.013	2.000	5.055	3.267	2,269
27	0.750	3.976	3.199	0.804	7.069	4.712	0.667	0.679	0.000510	0.013	2.000	6.398	4.135	2,871
30	0.900	4.909	4.653	0.948	7.854	6.245	0.795	0.745	0.000451	0.013	2.000	9.307	6.015	4,177
33	0.900	5.940	5.630	0.948	8.639	6.870	0.795	0.820	0.000397	0.013	2.000	11.261	7.278	5,054
36	0.900	7.069	6.701	0.948	9.425	7.494	0.795	0.894	0.000354	0.013	2.000	13.401	8.661	6,015
42	0.900	9.621	9.120	0.948	10.996	8.743	0.795	1.043	0.000288	0.013	2.000	18.241	11.789	8,186
48	0.900	12.566	11.912	0.948	12.566	9.992	0.795	1.192	0.000241	0.013	2.000	23.825	15.397	10,693
54	0.900	15.904	15.077	0.948	14.137	11.241	0.795	1.341	0.000206	0.013	2.000	30.153	19.487	13,533
60	0.900	19.635	18.613	0.948	15.708	12.490	0.795	1.490	0.000179	0.013	2.000	37.226	24.058	16,707
72	0.900	28.274	26.803	0.948	18.850	14.989	0.795	1.788	0.000140	0.013	2.000	53.606	34.644	24,058

TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
Commercial	C-1	334	25%	84	n/a	83,500	50%	167	n/a	167,000
	C-2	159	29%	46	n/a	45,554	57%	91	n/a	91,107
	C-3	86	41%	35	n/a	35,088	82%	70	n/a	70,176
	C-4	68	45%	31	n/a	30,542	90%	61	n/a	61,084
	C-5	711	10%	69	n/a	68,612	19%	137	n/a	137,223
	C-6	266	25%	66	n/a	65,729	49%	131	n/a	131,457
	C-7	67	50%	34	n/a	33,500	100%	67	n/a	67,000
	C-8	281	15%	42	n/a	42,150	30%	84	n/a	84,300
	C-9	101	45%	45	n/a	45,450	90%	91	n/a	90,900
	C-10	114	30%	34	n/a	34,200	60%	68	n/a	68,400
	C-11	151	30%	45	n/a	45,300	60%	91	n/a	90,600
	C-12	170	30%	51	n/a	51,000	60%	102	n/a	102,000
Greenfield Twp	C-13	1012	20%	202	n/a	202,400	40%	405	n/a	404,800
Greenfield Twp	C-14	108	25%	27	n/a	26,938	50%	54	n/a	53,877
Greenfield Twp	C-15	851	5%	43	n/a	42,550	10%	85	n/a	85,100
Greenfield Twp	C-16	305	30%	92	n/a	91,500	60%	183	n/a	183,000
	C-17	406	9%	35	n/a	34,529	17%	69	n/a	69,057
	C-18	10	30%	3	n/a	3,135	60%	6	n/a	6,269
	C-19	85	5%	4	n/a	4,250	10%	9	n/a	8,500
Subtotal		**5,285**		**986**	**n/a**	**985,925**		**1,972**	**n/a**	**1,971,850**
Residential	SF-1	107	45%	48	480	48,042	90%	96	961	96,083
Single Family	SF-2	654	15%	98	981	98,123	30%	196	1962	196,246
	SF-3	159	10%	16	159	15,859	20%	32	317	31,718
Knox Acres	SF-4	5	---	---	n/a	11,600	---	---	n/a	11,600
	SF-4	31	10%	3	31	3,100	20%	6	62	6,200
	SF-5	378	20%	76	756	75,600	40%	151	1512	151,200
	SF-6	67	31%	21	205	20,536	61%	41	411	41,071

TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
	SF-7	100	20%	20	199	19,925	40%	40	398	39,850
	SF-8	52	20%	10	104	10,441	40%	21	209	20,883
	SF-9	252	10%	25	252	25,200	20%	50	504	50,400
Greenfield Twp	SF-10	1160	10%	116	n/a	116,000	20%	232	n/a	232,000
Greenfield Twp	SF-11	553	30%	166	n/a	165,815	60%	332	n/a	331,631
	SF-12	126	50%	63	630	63,000	100%	126	1260	126,000
	SF-13	345	35%	121	1207	120,750	70%	242	2415	241,500
	SF-14	138	5%	7	69	6,900	10%	14	138	13,800
	SF-15	634	5%	32	317	31,700	10%	63	634	63,400
	SF-16	1093	15%	164	1639	163,950	30%	328	3279	327,900
	SF-17	94	20%	19	188	18,800	40%	38	376	37,600
Carpico Drive	SF-18	19	---	---	n/a	10,800	---	---	n/a	10,800
	SF-18	743	16%	121	1210	121,000	32%	238	2378	237,760
Peters	SF-19	94	---	---	n/a	6,800	---	---	n/a	6,800
	SF-19	57	20%	11	114	11,400	40%	23	228	22,800
	SF-20	143	30%	43	429	42,900	60%	86	858	85,800
Kiester Manor	SF-21	41	---	---	n/a	21,600	---	---	n/a	21,600
	SF-21	69	10%	7	69	6,900	20%	14	138	13,800
Pleasant Lea	SF-22	46	---	---	n/a	16,800	---	---	n/a	16,800
	SF-22	16	10%	2	16	1,600	20%	3	32	3,200
Lakeside	SF-23	45	---	---	n/a	12,000	---	---	n/a	12,000
	SF-23	164	10%	16	164	16,400	20%	33	328	32,800
	SF-24	321	30%	96	963	96,300	60%	193	1926	192,600
	SF-25	60	30%	18	181	18,063	60%	36	361	36,125
	SF-26	305	20%	61	610	61,000	40%	122	1220	122,000
Subtotal		**8,070**		**1,379**	**10,975**	**1,458,903**		**2,754**	**21,907**	**2,833,966**

TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
Multi Family	MF-1	46	40%	18	185	18,467	80%	37	369	36,935
	MF-2	565	15%	84	838	83,846	30%	168	1677	167,692
	MF-3	411	20%	82	821	82,125	40%	164	1642	164,250
	MF-4	292	25%	73	730	73,000	50%	146	1460	146,000
Greenfield Twp	MF-5	365	25%	91	n/a	91,250	50%	183	n/a	182,500
	MF-6	43	22%	9	94	9,353	44%	19	187	18,705
	MF-7	11	15%	2	16	1,595	30%	3	32	3,190
Subtotal		**1,732**		**360**	**2,684**	**359,636**		**719**	**5,368**	**719,271**
Estate District	ED-1	132	30%	40	397	39,664	60%	79	793	79,329
Subtotal		**132**		**40**	**397**	**39,664**		**79**	**793**	**79,329**
Industrial										
(USP)	I-1	193	20%	39	n/a	50,186	40%	77	n/a	100,371
	I-2	106	20%	21	n/a	27,666	40%	43	n/a	55,331
	I-3	61	47%	29	n/a	37,112	94%	57	n/a	74,225
	I-4	32	50%	16	n/a	20,625	100%	32	n/a	41,249
	I-5	180	48%	86	n/a	112,437	96%	173	n/a	224,874
	I-6	36	30%	11	n/a	14,085	60%	22	n/a	28,169

TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
	I-7	148	30%	44	n/a	57,696	60%	89	n/a	115,393
	I-8	271	36%	98	n/a	127,709	73%	196	n/a	255,418
	I-9	262	10%	26	n/a	34,060	20%	52	n/a	68,120
(LTCP)	I-10	284	15%	43	n/a	55,383	30%	85	n/a	110,765
	I-11	60	5%	3	n/a	3,900	10%	6	n/a	7,800
	I-12	137	20%	27	n/a	35,345	40%	54	n/a	70,689
	I-13	70	10%	7	n/a	9,064	20%	14	n/a	18,128
	I-14	88	20%	18	n/a	22,942	40%	35	n/a	45,885
Rock Mill Ph 1	I-15	215	75%	161	n/a	209,625	100%	215	n/a	279,500
Subtotal		**2,143**		**629**	**n/a**	**817,833**		**1,151**	**n/a**	**1,495,917**
TOTAL		**17,363**		**3,394**	**14,055**	**3,661,961**		**6,676**	**28,068**	**7,100,333**

NOTES:

1. Estimated average day flows for 100% development are calculated as follows:

Residentia	1,000	gallons per acre per day
	3	people per household
	3.33	homes per acre
	10	people per acre
	100	gallons per person per day
Commerci:	1,000	gallons per acre per day
Industrial =	1,300	gallons per acre per day

2. Projected population does not include Greenfield Township or existing County populations that will be served in the future by Lancaster.

BULCHER

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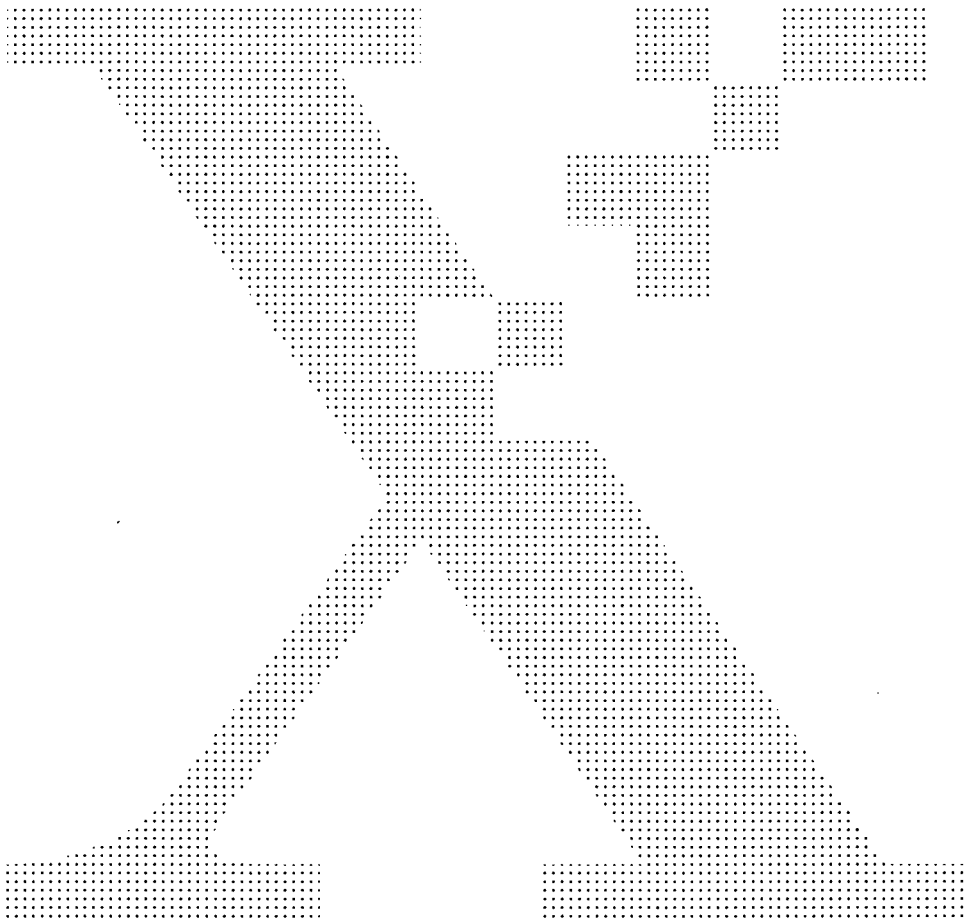


TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
Commercial	C-1	334	25%	84	n/a	83,500	50%	167	n/a	167,000
	C-2	159	29%	46	n/a	45,554	57%	91	n/a	91,107
	C-3	86	41%	35	n/a	35,088	82%	70	n/a	70,176
	C-4	68	45%	31	n/a	30,542	90%	61	n/a	61,084
	C-5	711	10%	69	n/a	68,612	19%	137	n/a	137,223
	C-6	266	25%	66	n/a	65,729	49%	131	n/a	131,457
	C-7	67	50%	34	n/a	33,500	100%	67	n/a	67,000
	C-8	281	15%	42	n/a	42,150	30%	84	n/a	84,300
	C-9	101	45%	45	n/a	45,450	90%	91	n/a	90,900
	C-10	114	30%	34	n/a	34,200	60%	68	n/a	68,400
	C-11	151	30%	45	n/a	45,300	60%	91	n/a	90,600
	C-12	170	30%	51	n/a	51,000	60%	102	n/a	102,000
Greenfield Twp	C-13	1012	20%	202	n/a	202,400	40%	405	n/a	404,800
Greenfield Twp	C-14	108	25%	27	n/a	26,938	50%	54	n/a	53,877
Greenfield Twp	C-15	851	5%	43	n/a	42,550	10%	85	n/a	85,100
Greenfield Twp	C-16	305	30%	92	n/a	91,500	60%	183	n/a	183,000
	C-17	406	9%	35	n/a	34,529	17%	69	n/a	69,057
	C-18	10	30%	3	n/a	3,135	60%	6	n/a	6,269
	C-19	85	5%	4	n/a	4,250	10%	9	n/a	8,500
Subtotal		**5,285**		**986**	**n/a**	**985,925**		**1,972**	**n/a**	**1,971,850**
Residential	SF-1	107	45%	48	480	48,042	90%	96	961	96,083
Single Family	SF-2	654	15%	98	981	98,123	30%	196	1962	196,246
	SF-3	159	10%	16	159	15,859	20%	32	317	31,718
Knox Acres	SF-4	5	---	---	n/a	11,600	---	---	n/a	11,600
	SF-4	31	10%	3	31	3,100	20%	6	62	6,200
	SF-5	378	20%	76	756	75,600	40%	151	1512	151,200
	SF-6	67	31%	21	205	20,536	61%	41	411	41,071

TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
	SF-7	100	20%	20	199	19,925	40%	40	398	39,850
	SF-8	52	20%	10	104	10,441	40%	21	209	20,883
	SF-9	252	10%	25	252	25,200	20%	50	504	50,400
Greenfield Twp	SF-10	1160	10%	116	n/a	116,000	20%	232	n/a	232,000
Greenfield Twp	SF-11	553	30%	166	n/a	165,815	60%	332	n/a	331,631
	SF-12	126	50%	63	630	63,000	100%	126	1260	126,000
	SF-13	345	35%	121	1207	120,750	70%	242	2415	241,500
	SF-14	138	5%	7	69	6,900	10%	14	138	13,800
	SF-15	634	5%	32	317	31,700	10%	63	634	63,400
	SF-16	1093	15%	164	1639	163,950	30%	328	3279	327,900
	SF-17	94	20%	19	188	18,800	40%	38	376	37,600
Carpico Drive	SF-18	19	---	---	n/a	10,800	---	---	n/a	10,800
	SF-18	743	16%	121	1210	121,000	32%	238	2378	237,760
Peters	SF-19	94	---	---	n/a	6,800	---	---	n/a	6,800
	SF-19	57	20%	11	114	11,400	40%	23	228	22,800
	SF-20	143	30%	43	429	42,900	60%	86	858	85,800
Kiester Manor	SF-21	41	---	---	n/a	21,600	---	---	n/a	21,600
	SF-21	69	10%	7	69	6,900	20%	14	138	13,800
Pleasant Lea	SF-22	46	---	---	n/a	16,800	---	---	n/a	16,800
	SF-22	16	10%	2	16	1,600	20%	3	32	3,200
Lakeside	SF-23	45	---	---	n/a	12,000	---	---	n/a	12,000
	SF-23	164	10%	16	164	16,400	20%	33	328	32,800
	SF-24	321	30%	96	963	96,300	60%	193	1926	192,600
	SF-25	60	30%	18	181	18,063	60%	36	361	36,125
	SF-26	305	20%	61	610	61,000	40%	122	1220	122,000
Subtotal		**8,070**		**1,379**	**10,975**	**1,458,903**		**2,754**	**21,907**	**2,833,966**

TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
Multi Family	MF-1	46	40%	18	185	18,467	80%	37	369	36,935
	MF-2	565	15%	84	838	83,846	30%	168	1677	167,692
	MF-3	411	20%	82	821	82,125	40%	164	1642	164,250
	MF-4	292	25%	73	730	73,000	50%	146	1460	146,000
Greenfield Twp	MF-5	365	25%	91	n/a	91,250	50%	183	n/a	182,500
	MF-6	43	22%	9	94	9,353	44%	19	187	18,705
	MF-7	11	15%	2	16	1,595	30%	3	32	3,190
Subtotal		**1,732**		**360**	**2,684**	**359,636**		**719**	**5,368**	**719,271**
Estate District	ED-1	132	30%	40	397	39,664	60%	79	793	79,329
Subtotal		**132**		**40**	**397**	**39,664**		**79**	**793**	**79,329**
Industrial										
(USP)	I-1	193	20%	39	n/a	50,186	40%	77	n/a	100,371
	I-2	106	20%	21	n/a	27,666	40%	43	n/a	55,331
	I-3	61	47%	29	n/a	37,112	94%	57	n/a	74,225
	I-4	32	50%	16	n/a	20,625	100%	32	n/a	41,249
	I-5	180	48%	86	n/a	112,437	96%	173	n/a	224,874
	I-6	36	30%	11	n/a	14,085	60%	22	n/a	28,169

TABLE A-2

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED DEVELOPMENT ACREAGES, POPULATIONS, AND AVERAGE FLOWS

Projected Land Use	Area	Acres	2025 Development	2025 Developed Acerage	2025 Projected Population	2025 Projected Average Water and Sewer Flow	2045 Development	2045 Developed Acerage	2045 Projected Population	2045 Projected Average Water and Sewer Flow
	I-7	148	30%	44	n/a	57,696	60%	89	n/a	115,393
	I-8	271	36%	98	n/a	127,709	73%	196	n/a	255,418
	I-9	262	10%	26	n/a	34,060	20%	52	n/a	68,120
(LTCP)	I-10	284	15%	43	n/a	55,383	30%	85	n/a	110,765
	I-11	60	5%	3	n/a	3,900	10%	6	n/a	7,800
	I-12	137	20%	27	n/a	35,345	40%	54	n/a	70,689
	I-13	70	10%	7	n/a	9,064	20%	14	n/a	18,128
	I-14	88	20%	18	n/a	22,942	40%	35	n/a	45,885
Rock Mill Ph 1	I-15	215	75%	161	n/a	209,625	100%	215	n/a	279,500
Subtotal		**2,143**		**629**	**n/a**	**817,833**		**1,151**	**n/a**	**1,495,917**
TOTAL		**17,363**		**3,394**	**14,055**	**3,661,961**		**6,676**	**28,068**	**7,100,333**

NOTES:

1. Estimated average day flows for 100% development are calculated as follows:

Residentia	1,000	gallons per acre per day
	3	people per household
	3.33	homes per acre
	10	people per acre
	100	gallons per person per day
Commerci:	1,000	gallons per acre per day
Industrial =	1,300	gallons per acre per day

2. Projected population does not include Greenfield Township or existing County populations that will be served in the future by Lancaster.

TABLE A-3

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED SEWERSHED FLOWS

Sewer Shed No.	Area	Total Area (Acres)	Percent of Area in Sewer Shed	Acres in Sewer Shed	2025 Average Sanitary Flow	2045 Average Sanitary Flow
41	C-4	68	8%	5	2,400	4,800
41	MF-2	565	69%	388	57,649	115,299
41	SF-1	106	55%	59	26,542	53,084
41	SF-2	655	29%	193	28,922	57,845
41	SF-6	68	0.2%	0	39	78
41	SF-6	68	3%	2	572	1,143
SUM				**647**	**116,125**	**232,249**
42	SF-2	655	60%	391	58,548	117,096
SUM				**391**	**58,548**	**117,096**
43	C-10	114	8%	9	2,786	5,572
43	C-5	711	28%	201	19,422	38,845
43	C-6	266	20%	53	13,003	26,006
43	I-9	262	77%	200	26,082	52,164
43	MF-3	411	0.0%	0	-	-
43	SF-1	106	16%	16	7,455	14,911
43	SF-2	655	11%	71	10,652	21,304
SUM				**551**	**79,401**	**158,801**
44	C-5	711	45%	321	30,998	61,995
44	I-9	262	11%	28	3,679	7,358
44	MF-4	292	47%	138	34,462	68,924
SUM				**487**	**69,138**	**138,276**
45	C-10	114	91%	104	31,065	62,131
45	C-11	151	49%	74	22,101	44,203
45	C-12	170	1%	2	641	1,282
45	C-5	711	13%	93	8,977	17,953
45	I-9	262	12%	32	4,119	8,239
45	MF-4	292	3%	10	2,468	4,936
SUM				**314**	**69,372**	**138,745**

TABLE A-3

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED SEWERSHED FLOWS

Sewer Shed No.	Area	Total Area (Acres)	Percent of Area in Sewer Shed	Acres in Sewer Shed	2025 Average Sanitary Flow	2045 Average Sanitary Flow
46	C-2	159	44%	71	20,238	40,476
46	C-3	86	100%	86	35,088	70,176
46	C-4	68	92%	63	28,142	56,284
46	C-5	711	13%	96	9,215	18,430
46	C-6	266	70%	185	45,760	91,520
46	I-15	215	1%	3	2,771	3,695
46	I-3	61	42%	26	15,665	31,331
46	I-4	32	100%	32	20,625	41,249
46	I-5	180	94%	169	105,440	210,880
46	I-8	272	46%	124	58,284	116,569
46	MF-2	565	3%	18	2,700	5,400
46	MF-2	565	0.02%	0	16	33
46	MF-2	565	1%	3	450	901
46	SF-1	106	29%	31	14,044	28,087
46	SF-6	68	97%	66	19,925	39,850
SUM				**972**	**378,365**	**754,880**
47	C-1	334	83%	278	69,319	138,637
47	C-2	159	53%	84	24,168	48,335
47	C-8	282	26%	73	10,888	21,775
47	I-1	192	69%	132	34,415	68,829
47	I-15	215	77%	165	161,194	214,926
47	I-2	107	100%	107	27,666	55,331
47	I-3	61	58%	35	21,447	42,896
47	I-5	180	3%	6	3,477	6,954
47	I-6	36	100%	36	14,085	28,169
47	I-7	149	63%	94	36,502	73,004
47	MF-2	565	3%	16	2,439	4,878
47	SF-10	1160	5%	62	6,224	12,448
47	SF-3	159	9%	14	1,414	2,829
47	SF-9	252	3%	8	826	1,653
SUM				**1111**	**414,064**	**720,664**

TABLE A-3

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED SEWERSHED FLOWS

Sewer Shed No.	Area	Total Area (Acres)	Percent of Area in Sewer Shed	Acres in Sewer Shed	2025 Average Sanitary Flow	2045 Average Sanitary Flow
48	C-7	67	100%	67	33,500	67,000
48	C-8	282	62%	175	26,228	52,456
48	ED-1	132	67%	89	26,613	53,227
48	I-15	215	22%	47	45,659	60,878
48	I-5	180	3%	6	3,520	7,040
48	I-7	149	37%	55	21,194	42,388
48	I-8	272	34%	91	42,841	85,681
48	SF-3	159	81%	128	12,785	25,569
SUM				**657**	**212,339**	**394,240**
49	C-6	266	11%	28	6,966	13,931
49	I-8	272	21%	57	26,584	53,168
49	I-9	262	1%	1	180	360
49	MF-3	411	57%	235	46,905	93,810
49	SF-4	5	100%	5	3,100	6,200
49	SF-4KA	31	100%	31	11,600	11,600
49	SF-5	378	51%	194	38,853	77,706
SUM				**551**	**134,188**	**256,776**
50	ED-1	132	32%	43	12,789	25,577
50	SF-3	159	2%	3	288	577
SUM				**46**	**13,077**	**26,154**
51	SF-12	127	28%	35	17,638	35,277
51	SF-13	346	100%	346	120,744	241,488
51	SF-14	139	98%	136	6,746	13,492
51	SF-15	634	4%	28	1,415	2,830
51	SF-15	634	3%	19	951	1,901
51	SF-16	1093	10%	110	16,436	32,872
51	SF-17	94	95%	89	17,766	35,532
SUM				**763**	**181,696**	**363,392**

TABLE A-3

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED SEWERSHED FLOWS

Sewer Shed No.	Area	Total Area (Acres)	Percent of Area in Sewer Shed	Acres in Sewer Shed	2025 Average Sanitary Flow	2045 Average Sanitary Flow
52	C-17	405	100%	405	34,529	69,057
52	SF-14	139	2%	3	154	308
52	SF-15	634	80%	506	25,292	50,584
52	SF-16	1093	3%	33	4,883	9,767
52	SF-17	94	5%	5	1,034	2,068
52	SF-18	743	9%	65	10,632	21,263
52	SF-18	743	6%	48	7,800	15,600
52	SF-18	743	5%	40	6,517	13,035
52	SF-18CD	20	100%	20	10,789	10,789
52	SF-19	57	64%	36	7,270	14,540
52	SF-19PE	94	2%	2	166	166
SUM				**1164**	**109,067**	**207,178**
53	SF-15	634	1%	5	258	517
53	SF-15	634	12%	76	3,784	7,567
SUM				**81**	**4,042**	**8,084**
54	C-18	9	100%	9	3,135	6,269
54	MF-6	43	100%	43	9,353	18,705
54	MF-7	11	100%	11	1,595	3,190
54	SF-18	743	79%	590	96,234	192,468
54	SF-18CD	20	0.11%	0	11	11
54	SF-19	57	9%	5	1,053	2,106
54	SF-19	57	27%	15	3,077	6,154
54	SF-19PE	94	98%	92	6,634	6,634
54	SF-20	141	100%	141	42,900	85,800
54	SF-21	69	72%	50	4,991	9,982
54	SF-21	69	1%	1	61	122
54	SF-21	69	16%	11	1,128	2,256
54	SF-21KM	41	0.01%	0	3	3
54	SF-21KM	41	99%	41	21,487	21,487
54	SF-22	16	19%	3	302	603
54	SF-22	16	0.03%	0	0	1
54	SF-22PL	46	0.10%	0	16	16
54	SF-22PL	46	0.43%	0	72	72
54	SF-24	321	99%	319	95,691	191,382
54	SF-25	60	9%	5	1,601	3,203
54	SF-26	305	59%	182	36,275	72,549
SUM				**1519**	**325,619**	**623,014**

TABLE A-3

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED SEWERSHED FLOWS

Sewer Shed No.	Area	Total Area (Acres)	Percent of Area in Sewer Shed	Acres in Sewer Shed	2025 Average Sanitary Flow	2045 Average Sanitary Flow
55	SF-21	69	4%	3	277	554
55	SF-21	69	0.05%	0	3	6
55	SF-21	69	6%	4	439	879
55	SF-21KM	41	1%	0	110	110
55	SF-22	16	0.45%	0	7	14
55	SF-22	16	4%	1	60	121
55	SF-22	16	77%	12	1,230	2,461
55	SF-22PL	46	99%	46	16,712	16,712
55	SF-23	164	100%	164	16,400	32,800
55	SF-23LS	45	100%	45	12,000	12,000
55	SF-24	321	0.06%	0	53	106
55	SF-24	321	1%	2	556	1,111
55	SF-25	60	91%	55	16,462	32,922
55	SF-26	305	41%	124	24,725	49,451
SUM				**456**	**89,036**	**149,248**
56	C-19	85	100%	85	4,250	8,500
56	I-13	71	100%	71	9,064	18,128
56	I-14	87	100%	87	22,942	45,885
SUM				**243**	**36,256**	**72,513**
57	I-12	136	76%	104	26,998	53,996
SUM				**104**	**26,998**	**53,996**
58	I-11	60	100%	60	3,900	7,800
58	I-12	136	24%	32	8,347	16,693
SUM				**92**	**12,247**	**24,493**
59	MF-1	46	85%	39	15,645	31,291
59	SF-5	378	19%	71	14,255	28,509
59	SF-8	52	17%	9	1,800	3,600
SUM				**120**	**31,700**	**63,401**

TABLE A-3

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED SEWERSHED FLOWS

Sewer Shed No.	Area	Total Area (Acres)	Percent of Area in Sewer Shed	Acres in Sewer Shed	2025 Average Sanitary Flow	2045 Average Sanitary Flow
60	C-12	170	8%	14	4,235	8,470
60	I-10	287	0.14%	0	80	160
60	I-10	287	0.02%	0	11	23
60	I-10	287	0.17%	0	94	187
60	MF-1	46	15%	7	2,822	5,644
60	MF-3	411	42%	175	34,877	69,754
60	SF-5	378	30%	113	22,492	44,984
60	SF-7	100	91%	91	18,163	36,326
60	SF-8	52	83%	43	8,640	17,281
SUM				**443**	**91,415**	**182,830**
61	I-10	287	45%	128	24,662	49,323
61	SF-7	100	7%	7	1,485	2,971
61	SF-8	52	0.01%	0	1	2
SUM				**135**	**26,148**	**52,295**
62	C-10	114	1%	1	348	696
62	C-11	151	51%	77	23,199	46,397
62	C-12	170	90%	154	46,124	92,247
62	I-10	287	55%	158	30,536	61,072
62	MF-3	411	0.42%	2	343	686
62	MF-4	292	20%	59	14,787	29,574
62	SF-7	100	1%	1	238	475
62	SF-7	100	0.20%	0	39	78
SUM				**453**	**115,614**	**231,227**
63	MF-4	292	29%	85	21,283	42,565
SUM				**85**	**21,283**	**42,565**
64	C-9	101	97%	97	43,920	87,840
64	ED-1	132	1%	1	262	525
64	SF-3	159	3%	5	493	987
SUM				**103**	**44,676**	**89,352**

TABLE A-3

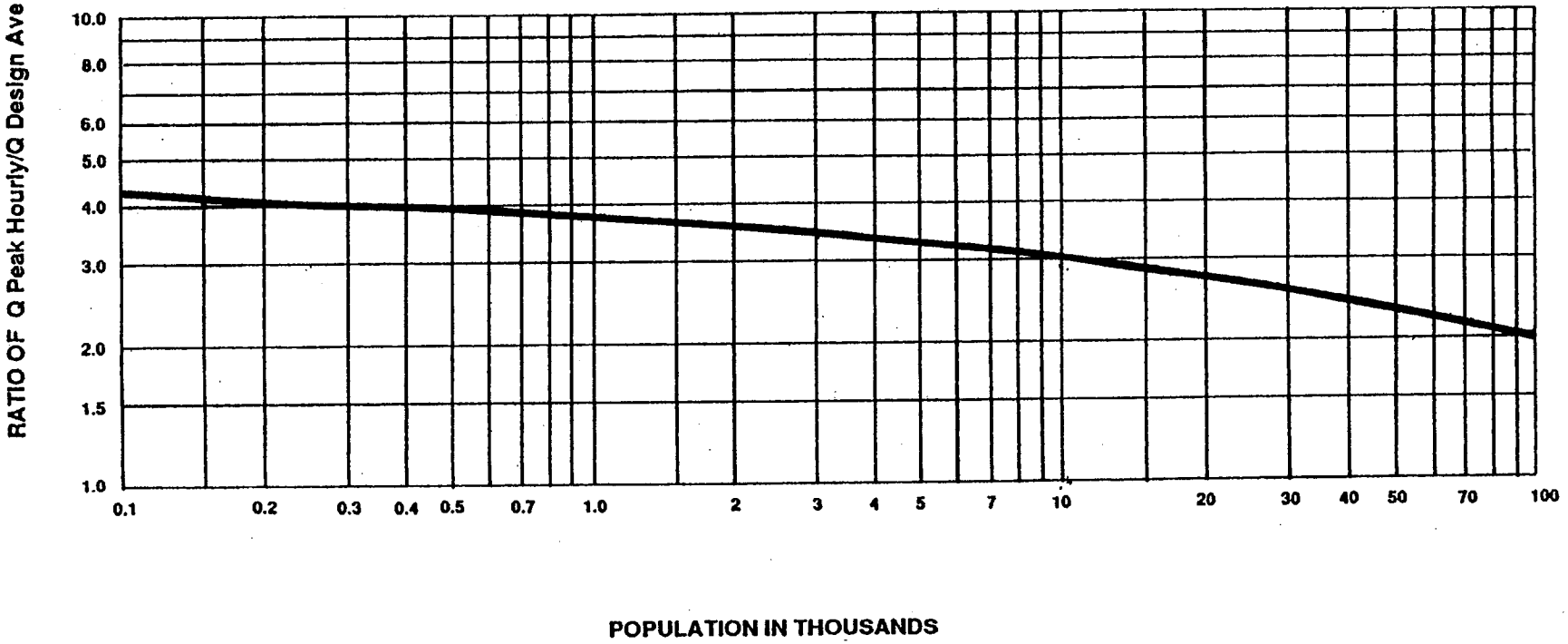
CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
PROJECTED SEWERSHED FLOWS

Sewer Shed No.	Area	Total Area (Acres)	Percent of Area in Sewer Shed	Acres in Sewer Shed	2025 Average Sanitary Flow	2045 Average Sanitary Flow
65	C-1	334	17%	57	14,181	28,363
65	C-13	1013	100%	1013	202,400	404,800
65	C-14	109	100%	109	26,938	53,877
65	C-15	851	100%	851	42,550	85,100
65	C-16	305	100%	305	91,500	183,000
65	C-2	159	3%	4	1,148	2,295
65	C-8	282	12%	34	5,034	10,068
65	C-9	101	3%	3	1,530	3,060
65	I-1	192	31%	60	15,771	31,542
65	MF-2	565	25%	139	20,591	41,182
65	MF-5	366	100%	366	91,250	182,500
65	SF-10	1160	95%	1098	109,776	219,552
65	SF-11	555	100%	555	165,815	331,631
65	SF-12	127	72%	91	45,362	90,723
65	SF-13	346	0.005%	0	6	11
65	SF-16	1093	87%	951	142,631	285,261
65	SF-3	159	6%	9	878	1,756
65	SF-9	252	97%	243	24,374	48,747
SUM				**5887**	**1,001,733**	**2,003,468**

Legend

Subdivision	Abbreviation
Knox Acres	KA
Carpico Drive	CD
Peters	PE
Kiester Manor	KM
Pleasant Lea	PL
Lakeside	LS

FIGURE 1.
RATIO OF PEAK HOURLY FLOW TO DESIGN AVERAGE FLOW



Q peak hourly: Maximum Rate of Wastewater Flow (Peak Hourly Flow)

Q design ave: Design Average Daily Wastewater Flow

Source: Q Peak Hourly/Q Design Ave $= \dfrac{18 + \sqrt{P}}{4 + \sqrt{P}}$ --- (P = population in thousands)

Fair, G.M. and Geyer, J.C. "Water Supply and Waste-water Disposal"
1st Ed., John Wiley & Sons, Inc., New York (1954), p. 136

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#1	46	C-2	100%	40,476								
	46	SF-6	100%	39,850								
	46	C-3	10%	7,018								
	46	I-3	50%	15,665								
	46	I-4	5%	2,062								
SUM				**105,071**	**12**	**397,805**	**12**	**52,536**	**208,203**	**100%**	**52,536**	**208,203**
#2	46	I-4	40%	16,500								
		#1		105,071								
SUM				**121,571**	**12**	**455,126**	**12**	**60,786**	**238,831**	**100%**	**60,786**	**238,831**
#3	46	C-4	100%	56,284								
	46	C-5	20%	3,686								
	46	MF-2	100%	5,400								
	46	SF-1	100%	28,087								
SUM				**93,458**	**10**	**356,891**	**12**	**46,729**	**186,409**	**100%**	**46,729**	**186,409**
#4	46	C-3	90%	63,158								
	46	I-4	5%	2,062								
		#3		93,458								
SUM				**158,678**	**15**	**581,043**	**15**	**79,339**	**306,453**	**100%**	**79,339**	**306,453**
#5	46	I-4	30%	12,375								
		#2		121,571								
		#4		158,678								
	46	I-4	20%	8,250								
	46	I-3	50%	15,665								
SUM				**316,540**	**18**	**1,083,356**	**18**	**158,270**	**579,676**	**100%**	**158,270**	**579,676**
#6	46	I-5	25%	52,720								
		#5		316,540								
SUM				**369,260**	**18**	**1,242,271**	**18**	**184,630**	**666,981**	**100%**	**184,630**	**666,981**

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#7	46	C-5	75%	13,822								
	46	C-6	40%	36,608								
	46	I-5	25%	52,720								
SUM				**103,151**	**12**	**391,072**	**12**	**51,575**	**204,612**	**100%**	**51,575**	**204,612**
#8	46	I-5	25%	52,720								
	46	I-8	30%	34,970								
			SUM →	**87,691**								
#8-ALT 1, 2A2, 4		#8 SUM		87,691								
		#32		136,510								
SUM				**224,200**	**15**	**795,170**	**18**	**112,100**	**422,334**	**100%**	**112,100**	**422,334**
#8-ALT 2A1		#8 SUM		87,691								
		#61		813,838								
SUM				**901,528**	**24**	**2,703,929**	**24**	**450,764**	**1,481,398**	**100%**	**450,764**	**1,481,398**
#9	46	I-5	10%	21,088								
	46	C-5	5%	921								
		#7		103,151								
			SUM →	**125,160**								
#9-ALT 1, 2A2, 4		#9 SUM		125,160								
		#8-ALT 1		224,200								
SUM				**349,361**	**18**	**1,182,713**	**18**	**174,680**	**634,221**	**100%**	**174,680**	**634,221**
#9-ALT 2A1		#9 SUM		125,160								
		#8 ALT 2A1		901,528								
SUM				**1,026,688**	**27**	**3,021,863**	**24**	**513,344**	**1,660,352**	**100%**	**513,344**	**1,660,352**

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#10	46	I-5	15%	31,632								
SUM				**31,632**	**10**	**128,696**	**8**	**15,816**	**66,166**	**100%**	**15,816**	**66,166**
#11	46	#6		369,260								
	46	#9		125,160								
	46	I-15	100%	3,695								
	46	#10		31,632								
SUM				**529,746**	**21**	**1,706,657**	**18**	**264,873**	**923,821**	**80%**	**211,899**	**755,659**
#12	47	I-5	100%	6,954								
	47	I-15	5%	10,746								
			SUM →	**17,700**								
#12 ALT 1, 2A2, 4		#12 SUM		17,700								
		#11		529,746								
SUM				**547,446**	**21**	**1,756,365**	**18**	**273,723**	**951,441**	**80%**	**218,979**	**778,434**
#12 ALT 2A1		#12 SUM		17,700								
		#63		1,427,580								
SUM				**1,445,280**	**30**	**4,038,812**	**27**	**722,640**	**2,235,299**	**50%**	**361,320**	**1,218,567**
#13	47	C-1	100%	138,637								
	47	C-2	100%	48,335								
	47	I-2	100%	55,331								
	47	I-3	100%	42,895								
	47	MF-2	100%	4,878								
	47	I-1	100%	68,830								
	47	I-15	45%	96,717								
	47	SF-9	100%	1,653								
	47	SF-10	50%	6,224								
SUM				**463,500**								

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#13 ALT 1, 2A2, 4		#12 ALT 1		547,446								
		#13 SUM		463,500								
SUM				**1,010,946**	**27**	**2,982,278**	**24**	**505,473**	**1,638,046**	**75%**	**379,105**	**1,271,557**
#13 ALT 2A1		#12 ALT 2A1		1,445,280								
		#13 SUM		463,500								
SUM				**1,908,780**	**30**	**5,101,880**	**30**	**954,390**	**2,839,121**	**50%**	**477,195**	**1,557,436**
		#13 ALT 1, 2A2,										
#14	47	4		1,010,946								
	47	I-15	50%	107,463								
	47	SF-10	50%	6,224								
	47	I-6	100%	28,169								
	47	I-7	100%	73,004								
	47	C-8	100%	21,775								
	47	SF-3	100%	2,829								
SUM				**1,250,410**	**30**	**3,573,325**	**27**	**625,205**	**1,971,716**	**75%**	**468,904**	**1,533,658**
#15-ALT 1, 4		#36		2,538,728								
		#14		1,250,410								
	64	ED-1	100%	525								
	64	SF-3	100%	987								
	64	C-9	100%	87,840								
SUM				**3,878,491**	**30**	**9,187,465**	**30**	**1,939,246**	**5,169,904**	**25%**	**484,811**	**1,579,221**
#15-ALT 2A1,2A2		#36		2,538,728								
		#14		239,464								
	64	ED-1	100%	525								
	64	SF-3	100%	987								
	64	C-9	100%	87,840								
SUM				**2,867,545**	**30**	**7,158,924**	**30**	**1,433,772**	**4,011,665**	**0%**	**-**	**-**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#16		#25		522,864								
		#53		54,394								
		#54		194,363								
		Existing Areas 28-31		1,254,286								
SUM				**2,025,907**	**30**	**6,077,256**	**30**	**4,651,432**	**10,669,842**	**75%**	**3,488,574**	**8,418,716**
#17	43	C-5	100%	38,845								
	43	C-6	100%	26,006								
	43	SF-1	100%	14,911								
	43	SF-2	80%	17,043								
	43	I-9	50%	26,082								
	42	#29		121,357								
	41	#31		232,249								
SUM				**476,492**	**18**	**1,555,424**	**18**	**238,246**	**839,930**	**40%**	**95,298**	**363,410**
#18	44	C-5	100%	61,995								
		I-9	100%	7,358								
		#40		111,489								
SUM				**180,842**	**15**	**654,535**	**15**	**90,421**	**346,110**	**40%**	**36,168**	**146,212**
#19	43	I-9	40%	20,865								
		#17		476,492								
		#18		180,842								
SUM				**678,200**	**21**	**2,115,884**	**21**	**339,100**	**1,151,806**	**40%**	**135,640**	**503,324**
#20	45	C-5	60%	10,772								
	45	C-10	40%	24,852								
		#28		58,459								
SUM				**94,083**	**10**	**359,108**	**12**	**47,042**	**187,588**	**50%**	**23,521**	**96,942**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#21	45	C-5	40%	7,181								
	45	C-10	40%	24,852								
	45	C-12	100%	1,282								
	45	I-9	100%	8,239								
		#20		94,083								
SUM				**135,638**	**12**	**503,318**	**12**	**67,819**	**264,660**	**50%**	**33,910**	**137,511**
#22-Alt 4		#19		678,200								
		#21		135,638								
SUM				**813,838**	**24**	**2,476,480**	**21**	**406,919**	**1,353,679**	**50%**	**203,459**	**728,381**
#23		#24		23,335				40,837				
		#39		51,862				90,758				
	65	SF-12	80%	90,723				127,012				
	65	SF-13	100%	11				20				
	65	SF-16	30%	285,261				149,762				
SUM				**451,193**	**18**	**1,482,636**	**18**	**408,389** ←				
								225,596	**799,634**	**75%**	**169,197**	**616,069**
#24	65	SF-12	10%	9,072				15,877				
	65	SF-16	5%	14,263				24,960				
SUM				**23,335**	**10**	**96,209**	**8**	**40,837** ←				
								11,668	**49,292**	**75%**	**8,751**	**37,269**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#25		#23		116,682								
		#37		28,526								
		#38		14,263								
	51	SF-16	100%	32,872								
	51	SF-12	100%	35,277								
	51	SF-13	100%	241,488								
	51	SF-14	100%	13,492								
	51	SF-15	100%	4,731								
	51	SF-17	100%	35,532								
SUM				**522,864**	**18**	**1,687,256**	**18**	**261,432**	**913,047**	**75%**	**196,074**	**704,389**
#26	61	I-10	100%	49,323								
	59	SF-5	100%	28,509								
	59	SF-8	100%	3,600								
	59	MF-1	100%	31,291								
	50	MF-1	100%	5,644								
	50	SF-5	100%	44,984								
	50	SF-7	40%	14,530								
	61	SF-7	100%	2,971								
	50	SF-8	100%	17,281								
	61	SF-8	100%	2								
			SUM →	**198,135**								
#26-ALT 1		#27-ALT 1 #26 SUM										
SUM					**56**	**18,306,409**	**54**	**3,841,138**	**9,114,482**	**50%**	**1,920,569**	**5,128,227**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#27	62	C-12	100%	92,247								
	62	C-10	100%	696								
	43	C-10	100%	5,572								
	62	C-11	100%	46,397								
	62	MF-4	100%	29,574								
	60	C-12	100%	8,470								
	62	MF-3	100%	686								
	60	MF-3	100%	69,754								
	62	I-10	100%	61,072								
	60	I-10	100%	370								
	60	SF-7	60%	21,796								
	62	SF-7	100%	553								
			SUM →	**337,189**								
#27-ALT 1		#27 SUM		337,189								
		#15-ALT 1		3,878,491								
		#16		2,025,907								
		Sewershed 48		394,240								
		Sewershed 50		26,154								
		#68-Alt 1		822,161								
SUM				**7,484,141**	**56**	**17,953,446**	**54**	**3,742,071**	**8,920,257**	**50%**	**1,871,035**	**5,017,315**
#27-ALT 2A1, 4		#27 SUM		337,189								
	45	C-10	5%	3,107								
	43	I-9	10%	5,216								
SUM				**345,512**	**18**	**1,171,136**	**18**	**172,756**	**627,858**	**0%**	**-**	**-**
#27-ALT 2A2		#68-Alt 2A2		822,161								
		#27 SUM		337,189								
SUM				**1,159,349**	**27**	**3,351,255**	**27**	**579,675**	**1,846,200**	**0%**	**-**	**-**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#28	45	C-10	15%	9,320								
	45	C-11	100%	44,203								
	45	MF-4	100%	4,936								
SUM				**58,459**	**10**	**230,232**	**10**	**29,229**	**119,352**	**0%**	**-**	**-**
#29	43	SF-2	20%	4,261								
	42	SF-2	25%	29,274								
	42	#41		87,822								
SUM				**121,357**	**12**	**454,388**	**12**	**60,679**	**238,437**	**0%**	**-**	**-**
#30	41	MF-2	75%	86,474								
	41	C-4	100%	4,800								
	41	SF-6	100%	1,221								
	41	SF-1	30%	15,925								
	41	SF-2	50%	28,922								
SUM				**137,343**	**12**	**509,118**	**15**	**68,671**	**267,773**	**0%**	**-**	**-**
#31	41	SF-1	70%	37,159								
	41	SF-2	50%	28,922								
	41	MF-2	25%	28,825								
		#30		137,343								
SUM				**232,249**	**18**	**820,863**	**18**	**116,125**	**436,303**	**0%**	**-**	**-**
#32	46	C-6	60%	54,912								
	46	I-8	70%	81,598								
SUM				**136,510**	**12**	**506,286**	**12**	**68,255**	**266,253**	**0%**	**-**	**-**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#33	65	I-1	100%	31,542								
	65	MF-2	100%	41,182								
	65	C-2	100%	2,295								
	65	SF-9	100%	48,747								
	65	SF-10	10%	21,955								
SUM				**145,722**	**15**	**537,510**	**15**	**72,861**	**283,025**	**0%**	**-**	**-**
#34	65	SF-10	20%	43,910								
		#33		145,722								
SUM				**189,632**	**15**	**683,367**	**15**	**94,816**	**361,703**	**0%**	**-**	**-**
#35		#34		189,632								
		#46		925,396								
	65	C-13	10%	40,480								
	65	SF-10	20%	43,910								
SUM				**1,199,418**	**30**	**3,449,353**	**27**	**599,709**	**1,901,626**	**0%**	**-**	**-**
#36		#35		1,199,418								
		#47		919,626								
	65	C-13	20%	404,800								
	65	C-8	100%	10,068								
	65	C-9	100%	3,060								
	65	SF-3	100%	1,756								
SUM				**2,538,728**	**30**	**6,471,006**	**30**	**1,269,364**	**3,619,164**	**0%**	**-**	**-**
#37	65	SF-16	20%	57,052				99,841				
SUM				**57,052**	**10**	**225,018**	**8**	**99,841** ←				
								28,526	**116,607**	**0%**	**-**	**-**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#38	65	SF-16	10%	28,526				49,921				
SUM				**28,526**	**10**	**116,607**	**8**	49,921 ←				
								14,263	**59,877**	**0%**	**-**	**-**
#39	65	SF-16	15%	42,789				74,881				
	65	SF-12	10%	9,072				15,877				
SUM				**51,862**	**10**	**205,683**	**8**	90,758 ←				
								25,931	**106,439**	**0%**	**-**	**-**
#40	63	MF-4	100%	42,565								
	44	MF-4	100%	68,924								
SUM				**111,489**	**12**	**420,207**	**12**	**-**	**-**	**0%**	**-**	**-**
#41	42	SF-2	75%	87,822								
SUM				**87,822**	**10**	**336,856**	**10**	**-**	**-**	**0%**	**-**	**-**
#42	65	MF-5	15%	27,375								
	65	SF-10	45%	98,798								
	65	MF-5	50%	91,250								
	65	C-13	5%	20,240								
SUM				**237,663**	**18**	**838,079**	**18**	**-**	**-**	**0%**	**-**	**-**
#43	65	C-15	40%	34,040								
	65	C-14	100%	53,877								
	65	C-13	15%	60,720								
	65	MF-5	35%	63,875								
SUM				**212,512**	**15**	**757,636**	**15**	**-**	**-**	**0%**	**-**	**-**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#44		#42		237,663								
		#43		212,512								
	65	C-13	10%	40,480								
SUM				**490,655**	**18**	**1,595,899**	**18**	**-**	**-**	**0%**	**-**	**-**
#45	65	C-15	60%	51,060								
	65	C-16	80%	146,400								
	65	SF-11	25%	82,908								
	65	C-13	10%	40,480								
SUM				**320,848**	**18**	**1,096,482**	**18**	**-**	**-**	**0%**	**-**	**-**
#46		#44		490,655								
		#45		320,848								
	65	SF-10	15%	32,933								
	65	C-13	20%	80,960								
SUM				**925,396**	**24**	**2,765,140**	**24**	**-**	**-**	**0%**	**-**	**-**
#47		#50		451,193								
		#49		85,578								
	65	SF-16	20%	57,052								
	65	C-16	20%	36,600								
	65	SF-11	75%	248,723								
	65	C-13	10%	40,480								
SUM				**919,626**	**24**	**2,750,370**	**24**	**-**	**-**	**0%**	**-**	**-**
#48		#37		57,052								
		#38		28,526								
SUM				**85,578**	**10**	**328,843**	**10**	**42,789**	**171,502**	**0%**	**-**	**-**

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WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#49		#48		85,578								
SUM				**85,578**	**10**	**328,843**	**10**	**42,789**	**171,502**	**0%**	**-**	**-**
#50		#23		451,193								
SUM				**451,193**	**18**	**1,482,636**	**18**	**225,596**	**799,634**	**0%**	**-**	**-**
#51-ALT 2A1 &4		#27 ALT-2A1 #26 SUM		345,512 198,135								
SUM				**543,647**	**21**	**1,745,717**	**18**	**271,823**	**945,523**	**0%**	**-**	**-**
#51-ALT 2A2		#27 ALT-2A2 #26 SUM		1,159,349 198,135								
SUM				**1,357,485**	**30**	**3,830,647**	**27**	**678,742**	**2,117,350**	**5000%**	**#########**	**#########**
#52-Alt 2A2		#51-Alt 2A2		1,357,485								
SUM				**1,357,485**	**30**	**3,830,647**	**27**	**678,742**	**2,117,350**	**0%**	**-**	**-**
#53	49	SF-5	70%	54,394								
SUM				**54,394**	**10**	**215,137**	**8**	**27,197**	**111,408**	**0%**	**-**	**-**
#54	49	SF-5	30%	23,312								
	49	MF-3	100%	93,810								
	49	SF-4	100%	6,200								
	49	SF-4KA	100%	3,583								
	49	I-8	100%	53,168								
	49	C-6	100%	13,931								
	49	I-9	100%	360								
SUM				**194,363**	**15**	**698,816**	**15**	**97,182**	**370,065**	**0%**	**-**	**-**

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CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#55-ALT 1		#26-ALT 1		7,682,277								
SUM				**7,682,277**	**56**	**18,306,409**	**54**	**3,841,138**	**9,114,482**	**50%**	**1,920,569**	**5,128,227**
#56		Existing Area 18		12,926								
SUM				**12,926**	**10**							
#57		Existing Areas 12A, 12B,13, 32		1,170,726								
SUM				**1,170,726**	**27**							
#58		Existing Area 10		24,005								
SUM				**24,005**	**10**							
#59-ALT 2A1		Sewershed 48 Sewershed 50 #60-ALT 2A1		394,240 26,154 1,908,780								
SUM				**2,329,174**	**30**	**6,023,698**	**30**	**1,164,587**	**3,364,113**	**50%**	**582,293**	**1,853,463**
#59-ALT 2A2		Sewershed 48 Sewershed 50 #60-ALT 2A2		394,240 26,154 1,010,946								
SUM				**1,431,340**	**30**	**4,005,923**	**27**	**715,670**	**2,216,656**	**75%**	**536,753**	**1,726,365**
#60-ALT 2A1		#13 ALT 2A1		1,908,780								
SUM				**1,908,780**	**30**	**5,101,880**	**30**	**954,390**	**2,839,121**	**50%**	**477,195**	**1,557,436**
#60-ALT 2A2		#13 ALT 2A2		1,010,946								
SUM				**1,010,946**	**27**	**2,982,278**	**24**	**505,473**	**1,638,046**	**76%**	**383,149**	**1,283,552**

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#61-Alt 2A1		#62		813,838								
SUM				**813,838**	**24**	**2,476,480**	**21**	**406,919**	**1,353,679**	**45%**	**183,113**	**662,003**
#62-Alt 2A1		#19 #21		678,200 135,638								
SUM				**813,838**	**24**	**2,476,480**	**21**	**406,919**	**1,353,679**	**45%**	**183,113**	**662,003**
#63-ALT 1, 2A2, 4		#11		529,746								
SUM				**529,746**	**21**	**1,706,657**	**18**	**264,873**	**923,821**	**80%**	**211,899**	**755,659**
#63-ALT 2A1		#6 #10 #9 ALT 2A1		369,260 31,632 1,026,688								
SUM				**1,427,580**	**30**	**3,997,040**	**27**	**713,790**	**2,211,621**	**50%**	**356,895**	**1,205,322**
#64-ALT 1		#15-ALT 1 #16 Sewershed 48 Sewershed 50		3,878,491 2,025,907 394,240 26,154								
SUM				**6,324,792**	**54**	**15,843,808**	**54**	**3,162,396**	**7,762,953**	**50%**	**1,581,198**	**4,356,472**
#65-Alt 4		#22-Alt 4		813,838								
SUM				**813,838**	**24**	**2,476,480**	**21**	**406,919**	**1,353,679**	**50%**	**203,459**	**728,381**

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#66-Alt 4		Sewershed 48 Sewershed 50 #15-ALT 4 #16		394,240 26,154 3,878,491 2,025,907								
SUM				**6,324,792**	**54**	**15,843,808**	**54**	**3,162,396**	**7,762,953**	**0%**	**-**	**-**
#67-Alt 4		#27-ALT 4 #26 SUM		345,512 198,135								
SUM				**543,647**	**21**	**1,745,717**	**18**	**271,823**	**945,523**	**0%**	**-**	**-**
#68-Alt 1 & 2A2		#19 #21		678,200 135,638								
	43	I-9	10%	5,216								
	45	C-10	5%	3,107								
SUM				**822,161**	**24**	**2,498,247**	**21**	**411,080**	**1,365,890**	**40%**	**164,432**	**600,236**
#69-ALT 1		#55 #56		7,682,277 12,926								
SUM				**7,695,203**	**54**	**18,351,650**	**54**	**3,847,601**	**9,127,120**	**50%**	**1,923,801**	**5,135,444**
#69-ALT 2A2		#52 #56		1,357,485 12,926								
SUM				**1,370,411**	**30**	**3,875,888**	**27**	**685,205**	**2,134,796**	**0%**	**-**	**-**

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#70 -ALT 1		#69-ALT 1 #57		7,695,203 1,170,726								
SUM				**8,865,929**	**54**	**22,449,192**	**60**	**4,432,965**	**10,255,934**	**50%**	**2,216,482**	**5,779,978**
#70-ALT 2A1		#51-ALT 2A1 #57		543,647 1,170,726								
SUM				**1,714,373**	**30**	**5,843,259**	**30**	**857,187**	**2,589,433**	**100%**	**857,187**	**2,589,433**
#70-ALT 2A2		#69-ALT 2A2 #57		1,370,411 1,170,726								
SUM				**2,541,137**	**42**	**7,973,430**	**36**	**1,270,568**	**3,622,072**	**75%**	**952,926**	**2,835,396**
#70-ALT 4		#57		1,170,726								
SUM				**1,170,726**	**27**			**1,170,726**	**3,379,171**	**100%**	**1,170,726**	**3,379,171**
#71-ALT 1		#70-ALT 1 #58		8,865,929 24,005								
SUM				**8,889,934**	**54**	**22,533,211**	**60**	**4,444,967**	**10,278,772**	**50%**	**2,222,484**	**5,793,016**
#71-ALT 2A1		#70-ALT 2A1 #58		1,714,373 24,005								
SUM				**1,738,379**	**33**	**5,927,278**	**30**	**1,564,541**	**4,317,827**	**100%**	**1,564,541**	**4,317,827**
#71-ALT 2A2		#70-ALT 2A2 #58		2,541,137 24,005								
SUM				**2,565,142**	**42**	**8,057,449**	**36**	**1,282,571**	**3,651,030**	**75%**	**961,928**	**2,858,289**
#71-ALT 4		#70-ALT 4 #58		1,170,726 24,005								
SUM				**1,194,732**	**30**			**1,194,732**	**3,437,911**	**100%**	**1,194,732**	**3,437,911**

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#72	55	SF-22	100%	2,596								
	55	SF-22PL	100%	19,242								
	55	SF-21	100%	1,439								
	55	SF-21KM	100%	36								
	55	SF-23	100%	32,800								
	55	SF-23LS	100%	8,486								
	55	SF-24	100%	1,217								
	55	SF-25	100%	32,923								
	55	SF-26	100%	49,451								
SUM				**148,189**	**15**	**545,833**	**15**	**74,094**	**287,501**	**0%**	**-**	**-**
#73		#72		148,189								
	56	C-19	100%	8,500								
	56	I-14	100%	45,885								
	56	I-13	100%	18,128								
SUM				**220,701**	**15**	**783,960**	**15**	**110,351**	**416,244**	**0%**	**-**	**-**
#74-ALT 1		#75		3,323,874								
		#71-ALT 1		8,889,934								
SUM				**12,213,809**	**54**	**33,648,866**	**60**	**6,106,904**	**13,343,388**	**50%**	**3,053,452**	**7,541,087**
#75		#73		220,701								
	57	I-12	100%	53,996								
	58	I-12	100%	16,693								
	58	I-11	100%	7,800								
		Existing Area 1		3,024,684								
SUM				**3,323,874**	**42**	**11,616,627**	**42**	**1,661,937**	**4,542,712**	**0%**	**-**	**-**

TABLE A-4

CITY OF LANCASTER
WATER AND WASTEWATER IMPROVEMENTS MASTER PLAN
SANITARY SEWER SIZING PER TEN STATES STANDARDS

Pipe ID #	Sewer Shed ID #	Area	Percent of Flow to Pipe	2045 Avg San Flow (gpd)	Dia per Std H_Loss.xls (inches)	2045 Peak Flow per 10 States Stds (gpd)	Dia per Std H_Loss.xls (inches)	2025 Avg San Flow (gpd)	2025 Peak Flow per 10 States Stds (gpd)	Percent of 2025 Avg Flow for 2015	2015 Avg San Flow (gpd)	2015 Peak Flow per 10 States Stds (gpd)
#76		#15 -Alt 4 #16 Sewershed 48 Sewershed 50		3,878,491 2,025,907 394,240 26,154								
SUM				**6,324,792**	**54**	**15,843,808**	**54**	**3,162,396**	**7,762,953**	**50%**	**1,581,198**	**4,356,472**

Resolution 03-04.08.g

IN THE MATTER OF ADOPTION OF THE FAIRFIELD COUNTY DEVELOPMENT STRATEGY AND LAND USE PLAN

WHEREAS, the Fairfield County Regional Planning Commission adopted the Fairfield County Development Strategy and Land Use Plan on March 5, 2002 and amended said plan with the adoption of the U.S. 33 Bypass Corridor Plan and Development Manual on July 2, 2002; and

WHEREAS, the Fairfield County Board of Commissioners is in agreement with the overall goals, objectives, and policies contained within the Fairfield County Development Strategy and Land Use Plan; and

WHEREAS, the Fairfield County Regional Planning Commission is committed to coordinate with appropriate agencies, organizations, and local governments to implement the recommendations of the Fairfield County Development Strategy and Land Use Plan; and

WHEREAS, the Fairfield County Regional Planning Commission is committed to working with Fairfield County townships in developing acceptable zoning measures to aid in the implementation of the land use and agricultural preservation policies of the Fairfield County Development Strategy and Land Use Plan; and

WHEREAS, it is in the best interest of Fairfield County to use the plan recommendations so that Fairfield County can accommodate continued growth while retaining the inherent qualities so important to Fairfield County citizens; NOW **THEREFORE,**

BE IT RESOLVED by the Board of Commissioners, County of Fairfield, State of Ohio:

That this Board hereby adopts the Fairfield County Development Strategy and Land Use Plan.

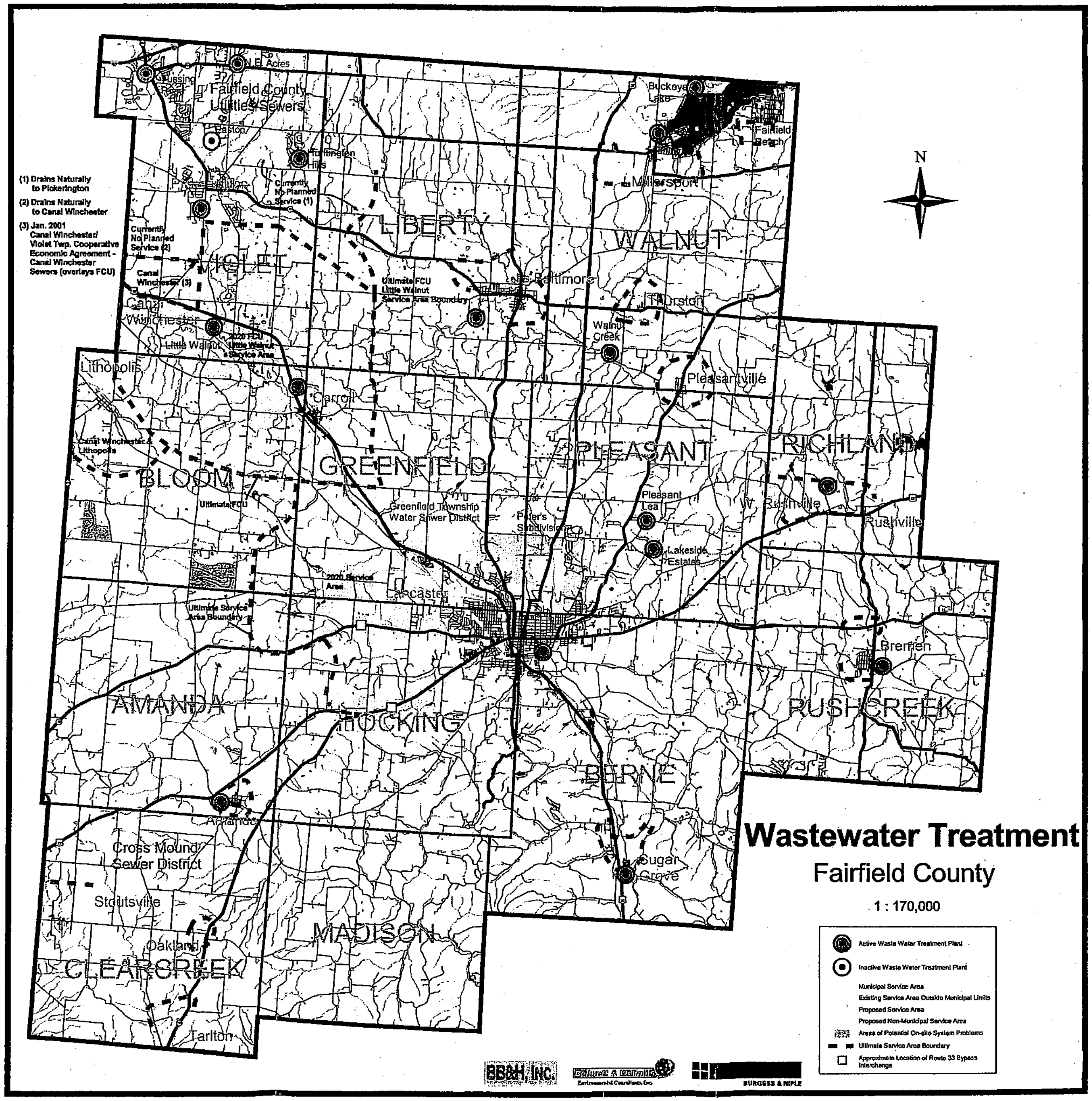
Motion by Mike Kiger Seconded by Judith Shupe that the resolution be adopted was carried by the following vote:

YEAS: Kiger, Shupe and Myers NAYS: NONE
ABSTENTIONS: NONE

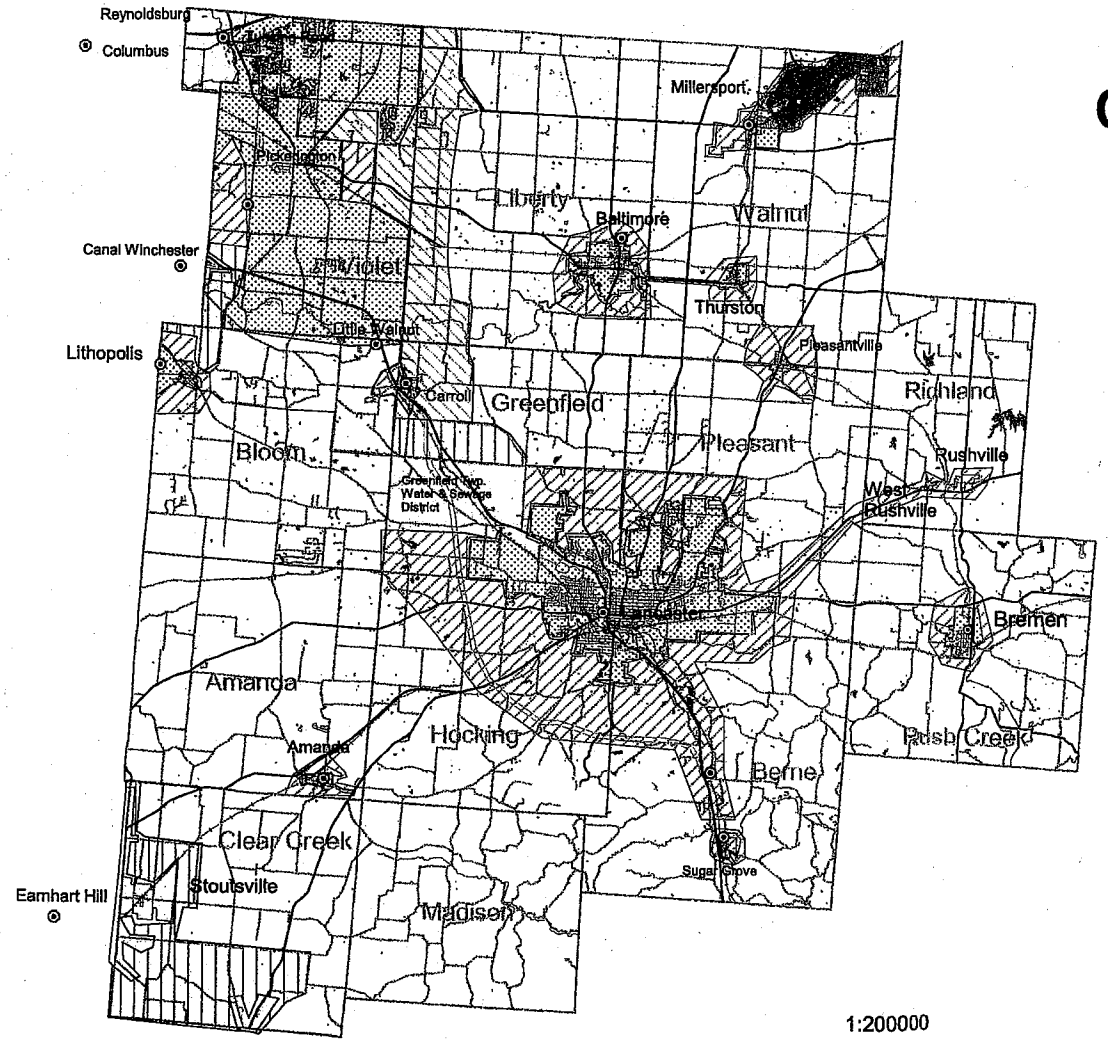
cc: Fairfield County Regional Planning Commission

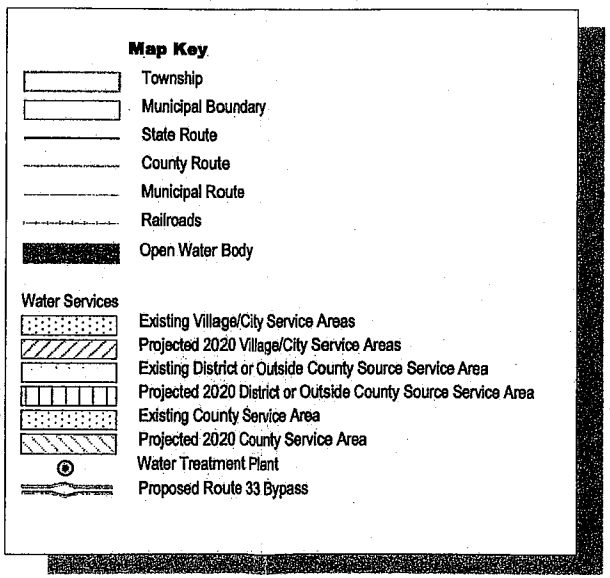
Judith K. Shupe
Jon Myers
Mike Kiger
BOARD OF COUNTY COMMISSIONERS

ADOPTED April 8, 2003
Jacqueline D. Long
JACQUELINE D. LONG, CLERK


Wastewater Treatment
Fairfield County
1 : 170,000
Active Waste Water Treatment Plant
Inactive Waste Water Treatment Plant
Municipal Service Area
Existing Service Area Outside Municipal Units
Proposed Service Area
Proposed Non-Municipal Service Area
Areas of Potential On-site System Problems
Ultimate Service Area Boundary
Approximate Location of Route 33 Bypass Interchange
(1) Drains Naturally to Pickerington
(2) Drains Naturally to Canal Winchester
(3) Jan. 2001 Canal Winchester/ Violet Twp. Cooperative Economic Agreement - Canal Winchester Sewers (overlays FCU)
N
LIBERTY
WALNUT
VIOLET
BLOOM
GREENFIELD
PLEASANT
RICHLAND
AMANDA
HOCKING
BERNE
RUSHCREEK
MADISON
CLEARCREEK
Fairfield County Utilities/Sewers
Baltimore
Millersport
Buckeye Lake
Fairfield Beach
Thurston
Walnut Creek
Pleasantville
Carroll
Canal Winchester
Lithopolis
Greenfield Township Water Sewer District
Pleasant Lea
Lakeside Estates
Lancaster
Rushville
Bremen
Sugar Grove
Amanda
Cross Mound Sewer District
Stoutsville
Oakland
Tarlton
BB&H, INC.
BURGESS & NIPLE

Fairfield County Centralized Water Systems Service Boundaries





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BURGESS & NIPLE, INC.

CONTRACT BETWEEN THE CITY OF LANCASTER AND THE GREENFIELD TOWNSHIP WATER & SEWER DISTRICT

THIS AGREEMENT made pursuant to Resolution 117-98 passed and approved by the City of Lancaster, Ohio, on the 11/24/98 authorizing and directing the Safety-Service Director of the City of Lancaster, Ohio, to enter into this Agreement, and pursuant to Resolution 98-09, adopted by the Greenfield Township Water and Sewer District, Ohio, on 12/28/98 authorizing and directing its Chairman of the Board of Trustees to enter into this Agreement, is hereby made and entered into by and between the City of Lancaster, Ohio, (hereinafter referred to as "City") a municipal corporation, and the Greenfield Township Water & Sewer District, Ohio, (hereinafter referred to as "District"), a regional water and sewer district, established under Ohio Revised Code Section 6119, this 1 day of March, 1999.

WITNESSETH

WHEREAS, the District is requesting permission to discharge untreated domestic wastewater from their sanitary sewer collection system for purpose of treatment by the City wastewater treatment facility, and the City is willing to treat said wastewater in exchange for compensation by the District in accordance with Section 4 of this contract and for the period of twenty (20) years;

WHEREAS, City of Lancaster is acting under the authority of Article XVIII, Section 4 of the Ohio Constitution, the District is acting under the authority of Revised Code Chapter 6119, and particularly Sections 6119.06(G), 6119.06(O), 6119.09 and 6119.41, and both are fully empowered to enter into this Agreement for which complete, adequate and sufficient consideration exists and is being exchanged;

NOW, THEREFORE, in consideration of the mutual promises and covenants each to the other made, and in consideration of other good and valuable consideration, the City and the District do hereby promise, covenant and agree that:

SECTION 1: DEFINITIONS

1.1. District a regional water and sewer district established under Ohio Revised Code Section 6119.

1.2. Service Area The geographic area shown in Appendix A. The Service Area is not coterminous with the legal boundaries of the District. The Service Area is that area within the District which the City has agreed to provide with wastewater treatment services.

1.3. Total Base Rate

Shall be the user charge plus the debt charge as described in Lancaster Codified Ordinances 915.04, r its successor.

4-21-99

1.4. Total Cubic Feet Usage

Total of units per cubic feet used by the District users as read by the master meters between the first day of each calendar month and the last day of each calendar month.

1.5. Total Treatment Rate

Shall be the user charge per 100 cubic feet plus the debt charge per 100 cubic feet as described in Lancaster Codified Ordinances 915.04, or its successor.

1.6. Total Monthly Charge

Will be the total amount payable to the City by the District per month.

1.7. Total units of Usage

Will be the total cubic feet usage divided by 100.

1.8. Excessive strength discharge

As defined in Lancaster Codified Ordinance 916.08, or its successor.

1.9. Unsewered

Unsewered is defined as that area within the District which has not been provided with sanitary sewer collection services.

2.0. Customer

Means any and all persons natural or artificial, including any individual, firm, company or private corporation, partnership, co-institution, enterprise, government agency, or other legal entity, or their representatives, agents, or assigns.

2.1. Number of Customers

Shall be calculated by total number of customers using the system in the Service Area as determined through permits issued as of the first of each calendar month. The number of customers for current manufactured homes in Colonial Estates shall be times .75. Any new manufactured homes in Colonial Estates and any other manufactured homes in the Service Area shall be times 1.0.

2.2 New Customer

Shall be any Customer in the Service Area whose property is not listed on Appendix C as being previously assessed or otherwise charged for connection to the District's sewer system as of date of execution of this Agreement.

SECTION 2: GENERAL AGREEMENT

The City does hereby agree to provide sanitary sewerage treatment services to the District in the Service Area by means of a District sanitary sewer collection system which the District shall construct, develop, maintain and may extend during the term of this Agreement.

SECTION 3. GUIDELINES; OBLIGATIONS OF THE PARTIES

3.1. Guidelines

3.1.1. Both parties agree that sanitary sewerage treatment services shall be provided to the District in the Service Area according to the following general guidelines - sanitary sewerage treatment services shall be provided by City; said services shall be provided to users in the Service Area through lines and systems components which have been constructed and which will be constructed in the future by the District; the District shall pay the rates for such sewerage service as hereafter provided; District shall maintain and repair said lines and systems components and invoice customers; all as hereafter set forth.

3.2. Obligations of the District

3.2.1. The District will transport to the City for treatment such volume of effluent as it deems necessary or advisable, but not to exceed the volumes established in Section 5.

3.2.2. Subject to the availability of acceptable financing, and in accordance with Ohio law, the District during the term of the Agreement or any extension thereof, may at its own expense construct extensions to its sanitary sewer collection system, including all necessary components and appurtenances, which are necessary and appropriate to service users of the District in the Service Area. The District shall be permitted to connect such systems at permitted points of connection as set forth in Section 3.3.1. hereunder. The permitted connection points must first be approved by the City in writing. Further, the District shall be required to submit plans and specifications to the City for approval for such points of connection. Such plans and specifications for such connections shall conform to the City's specifications for such connections. The City may reject plans and/or require revisions of specifications not conforming to the City's established rules, regulations, or specifications for such connections. The City will provide a written statement as to any reason(s) for the rejection or required revisions. The City must notify the District in writing of its approval or rejection within forty-five (45) days of receipt of said plans and specifications unless a time extension is agreed to in writing by both the City and District. Failure of the City to so notify the District within forty-five (45) days shall be deemed to have approved said plans and specifications. The District agrees to obtain the appropriate tapping permit and notify the City at least forty eight (48) hours prior to tapping any City sewers.

3.2.3. The City shall retain its authority to prohibit or regulate the discharge of toxic materials into its sanitary sewer collection system as provided in Ohio Revised Code Section 6111.032, or its successor. Further, the District and the City shall each have full authority to enforce its ordinances and all rules and regulations including, but not limited to the City Sewer Use Ordinance 912 and 916, or their successor's, which prohibit the discharge of toxic and other harmful or objectionable materials into the sanitary sewer collection system of the District to be treated by the City.

3.2.4. The point of monitoring shall be the master meters and the District must be in compliance at the monitoring point with Ohio Revised Code 6111.032, or its successor, Lancaster Revised Code 912 and 916, or their successor's, as well as any other local, state or federal rules and regulations which may be applicable.

3.3. Obligations of The City

3.3.1. The City shall provide the District for its user within the Service Area, sanitary sewerage treatment services through the sanitary sewer collection system which has been constructed by the District. Said sewerage services shall be provided by permitting the District to tap into or connect its lines, systems components, and facilities to the City sanitary sewer collection system at such points as mutually agreed to by the parties in writing. When the District requests to connect at a permitted point, it shall notify the City as set forth in Section 3.2.2. Thereafter, the District shall have the right to make any actual connection to the City sanitary sewer collection system and the District shall pay the actual costs of labor and materials to make said connection. The individual or company who will perform the tapping for the District shall be bonded pursuant to Lancaster Codified Ordinance 912 or its successor. From all such mutually agreed upon connection points, the City shall transport all untreated domestic wastewater, via sanitary sewer collection system, to the City wastewater treatment facility.

3.3.2. The City shall provide to the District the right of access to make connection on the appropriate City right-of-way. It shall be the obligation of the District to obtain any necessary easements to access and maintain connections and lines, to the point of connection.

3.3.3. The City has no obligation to provide sewerage treatment service to the District for its users located outside the Service Area. However, the District and the City may negotiate further written amendments to provide such service.

SECTION 4: METER/FEES/BILLING

4.1. At all points of connection to the City's system, the District shall install a master meter approved by Service-Safety Director, which will measure the amount of effluent being discharged into the City's system from the District. The Service-Safety Director shall approve all bid specifications for any master meter. Each master meter must be calibrated to read in one hundred (100) cubic feet units. Each master meter shall have a chart recorder capable of charting a seven (7) day period. Copies of the charts will be maintained for one (1) year and will be provided to City upon request. The City shall have twenty-four (24) hour access to every master meter, including a key to any enclosures housing the master meter. Each master meter shall be calibrated by the District at least monthly and the results documented and available upon request of City. Each master meter shall be factory calibrated each year at the District's expense. The factory calibration certificate shall be provided to the Service-Safety Director by June 1, of each year.

4.2. The District shall pay for the City's treatment of such discharge at the following rate:

[(Number Of Customers) x (Total Base Rate less user charge)] + [(Total units of usage) x (Total Treatment Rate)] = Total Monthly Charge.

The City shall increase the rates for the District as is done for City customers, pursuant to Lancaster

Codified Ordinances 915, or its successor.

4.3. Excessive Strength Discharges will be subject to a strength surcharge as defined in Lancaster Codified Ordinance 912 and 916, or their successors.

4.4. The District shall also pay to the City for any New Customers not listed in Appendix C of this agreement one and a half (1 ½) times the capacity charge for sewer benefits fee imposed by the City for service connection as established and periodically amended by City Ordinance 912, or its successor.

4.5. Utilizing the master meters, the City shall on a monthly basis bill the District for treatment services. The District shall remit payment for such within thirty (30) days after receipt of bill. There shall be a ten percent (10%) penalty for each late payment.

4.6. The District agrees to establish a system of sewer service and connection permits and shall transmit to the City each month copies of such sewer service permits which have been issued along with such system capacity charges as the District has collected for that month. The District shall keep and maintain an accurate record of all premises connected to its sewers and this record shall, upon demand, be made available to the City.

SECTION 5: SERVICE AREA CAPACITY

5.1. The City agrees to provide total transport from the master meter(s) and sanitary sewer and treatment services for the following volume of effluent and on the following schedule per year:

Year	Gallons Per Day Discharge of Effluent	100 Cubic Feet Per day of Effluent
1998	160,000	213
1999	185,000	247
2000	210,000	280
2001	235,000	313
2002	260,000	347
2003	285,000	380
2004	310,000	413
2005	335,000	447
2006	360,000	480
2007	386,000	515
2008-2018	400,000	533

5.2. In the event that the District desires additional capacity then District may request negotiations with the City to provide such additional capacity.

5.3. There shall be a surcharge of one thousand dollars ($1,000.00) per day when the District exceeds the Total Cubic Feet Usage. Such surcharge shall be based on an average of the Total Cubic Feet Usage over the thirty (30) day period immediately preceding the date on which the Total Cubic Feet Usage is exceeded. The surcharge will appear on the next monthly bill.

SECTION 6: TERM AND RENEWAL

This Agreement shall be effective upon the date of the execution of the same by the authorized agents as set forth in this Agreement and approved by legal counsel for the respective parties for a period of twenty (20) years therefrom, subject to automatic two (2) year renewals unless either the City or the District notify the other in writing one (1) year prior to the automatic renewal date of this Agreement that the Agreement is being terminated or subject to earlier termination or to revision, or to properly authorized modification, or to earlier renewal upon mutual agreement of the parties hereto and shall supersede and cancel any and all previous agreements concerning sewerage service between the parties.

SECTION 7: TERMINATION

Failure on the part of either party to this Agreement to faithfully discharge its obligations and responsibilities hereunder, either in whole or in part, shall vest in the other party to the Agreement the right to terminate same, effective ninety (90) days after written notice of such failure and the intent to terminate is filed by such party with the offending party; provided that the offending party shall have the right to correct the said failure to faithfully discharge its obligations and responsibilities and, upon demonstration thereof, such notice of cancellation shall not be effective and this Agreement shall remain in full force and effect without prejudice to the rights of the parties, including but not limited to the rights of City to collect amounts due and owing to it under the terms of this Contract prior to termination. If the failure to perform obligations or responsibilities is other than the payment of money and is of such nature that it can be corrected but not within ninety (90) days, the notice of cancellation shall not be effective and this Agreement shall remain in full force and effect without prejudice to the rights of the parties if corrective action is instituted within thirty (30) days and diligently pursued to its completion.

SECTION 8: SUBORDINATION

This Agreement shall, in all respects, be subject to the provisions of any indenture of mortgage, trust agreement, trust indenture agreement, bond agreement, loan agreement, or other financing agreement entered into by the City to secure bonds, notes or other financing to pay the cost, or a portion thereof, of extending and improving its wastewater collection or treatment systems.

SECTION 9. UNFORSEEN INTERVENING CAUSES

City shall be obligated to provide the sanitary sewer services required under the terms of this Agreement unless City is unable to provide such due to strikes, war, riot, weather conditions, and unforseen intervening causes. In any of these events, City shall use its best efforts to promptly provide or re-establish such service.

SECTION 10. TEMPORARY REPAIRS

It is further agreed that City shall have the right to temporarily suspend services to the District for all or any part of the Service Area whenever alterations, additions or maintenance operations make it necessary. Further, the District shall have the right, upon twenty-four (24) hour notice to the Water Pollution Control Superintendent of the City, to temporarily discontinue services whenever alterations, additions or maintenance operations make it necessary. However, in the case of an emergency, the District shall immediately notify the Superintendent of Water Pollution Control Department of the City of any such discontinue.

SECTION 11: ENFORCEABILITY

If any portion of this Agreement proves to be invalid or unconstitutional, the same shall not be held to invalidate or impair the validity, force, or effect of any other portion of this Agreement unless it clearly appears that such other portion is wholly or necessary dependent for its operation upon the portion so held invalid or unconstitutional.

SECTION 12: BINDING EFFECT

The City, its successors and assigns and the District, its successors and assigns, have bound themselves to this Agreement. Neither party shall be permitted to assign, sublet or transfer any part of its interest in this Agreement without written consent of the other party.

SECTION 13: WAIVER OF BREACH

The waiver by either party of a breach or violation of any provision of this Agreement shall not operate or be construed to be a waiver of any subsequent breach thereof.

SECTION 14: ENTIRE AGREEMENT, MODIFICATION

This Agreement contains the entire agreement of the parties. It may not be modified orally, but only by agreement in writing signed by both parties.

SECTION 15. GOVERNING LAW

Provisions of this Agreement shall be governed by and construed in accordance with the laws of the State of Ohio, the Codified Ordinances of the City of Lancaster and the Rules and Regulations of the Lancaster Water and Wastewater Departments.

SECTION 16: MISCELLANEOUS

16.1. Nothing contained in this Agreement may be construed so as to limit the authority of the District under Chapter 6119 of the Ohio Revised Code, including, but not limited to, the right of the District to levy taxes and assessments, charges, fees, etc. as the District deems necessary or appropriate.

16.2. The District shall petition the Fairfield County Court of Common Pleas to amend the legal boundary of the territory and jurisdiction of the District to conform to the boundary shown in Appendix B within thirty (30) days of the signing of this contract.

16.3 The District will furnish a performance payment bond as security for payment of all its obligations under the Agreement. The bond shall be in an amount equal to seventy-five thousand dollars ($75,000.00)

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement the day and year first above written.

THE CITY OF LANCASTER, OHIO

Mayor, City of Lancaster

Service-Safety Director

APPROVED AS TO FORM:

Lancaster City Law Director

THE GREENFIELD TOWNSHIP WATER & SEWER DISTRICT

Chairman, Board of Trustees

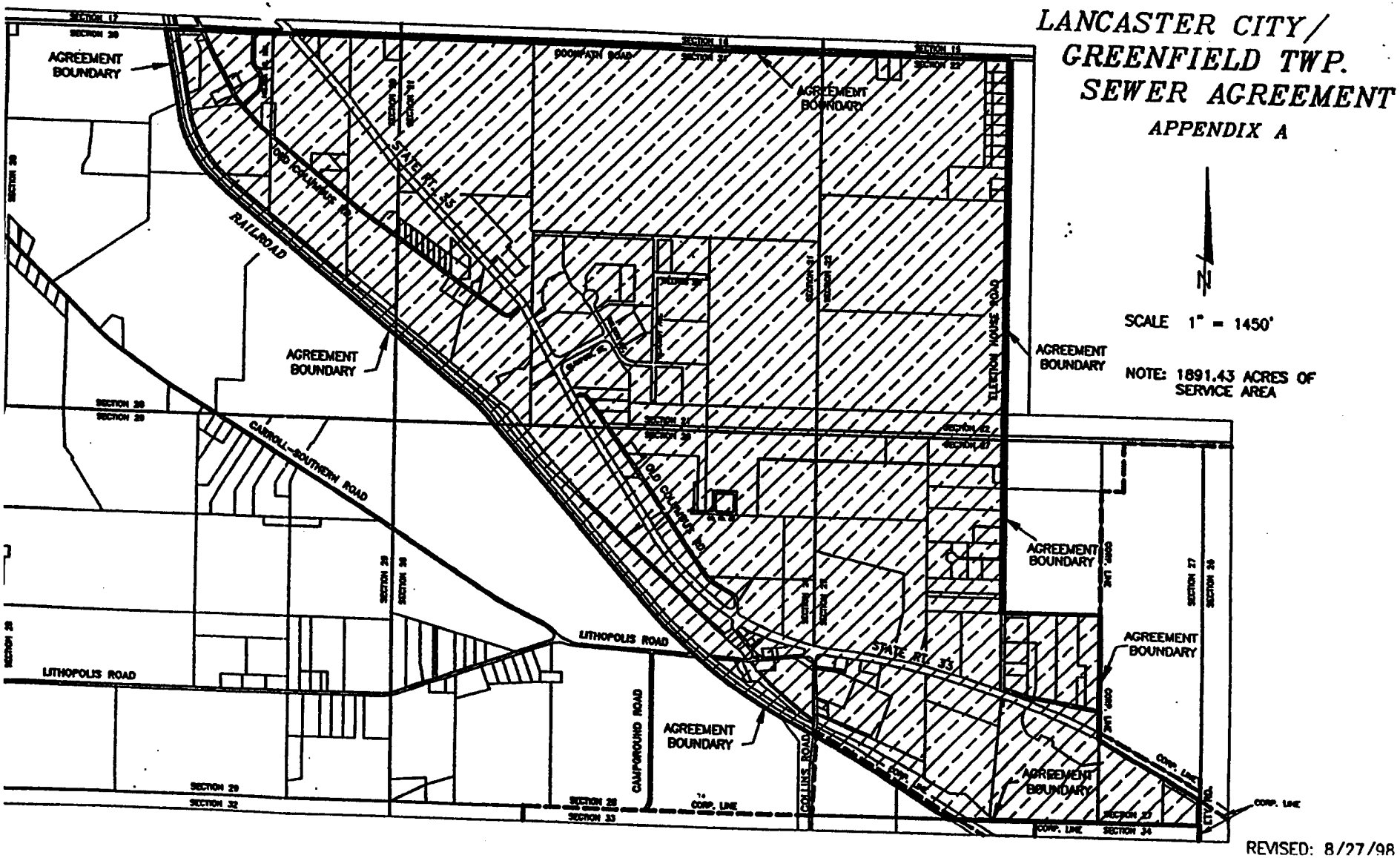
APPROVED AS TO FORM:

District Legal Counsel

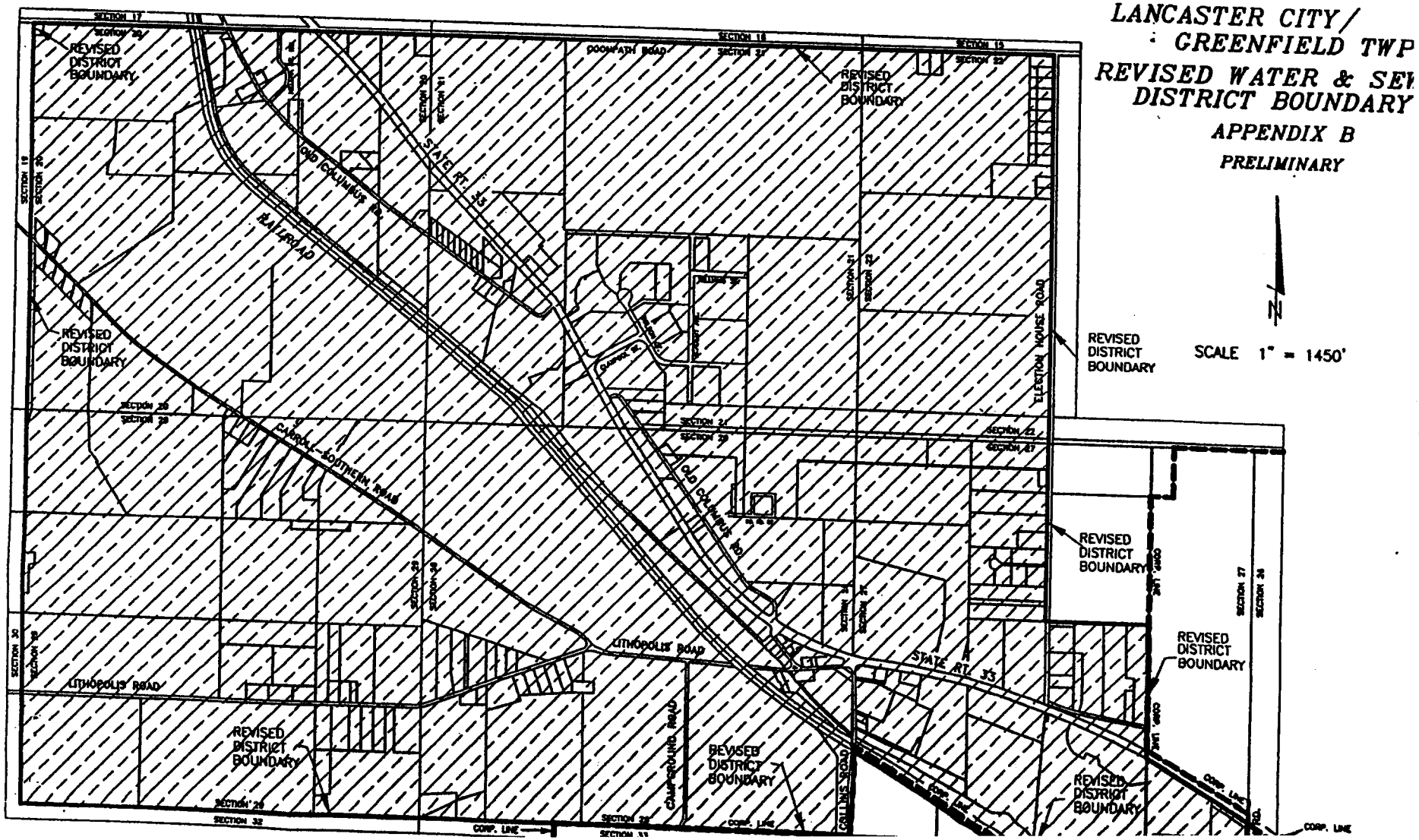
C:\LAW.DIR\GREENFIE.SWR.REVISED 11-20-98

LANCASTER CITY/ GREENFIELD TWP. SEWER AGREEMENT

APPENDIX A



REVISED: 8/27/98


LANCASTER CITY/
GREENFIELD TWP
REVISED WATER & SEV
DISTRICT BOUNDARY
APPENDIX B
PRELIMINARY
SCALE 1" = 1450'
REVISED DISTRICT BOUNDARY
REVISED DISTRICT BOUNDARY
REVISED DISTRICT BOUNDARY
REVISED DISTRICT BOUNDARY
REVISED DISTRICT BOUNDARY
REVISED DISTRICT BOUNDARY
REVISED DISTRICT BOUNDARY
DOGWATH ROAD
STATE RT. 33
OLD COLUMBUS RD.
RAILROAD
CARROLL-SOUTHERN ROAD
LITHOPOLIS ROAD
LITHOPOLIS ROAD
CAMPGROUND ROAD
COLLINS ROAD
ELECTION HOUSE ROAD
STATE RT. 33
CORP. LINE
CORP. LINE
CORP. LINE
CORP. LINE
CORP. LINE
SECTION 17
SECTION 18
SECTION 15
SECTION 19
SECTION 20
SECTION 21
SECTION 22
SECTION 26
SECTION 29
SECTION 28
SECTION 27
SECTION 30
SECTION 31
SECTION 32
SECTION 33
SECTION 34
SECTION 35
SECTION 36

(120)

RESOLUTION NO. 117 -98

A RESOLUTION AUTHORIZING THE MAYOR TO ENTER INTO A CONTRACT WITH GREENFIELD TOWNSHIP WATER AND SEWER DISTRICT TO PROVIDE SEWER SERVICES

BE IT RESOLVED BY COUNCIL OF THE CITY OF LANCASTER, STATE OF OHIO.

SECTION 1. That the Mayor is hereby authorized to enter into a contract with Greenfield Township Water and Sewer District to provide sewer services

SECTION 2. That this resolution shall take effect and be in force from and after the earliest period allowed by law.

Passed: 11/23/98 after 3rd reading. Vote: Yeas 7 Nays 1

Approved: 11/24/98

Robert E. Mc
President of Council

Attest: Mary C. Stewart

Arthur M. Wolfe
Mayor

Offered by: D Andrews

Second by: Robert L. Harris

Requested by Water Pollution Control Committee

CERTIFICATION

I, Teresa McClellan-Sandy, Notary hereby certify this to be a true and correct copy of the Original Resolution 117-98 passed by Lancaster City Council on November 23, 1998

Witness my signature and seal this 1st day of December, 1998

Teresa McClellan-Sandy
Notary Public

TERESA McCLELLAN - Sandy
Notary Public, State of Ohio
My Commission Expires 10-6-99

RESOLUTION NO. 98-09

Fairfield County, Ohio

Be it Resolved by the Board of Trustees of the Greenfield Township Regional Water and Sewer District, that:

Lloyd Helber made the motion to adopt the following:

To accept the contract with Lancaster as proposed.

That is found and determined that all formal actions of this Board of Trustees concerning and relating to the adoption of the Resolution were adopted in an open meeting of this Board of Trustees, and that all deliberations of this Board of Trustees and of any of its committees resulting in such formal action, were in meetings open to the public, in compliance with the law, including Section 121.22 of the Revised Code of Ohio.

Seconded as to all of the above by Martin Furey, vote resulted as follows:

-Arnett	.....Aye
-Furey	.....Aye
-Helber	.....Aye
-Fulks	.....Nay
-Fields	.....Nay

Adopted the 28th day of December 1998.

Attest:

Jim Fields, Secretary
Board of Trustees

AMENDMENT NUMBER ONE
TO THE
CONTRACT BETWEEN THE CITY OF LANCASTER
AND THE GREENFIELD TOWNSHIP WATER & SEWER DISTRICT

The Contract between the City of Lancaster (hereafter "City") and the Greenfield Township er & Sewer District (hereafter "District") was entered into the 1st day of March, 1999 (hereafter erred to as "The Agreement"); and

This Amendment Number One is entered into this 1st day of April, 1999.

Except as hereafter provided, all other terms and provisions of the Agreement shall remain in full force and effect.

The parties to the Agreement, in consideration of the mutual promises and covenants each to the other made, and in consideration of other good and valuable consideration, receipt of which is hereby acknowledged, hereby agree as follows:

1. That the District shall be obligated to provide the City with a notarized statement each year that it has renewed the performance payment bond required by section 16.3 of the Agreement, within fourteen (14) days of the renewal.
2. That the District shall be obligated to provide the City with immediate notice in the event that the District receives notice that its performance payment bond has been cancelled by the underwriter.

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement the day and year first above written.

THE CITY OF LANCASTER, OHIO

Mayor, City of Lancaster

Service-Safety Director

APPROVED AS TO FORM:

Lancaster City Law Director

THE GREENFIELD TOWNSHIP REGIONAL WATER & SEWER DISTRICT

Chairman, Board of Trustees

APPROVED AS TO FORM:

District Legal Counsel

BCO/slf/MyDoc/Green/LancKAmend1/022599

Ohio Farmers Insurance Co.

Westfield Companies
Westfield Center, Ohio 44251-5001

BOND #:5806798

KNOW ALL MEN BY THESE PRESENTS:

THAT WE, ...Greenfield Township Water & Sewer District.....as Principal and Ohio Farmers Insurance Company, an Ohio corporation with principal office at Westfield Center, Ohio, as Surety are held and firmly bound unto the City of Lancaster of 104 East Main Street, City of Lancaster, County of Fairfield, State of Ohio, as Obligee, in the sum of .....Seventy-five thousand dollars and 00/100 $75,000———or the payment of which sum, well and truly to be made, we bind ourselves, our personal representatives, successors and assigns, jointly and severally, firmly by these presents.

Whereas said Principal has entered into an agreement attached as Exhibit 1, with the Obligee, dated the 2ND day of MARCH, 1999 providing for sanitary sewage treatment services.

NOW, THEREFORE, the condition of this obligation is such that, if said Principal shall well and truly pay all due and just sanitary sewerage treatment bills incurred under said contract, then this obligation shall be fulfilled and void, otherwise, to remain in full force and effect. The term of this bond shall be for twelve (12) months.

This bond may be cancelled and the Surety relieved of all further liability hereunder by the Surety giving thirty (30) days written notice thereof to the Obligee.

The maximum aggregate liability of the Surety under this bond shall in no event exceed the penal sum stated above and is non-cumulative from period to period, regardless of the years the bond remains in force.

In WITNESS WHEREOF, we have hereunto set our hands and seals this 2ND day of MARCH, 1999

By _____
Principal

Address of Surety
OHIO FARMERS INSURANCE CO.
ONE PARK CIRCLE
WESTFIELD CENTER, OH 44251

Ohio Farmers Insurance Company
By _____
STEVEN D. WILLIS
Attorney-in-Fact

General
Power
of Attorney
CERTIFIED COPY

POWER NO. 0000178 00

Ohio Farmers Insurance Co.

Westfield Center, Ohio

Know All Men by These Presents, That OHIO FARMERS INSURANCE COMPANY, a corporation duly organized and existing under the laws of the State of Ohio, and having its principal office in Westfield Center, Medina County, Ohio, does by these presents make, constitute and appoint **STEVEN D. WILLIS**

of **COLUMBUS** and State of **OH** its true and lawful Attorney(s)-in-Fact, with full power and authority hereby conferred in its name, place and stead, to execute, acknowledge and deliver **any and all bonds, recognizances, undertakings, or other instruments or contracts of suretyship to include waivers to the conditions of contracts and consents of surety** and to bind the Company thereby as fully and to the same extent as if such bonds were signed by the President, sealed with the corporate seal of the Company and duly attested by its Secretary, hereby ratifying and confirming all that the said Attorney(s)-in-Fact may do in the premises. Said appointment is made under and by authority of the following resolutions adopted by the Board of Directors of the Ohio Farmers Insurance Company:

"Be It Resolved, that the President, any Vice-President, any Secretary or any Assistant Secretary shall be and is hereby vested with full power and authority to appoint any one or more suitable persons as Attorney(s)-in-Fact to represent and act for and on behalf of the Company subject to the following provisions:

"Section 1. Attorney-in-Fact. Attorney-in-Fact may be given full power and authority for and in the name of and on behalf of the Company, to execute, acknowledge and deliver, any and all bonds, recognizances, contracts, agreements of indemnity and other conditional or obligatory undertakings and any and all notices and documents canceling or terminating the Company's liability thereunder, and any such instruments so executed by any such Attorney-in-Fact shall be as binding upon the Company as if signed by the President and sealed and attested by the Corporate Secretary." (Adopted at a meeting held on the 3rd day of July, 1957.)

"Be It Resolved, that the power and authority to appoint Attorney(s)-in-Fact granted to certain officers by a resolution of this Board on the 3rd day of July, 1957, is hereby also granted to any Assistant Vice-President." (Adopted at a meeting held on the 13th day of July, 1976.)

This power of attorney and certificate is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of the Ohio Farmers Insurance Company at a meeting duly called and held on the 9th day of June, 1970:

"Be It Resolved, that the signature of any authorized officer and the seal of the Company heretofore or hereafter affixed to any power of attorney or any certificate relating thereto by facsimile, and any power of attorney or certificate bearing facsimile signatures or facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is attached."

In Witness Whereof, OHIO FARMERS INSURANCE COMPANY has caused these presents to be signed by its **Vice President,** and its corporate seal to be hereto affixed this **08th** day of **MAY** A.D., **1998** .

Corporate Seal Affixed

OHIO FARMERS INSURANCE COMPANY

By Jim Chapman

James R. Chapman *Vice President*

State of Ohio
County of Medina ss.:

On this **08th** day of **MAY** A.D., **1998** , before me personally came **James R. Chapman,** to me known, who, being by me duly sworn, did depose and say, that he resides in **Medina, Ohio;** that he is **Vice President** of OHIO FARMERS INSURANCE COMPANY, the company described in and which executed the above instrument; that he knows the seal of said Company; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said Company; and that he signed his name thereto by like order.

Notarial Seal Affixed

James M. Walker

James M. Walker *Notary Public*

State of Ohio
County of Medina ss.:

My Commission Does Not Expire
Sec. 147.03 Ohio Revised Code

CERTIFICATE

I, **Richard L. Kinnaird, Jr.,** Assistant Secretary of the OHIO FARMERS INSURANCE COMPANY, do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney, executed by said Company, which is still in full force and effect; and furthermore, the resolutions of the Board of Directors, set out in the Power of Attorney are in full force and effect.

In Witness Whereof, I have hereunto set my hand and affixed the seal of said Company at Westfield Center, Ohio, this 2ND day of MARCH A.D., 1999 .

Richard L. Kinnaird, Jr.

Richard L. Kinnaird, Jr. *Assistant Secretary*