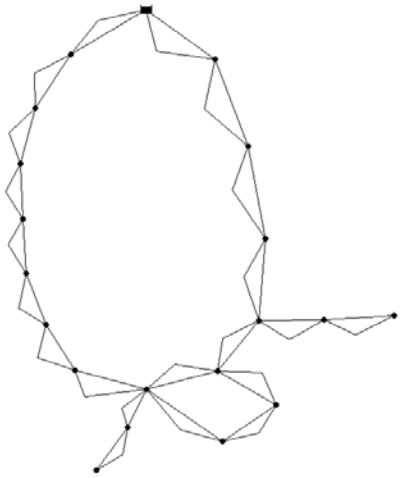
SYSTEM ID: New York Tunnels System

NARRATIVE DESCRIPTION

The New York Tunnels System represents the major water supply transmission tunnels for the City of New York in 1969. The system consists of 1 reservoir (Hill View) and 21 tunnels with two loops. The total length of tunnels is 69.2 miles and they range from 60 inches to 204 inches in diameter. The average daily demand of the system was 1305 million gallons.

NETWORK SCHEMATIC:



HISTORY OF THE NETWORK FILE

The system was first studied by Schaake and Lai in 1969 who attempted to optimize duplications to the existing tunnels to meet projected increases in demands. They used linear programming to carry out the optimization. Subsequently, the system has been the subject of many optimization studies including Quindry et al (1981), Bhave (1985), Morgan and Goulter (1985), Fujiwara and Khang (1990), Dandy et al (1996) and Maier et al (2003). A more complete summary of studies aimed at optimizing this network is given by De Corte and Sorensen (2013).

AVAILABLE INFORMATION

Physical attributes	Yes
Schematic diagram	Yes
Network geometry data	Yes
GIS data file	No
Background map	No
Elevation data	Yes
Pipe data	Yes
Pipe material	No
Pipe age	No
Pipe pressure class	No
Nominal or actual diameters	Actual
Pump data	N.A.
Useful horsepower	
Pump operating curves	
Tank data	N.A.
Elevation data	
Stage storage curves	
Water quality information	
Valve data	N.A.
PRV/FCV data	
Isolation valve data	
Hydrant data	
Demand data	Yes
Total system demand	Yes
Nodal demand data	Yes
Temporal data demands	No
System leakage	No
Hydraulic data	Yes
Hydraulically calibrated model	
Field hydraulic calibration data	
Water quality data	No
Disinfection method	
Chlorine residual data	
Booster station data	
Fluoride/Chloride field data	
Water quality calibrated model	
Operational data	No
SCADA datasets	No
Operational rules	No

REFERENCES:

Bhave, P.R. (1985), Optimal expansion of water distribution systems, J. Environ. Eng., ASCE, 111(2), 177-197

Dandy, G.C., Simpson, A. R. and Murphy, L.J. (1996) An improved genetic algorithm for pipe network optimization, Water Resour. Res., 32 (2), 449-458.

De Corte, A. and Sorensen, K. (2013) Optimisation of gravity-fed water distribution network design: A critical review, European Journal of Operational Research, 228, 1 - 10.

Fujiwara, O. and Khang, D.B. (1990), A two-phase decomposition method for optimal design of looped water distribution networks, Water Resour. Res., 26(4), 539-549.

Maier, H.R., Simpson, A.R., Zecchin, A.C., Foong, W.K. Phang, K.Y., Siah, H.Y. and Tan, C.L. (2003) Ant colony optimization for the design of water distribution networks. J. of Water Resources Plan. and Man.

Morgan D.R. and Goulter, I.C. (1985), Optimal urban water distribution design, Water Resour. Res., 21 (5), 642-652.

Quindry, G., Brill, E.D. and Liebman, J.C. (1981), Optimization of looped water distribution systems, J. Environ. Eng. Div., ASCE, 107(EE4), 665-679.

Schaake, J.C. and Lai, D. (1969) Linear programming and dynamic programming applications to water distribution network design, Report 116, Hydrodyn. Lab., Dep. of Civil Eng., MIT, Cambridge, Mass.

DETAILED DATA SUMMARIES

PHYSICAL ASSETS:

Asset Type:	# of Assets
Master Meters	0
Tanks	0
Pumps	0
Pump Stations	0
Water Treatment Plants	0

NETWORK CHARACTERISTICS:

# Total Pipes:	21
# Branch Pipes:	4
Ratio (Branch Pipes / Total Pipes):	0.19
# Nodes	20
# Reservoirs	1
# Tanks	0
# Regulating Valves	Unknown
# Isolation Values	Unknown
# Hydrants	Unknown
Elevation Data	YES

TUNNEL DATA:

Diameter (in)	Length (ft)
60	76,800
72	84,000
132	22,100
180	84,300
204	98,000

PUMP DATA:

Pump Horsepower	NO
Pump Curves:	NO

DEMAND STATISTICS:

Demographic Type	Population	Households
Directly Serviceable:	Unknown	Unknown
Indirectly Serviceable:	Unknown	Unknown
Total Serviceable:	Unknown	Unknown

Production Statistics	
Total Annual Volume Produced (MG):	1305
Total Annual Volume Purchased (MG):	1305
Total Annual Volume Provided (MG):	1305
Estimated Annual Water Loss:	Unknown

Water Costs	
Customer Type	Cost per 1000 gallons
Customers within the municipality	Unknown
Customers outside the municipality	Unknown

CUSTOMERS AND USAGE:

Customer Type	Customer Count	Average Daily Demand (MGD)
Wholesale:		
Residential:		
Commercial:		
Institutional:		
Industrial:		
Other:		
Total Customers:		
Flushing, Maintenance & Fire Protection:		
Total Water Usage:		1305

DATA FILE ATTRIBUTES:

ATTRIBUTE		UNITS
Pipe Length & Diameter	X	Feet, inches
Pipe Age		
Node Elevation	X	Feet
Node Demand	X	GPM
Valves		
Hydrants		
Tank Levels		
Tank Volume		
PRVs		
WTP		
WTP Capacity		
Pump Data		