Improving the Weno, Chuuk Water Distribution System Using Hydraulic Modeling and Geographic Information Systems

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WERI

WATER AND ENVIRONMENTAL RESEARCH INSTITUTE
OF THE WESTERN PACIFIC
UNIVERSITY OF GUAM

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ABSTRACT

Water hours and low delivery pressure have long been a part of the daily lives of the people in the Micronesian Islands. The problems with delivery of adequate supplies of water to the customers at appropriate pressure have become more and more of a challenge to public utilities throughout these islands. Part of these problems is due to the growth rate occurring in the island centers. This is particularly true on the island of Weno in Chuuk State, Federated States of Micronesia (FSM).

Over the years the Chuuk Public Utility Commission's (CPUC) water distribution system has grown without adequate documentation as to the extent and size of supply and transmission resources and where these resources are located. Just at the turn of the century several new wells were added to the CPUC's water supply system. In 2003 and 2004 investigators from the University of Guam Water and Environmental Research Institute (WERI) gathered water quality information from all the existing wells and developed a preliminary map of the water delivery system. Since then many changes and additions have made to the delivery system.

This project resulted in the development of a set of management and engineering tools, which the planning, operation, and engineering staffs at CPUC can use to better plan, operate, and maintain the water delivery system. These tools will assist CPUC develop a water system that can deliver adequate water to all the households in Weno on a continuous basis with sufficient pressure.

The first management tool that was developed was a computerized water system network model. This model was developed using information gathered from previous studies and additional information documenting changes and additions to the system since the original data was gathered. Other information such as system pressure and flows was gathered as part of the calibration process of this model. The model will be available to the CPUC engineering and planning staffs to help in pinpointing problems areas and to explore operations options for improving system performance. The model was developed using the free water distribution modeling program "EPANET".

The second tool developed was a Geographic Information System based (GIS) inventory of system resources. This GIS system describes the water sources available, the well systems in place, water storage facilities and major transmission lines in the distribution system. The GIS system consists of maps showing the location of the various components of the water transmission system and ancillary equipment. The GIS will be available to managers and engineers so that they can explore various scenarios for long range planning for system maintenance and improvements. The GIS will also be available to operations personnel so that they can maximize their resources for responding to emergencies, planning repairs, and purchasing the inventory of spare parts needed by the utility.

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Water hours and low delivery pressure have long been a part of the daily lives of the people in the Micronesian Islands. The problems with delivery of adequate supplies of water to the customers at appropriate pressure have become more and more of a challenge to public utilities throughout these islands. Part of these problems is due to the growth rate occurring in the island centers. This is particularly true on the island of Weno in Chuuk State, Federated States of Micronesia (FSM).

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STUDY AREA

As shown in Figure 1, the Island of Weno is located in the Western Pacific approximately 2100 miles South East of the Island of Japan. Weno is an Island located in Chuuk State in the Federated States of Micronesia (FSM). The more detailed map in Figure 2 shows the village boundaries for the island. The land area of the island is approximately 38.5 square miles. Rainfall on the island averages 140 inches per year.

As of the year 2000 the population of the island was approximately 13,820 (2000 census). The island is served by the Chuuk Public Utility Corporation. The CPUC provides both water and power to the island.

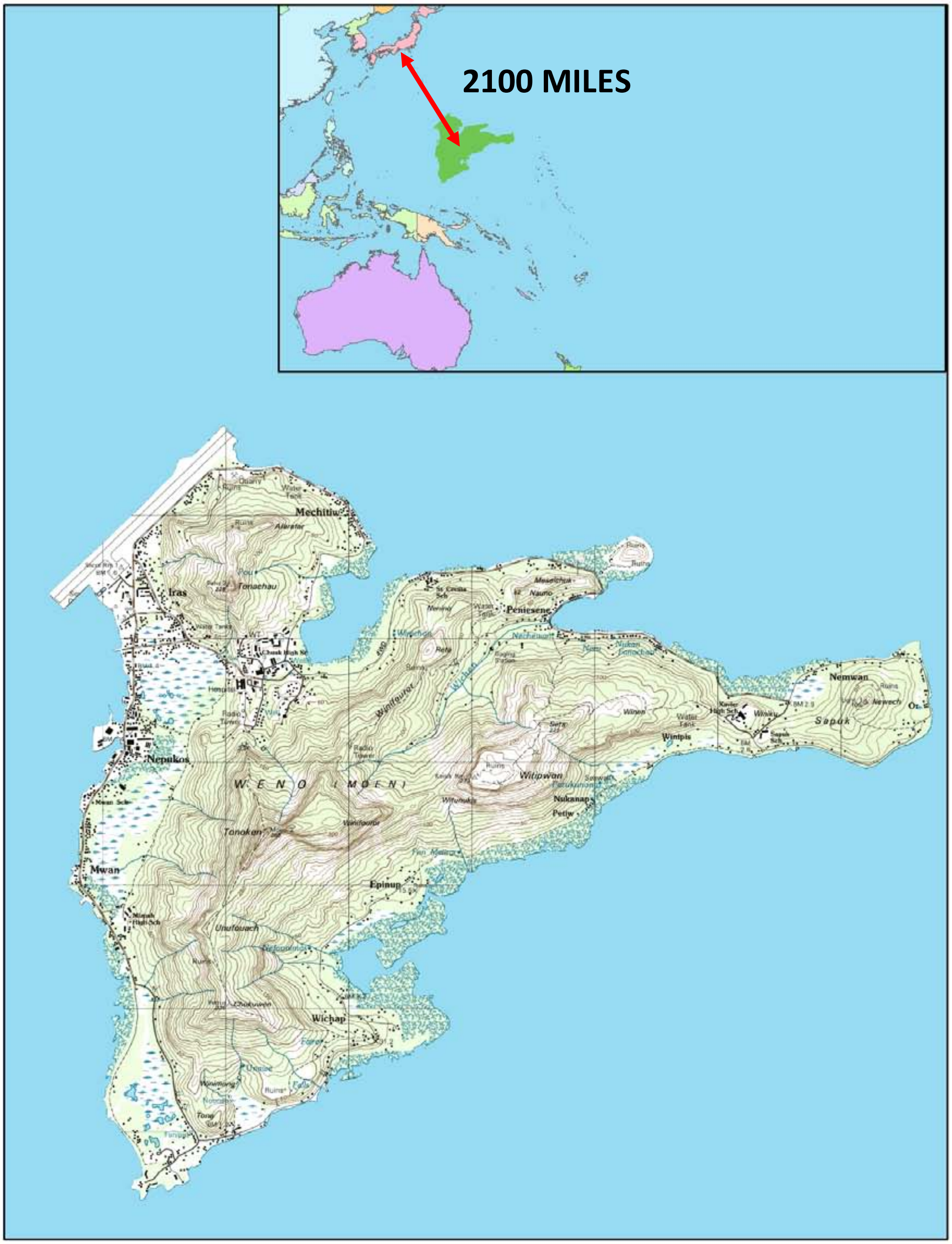

Figure 1. Weno Island, Chuuk State, FSM island location map

Figure 2. Island of Weno showing village boundaries

GOALS AND OBJECTIVES

The goal of this project was to gather the required data for and develop a hydraulic model and a GIS database of the water distribution system for Weno Island, Chuuk State, FSM. In order to achieve this goal the following objectives were carried out:

1. Gather data on the complete physical and hydraulic description of the Weno water distribution system.
2. Develop a hydraulic model of the system using the information developed in objective 1.
3. Develop a GIS database using the information developed in objectives 1and 2.

RELATED RESEARCH

Researchers from WERI completed a networked hydraulic model for portions of the Weno, Chuuk water systems in 1986. (Heitz, 1986) The model used was an early version of the Kentucky Pipe Network Model. This model was a non graphical interface based model. Data files of pipe lengths, network connectivity and water demands were developed for the system. The model predicted flows and pressures in the system. The data files and maps for the 1986 study were used as a starting point for this study. WERI researchers carried out similar studies for the Island of Pohnpei. (Khosrowpanah, 1987) and have completed two modeling projects in Guam using the Haestad Cybernet model. They have also developed a hydraulic model using WaterCAD for AutoCAD and a GIS database for the Saipan Water Distribution System using ARCGIS. (Heitz et al, 2008), (Heitz and Khosrowpanah, 2011).

METHODOLOGY

This proposed project was divided into three phases.

Phase I. Gather a complete physical and hydraulic description of the Weno water distribution system

Information gathered during the 1986 study (Heitz, 1986) was used as the starting point for this phase. Since the EPANET model used in this study is a graphics based model it was necessary to secure a high quality base map to use as the basis for mapping the locations of the pipes, pumps, and tanks that were part of the system. A Lakewood, Colorado, USA company named Digital Data Services was retained to purchase a clean fresh US Geological Survey Quadrangle Topographic Map of Weno Island. After procuring the map they made a high resolution digital scan of the map. This digitized map served as the base map for all of the future work that was done on the project. Along with digitizing the base map, they also created separations of the contour lines that were included on the map. These separations were later used to develop a digital elevation model (DEM) of Weno that was used to determine the elevations for the pipe junctions in the model.

The Weno Island Master PLAN (FSM/UN Water Resources Assessment and Development Project, 1993) proved to be a valuable source of information about the physical characteristics of the Weno water system. Information on the location, diameter and material was provided for the pipes in the system. Tank sizes and elevations were provided along with the location of wells and their characteristics as well as pumps sizes for the wells that existed at that time. Estimates of consumer water demands were also available in the report.

WERI researchers spend a week on WENO working with the CPUC staff in order to be sure that the system maps were accurately drawn and that the system component were properly characterized. CPUC staff also provided information on the locations and consumption rate of the high use customers in the system. The CPUC's staff was also invaluable in identifying system operation and updating all the system description information to present day conditions. At the request of the CPUC the water model was split into water delivery zones. These zones were identified by the CPUC and are shown in Figure 3.

Figure 3. Water delivery zones, Weno water system

Phase II. Develop a Hydraulic Network Model of the CPUC Water Transmission System

Phase II involved the development of a hydraulic network model of the CPUC system using the hydraulic modeling program EPANET. This public domain (and at no cost) program was developed by the US Environmental Protection Agency (EPA) and is available on the EPA web site http://www.epa.gov/nrmrl/wswrd/dw/epanet.html. The model has been used worldwide to simulate water distribution systems. Figure 4 shows the EPANET user interface. The interface is very simple and easy to use, but is cleverly designed to provide easy access even to the more complex functions.

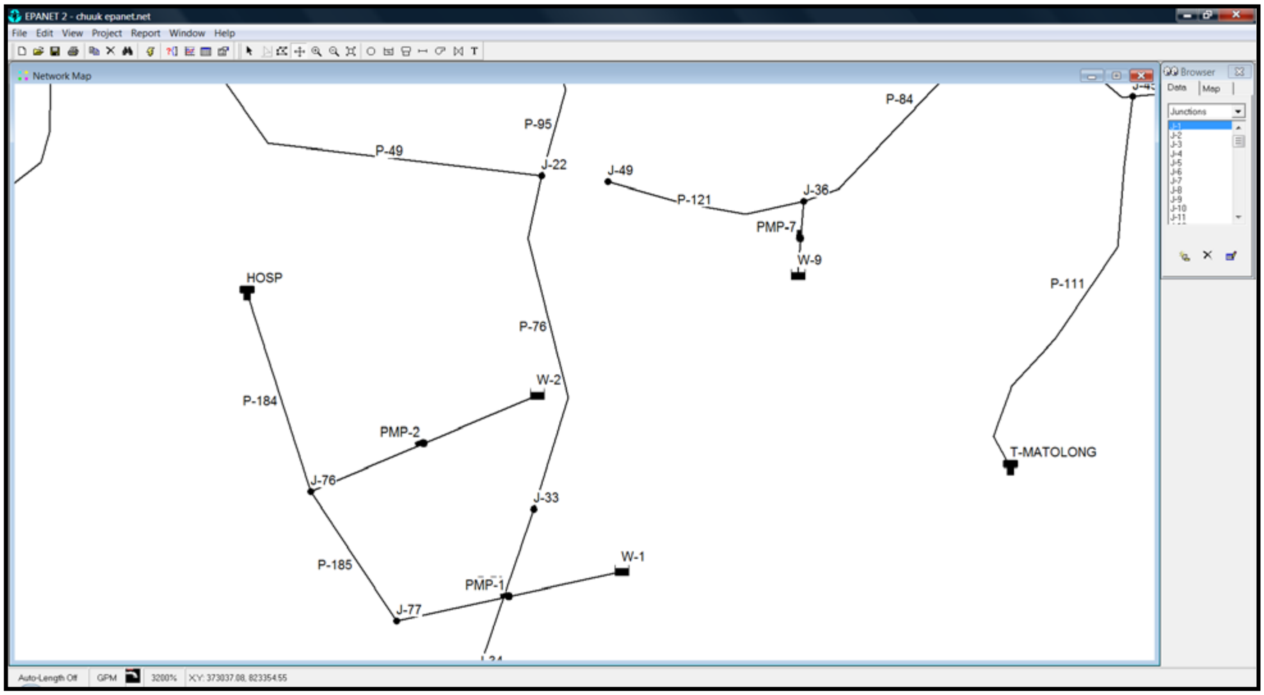

Figure 4. User interface for the EPANET model showing a portion of the Weno water supply system

The model is relatively easy to use and yet very sophisticated. It can be used to model systems from the very simple to the very complex looped piping systems. It has the capability to do time simulations and therefore can model a system over days months or even years. By using what is called patterns the model is able to change customers' demands in order to simulate real time changing use rates in a real world environment. The model can also simulate changing water quality parameters throughout a water system, although we did not implement these capabilities in the Weno model. This capability could be easily adopted in the future since the basic hydraulic model will already be in place. Although there are more sophisticated and more costly water system modeling programs, this program will be able to provide CPUC with all the computational capabilities required for them to analyze and hopefully improve the operation of their system. Another plus for the program is the capability of other modeling programs to read the input files created by EPANET. Therefore, in the future, if CPUC should decide to move up to a more sophisticated model the time and expense invested in the developing the EPANET model will not be lost.

Functionality of the EPANET Model

A complete operational manual for the model (Rossman, 2002) is available on the USEPA Web site http://www.epa.gov/nrmrl/wswrd/dw/epanet.html . In this model all of the components of a water system are simulated using two basic element types. These two elements are nodes and links.

Node elements include junctions, tanks and reservoirs. Junctions are always connected to link elements. Junctions are the points in the system where pressure and hydraulic head are calculated and where demands are input to the system. Tanks are node point where water can be stored for later release into the system. It is possible to model various shapes of tanks. Floor elevation, diameter, maximum and minimum levels, and starting elevations are the most commonly used input variables for a tank node. Reservoirs are a special kind of tank node which serve as an infinite source of water. The water surface elevation always remains at a user provided elevation. Water cannot be stored in a reservoir node.

Link elements include pipes, valves and pumps. Pipe elements are described by their two connecting nodes. Other commonly used pipe variables include diameter, length, hydraulic roughness, minor losses, and pipe flow control conditions such as the existence of a check valve or whether the pipe is closed or open for flow. Valve elements are used to model control elements in a system such as pressure reducing, pressure breaker, flow control, throttle control and general purpose valves. The operational manual referenced above and the on-line help files describe each of these valves in detail and how to implement the valves in the model. The Weno model only used the pressure sustaining valve in order to implement a top feed condition for the Wichap tank. Pump links are used to implement pumps in the system. In order to implement a well in the model the pump link is connected between a reservoir node and a normal junction node. All of the pumps in the Weno model were implemented using a defined pump curve. A sample of the curves used in the Weno system is contained in Figure 5.

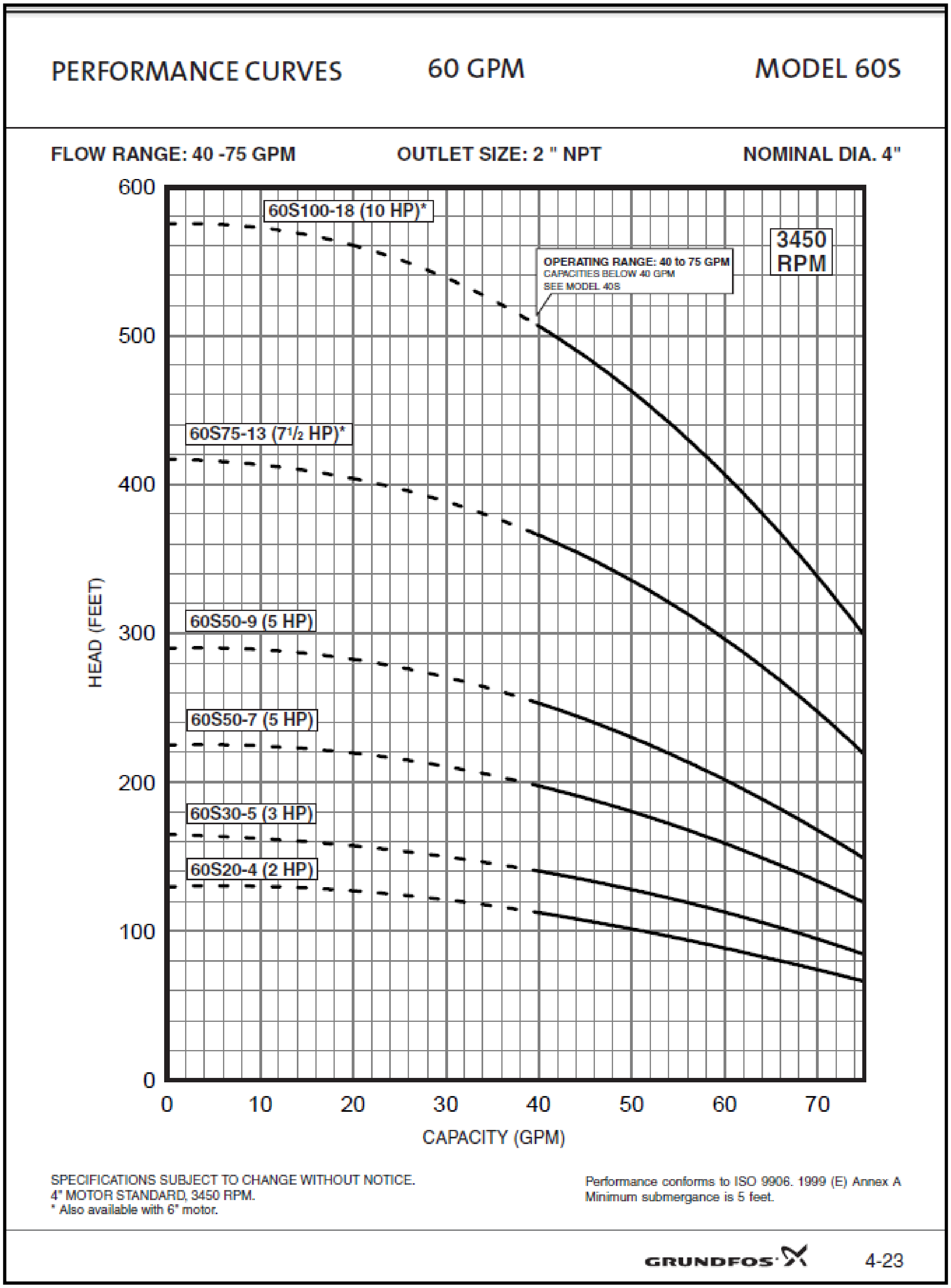

Figure 5. Pump Curves used in the Weno water system model

Before assembling the node and link system elements in the model we provided a Backdrop graphic on which to digitize the elements. This graphic was created in ArcGIS using the digitized topographic map shown in Figure 3. The map was exported using the Metafile graphics format and stored in the same folder as the EPANET data file. The file was imported to EPANET using the (View-Backdrop-Load) menu. It is important to get the scale and coordinate zero values adjusted if the model is to be used later with other programs such as Geographic Information Systems (GIS). This is accomplished using option contained in the (View-Dimensions) menu. The help menu and software manual explain the procedure to use to get proper alignment of the graphics backdrop file. We aligned our backdrop so that it matched the Universal Transverse Mercator (UTM) Grid 56N projection, using a geographic coordinate system of WGS 84 with units of feet. Figure 6. shows the backdrop file before loading the system elements.

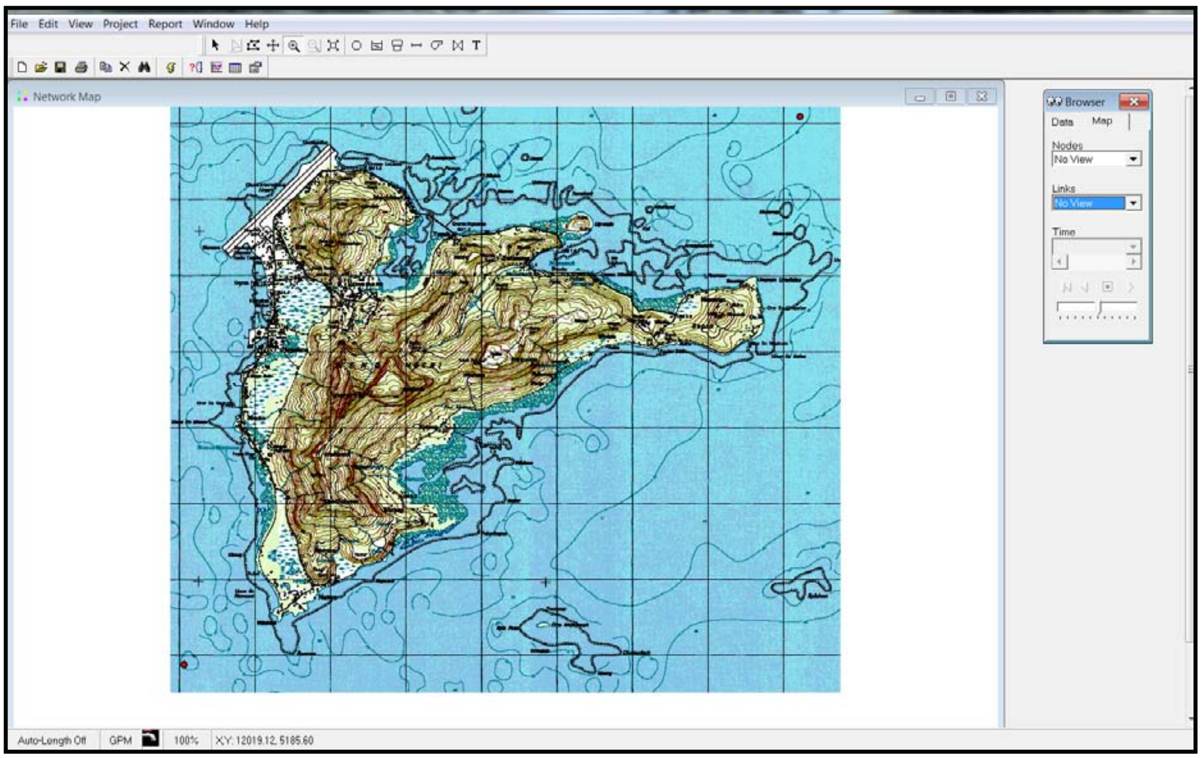

Figure 6. Weno Island backdrop scaled to the UTM Zone 56 N WGS 1984 coordinate system

The data gathered in Phase I of the study was then input to the model. The Map Tool Bar as shown in Figure 7 was used to input the water system elements onto the topographic map backdrop. Also included in the Figure is a help screen showing the function of each of the buttons. To input an element the user simply chooses the correct button for the desired element and moves to the point on the backdrop where the element is to be placed. Pressing the mouse select button will place the element at that location.
The location of the element can be changed by selecting the element with the button and holding the button down while moving to a new location. It is important to note that when

entering pipe elements the Auto-Length toggle in the lower left corner of the screen should be on in order for the program to automatically compute the correct pipe lengths. Pipes are always connected between node points. Once all the elements are in place they are selected one by one and the data describing that element are added.

Figure 8 shows the entire water system network map for the Weno system. Figure 9 shows a close up of the water system network in the central hospital region.

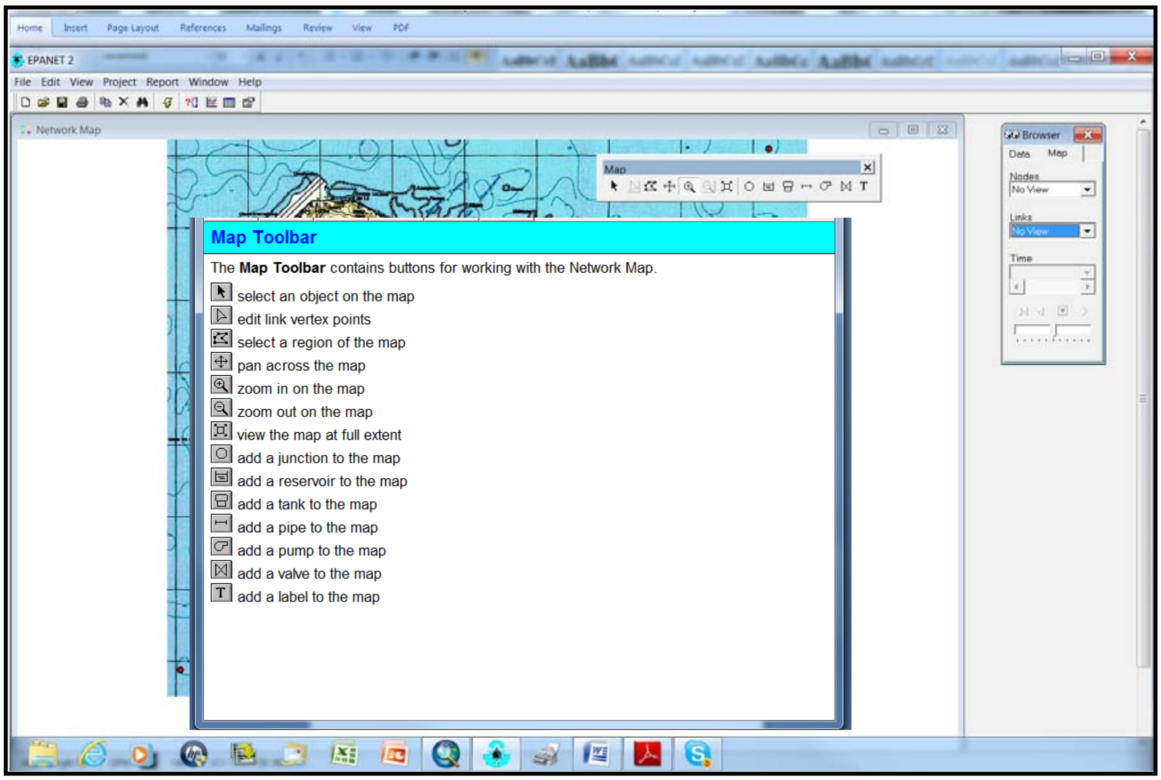

Figure 7. EPANET Map Toolbar, and Help Screen showing function of the map toolbar buttons

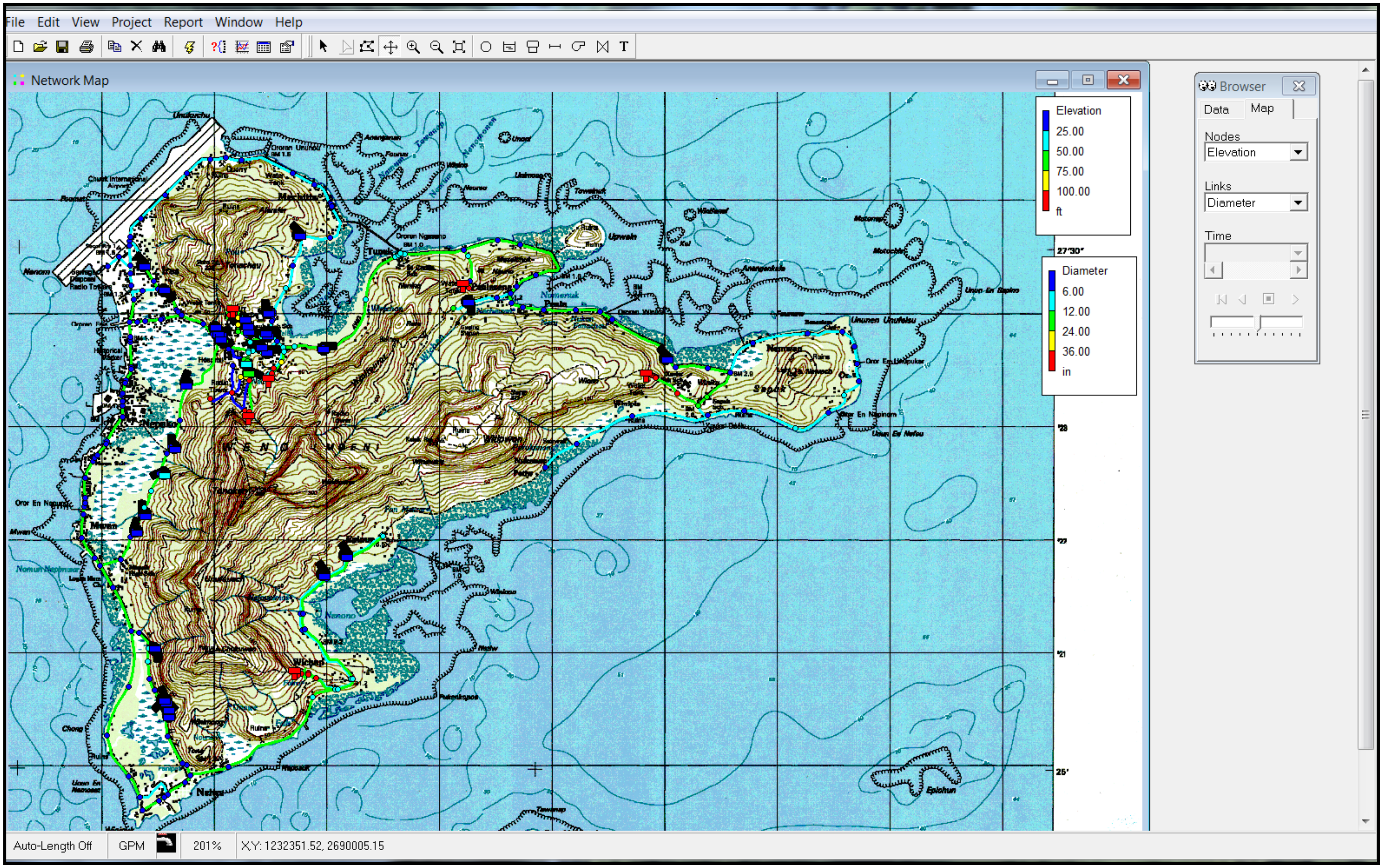

Figure 8. Entire EPANET water system network map for the Weno system

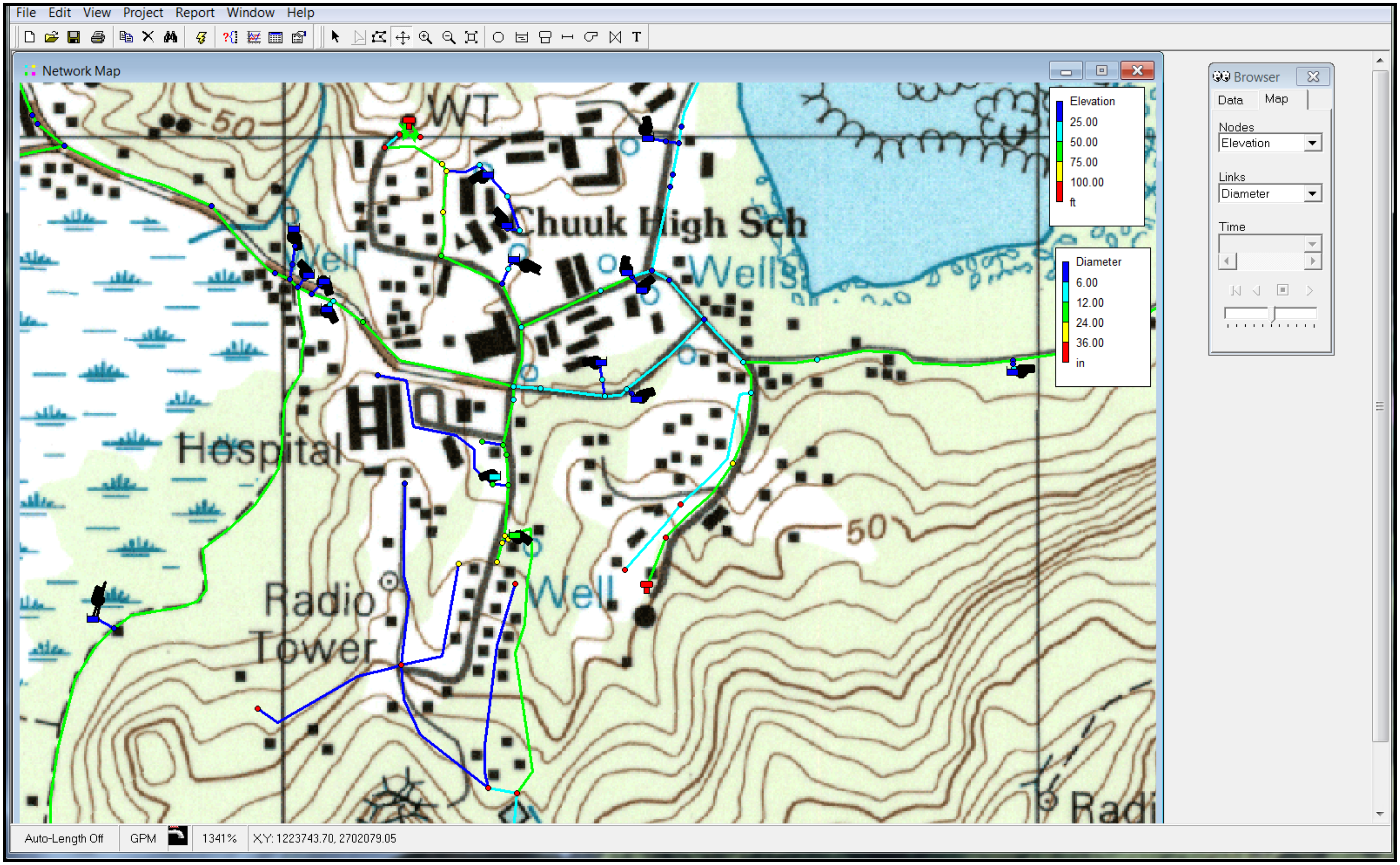

Figure 9. Expanded view of the water system network in the central hospital region

Input Data for EPANET model

The next major effort came in assigning demands to the junction nodes where users require the delivery of water. A spreadsheet was developed to do all the water use rate calculations. We began first with the higher use rate customers. CPUC provide data on the location and characteristics of the high use customers. Table 1 shows a summary of the rates used by various classes of high rate user. Table 2 shows the actual use values that were assigned to the high user junctions. A junction was located in the water system model for each of the high users and the computed value for that user was assigned as the base demand for that junction.

USE RATES FROM CHUUK MASTER PLAN REPORT		
TYPE OF USE	AMOUNT	UNITS
DOMESTIC APARTMENTS	50	GAL/DAY/PERSON
HOTEL	175	GAL/BED
ICE PLANT	1000	GAL/DAY
LAUNDRY	1500	GAL/DAY
BIG COMMERCIAL SHOPS	800	GAL/DAY
SMALL SHOPS	300	GA/DAY
RESTURANT	700	GAL/DAY
SCHOOL WITH DORM	100	GAL/DAY/STUDENT
HOSPITAL	360	GAL/BED/DAY
SCHOOL WITH CAFETERIA	12	GAL/DAY/STUDENT

Table 1. Generalized use rates used for high use rate customers (from CPUC)

The Weno water delivery system was divided into 8 water delivery zones as shown in Figure 3. These zones were determined by the CPUC based on operational constraints of the system. The CPUC determined the number of residential dwelling in each of the zones. These served as basic input to the calculations that resulted in the demand per junction that served as input to the hydraulic models that were developed. The other input parameters included the number of people residing in each residence and the water consumption rate per person. The final values used were 8 people per residence and 50 gallons per capita per day. These values were kept as variables to add flexibility to the spreadsheet so that we could explore other use rate combinations. Table 3 shows the residential use computational table. The values in demand per junction column were then transferred to the EPANET model of the Weno system. All the residential junctions in the same zone were assigned the same base demand as determined on the spreadsheet for that zone.

The Weno system is largely supplied by well pumps so it is very important that the hydraulic description of each of the pumps stations is accurately described. Some of the description information was obtained by field visits by WERI investigators, but the majority of the information was supplied directly by CPUC. All of the well pumps in the system were 60S series pumps made by Grundfos pumps. Each of the 60 S models is identified by its pumping horsepower. Other important parameters are ground elevation at the well heads, location of the pump in the well, static water elevation, pumping drawdown, and a description of the piping system from the pump to the distribution system main. These are shown for each well in Table 4. The data from the table was transferred to the EPANET model input property descriptions for each of the elements in the wells.

WATER USE AT HIGH DEMAND NODES							
				PEOPLE/APARTMENT	5	WERI ASSUMPTION	
				BEDS/HOTEL ROOM	1.5	WERI ASUMPTION	
DATA FROM LUCIO HALLER	ZONE	BEDS	STUDENTS	HOTEL AND APARTMENT ROOMS	PEOPLE IN APARTMENT	DEMAND GAL/DAY	DEMAND AVERAGE GPM
Public Schools / Hospital							
1. Chuuk Hospital 120 beds	2	120				43200	30.00
2. Chuuk High School 500 students	1		500			6000	4.17
3. Weno Junior High 350 students	8		350			4200	2.92
4. COM Chuuk Branch 450 students	2		450			5400	3.75
5. Iras Demo School 500 students	2		500			6000	4.17
6. Mwan Elementary School 350 students	2		350			4200	2.92
7. Neiwe Elementary School 190 students	5		190			2280	1.58
8. Mechitiw Elementary 180 students	1		180			2160	1.50
9. Sapuk Elementray 230 students	3		230			2760	1.92
10. Penia Elementary 200 students	3		200			2400	1.67
		TOTAL				**78600**	**54.58**
Hotels / Apartments							
1. Blue Lagoon Resort 70 rooms	5			70		18375	12.76
2. Truk Stop Hotel 30 rooms	2			30		7875	5.47
3. High Tide Hotel 28 rooms	2			28		7350	5.10
4. Island Motel Apartment 10 rooms	2			10	50	2500	1.74
5. Truk Development Apt 8 rooms	2			8	40	2000	1.39
6. RS Plasa Apartments 20 rooms	2			20	100	5000	3.47
7. Kaminanga Apartments 10 rooms	2			10	50	2500	1.74
8. Nantaku Loop Apartments 6 rooms	2			6	30	1500	1.04
9. His n Hers Apartments 6 rooms	1			6	30	1500	1.04
10. Jesse Mori Apartments 8 rooms	1			8	40	2000	1.39
11. Joe Suka Apartments 8 rooms	1			8	40	2000	1.39
12. Pacific Gardens Apt 12 rooms	1			12	60	3000	2.08
13. Victoria Apartments 8 rooms	2			8	40	2000	1.39
14. Kurassa Apartment/Hotel 17 rooms	1			17	85	4250	2.95
15. Isauso Kowena Apartment 10 rooms	1			10	50	2500	1.74
		TOTAL				**64350**	**44.69**
		TOTAL HOTELS				**33600**	**23.33**
		TOTAL APARTMENTS				**30750**	**21.35**
Private Schools							
1. St. Cecilia Elementary School 260 students	3		260			3120	2.17
2. Penticostal Light House School 180 students	2		180			2160	1.50
3. Berea Christian School 600 students	2		600			7200	5.00
4. Saramen Chuuk High School 200 students (plus 50 CCPI)	2		250			3000	2.08
5. Mizpah High School 200 students	5		200			2400	1.67
6. Seventh Day Adventist (SDA) 400 students	5		400			4800	3.33
		TOTAL	**1890**			**22680**	**15.75**
Laundromats & Commercial Stores							
1. TTC Truk Trading company 60 people	2					1500	1.04
2. AWM store 150 people	2					3000	2.08
3. Susmu Enterprises 80 people	2					2000	1.39
4.Blue lasgoon laundramat	5					1500	1.04
5. laundramat 2	2					1500	1.04
6. Landramat 3	2					1500	1.04
7. Laundramat 6	3					1500	1.04
8. Niewe laundry	5					1500	1.04
9. Laundramat 5	1					1500	1.04
10. Laundramat 7@ (5000 GAL/DAY EACH)	2					1500	1.04
11. Ice Plant	2					1000	0.69
12. AS Mart	2					500	0.35
13. Mimi Mori Aisek	1					250	0.17
14. Bottled Water Factory	3					500	0.35
		TOTAL				**19250**	**13.37**
Other Government Buildings							
1. Airport	2					1000	0.69
2. Power Plant	2					800	0.56
3. Legislature building	2					0.56	0.00
4. Airport Fire fighting (included with Airport)	2					0	0.00
		TOTAL				**1800.56**	**1.25**
GRAND TOTAL ALL HIGH DEMAND USAGE						**186680.56**	**129.64**
GRAND TOTAL ALL HIGH DEMAND USAGE-APARTMENTS						**155930.56**	**108.29**

Table 2. Actual use rates assigned to high rate users in the Weno system

ZONE	RESIDENCES	OID	ZONE_1 *	NON HIGH JUCTIONS	RESIDENTIAL JUNCTIONS	PEOPLE IN ZONE	ZONE DEMAND GAL/DAY	ZONE DEMAND GPM	DEAMAND PER JUNCTION GPM	MONTHLY DEMAND MILLION GALLONS
1	223	0	1	33	12	1784	89200	61.94	5.16	2.713
2	578	1	2	54	43	4624	231200	160.56	3.73	7.032
3	213	2	3	41	33	1704	85200	59.17	1.79	2.592
4	80	3	4	16	11	640	32000	22.22	2.02	0.973
5	178	4	5	26	22	1424	71200	49.44	2.25	2.166
6	46	5	6	7	7	368	18400	12.78	1.83	0.560
7	31	6	7	5	5	248	12400	8.61	1.72	0.377
8	25		8		7	200	10000	6.94	0.99	0.304
	1374			**182**	**140**	**10992**	**549,600.00**	**381.67**		**16.413**
	171.75				**17.50**	**1374.00**	**68700.00**	**47.71**	**2.64**	**2.34**

Table 3. Computation of residential demands by zone and per junction

MODEL WELL NAME	PUMP SIZE HP	STATUS IN MODEL	STATUS IN SYSTEM	MODEL PRODUCTION (GPM)	MAXIMUM Q (GPM) FROM PUMP CURVE	CUTOFF HEAD FROM PUMP CURVE (FT)	MEASURED (GPM)	MODEL PRESSURE (PSI)	MEASURED PRESSURE (PSI)	ZONE	GROUND ELEVATION AT WELL HEAD (FT)	STATIC LEVEL (FT)	DRAWDOWN (FT)	ELEVATION OF WATER WHEN PUMPING (FT)	DISTANCE WELL PLATE TO BOTTOM OF PUMP (FT)	LENGTH OF 2" LINE FROM PUMP TO WELL HEAD (FT)	ADDITIONAL 2" LINE (FT)	MINOR LOSS K IN 2" LINE	4" LINE TO MAIN (FT)
PMP-1	5	OPEN	ON	999	107.6371178	290	37	888	5	2	78.4	12.38	2.62	63.4	125	121.5	13	11	54
PMP-2	7.5	OPEN	ON	999	107.8356299	418	60	888	66	2	62.2	10.42	16.59	35.19	120	116.5	13	11	25
PMP-3	5	OPEN	ON	6.34	107.6371178	290	75	888	32	8	48.951	33.42	6.25	9.281	67	63.5	65	11	0
PMP-4	5	OPEN	ON	999	107.6371178	290	55	888	20	2	38	16.89	12.61	8.5	120	116.5	13	11	67
PMP-7	7.5	OPEN	ON	999	107.8356299	418	85	58.16	58.16	3	38	16.42	22.91	-1.33	101	97.5	13	11	130
PMP-9	2	OPEN	ON	999	105.9516747	130		888		3	38	20.17	20	-2.17	110	106.5	13	11	60
PMP-10	3	OPEN	ON	999	111.0036736	165	55	888	30	2	20	10.5	21.83	-12.33	75	71.5	33	11	20
PMP-11	3	OPEN	ON	999	111.0036736	165		888		2	26	30	20	-24	100	96.5	72	11	16
PMP-12	5	OPEN	ON	999	107.6371178	290	60	888	42	1	38	14	19.58	4.42	70	66.5	38	11	0
PMP-13	5	OPEN	ON	10.08	107.6371178	290	55	888		8	38	15.08	11.3	11.62	82	78.5	220.71	11	0
PMP-14	3	OPEN	ON	999	111.0036736	165	18	888	15	3	38	18	20	0	35	31.5	144	11	0
PMP-15	5	OPEN	ON	999	107.6371178	290	100	888	43	1	38	8.67	20.46	8.87	72	68.5	128	11	14
PMP-17	3	OPEN	ON	999	111.0036736	165		888		5	31.2	11.32	20	-0.12	68	64.5	43	11	0
PMP-20	2	OPEN	ON	999	105.9516747	130		888		5	31.2	15.48	20	-4.28	120	116.5	138	11	0
PMP-TH-3		CLOSED	OFF	999				888											
PMP-TH-5		CLOSED	OFF	999				888											
PMP-TH-9	5	OPEN	ON	999	107.6371178	290	25	888	0	4	26	52	10.5	-36.5	80	76.5	78	11	0
PMP-83-3		CLOSED	OFF	999		#N/A		888											
PMP--83-7	5	OPEN	ON	999	107.6371178	290	60	888	16	4	26	17.17	24.5	-15.67	60	56.5	63	11	0
PMP-83-19	7.5	OPEN	ON	999	107.8356299	418	60	888	30	2	20	14.67	9.62	-4.29	70	66.5	20	11	8
PMP_83-18	3	ON	ON	999	111.0036736	165		888		2	20	17.42	20	-17.42	78	74.5	28	11	10
PMP-83-25	5	OPEN	ON	999	107.6371178	290		888	15	5	26.57	26.5	16.17	-16.1	45	41.5	63	11	0
PMP-83-26	2	OPEN	ON	999	105.9516747	130		888		5	26.57	20	20	-13.43	68	64.5	73	11	0
PMP-83-28	3	OPEN	ON	999	111.0036736	165		888		5	26.57	19.08	20	-12.51	60	56.5	73	11	0
PMP-T-1		CLOSED NO ZONE	OFF	999				888											
PMP-T-2		CLOSED NO ZONE	OFF	999				888											
PMP-ADB-1	3	OPEN	ON	999	111.0036736	165	55	888	16	2	19.7	8	15	-3.3	55	51.5	16	11	12
PMP-ADB-2	5	OPEN	ON	999	107.6371178	290	95	888	65	2	19.3	7.17	20	-7.87	50	46.5	16	11	12
PMP-ADB-4	3	OPEN	ON	999	111.0036736	165		888	34	1	35	18.5	20	-3.5	90	86.5	13	11	40
PMP-ADB-8	2	OPEN	ON	999	105.9516747	130	37	888	0	3	39	20	20	-1	75	71.5	13	11	40
PMP-ADB-10	3	OPEN	ON	999	111.0036736	165		888		3	27	10	20	-3	90	86.5	15	11	8
PMP-ADB-14	2	OPEN	OFF	999	105.9516747	130	30	888	30	3	20	8.5	17.92	-6.42	35	31.5	14	11	24
PMP-ADB-99-1	3	OPEN	ON	999	111.0036736	165		888		4	19.4	3.5	20	-4.1	47	43.5	109	11	0
POU SOURCE 1		CLOSED	ON/OFF					888		6	20								
POU SOURCE 2		CLOSED	ON/OFF					888		7	20								
TOTALS				**30985.42**	**3039.67**			**30250.16**											

Table 4. Well pump station parameters

There are six tanks located in the Weno system. These are shown in Table 5. At this time only two of the tanks (Matalong and Pou) are on line. The Pou Tank is used as a storage location for water produced by the surface water treatment plant. The data from the table was transferred to the EPANET model input property descriptions for each of the tanks.

TANK NAME	STATUS	BASE ELEVATION (FEET)	TANK HEIGHT (FEET)	TANK VOLUME (MILLION GALLONS)	TANK DIAMETER (FEET)
Wichap	not on line	157	33	1	71.82
Xavier	not lone line	217	30	1	75.32
Matalong	on line	156	35	2	98.62
Tannuck	not on line	158	32	1	72.93
Pou	on line	219	40	1	65.23
Intelligence Hill	not used	156	34	1	70.25

Table 5. Water storage tanks in the Weno system

Patterns of demand use changes during the day were developed in order that time simulations could be run using the EPANET model. These patterns provide a multiplying factor (to be multiplied by the average base flow) in order to get the correct flow value for a particular time interval. Table 6 shows the values that were developed for the Weno system. The residential pattern is similar to that which was used for previous studies in Saipan. (Heitz and Khosrowpanah, 2008) The other patterns are best estimates of reasonable values to use. We are presently performing a study in Saipan where we are actually using digital water meters to refine these water use pattern estimates. As data from this study becomes available it can be easily added to the Weno water system model.

START TIME	END TIME	AVERAGE TIME	RESIDENTIAL PATTERN	SCHOOLS PATTERN	COMMERCIAL PATTERN	GOVERNMENT PATTERN	DOMESTIC RAIN CATCH PATTERN
0	1	0.5	0.330	0	0	0	0
1	2	1.5	0.330	0	0	0	0
2	3	2.5	0.412	0	0	0	0
3	4	3.5	0.412	0	0	0	0
4	5	4.5	1.287	0	0	0	0
5	6	5.5	1.287	0	0	0	0
6	7	6.5	1.452	0	2.000	0	1.6
7	8	7.5	1.452	2.400	2.000	2.182	1.6
8	9	8.5	1.488	2.400	2.000	2.182	1.6
9	10	9.5	1.488	2.400	2.000	2.182	1.6
10	11	10.5	0.957	2.400	2.000	2.182	1.6
11	12	11.5	0.957	2.400	2.000	2.182	1.6
12	13	12.5	0.957	2.400	2.000	2.182	1.6
13	14	13.5	0.957	2.400	2.000	2.182	1.6
14	15	14.5	1.488	2.400	2.000	2.182	1.6
15	16	15.5	1.488	2.400	2.000	2.182	1.6
16	17	16.5	1.237	2.400	2.000	2.182	1.6
17	18	17.5	1.237	0	2.000	2.182	1.6
18	19	18.5	1.237	0	0	0	1.6
19	20	19.5	1.237	0	0	0	1.6
20	21	20.5	0.825	0	0	0	1.6
21	22	21.5	0.825	0	0	0	0
22	23	22.5	0.330	0	0	0	0
23	24	23.5	0.330	0	0	0	0

Table 6. Water use patterns for the Weno water system

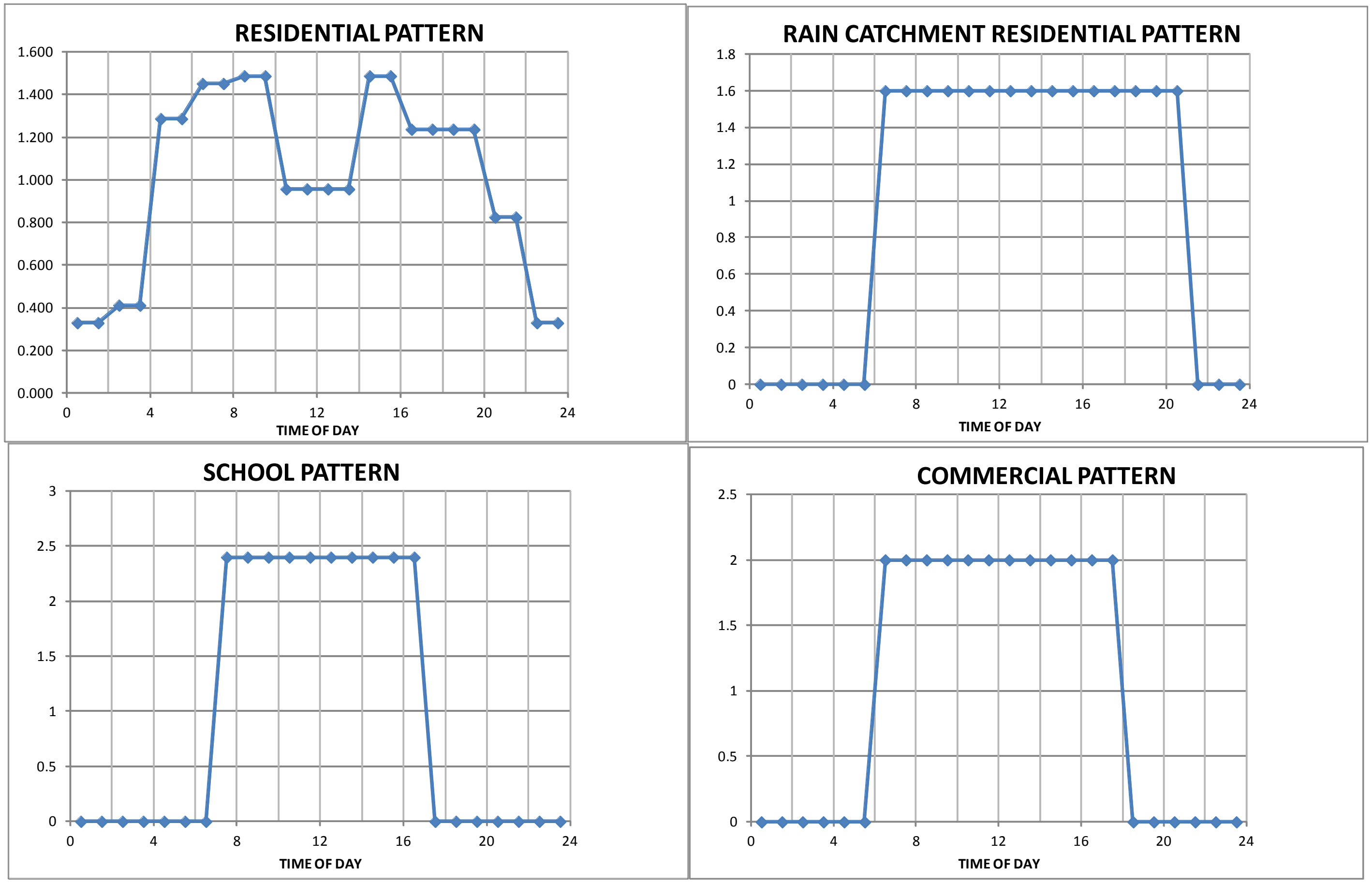

Figure 10. Plots of the use patterns provide for the Weno water system model

Development of an alternative water system model

After developing the input files for the EPANET model the model was run to verify that all components of the system were being modeled correctly. We noticed during this verification process that the total hydraulic head was different in each of the water division zones shown in Figure 3, but this total head remained relatively constant throughout each of the zones. Upon further inspection we could see that because of the relatively large size of the distribution system mains the friction losses in the mains were very small throughout the zones. Because of this the total head in the distribution system within a zone remained relatively constant. This led us to believe that we might be able to develop a somewhat simpler hydraulic model than the EPANET model for the Weno system. While this model would not be able to compute exact pressures and flows throughout the system, it would be able to compute pump flows for various system demands. Secondly we could base this simple model on a spreadsheet application which would greatly simplify the input of hydraulic and demand values over that required when using the EPANET program.

The model is set up in the same workbook that is used to maintain the parameters for the EPANET model therefore it is easy to keep both models updated with the same parameters. The spreadsheet model runs in a separate spreadsheet in the workbook, and most of the computations are done in a set of Microsoft Visual Basic macros that were designed for the relatively hydraulically simple Weno system.

The computation procedure used in the model is shown in Figure 11. Again the basic premise that makes the model possible is that the total hydraulic head (Elevation plus pressure head) is different from zone to zone but constant within a zone.

The technique is an iterative technique in which each zones is operated upon until the total flow from all the pumps in the zones is equal to the zone demands for all users. The zone demands are linked to the demand worksheet tables that were shown previously in Tables 1 through 4. Point 1 on the Figure 11 is the entry point of the program. Zone 1 is the first computational zone. At Point 2 the initial zone total head is assigned. The value picked here is higher than the highest cutoff head for all of the pumps in the zone. This guarantees that no pump will be pumping on the first pass through the zone iteration.

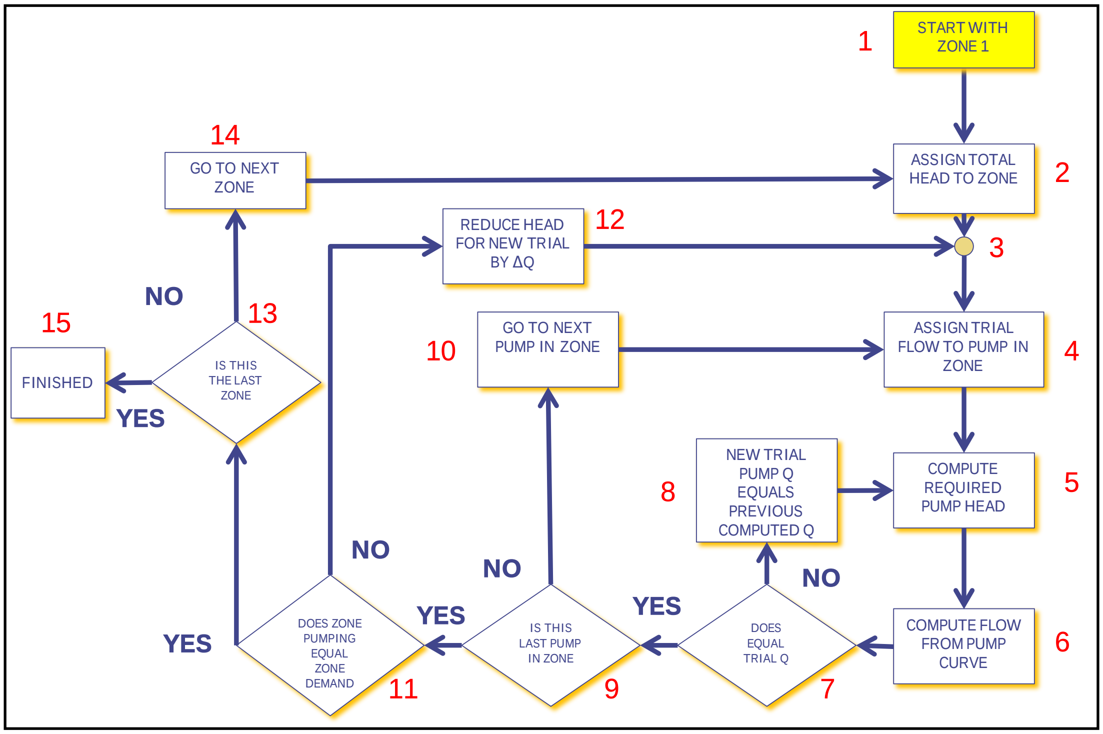

Figure 11. Computational procedure flow chart for the spreadsheet hydraulic model

The next step will be to compute the flow from each of the pumps in the zone based on the trial zone head. This is done using an iterative process because the head seen by the pump is a function of the head in the distribution main and the losses in the system between the pump and the distribution system which are a function of the flow. To solve this complex hydraulics problem we assigned a small trial flow for the first time through the interactive technique (Point 4 on the flow chart). The pump head required for this flow is then computed in Point 5. This is simply the solution of the total energy equation between the water level in the well and the distribution main. All head losses are computed exactly the same as in the EPANET program using the Hazen Williams equations for friction head losses. The parameters used in this calculation were shown previously in Table 4. Again these are the same parameters that were input to the EPANET model. Using the required pump head we move to Point 6 where we use the pump curve to compute what flow the pump curve can produce for the computed pump head. This is done using the same three point pump curve parameters that are computed by the EPANET program for that particular model pump. At Point 7, we check to see if the flow computed from the pump curve is the same as that assumed at the beginning of the iteration (Point 4). If not we move to Point 8 where the trial pump flow is replaced by the recently computed value from point 6. The model iterates between Points 5, 6, 7, and 8 until the trial pump flow equals the computed pump flow from the curve. We now know that the pump flow for that pump is correct for the assumed trial zone head. We repeat this process for each pump in the zone.

At Point 11 all the trial pumping rates in a zone have been computed and these rates are summed and compared to the total zone demands. If the total is too small then we move to Point 14 where the total head for the zone is decreased and the whole cycle is repeated by returning to Point 2. The criterion for decreasing the total head is set by the user. A relaxed criterion (large value) means a faster solution and less accurate computation of total pump flows that match the total demands for the zone. A more stringent criterion (smaller value) leads to slower solutions and more accurate prediction of pump flows. We achieved good results using criteria values between 0.1 and 0.05 ft.

The procedure is repeated until all the pump flows in the zones have been computed correctly.

The Program interface is shown in Table 7. The only requirement to run the model is to select the total head change criteria and push the compute pump flows button. As discussed previously the input values for the model are maintained by a separate worksheet in the workbook as shown previously on Tables 1 through 4. Once the model has run, a summary showing the zone demands and pump sums for each zone and the zone total head is shown. Note that the demand loss rate used is also shown in the interface. This variable is provided because of its importance in calibrating the model input demands. The value for loss rate is changed on the worksheet that maintains the input demand data.

Detailed computational results are provided on the worksheet and are shown in Table 8 below. A second table is provided on the worksheet that provides detailed pump data for a selected zone. This table is shown in Table 8.

HYDRAULICALLY SEPARATE ZONE DEMAND AND PUMPING SUMMARY

LOSS RATE = 40 PERCENT (CHANGE ON ZONE DEMAND AND PRODUCTION SHEET)

COMPUTE PUMP FLOWS

ZONE	DEMAND	COMPUTED ZONE DEMAND	PUMP SUMS	ZONE HEAD (FT)
1	132.36	132.36	132.49	161.4
2	402.07	402.07	402.07	152.7
3	110.51	110.51	110.57	157.1
4	37.04	37.04	37.04	251.0
5	118.12	118.12	118.18	142.3
6	21.30	21.30	0.00	1.1
7	14.35	14.35	0.00	1.1
8	16.44	16.44	16.76	297.9
TOTALS	**852.18**	**852.18**	**817.11**	

ZONE HEAD CHANGE CRITERIA 0.1 FT
(SMALL MORE ACCURATE BUT TAKES LONGER

ONLY CELL TO CHANGE ON THIS SHE

Table 7. Interface for spreadsheet hydraulic model

MODEL WELL NAME	PUMP SIZE HP	ZONE	PUMP Q (GPM)	MEASURED PUMP Q (GPM)	MODEL PUMP Q (GPM)	PUMP HEAD (FT)	ZONE HEAD (FT)	WELL HEAD PRESSURE (PSI)	WELL HEAD PRESSURE MEASURED (PSI)	WELL HEAD PRESSURE MODEL (PSI)	COMPUTED PUMP IN RANGE (40-75 GPM) *	MEASURED PUMP IN RANGE (40-75 GPM) *	MODEL PUMP IN RANGE (40-75 GPM) *
PMP-1	5	2	80.03	37.00	999.00	133.0	152.7	38.66	5.00	888.00	NO	NO	NO
PMP-2	7.5	2	84.93	60.00	999.00	164.8	152.7	46.37	66.00	888.00	NO	YES	NO
PMP-3	5	8	6.87	75.00	6.34	289.0	297.9	107.98	32.00	888.00	NO	NO	NO
PMP-4	5	2	68.56	55.00	999.00	176.0	152.7	54.51	20.00	888.00	YES	YES	NO
PMP-7	7.5	3	79.66	85.00	999.00	196.7	157.1	58.28	58.16	58.16	NO	NO	NO
PMP-9	2	3	0.00		999.00	159.3	157.1	51.61		888.00	NO	NO	NO
PMP-10	3	2	0.00	55.00	999.00	165.0	152.7	57.51	30.00	888.00	NO	YES	NO
PMP-11	3	2	0.00		999.00	176.7	152.7	54.91		888.00	NO	NO	NO
PMP-12	5	1	66.64	60.00	999.00	182.5	161.4	59.68	42.00	888.00	YES	YES	NO
PMP-13	5	8	9.89	55.00	10.08	287.9	297.9	113.17		888.00	NO	YES	NO
PMP-14	3	3	16.89	18.00	999.00	159.9	157.1	52.66	15.00	888.00	NO	NO	NO
PMP-15	5	1	64.11	100.00	999.00	190.8	161.4	65.39	43.00	888.00	YES	NO	NO
PMP-17	3	5	31.68		999.00	148.8	142.3	49.71		888.00	NO	NO	NO
PMP-20	2	5	0.00		999.00	146.6	142.3	48.15		888.00	NO	NO	NO
PMP-TH-3	0												
PMP-TH-5	0												
PMP-TH-9	5	4	9.02	25.00	999.00	288.3	251.0	97.70	0.00	888.00	NO	NO	NO
PMP-83-3	0												
PMP--83-7	5	4	28.02	60.00	999.00	272.1	251.0	99.03	16.00	888.00	NO	YES	NO
PMP-83-19	7.5	2	80.87	60.00	999.00	189.6	152.7	64.67	30.00	888.00	NO	YES	NO
PMP_83-18	3	2	0.00		999.00	170.1	152.7	57.50		888.00	NO	NO	NO
PMP-83-25	5	5	66.29		999.00	183.7	142.3	58.10	15.00	888.00	YES	NO	NO
PMP-83-26	2	5	0.00		999.00	155.7	142.3	50.15		888.00	NO	NO	NO
PMP-83-28	3	5	20.22		999.00	157.9	142.3	51.05		888.00	NO	NO	NO
PMP-T-1	0												
PMP-T-2	0												
PMP-ADB-1	3	2	20.16	55.00	999.00	158.0	152.7	58.08	16.00	888.00	NO	YES	NO
PMP-ADB-2	5	2	67.52	95.00	999.00	179.6	152.7	62.55	65.00	888.00	YES	NO	NO
PMP-ADB-4	3	1	1.73		999.00	164.9	161.4	54.78	34.00	888.00	NO	NO	NO
PMP-ADB-8	2	3	0.00	37.00	999.00	158.1	157.1	51.18	0.00	888.00	NO	NO	NO
PMP-ADB-10	3	3	14.03		999.00	161.4	157.1	56.59		888.00	NO	NO	NO
PMP-ADB-14	2	3	0.00	30.00	999.00	163.5	157.1	59.41	30.00	888.00	NO	NO	NO
PMP-ADB-99-1	3	4	0.00		999.00	255.1	251.0	100.36		888.00	NO	NO	NO
											* SPECIFIED BY GRUNDFOS		

Table 8. Pump flow output for the spreadsheet hydraulic model

	ZONE	2									
MODEL WELL NAME	PUMP SIZE HP	ZONE	PUMP Q (GPM)	MEASURED PUMP Q (GPM)	MODEL PUMP Q (GPM)	PUMP HEAD (FT)	ZONE HEAD (FT)	WELL HEAD PRESSURE (PSI)	WELL HEAD PRESSURE MEASURED (PSI)	WELL HEAD PRESSURE MODEL (PSI)	COMPUTED PUMP IN RANGE (40-75 GPM) *
PMP-1	5	2	80.03	37.00	999	132.98	152.70	38.66	5.00	888.00	NO
PMP-2	7.5	2	84.93	60.00	999	164.80	152.70	46.37	66.00	888.00	NO
PMP-4	5	2	68.56	55.00	999	176.00	152.70	54.51	20.00	888.00	YES
PMP-10	3	2	0.00	55.00	999	165.04	152.70	57.51	30.00	888.00	NO
PMP-11	3	2	0.00	0.00	999	176.71	152.70	54.91	0.00	888.00	NO
PMP-83-19	7.5	2	80.87	60.00	999	189.58	152.70	64.67	30.00	888.00	NO
PMP_83-18	3	2	0.00	0.00	999	170.13	152.70	57.50	0.00	888.00	NO
PMP-ADB-1	3	2	20.16	55.00	999	157.97	152.70	58.08	16.00	888.00	NO
PMP-ADB-2	5	2	67.52	95.00	999	179.56	152.70	62.55	65.00	888.00	YES

Table 9. Pump flow output for the spreadsheet hydraulic model for Zone 2

Model Calibration

Both the complete EPANET model and the spreadsheet model were run several times in order to insure that all components were properly sized and described. This "calibration" process uncovered some short comings in the existing data available to the modelers. One critical parameter for the model is the elevation of the water in the well while the pump is in operation. The elevation is calculated from data provided by the CPUC operators. They physically measure the distance from the well head to the pumping water level. This parameter is usually fairly easy to obtain. The second parameter needed to get this well water elevation is the ground elevation at the well head. This parameter needs to be fairly accurate since it is used to set the pumping water elevation which is used to determine the distribution of water deliveries for each pump in a particular water delivery zone. If either the depth to water or well head elevation is in error, then the delivery predicted by the models will be in error. We were never able to get a complete listing of all of the well head elevations.

Because of the separate nature of the water delivery zones, the wells in each zone will attempt to deliver the input demands for that zone. It is recognized that there is a certain degree of water loss in all parts of the system, but it is unknown exactly how much that loss is at this time. Again in order to calibrate the model to the existing conditions it is important to have a firm grasp of the customer use rates and losses. We tried several different loss rates and were able to come close to the measured pump rate, but more work needs to be accomplished on this issue.

What is needed now is to accurately measure the elevations of each of the well heads and recheck all of the depths to water while pumping. When these two variables are confirmed then the "calibration" process can then be continued until reasonable use and loss rates are obtained. In the future as leak detection and repair studies are made then the model will need adjustments to match the improvements that are made.

Again we stress that the model is not completely calibrated at this point and will require further work by CPUC if it is to be a useful operations and management tool.

Phase III. Development of a GIS database of the water system resources

Using the data developed in Phases I and II, GIS maps and databases describing PUC's water system were developed. The GIS database developed consists of the physical location descriptions of the pumps, pipes, tanks, and valves in the system. System component attributes included parameters such as size, pipe length and diameter, materials, and connectivity to other components of the system. Parameters such as date of installation and condition of the component can be added at a later date wherever available. Most of the data for the GIS was obtained through exportation of the EPANET water system model data. This was accomplished by first inputting the EPANET data files into the Haestad Water system modeling software. The Haestad model has a means of directly exporting the water system component data to ARCGIS shape files. Figure 12 shows the ARCGIS program with the basic system components visible. A sample of the kind of data that is included in the database is shown in Figure 13. In this case we have joined portions of the input data worksheets described previously to the attribute table for the pump shape file. Maintenance items such as when scheduled maintenance is required could easily be added to the data base. Also links to graphical data can be place in the attribute table. Figure 14 shows linked pictures of the pump station and a linked copy of the pump performance curves.

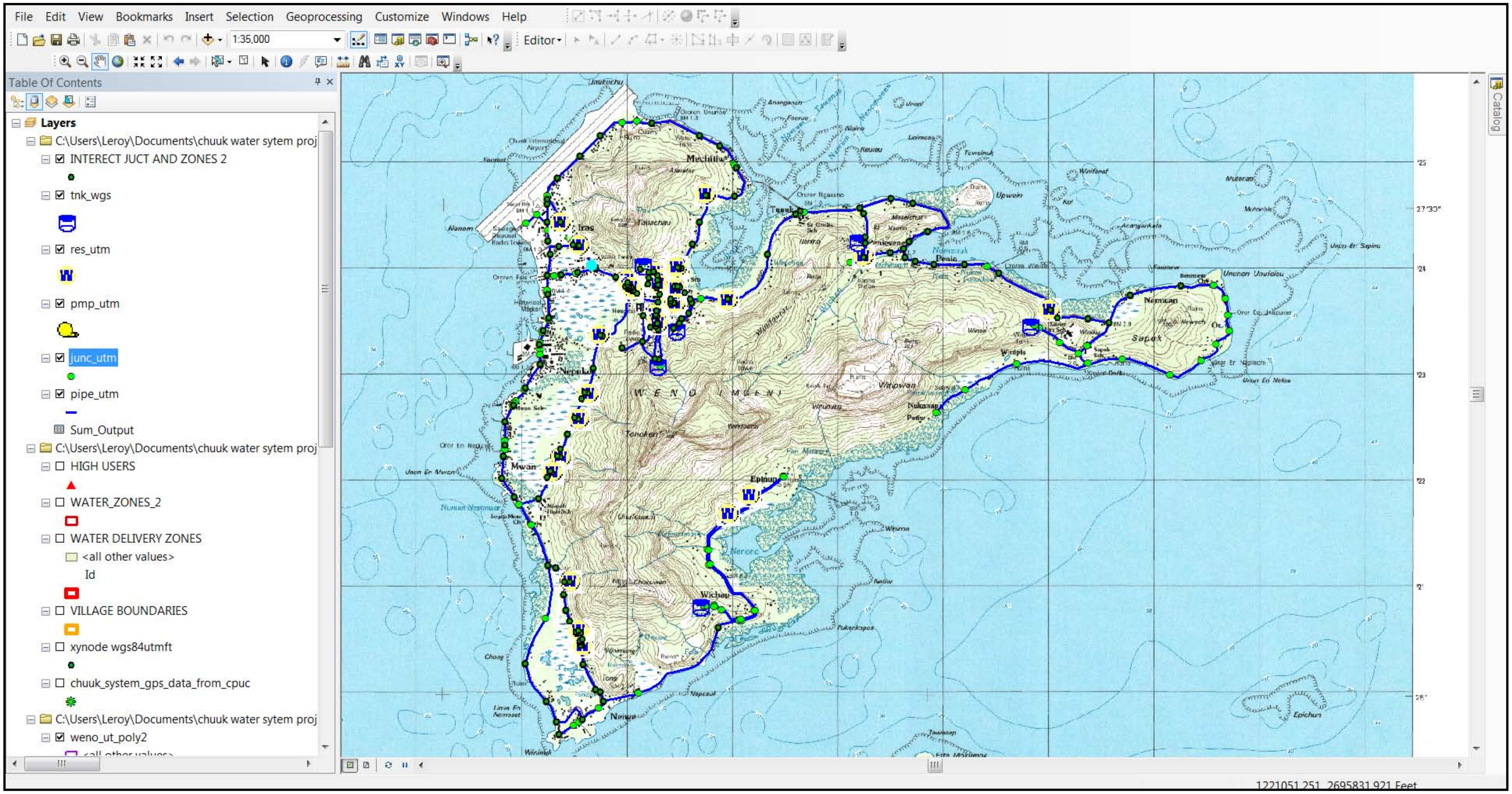

Figure 12. ARCVIEW GIS program showing the basic components of the Weno water system

pmp_utm

FID	Shape *	LABEL	LABEL_1	CLOSED?	PUMP_DEFIN	MODEL WELL NAME	PUMP SIZE HP	STATUS IN MODEL	STATUS IN SYSTEM	MODEL PRODUCTION (GPM)	MAXIMUM Q (GF
0	Point	PMP-7		0	W-7-J-172 (PMP-7)	PMP-7	7.5	OPEN	ON	999	
1	Point	PMP-ADB-14		0	W-ADB-14-J-138 (PMP-ADB-14)	PMP-ADB-14	2	OPEN	OFF	999	
2	Point	PMP-20		0	W--20-J-203 (PMP-20)	PMP-20	2	OPEN	ON	999	
3	Point	PMP-T-2_OFF_LINE		0	W-T-2-J-2 (PMP-T-2_OFF_LINE)	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
4	Point	PMP-4		0	W-4-J-180 (PMP-4)	PMP-4	5	OPEN	ON	999	
5	Point	PMP-83-25		0	W-83-25-J-194 (PMP-83-25)	PMP-83-25	5	OPEN	ON	999	
6	Point	PMP-11		0	W-11-J-85 (PMP-11)	PMP-11	3	OPEN	ON	999	
7	Point	PMP-83-7		0	W-83-7-J-76 (PMP-83-7)	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
8	Point	PMP-83-3_OFF_LINE		0	W-83-3-J-82 (PMP-83-3_OFF_LINE)	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
9	Point	PMP-ADB-1		0	W-ADB-1-J-59 (PMP-ADB-1)	PMP-ADB-1	3	OPEN	ON	999	
10	Point	PMP-TH-9		0	W-TH-9-J-74 (PMP-TH-9)	PMP-TH-9	5	OPEN	ON	999	
11	Point	PMP-TH-5_OFF_LINE		0	W-TH-5-J-72 (PMP-TH-5_OFF_LINE)	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
12	Point	PMP-14		0	W-14-J-173 (PMP-14)	PMP-14	3	OPEN	ON	999	
13	Point	PMP-ADB-8		0	W-ADB-8-J-117 (PMP-ADB-8)	PMP-ADB-8	2	OPEN	ON	999	
14	Point	PMP-1		0	W-1-J-192 (PMP-1)	PMP-1	5	OPEN	ON	999	
15	Point	PMP-83-28		0	W-83-28-J-201 (PMP-83-28)	PMP-83-28	3	OPEN	ON	999	
16	Point	PMP-17		0	W-17-J-200 (PMP-17)	PMP-17	3	OPEN	ON	999	
17	Point	PMP-ADB-10		0	W-ADB-10-J-132 (PMP-ADB-10)	PMP-ADB-10	3	OPEN	ON	999	
18	Point	PMP-ADB-99-1_OFF_LINE		0	W-ADB-99-1-J-77 (PMP-ADB-99-1_OFF_LINE)	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
19	Point	PMP-12		0	W-12-J-174 (PMP-12)	PMP-12	5	OPEN	ON	999	
20	Point	PMP-2		0	W-2-J-230 (PMP-2)	PMP-2	7.5	OPEN	ON	999	
21	Point	PMP-83-19		0	W-83-19-J-83 (PMP-83-19)	PMP-83-19	7.5	OPEN	ON	999	
22	Point	PMP-ADB-4		0	W-ADB-4-J-106 (PMP-ADB-4)	PMP-ADB-4	3	OPEN	ON	999	
23	Point	PMP-9		0	W-9-J-171 (PMP-9)	PMP-9	2	OPEN	ON	999	
24	Point	PMP-15		0	W-15-J-110 (PMP-15)	PMP-15	5	OPEN	ON	999	

pmp_utm

MAXIMUM Q (GPM) FROM PUMP CURVE	CUTOFF HEAD FROM PUMP CURVE (FT)	MEASURED (GPM)	MODEL PRESSURE (PSI)	MEASURED PRESSURE (PSI)	ZONE	GROUND ELEVATION AT WELL HEAD (FT)	STATIC LEVEL (FT)	DRAV
107.83563	418	85	888	28	3	38	16.42	
105.951675	130	<Null>	888	<Null>	3	20	18.25	
105.951675	130	<Null>	888	<Null>	5	31.2	15.48	
<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
107.637118	290	90	888	71.78	2	38	16.89	
107.637118	290	60	888	62.47	5	26.57	26.5	
111.003674	165	20	888	<Null>	2	26	30	
<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
111.003674	165	<Null>	888	32	2	19.7	8	
107.637118	290	30	888	12	4	26	48	
<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
111.003674	165	20	888	15	3	38	18	
105.951675	130	<Null>	888	<Null>	3	39	20	
107.637118	290	60	888	57.31	2	78.4	12.38	
111.003674	165	<Null>	888	<Null>	5	26.57	19.08	
111.003674	165	<Null>	888	<Null>	5	31.2	11.32	
111.003674	165	<Null>	888	<Null>	3	27	10	
<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
107.637118	290	60	888	42	1	38	14	
107.83563	418	60	888	64.96	2	62.2	10.42	
107.83563	418	70	888	14	2	20	14.67	
111.003674	165	<Null>	888	34	1	35	18.5	
105.951675	130	<Null>	888	<Null>	3	38	20.17	
107.637118	290	80	888	94.04	1	38	8.67	

Figure 13 Sample of a portion of the pump attribute table for the Weno water system GIS

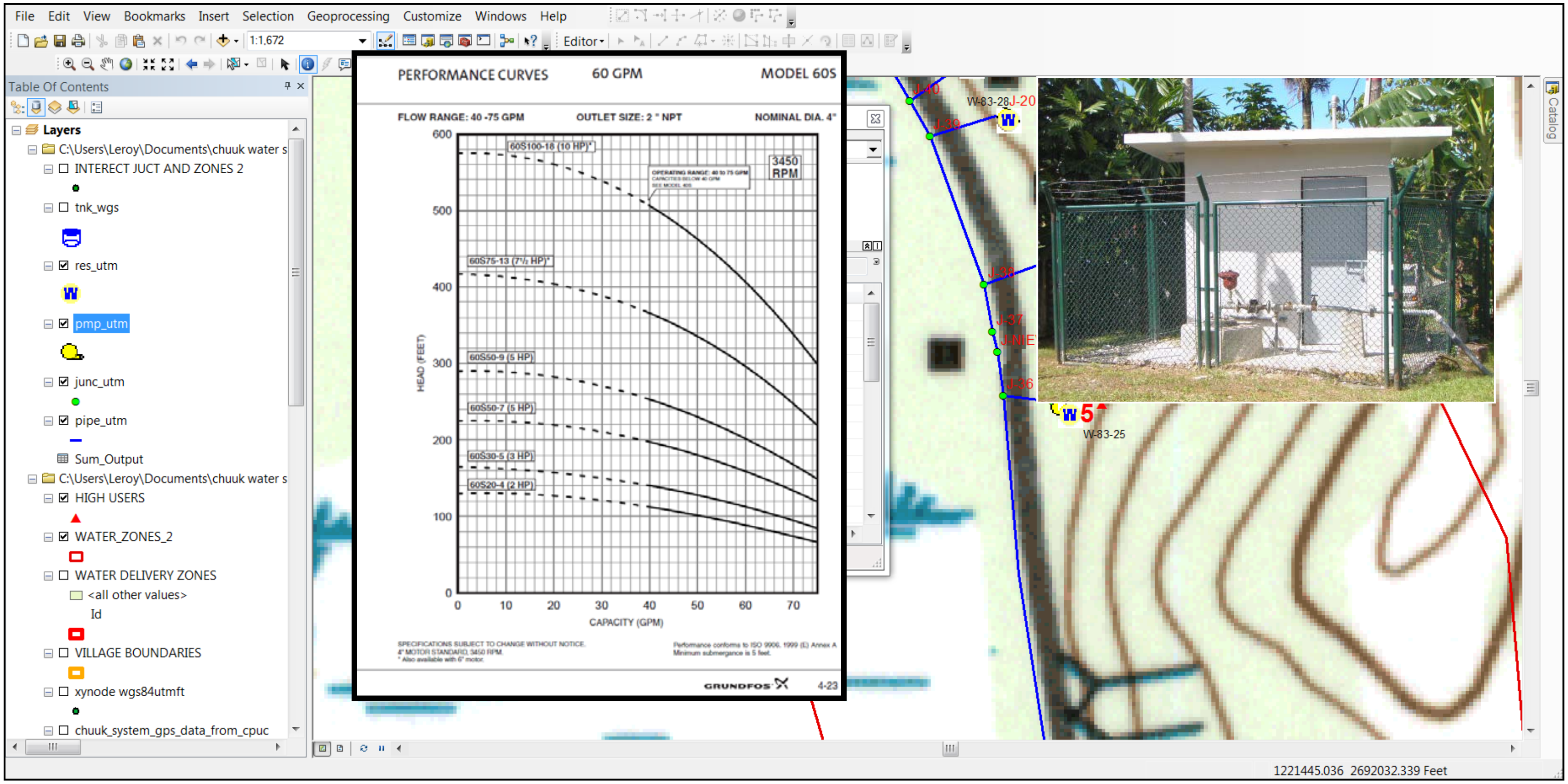

Figure 14. Useful graphical links that can be added to the GIS data file

RESULTS AND DISCUSSION

A complete water system hydraulic model and GIS database of water system components was developed for the Weno Island water system in Chuuk State, Federated States of Micronesia.

The hydraulic model is running well but requires further calibration because of lack of accurate well head elevations and depths to water in the wells while the pumps are operating. These inadequacies should be remedied to insure accurate model calibration.

A second area of concern is with the estimates of customer water use and loss rates within the piping system. Spot checking of metered usage and number of residents served by meters would be helpful in getting more accurate estimates for the model. Probably even more important to model calibration is estimating losses because of leakage in the system. The model can easily account for losses as a percentage of total delivery but the loss rates used thus far are fairly crude estimates. As time goes by and leak detection studies are carried out hopefully better loss rate values will be available and these loss rates will be reduced over time.

Because of the nature of the distribution system additional studies should be made to determine if the water is receiving adequate chlorine contact time before being delivered to customers. In many cases the water from the wells is delivered to customers at fairly short distance from the well locations. This tends to limit chlorine contact time. The US EPA recommends a minimum contact times between chlorine injection and delivery to customers. This allows the chlorine adequate time to kill the bacteria and other microorganisms possibly contained in the water. A good source of information on chlorination in general and chlorine contact time can be found at http://waterquality.cce.cornell.edu/publications/CCEWQ-05-ChlorinationDrinkingWtr.pdf

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APPENDIX I
LISTING OF INPUT FILE FOR WENO EPANET WATER SYSTEM MODEL

```
[TITLE]


[JUNCTIONS]
;ID     Elev      Demand     Pattern
 J-1    44.26     0          ;
 J-5    26.69     0          ;
 J-13   11.85     0          ;
 J-14   22.51     0          ;
 J-15   22.67     0          ;
 J-16   34.38     0          ;
 J-17   45.8      2.25       ;
 J-19   31        0          ;
 J-20   10.4      2.25       ;
 J-21   139.91    0          ;
 J-22   161.53    0          ;
 J-24   190       0          ;
 J-25   190       0          ;
 J-26   13.75     2.25       ;
 J-27   9.68      2.25       ;
 J-28   6.28      2.25       ;
 J-29   5.15      2.25       ;
 J-30   7.26      2.25       ;
 J-31   10.31     0          ;
 J-32   18.52     2.25       ;
 J-33   19        2.25       ;
 J-34   10        2.25       ;
 J-35   22.91     2.25       ;
 J-36   21.1      2.25       ;
 J-37   20.81     2.25       ;
 J-38   21.07     2.25       ;
 J-39   0         2.25       ;
 J-40   0         2.25       ;
 J-41   24.76     2.25       ;
 J-42   21.09     2.25       ;
 J-43   25.24     2.25       ;ZONE 5
 J-44   25.8      2.25       ;
 J-45   23.39     2.25       ;
 J-2    0         0          ;
 J-3    0         0          ;
 J-6    11.27     2.25       ;
 J-7    20.58     2.02       ;
 J-8    8         3.73       ;
 J-9    0         3.73       ;
 J-10   6         3.73       ;
 J-11   5         3.73       ;
 J-12   4         3.73       ;
 J-18   1.57      3.73       ;
 J-23   3         3.73       ;
 J-46   2         3.73       ;
 J-47   2         3.73       ;
 J-48   2         3.73       ;
```

J-49	2	3.73			;	
J-50	2	3.73			;	
J-51	12	3.73			;	
J-52	17.86		3.73			;
J-53	7	3.73			;	
J-55	0	3.73			;	
J-56	0	3.73			;	
J-57	6.56		3.73			;
J-58	12.03		3.73			;
J-59	0	0		;		
J-60	16.56		2.02			;
J-61	16.48		2.02			;
J-62	0	2.02			;	
J-63	25.71		2.02			;
J-64	34.51		2.02			;
J-65	17.43		2.02			;
J-66	17.13		2.02			;
J-67	11.41		2.02			;
J-68	7.39		2.02			;
J-69	10.85		2.02			;
J-71	0	0		;		
J-72	0	0		;		
J-74	0	0		;		
J-76	0	0		;		
J-77	0	0		;		
J-78	18.331		3.73			;
J-79	30.47		3.73			;
J-80	0	0		;		
J-81	20.52		3.73			;
J-82	0	0		;		
J-83	0	0		;		
J-84	0	3.73			;	
J-85	0	0		;		
J-86	16.24		3.73			;
J-88	23.69		3.73			;
J-89	7.56		3.73			;
J-90	0	0		;		
J-91	12.24		3.73			;
J-92	10.25		3.73			;
J-93	1.63		3.73			;
J-AIRPORT	2.36		.69		;	
J-95	2.31		3.73			;
J-FIRE_FIGHTING		2.2	0		;	
J-98	13	5.16			;	
J-99	13	3.73			;	
J-101	15	5.16			;	
J-102	15	5.16			;	
J-103	15	5.16			;	
J-104	20	5.16			;	
J-105	21.53		5.16			;
J-106	0	0		;		
J-107	33	5.16			;	
J-108	22	5.16			;	
J-109	20.55		5.16			;
J-110	22	0		;		
J-111	20.33		5.16			;

J-112	19.36		5.16			;
J-113	17.68		1.79			;
J-114	22.48		1.79			;
J-115	26.83		1.79			;
J-116	22.7		1.79			;
J-117	25.5		0		;	
J-118	30	1.79			;	
J-119	32.2		1.79			;
J-120	12.65		1.79			;
J-121	9.7	1.79			;	
J-122	30.48		1.79			;
J-123	0	1.79			;	
J-124	136.5		1.79			;
J-125	10	1.79			;	
J-126	10	1.79			;	
J-127	10	1.79			;	
J-128	8.16		1.79			;
J-129	16.59		1.79			;
J-132	30	0		;		
J-133	8.27		1.79			;
J-134	10	1.79			;	
J-135	14.78		1.79			;
J-136	7.44		1.79			;
J-137	2.2	1.79			;	
J-138	1.5	0		;		
J-139	3.16		1.79			;
J-141	7.81		1.79			;
J-143	7.16		1.79			;
J-144	2	1.79			;	
J-145	20	1.79			;	
J-146	20	0		;		
J-147	2	0		;		
J-148	2	0		;		
J-149	6.76		0		;	
J-150	40	0		;		
J-151	20	0		;		
J-152	20	0		;		
J-153	30	0		;		
J-154	18.31		0		;	
J-155	55.6		0		;	
J-156	134		0		;	
J-157	217		0		;	
J-160	8.07		0		;	
J-161	14.01		0		;	
J-162	9.25		0		;	
J-165	148		1.72			;
J-166	84	1.72			;	
J-167	39.99		1.79			;
J-168	31.34		1.79			;
J-169	37.54		3.73			;
J-170	33.15		3.73			;
J-171	0	0		;		
J-172	0	0		;		
J-173	0	0		;		
J-174	22	0		;		
J-175	3.34		3.73			;

J-176	52.79		.99			;	
J-177	30.09		0			;	
J-178	33.15		.99			;	
J-179	41.46		.99			;	
J-180	0	0			;		
J-182	49	0			;		
J-183	0	0			;		
J-184	55.38		3.73				;
J-186	88.09		3.73				;
J-187	117.45		1.83				;
J-188	140.59		1.83				;
J-189	157		1.83				;
J-190	59.82		3.73				;
J-191	62.2		0			;	
J-192	0	0			;		
J-195	190		0			;	
J-196	190		0			;	
J-197	94.5		.99			;	
J-198	143.04		.99			;	
POU_SOURCE		157		0	CONST_1		;
J-194	0	0			;		
J-200	0	0			;		
J-201	0	0			;		
J-202	0	0			;		
J-203	0	0			;		
J-181	197		0			;	
J-204	34.4		0			;	
J-205	157		0			;	
J-206	161.5		0			;	
J-BLU_LAG		10	12.76				;
J-158	0	1.79				;	
J-159	26	1.79				;	
J-163	66	1.79				;	
J-164	35	.99			;		
J-185	78	.99			;		
J-193	40	1.79				;	
J-199	88	3.73				;	
J-207	98	3.73				;	
J-209	0	1.83				;	
J-210	162		1.83				;
J-211	96	1.83				;	
J-212	115		1.83				;
J-213	0	0			;		
J-214	52	3.73				;	
J-HOSPITAL		68.6		30			;
J-216	33	1.72				;	
J-217	115		1.72				;
J-219	148		1.72				;
J-4	34.38	0			;		
J-54	31	0			;		
J-70	22.67		0			;	
J-73	22.51		0			;	
J-75	11.85		0			;	
J-96	26.69		0			;	
J-100	44.26		0			;	
J-NIEWE_ELEM		5	1.58				;HIGH_5

J-SDA_SCHOOL	10	3.33	;
J-BLUE_LAG_LAUN	10	1.04	;
J-NIEWE_LAUNDRY	21	1.04	;
J-MIZPAH_HS	15	1.67	;
J-ISLAND_HOTEL	5	1.74	;
J-87	5	3.73	;
J-MWAN_ELEMENTRY	4	2.92	;
J-TRUK_STOP	4	5.47	;
J-TRUK_DEVEL	4	1.39	;
J-AWM	3	2.08	;
J-SARAMEN_CHUUK_HS	2	2.08	;
J-ICE_PLANT	2	.69	;
J-LAUNDRAMAT2	2	1.04	;
J-SUSMU_ENT	2	1.39	;
J-BEREA_CHRIS_SCHOOL	2	5.00	;
J-COM	2	3.75	;
J-LAUNDRAMAT_3	5	1.04	;
J-AS_MART	12	.35	;
J-POWER-plant	17	.56	;
J-PENTECOST_SCHOOL	9	1.5	;
J-LEGISLATURE	7	0	;
J-IRAS_DEMO_SCHOOL	7	4.17	;
J-HIGH_TIDE_HOTEL	2	5.1	;
J-RS_PLAZA	10	3.47	;
J-142	10	3.73	;
J-PACIFIC_GARD_APT	14	2.08	;
J-KURASSA	14.5	2.95	;
J-MECHITIW_ELM_SCHOOL	15	1.5	;
J-208	15	5.16	;
J-MINI_MORI_AISEK	20.6	.17	;
J-ISAUSO_KOWENA	21	1.74	;
J-LAUNDRAMAT_5	21	1.04	;
J-LAUDRAMAT_6	27	1.04	;
J-BOTTLED_WATER_FACTORY	30	.35	;
J-ST_CECELIA_SCHOOL	30	2.17	;
J-222	30	1.79	;
J-PENIA_ELEMENTARY_SCHOOL	11	1.67	;
J-CHUUK_HIGH_SCHOOL	25	4.17	;
J-WENO_JUNIOR_HIGH	88	2.92	;
J-LAUNDRAMAT_7	38	1.04	;
J-VICTORIA_APT	5	1.39	;
J-TRUK_TRADING_COMPANY	2	1.04	;
J-SAPUK_ELEM__SCHOOL	50	1.92	;
J-97	31	0	;
J-130	0	0	;
J-WELL_HEAD_83-19	20	0	;
J-140	0	0	;
J-WELL_HEAD_ADB-1	19.7	0	;
J-WELL_HEAD_ADB-2	19.3	0	;
J-WELL_HEAD_ADB-4	35	0	;
J-221	0	0	;
J-WELL_HEAD_ADB-8	39	0	;
J-WELL_HEAD_ADB-10	27	0	;
J-WELL_HEAD_ADB-14	20	0	;
J-228	28	0	;
J-WELL_HEAD_9	0	0	;

```
 J-230                  0           0                                  ;
 J-231                  76.2                    0                                  ;
 J-KAMINAGA_APTS        17          1.74                                           ;
 J-NANTAKU_APT          52          1.04                                           ;
 J-HIS_N_HERS_APT       15          1.04                                           ;
 J-JESSE_MORI_APT       15          1.39                                           ;
 J-JOE_SUKA_APT         15          1.39                                           ;
 J-94                   0           0                                  ;
 J-WELL_HEAD_83-18      20          0                                  ;
 J-227                  20.52                   3.73                               ;
 J-WELL_HEAD_83-25      26.57                   0                                  ;
 J-WELL_HEAD_17         31.2                    0                                  ;
 J-WELL_HEAD_1          78.4                    0                                  ;WELL HEAD W-1
 J-WELL_HEAD_2          62.2                    0                                  ;
 J-236                  0           0                                  ;
 J-WELL_HEAD_3          48.95                   0                                  ;
 J-WELL_HEAD_4          38          0                                  ;
 J-WELL_HEAD_7          38          0                                  ;
 J-WELL_HEAD_10         20          0                                  ;
 J-WELL_HEAD_15         38          0                                  ;
 J-WELL_HEAD_13         38          0                                  ;
 J-WELL_HEAD_83-28      26.57                   0                                  ;
 J-WELL_HEAD_83-26      26.57                   0                                  ;
 J-WELL_HEAD_20         31.2                    0                                  ;
 J-220                  0           0                                  ;
 J-WELL_HEAD_12         38          0                                  ;
 J-WELL_HEAD_11         26          0                                  ;
 J-232                  0           0                                  ;
 J-233                  0           0                                  ;
 J-234                  0           0                                  ;
 J-235                  0           0                                  ;
 J-WELL_HEAD_14         38          0                                  ;
 J-131                  0           0                                  ;
 J-215                  0           0                                  ;
 J-218                  0           0                                  ;
 J-WELL_HEAD_TH-9       26          0                                  ;
 J-WELL_HEAD_83-7       26          0                                  ;

[RESERVOIRS]
;ID             Head            Pattern
 W-83-25                -16.1                                      ;
 W-17                   -.12                           ;
 W-83-28                -12.51                                     ;
 W-83-26                -13.43                                     ;
 W-20                   -4.28                                      ;
 W-T-2                  15                             ;
 W-T-1                  15                             ;
 W-ADB-1                -3.3                           ;
 W-TH-3                 -.6                            ;
 W-TH-5                 -.6                            ;
 W-TH-9                 -36.5                                      ;
 W-83-7                 -15.67                                     ;
 W-ADB-99-1                         -6.6                           ;
 W-83-3                 -2.2                           ;
 W-83-19                -17.42                                     ;
 W-11                   -24                            ;
```

W-10	-12.33		;
W-ADB-2	-7.87		;
W-ADB-4	-3.5	;	
W-15	8.87		;
W-ADB-8	-1	;	
W-ADB-10	-3	;	
W-ADB-14	-6.42		;
W-9	-2.17		;
W-7	-1.33		;
W-14	0	;	
W-12	4.42		;
W-4	8.5	;	
W-13	11.62		;
W-3	9.281		;
W-2	35.19		;
W-1	63.4		;
W-83-18	-17.42		;

```
[TANKS]
;ID            Elevation    InitLevel    MinLevel    MaxLevel    Diameter    MinVol    VolCurve
 T-WHICHAP                  157          16.5        0     33    71.82       0              ;
 T-TANNUCK                  158          15     0    32    72.93       0                    ;
 T-XAVIER      217          15     0     30    75.32       0                ;
 T-MATOLONG                 156          17.5        0     35    98.62       0              ;
 T-INTEL_HILL               156          17     0    34    70.25       0                    ;
 T-POU         219          20     0     40    65.23       0                ;

[PIPES]
;ID      Node1    Node2        Length     Diameter    Roughness    MinorLoss    Status
 P-1     J-1      J-5          1173.88    6    140        0    Open    ;
 P-2     J-5      J-13         930.50     6    140        0    Open    ;
 P-3     J-13     J-14         1354.24    6    140        0    Open    ;
 P-4     J-14     J-15         502.32     6    140        0    Open    ;
 P-5     J-15     J-19         2121.12    6    140        0    Open    ;
 P-6     J-19     J-16         589.83     6    140        0    Open    ;
 P-8     J-16     J-21         744.36     6    140        0    Open    ;
 P-9     J-21     J-22         250.08     12   140        0    Closed  ;
 P-12        J-25        T-WHICHAP        106.09      6    140        0    Open    ;
 P-15        J-26        J-28        1181.99     8     140     0    Open    ;
 P-17        J-28        J-29        718.84      12    140     0    Open    ;
 P-18        J-29        J-30        1369.89     12    140     0    Open    ;
 P-19        J-30        J-31        1571.08     12    140     0    Open    ;
 P-20        J-31        J-32        1646.74     12    140     0    Open    ;
 P-21        J-20        J-33        312.48      12    140     0    Open    ;
 P-22        J-33        J-34        155.90      12    140     0    Open    ;
 P-23        J-34        J-35        884.59      12    140     0    Open    ;
 P-24        J-35        J-36        576.90      12    140     0    Open    ;
 P-26        J-37        J-38        66.34       12    140     0    Open    ;
 P-27        J-38        J-39        217.60      12    140     0    Open    ;
 P-28        J-39        J-40        56.33       12    140     0    Open    ;
 P-29        J-40        J-41        397.59      12    140     0    Open    ;
 P-30        J-41        J-42        373.96      12    140     0    Open    ;
 P-31        J-42        J-43        489.16      12    140     0    Open    ;
 P-32        J-43        J-44        381.72      12    140     0    Open    ;
 P-33        J-44        J-45        579.67      12    140     0    Open    ;
 P-34        J-45        J-32        236.65      12    140     0    Open    ;
 P-35        J-2         J-5         77.6        2     100     11.4         Open    ;
 P-36        J-3         J-13        74.7        2     100     11   Open    ;
 P-39        J-6         J-7         621.79      12    150     0    Closed  ;
 P-40        J-6         J-8         266.82      12    140     0    Closed  ;
 P-41        J-8         J-9         698.09      12    140     0    Open    ;
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P-42	J-9	J-10	679.21	12	140	0	Open	;
P-46	J-23	J-46	851.97	12	140	0	Open	;
P-48	J-49	J-50	723.75	12	140	0	Open	;
P-54	J-51	J-52	563.68	12	140	0	Open	;
P-56	J-18	J-55	661.81	12	140	0	Open	;
P-57	J-55	J-56	556.84	8	140	0	Open	;
P-58	J-56	J-57	437.74	8	140	0	Open	;
P-62	J-7	J-60	730.90	12	150	0	Open	;
P-64	J-60	J-61	199.25	12	150	0	Open	;
P-65	J-61	J-71	66.53	2	100	11.4	Open	;
P-66	J-61	J-62	516.01	12	150	0	Open	;
P-67	J-62	J-72	142	2	100	11.4	Open	;
P-68	J-62	J-63	238.08	12	150	0	Open	;
P-70	J-63	J-64	525.15	12	150	0	Open	;
P-71	J-64	J-65	567.13	12	150	0	Open	;
P-73	J-65	J-66	617.02	12	150	0	Open	;
P-74	J-66	J-67	227.10	12	150	0	Open	;
P-77	J-67	J-68	807.21	12	150	0	Open	;
P-78	J-68	J-69	1051.60	12	150	0	Open	;
P-79	J-69	J-77	121	2	100	11.4	Open	;
P-80	J-69	J-78	1923.14	12	150	0	Closed	;
P-84	J-81	J-78	67.43	12	140	0	Open	;
P-87	J-78	J-84	47.43	12	140	0	Open	;
P-89	J-84	J-86	68.59	12	140	0	Open	;
P-90	J-86	J-88	402.50	12	140	0	Open	;
P-91	J-88	J-52	695.88	12	140	0	Open	;
P-94	J-89	J-91	847.96	8	140	0	Open	;
P-95	J-91	J-92	135.75	8	140	0	Open	;
P-96	J-92	J-93	570.42	6	140	0	Open	;
P-97	J-93	J-AIRPORT	437.25	6	140	0	Open	;
P-100	J-FIRE_FIGHTING	J-AIRPORT	422.64	8	140	0	Open	;
P-102	J-99	J-98	907.28	8	140	0	Closed	;
P-105	J-101	J-102	1610.36	8	140	0	Open	;
P-107	J-103	J-104	1121.12	8	140	0	Open	;
P-108	J-104	J-105	879.38	8	140	0	Open	;
P-110	J-105	J-108	859.89	8	140	0	Open	;
P-111	J-108	J-107	755.32	8	140	0	Open	;
P-114	J-113	J-112	88.07	8	140	0	Closed	;
P-115	J-112	J-111	89.51	8	140	0	Open	;
P-117	J-113	J-114	229.72	8	140	0	Open	;
P-118	J-114	J-115	248.32	8	140	0	Open	;
P-121	J-116	J-119	2089.96	12	140	0	Open	;
P-122	J-119	J-118	1597.18	12	140	0	Open	;
P-125	J-123	J-124	205.89	12	140	0	Open	;

P-126	J-120	J-121	1020.66	12	140	0	Open	;
P-127	J-121	J-125	679.48	12	140	0	Open	;
P-128	J-125	J-126	2134.73	12	140	0	Open	;
P-133	J-126	J-127	662.33	12	140	0	Open	;
P-134	J-120	J-122	215.02	12	140	0	Open	;
P-135	J-122	J-123	754.73	12	140	0	Open	;
P-138	T-TANNUCK	J-124	204.12	12	140	0	Closed	;
P-141	J-133	J-134	605.54	12	140	0	Open	;
P-142	J-134	J-135	943.76	12	140	0	Open	;
P-144	J-136	J-137	2049.99	12	140	0	Open	;
P-147	J-137	J-139	341.63	12	140	0	Open	;
P-148	J-139	J-141	938.93	12	140	0	Open	;
P-150	J-141	J-143	685.61	12	140	0	Open	;
P-151	J-143	J-144	1152.35	8	150	0	Open	;
P-152	J-144	J-145	1612.54	8	150	0	Open	;
P-153	J-145	J-146	1038.02	8	150	0	Closed	;
P-154	J-146	J-147	562.90	8	150	0	Open	;
P-155	J-147	J-148	517.87	8	150	0	Open	;
P-156	J-148	J-149	528.32	8	150	0	Open	;
P-157	J-149	J-150	653.61	8	150	0	Open	;
P-158	J-150	J-151	774.18	8	150	0	Open	;
P-159	J-151	J-153	1149.22	8	150	0	Open	;
P-160	J-153	J-152	1569.85	8	150	0	Open	;
P-161	J-152	J-154	1092.74	8	150	0	Open	;
P-162	J-154	J-155	442.56	8	140	0	Open	;
P-166	T-XAVIER	J-157	132.05	12	140	0	Closed	;
P-168	J-156	J-155	703.29	12	140	0	Open	;
P-170	J-161	J-160	1816.30	8	140	0	Open	;
P-175	J-165	J-166	436.71	12	140	0	Open	;
P-178	J-167	J-168	280.47	8	140	0	Open	;
P-179	J-168	J-169	115.95	8	140	0	Closed	;
P-180	J-169	J-170	263.58	12	140	0	Open	;
P-186	J-170	J-175	206.98	12	140	0	Open	;
P-187	J-175	J-176	290.03	12	140	0	Closed	;
P-188	J-175	J-177	67	4	100	0	Open	;
P-190	J-178	J-179	182.28	2	100	0	Open	;
P-195	J-79	J-184	155.66	12	140	0	Open	;
P-196	J-184	J-169	740.46	12	140	0	Open	;
P-198	J-191	J-190	66.24	4	100	0	Open	;
P-206	T-INTEL_HILL	J-196	79.14	12	140	0	Open	;
P-209	J-197	J-176	190.87	12	140	0	Open	;
P-210	T-INTEL_HILL	J-195	63.98	12	140	0	CV	;
P-211	J-195	J-198	85.54	8	140	0	Closed	;
P-213	T-MATOLONG	J-165	231.43	12	140	0	Open	;

P-124	POU_SOURCE	T-POU	71.39	8	140	0	Open	;
P-129	T-POU	J-189	206.40	8	140	0	Open	;
P-167	J-156	J-181	791.86	12	140	0	Open	;
P-216	J-181	J-157	158.57	12	140	0	Open	;
P-7	J-204	J-17	715.07	12	140	0	Closed	;
P-11	J-24	J-22	219.87	6	140	0	Open	;
P-13	T-WHICHAP	J-205	112.07	12	140	0	Open	;
P-217	J-205	J-206	299.75	12	140	0	Open	;
P-218	J-206	J-204	949.64	12	140	0	Open	;
P-137	J-BLU_LAG	J-27	549.41	12	140	0	Open	;
P-164	J-127	J-158	270.68	12	140	0	Open	;
P-165	J-158	J-128	281.09	12	140	0	Open	;
P-173	J-158	J-129	447.20	10	140	0	Open	;
P-174	J-129	J-159	829.48	10	140	0	Open	;
P-194	J-159	J-163	481.00	10	140	0	Open	;
P-219	J-178	J-164	159.46	2	100	0	Open	;
P-222	J-179	J-185	152.61	2	100	0	Open	;
P-223	J-167	J-193	107.35	8	140	0	Open	;
P-224	J-193	J-114	453.08	8	140	0	Open	;
P-226	J-190	J-199	218.87	12	140	0	Open	;
P-227	J-199	J-186	32.96	12	140	0	Open	;
P-228	J-186	J-207	84.91	12	140	0	Open	;
P-229	J-189	J-199	1298.42	12	100	0	Closed	;
P-230	J-188	J-187	903.41	2	100	0	Open	;
P-231	J-189	J-188	125.79	8	100	0	Open	;
P-232	J-188	J-210	695.56	4	100	0	Open	;
P-233	J-210	J-209	791.53	4	100	0	Open	;
P-234	J-210	J-211	592.47	2	100	0	Open	;
P-235	J-210	J-212	702.47	2	100	0	Open	;
P-238	J-214	J-HOSPITAL	92.26	4	100	0	Open	;
P-239	J-191	J-213	805.79	2	100	0	Open	;
P-240	J-216	J-217	615.66	6	100	0	Open	;
P-241	J-217	J-219	375.62	6	100	0	Open	;
P-242	J-166	J-216	317.54	12	100	0	Open	;
P-243	J-216	J-115	144.28	12	100	0	Closed	;
P-16	J-100	J-96	1181.46	12	140	0	Open	;
P-37	J-96	J-75	937.17	12	140	0	Open	;
P-55	J-75	J-73	1325.04	12	140	0	Open	;
P-63	J-73	J-70	466.56	12	140	0	Open	;
P-69	J-70	J-54	2114.83	12	140	0	Open	;
P-75	J-54	J-4	622.51	12	140	0	Open	;
P-88	J-4	J-204	69.60	12	140	0	Open	;
P-10	J-17	J-NIEWE_ELEM	3407.46	12	140	0	Open	;
P-99	J-NIEWE_ELEM	J-20	1141.71	12	140	0	Open	;

P-103	J-20	J-SDA_SCHOOL	252.13	12	140	0	Open	;
P-130	J-SDA_SCHOOL	J-26	640.41	12	140	0	Open	;
P-131	J-26	J-BLUE_LAG_LAUN	129.07	12	140	0	Open	;
P-132	J-BLUE_LAG_LAUN	J-BLU_LAG	190.71	12	140	0	Open	;
P-136	J-37	J-NIEWE_LAUNDRY	28.46	12	140	0	Open	;
P-139	J-NIEWE_LAUNDRY	J-36	61.08	12	140	0	Open	;
P-146	J-32	J-MIZPAH_HS	1381.11	12	140	0	Open	;
P-149	J-MIZPAH_HS	J-6	738.92	12	140	0	Open	;
P-25	J-87	J-ISLAND_HOTEL	109.95	12	140	0	Open	;
P-38	J-ISLAND_HOTEL	J-10	231.05	12	140	0	Open	;
P-43	J-11	J-MWAN_ELEMENTRY	542.78	12	140	0	Open	;
P-44	J-MWAN_ELEMENTRY	J-12	45.67	12	140	0	Open	;
P-45	J-12	J-TRUK_STOP	66.48	12	140	0	Open	;
P-182	J-46	J-SARAMEN_CHUUK_HS	327.69	12	140	0	Open	;
P-192	J-48	J-SUSMU_ENT	359.14	12	140	0	Open	;
P-197	J-SUSMU_ENT	J-49	62.36	12	140	0	Open	;
P-199	J-TRUK_STOP	J-TRUK_DEVEL	108.18	12	140	0	Open	;
P-200	J-TRUK_DEVEL	J-AWM	415.31	12	140	0	Open	;
P-201	J-AWM	J-23	70.88	12	140	0	Open	;
P-202	J-47	J-ICE_PLANT	68.69	12	140	0	Open	;
P-212	J-ICE_PLANT	J-LAUNDRAMAT2	308.99	12	140	0	Open	;
P-220	J-LAUNDRAMAT2	J-48	72.85	12	140	0	Open	;
P-244	J-50	J-BEREA_CHRIS_SCHOOL	95.37	12	140	0	Open	;
P-245	J-BEREA_CHRIS_SCHOOL	J-COM	52.72	12	140	0	Open	;
P-246	J-COM	J-18	436.20	12	140	0	Open	;
P-247	J-18	J-LAUNDRAMAT_3	219.06	12	140	0	Open	;
P-248	J-LAUNDRAMAT_3	J-53	215.70	12	140	0	Open	;
P-249	J-53	J-AS_MART	466.55	12	140	0	Open	;
P-250	J-AS_MART	J-51	59.44	12	140	0	Open	;
P-252	J-POWER-plant	J-58	694.76	12	140	0	Open	;
P-253	J-58	J-PENTECOST_SCHOOL	60.03	12	140	0	Open	;
P-254	J-PENTECOST_SCHOOL	J-57	104.28	12	140	0	Open	;
P-255	J-57	J-LEGISLATURE	260.13	12	140	0	Open	;
P-256	J-LEGISLATURE	J-IRAS_DEMO_SCHOOL	452.71	12	140	0	Open	;
P-257	J-IRAS_DEMO_SCHOOL	J-89	79.79	12	140	0	Open	;
P-258	J-91	J-RS_PLAZA	115.38	8	140	0	Open	;
P-259	J-RS_PLAZA	J-142	680.32	8	140	0	Open	;
P-260	J-142	J-99	964.73	8	140	0	Open	;
P-261	J-95	J-HIGH_TIDE_HOTEL	341.87	8	140	0	Open	;
P-262	J-HIGH_TIDE_HOTEL	J-93	242.82	8	140	0	Open	;
P-263	J-98	J-PACIFIC_GARD_APT	825.02	8	140	0	Open	;
P-264	J-PACIFIC_GARD_APT	J-KURASSA	478.70	8	140	0	Open	;
P-265	J-KURASSA	J-101	456.32	8	140	0	Open	;
P-266	J-102	J-208	696.85	8	140	0	Open	;

P-267	J-208	J-MECHITIW_ELM_SCHOOL	728.66	8	140	0	Open	;
P-269	J-109	J-ISAUSO_KOWENA	139.27	8	140	0	Open	;
P-270	J-ISAUSO_KOWENA	J-LAUNDRAMAT_5	53.02	8	140	0	Open	;
P-271	J-LAUNDRAMAT_5	J-112	372.63	8	140	0	Open	;
P-272	J-107	J-MINI_MORI_AISEK	764.18	8	140	0	Open	;
P-273	J-MINI_MORI_AISEK	J-109	73.55	8	140	0	Open	;
P-274	J-115	J-LAUDRAMAT_6	324.86	12	140	0	Open	;
P-275	J-LAUDRAMAT_6	J-116	871.89	12	140	0	Open	;
P-276	J-118	J-BOTTLED_WATER_FACTORY	123.73	12	140	0	Open	;
P-277	J-BOTTLED_WATER_FACTORY	J-222	59.59	12	140	0	Open	;
P-278	J-222	J-ST_CECELIA_SCHOOL	121.28	12	140	0	Open	;
P-279	J-ST_CECELIA_SCHOOL	J-120	1733.46	12	140	0	Open	;
P-280	J-128	J-133	355.23	12	140	0	Open	;
P-281	J-135	J-PENIA_ELEMENTARY_SCHOOL	715.61	12	140	0	Open	;
P-282	J-PENIA_ELEMENTARY_SCHOOL	J-136	418.30	12	140	0	Open	;
P-283	J-154	J-160	2277.26	8	140	0	Open	;
P-284	J-161	J-162	1158.58	8	140	0	Open	;
P-286	J-185	J-197	179.23	12	140	0	Open	;
P-287	J-170	J-CHUUK_HIGH_SCHOOL	378.09	12	140	0	Closed	;
P-288	J-CHUUK_HIGH_SCHOOL	J-111	148.98	12	140	0	Open	;
P-289	J-185	J-WENO_JUNIOR_HIGH	34.80	12	140	0	Open	;
P-290	J-WENO_JUNIOR_HIGH	J-198	271.81	12	140	0	Open	;
P-291	J-169	J-LAUNDRAMAT_7	58.09	12	140	0	Open	;
P-292	J-LAUNDRAMAT_7	J-214	199.70	12	140	0	Open	;
P-14	J-11	J-VICTORIA_APT	564.32	12	140	0	Open	;
P-47	J-VICTORIA_APT	J-87	162.41	12	140	0	Open	;
P-49	J-SARAMEN_CHUUK_HS	J-TRUK_TRADING_COMPANY	135.64	12	140	0	Open	;
P-50	J-TRUK_TRADING_COMPANY	J-47	160.26	12	140	0	Open	;
P-51	J-143	J-SAPUK_ELEM__SCHOOL	1013.04	12	140	0	Open	;
P-52	J-SAPUK_ELEM__SCHOOL	J-155	365.37	12	140	0	Closed	;
P-53	J-79	J-97	20	4	100	0	Open	;
P-60	J-81	J-130	54.65	4	100	0	Open	;
P-81	J-130	J-82	42	2	100	11.4	Open	;
P-85	J-WELL_HEAD_83-19	J-83	66.5	2	100	0	Open	;
P-98	J-140	J-84	16	4	100	0	Open	;
P-101	J-59	J-WELL_HEAD_ADB-1	51.5	2	100	11.4	Open	;
P-106	J-90	J-WELL_HEAD_ADB-2	46.5	2	100	0	Open	;
P-116	J-106	J-WELL_HEAD_ADB-4	86.5	2	100	0	Open	;
P-86	J-221	J-109	14	4	100	0	Open	;
P-109	J-WELL_HEAD_ADB-8	J-117	71.5	2	100	0	Open	;
P-113	J-132	J-WELL_HEAD_ADB-10	86.5	2	100	0	Open	;
P-123	J-138	J-WELL_HEAD_ADB-14	31.5	2	100	0	Open	;
P-145	J-228	J-167	130	4	100	0	Open	;
P-169	J-171	J-WELL_HEAD_9	119.5	2	100	11	Open	;

P-171	J-WELL_HEAD_9	J-193	60	4	100	0	Open	;
P-177	J-231	J-186	54	4	100	0	Open	;
P-143	J-POWER-plant	J-KAMINAGA_APTS	45.58	12	140	0	Open	;
P-181	J-KAMINAGA_APTS	J-52	148.35	12	140	0	Open	;
P-183	J-190	J-NANTAKU_APT	131.99	12	140	0	Open	;
P-189	J-NANTAKU_APT	J-214	46.01	12	140	0	Open	;
P-221	J-JESSE_MORI_APT	J-HIS_N_HERS_APT	65.87	8	140	0	Open	;
P-225	J-HIS_N_HERS_APT	J-MECHITIW_ELM_SCHOOL	52.72	8	140	0	Open	;
P-236	J-103	J-JOE_SUKA_APT	23.95	8	140	0	Open	;
P-237	J-JOE_SUKA_APT	J-JESSE_MORI_APT	16.39	8	140	0	Open	;
P-251	J-81	J-227	53.77	12	140	0	Open	;
P-268	J-227	J-79	46.90	12	140	0	Open	;
P-293	J-WELL_HEAD_83-18	J-94	74.5	2	100	0	Open	;
P-83	J-194	J-WELL_HEAD_83-25	41.5	2	100	0	Open	;
P-184	J-36	J-WELL_HEAD_83-25	63	2	100	11	Open	;
P-204	J-200	J-WELL_HEAD_17	64.5	2	100	0	Open	;
P-207	J-WELL_HEAD_17	J-38	43	2	100	11	Open	;
P-294	J-192	J-WELL_HEAD_1	121.5	2	100	0	Open	;
P-295	J-WELL_HEAD_1	J-231	13	2	100	11	Open	;
P-296	J-230	J-WELL_HEAD_2	116.5	2	100	0	Open	;
P-297	J-WELL_HEAD_2	J-236	13	2	100	11	Open	;
P-298	J-236	J-191	25	4	100	0	Open	;
P-172	J-182	J-WELL_HEAD_3	23.75	2	100	0	Open	;
P-176	J-WELL_HEAD_3	J-179	41.96	2	100	11	Open	;
P-191	J-180	J-WELL_HEAD_4	116.5	2	100	0	Open	;
P-193	J-WELL_HEAD_4	J-177	13	2	100	11	Open	;
P-163	J-172	J-WELL_HEAD_7	97.5	2	100	0	Open	;
P-299	J-WELL_HEAD_7	J-228	13	2	100	11	Open	;
P-300	J-80	J-WELL_HEAD_10	71.5	2	100	0	Open	;
P-301	J-WELL_HEAD_10	J-97	33	2	100	11	Open	;
P-302	J-110	J-WELL_HEAD_15	68.5	2	100	0	Open	;
P-303	J-WELL_HEAD_15	J-221	128	2	100	11	Open	;
P-59	J-183	J-WELL_HEAD_13	78.5	2	100	0	Open	;
P-61	J-WELL_HEAD_13	J-164	61.25	2	100	11	Open	;
P-205	J-201	J-WELL_HEAD_83-28	56.5	2	100	0	Open	;
P-208	J-WELL_HEAD_83-28	J-39	73	2	100	11	Open	;
P-214	J-202	J-WELL_HEAD_83-26	64.5	2	100	0	Open	;
P-304	J-WELL_HEAD_83-26	J-40	73	2	100	11	Open	;
P-305	J-203	J-WELL_HEAD_20	116.5	2	100	0	Open	;
P-306	J-WELL_HEAD_20	J-44	138	2	100	11	Open	;
P-119	J-WELL_HEAD_ADB-4	J-220	13	2	100	11	Open	;
P-215	J-220	J-105	40	4	100	0	Open	;
P-307	J-174	J-WELL_HEAD_12	66.5	2	100	0	Open	;
P-308	J-WELL_HEAD_12	J-111	38	2	100	11	Open	;

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P-93	J-85	J-WELL_HEAD_11	96.5	2	100	0	Open	;
P-185	J-WELL_HEAD_11	J-140	72	2	100	11	Open	;
P-309	J-WELL_HEAD_83-19	J-232	20	2	100	11	Open	;
P-310	J-232	J-78	8	4	100	0	Open	;
P-311	J-WELL_HEAD_83-18	J-233	28	2	100	11	Open	;
P-312	J-233	J-227	10	4	100	0	Open	;
P-313	J-WELL_HEAD_ADB-1	J-234	16	2	100	11	Open	;
P-314	J-234	J-58	12	4	100	0	Open	;
P-315	J-WELL_HEAD_ADB-2	J-235	16	2	100	11	Open	;
P-316	J-235	J-89	12	4	100	0	Open	;
P-82	J-173	J-WELL_HEAD_14	31.5	2	100	0	Open	;
P-104	J-WELL_HEAD_14	J-113	144	2	100	11	Open	;
P-112	J-WELL_HEAD_ADB-14	J-131	14	2	100	11	Open	;
P-140	J-131	J-137	24	4	100	0	Open	;
P-203	J-215	J-WELL_HEAD_ADB-10	15	2	100	11	Open	;
P-285	J-215	J-159	8	4	100	0	Open	;
P-317	J-WELL_HEAD_ADB-8	J-218	13	2	100	11	Open	;
P-318	J-218	J-116	40	4	100	0	Open	;
P-319	J-74	J-WELL_HEAD_TH-9	76.5	2	100	0	Open	;
P-320	J-WELL_HEAD_TH-9	J-65	78	2	100	11	Open	;
P-321	J-76	J-WELL_HEAD_83-7	56.5	2	100	0	Open	;
P-322	J-WELL_HEAD_83-7	J-67	63	2	100	11	Open	;

[PUMPS]
;ID	Node1	Node2	Parameters
PMP-T-2_OFF_LINE	W-T-2	J-2	HEAD GRUN_60S30-5	;GRUNDFOS 60S3-5
PMP-T-1_OFF_LINE	W-T-1	J-3	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-ADB-1	W-ADB-1	J-59	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-TH-3_OFF_LINE	W-TH-3	J-71	HEAD GRUN_60S75-13	;GRUNDFOUS 60S75-13
PMP-TH-5_OFF_LINE	W-TH-5	J-72	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-TH-9	W-TH-9	J-74	HEAD GRUN_60S50-9	;GRUNDFOUS 60S50-9
PMP-83-7	W-83-7	J-76	HEAD GRUN_60S50-9	;GRUNDFOUD 60S50-9
PMP-ADB-99-1_OFF_LINE	W-ADB-99-1	J-77	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-10	W-10	J-80	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-83-3	W-83-3	J-82	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-83-19	W-83-19	J-83	HEAD GRUN_60S75-13	;GRUNDFOUS 60S30-575-13
PMP-11	W-11	J-85	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-ADB-2	W-ADB-2	J-90	HEAD GRUN_60S50-9	;GRUNDFOUS 60S50-9
PMP-ADB-4	W-ADB-4	J-106	HEAD GRUN_60S30-5	;GROUNDFOUS 60S30-5
PMP-15	W-15	J-110	HEAD GRUN_60S50-9	;GRUNDFOUS 60S50-9
PMP-ADB-8	W-ADB-8	J-117	HEAD GRUN_60S20-4	;GRUNDFOUS 60S20-4
PMP-ADB-10	W-ADB-10	J-132	HEAD GRUN_60S30-5	;GRUNDFOUS 60S30-5
PMP-ADB-14	W-ADB-14	J-138	HEAD GRUN_60S20-4	;GRUNDFOUS 60S20-4
PMP-9	W-9	J-171	HEAD GRUN_60S20-4	;GRUNDDFOUS 60S20-4
```

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 PMP-7          W-7          J-172         HEAD GRUN_60S75-13  ;GRUNDFOUS 60S75-13
 PMP-14         W-14         J-173         HEAD GRUN_60S30-5   ;GRUNDFOUS 60S30-5
 PMP-12         W-12         J-174         HEAD GRUN_60S50-9   ;GRUNDFOUS 60S50-9
 PMP-4          W-4          J-180         HEAD GRUN_60S50-9   ;GRUNDFOUS 60S50-9
 PMP-3          W-3          J-182         HEAD GRUN_60S50-9   ;GRUNDFOUS 60S50-9
 PMP-13         W-13         J-183         HEAD GRUN_60S50-9   ;GRUNDFOUS 60S50-9
 PMP-83-25      W-83-25      J-194         HEAD GRUN_60S50-9   ;GRUNDDFOUS 60S50-9
 PMP-17         W-17         J-200         HEAD GRUN_60S30-5   ;GRUNDFOUS 60S30-5
 PMP-83-28      W-83-28      J-201         HEAD GRUN_60S30-5   ;GRUNDFOUS 60S30-5
 PMP-83-26      W-83-26      J-202         HEAD GRUN_60S20-4   ;GRUNDFOUS 60S20-4
 PMP-20         W-20         J-203         HEAD GRUN_60S20-4   ;GRUNDFOUS60S20-4
 PMP-1          W-1          J-192         HEAD GRUN_60S50-9   ;GRUNDFOUS 60S50-9
 PMP-2          W-2          J-230         HEAD GRUN_60S75-13  ;GRUNDFOUS 60S75-13
 PMP-83-18      W-83-18      J-94          HEAD GRUN_60S30-5   ;GRUNDFOUS 60S30-5

[VALVES]
;ID          Node1        Node2          Diameter       Type    Setting         MinorLoss
 PSV_WICHAP               J-24           J-25           12      PSV     0       0       ;
 INTELL_HILL-PSV          J-195          J-196          12      PSV     0       0       ;
```

[TAGS]

NODE	J-17	RES_5
NODE	J-20	RES_5
NODE	J-26	RES_5
NODE	J-27	RES_5
NODE	J-28	RES_5
NODE	J-29	RES_5
NODE	J-30	RES_5
NODE	J-32	RES_5
NODE	J-33	RES_5
NODE	J-34	RES_5
NODE	J-35	RES_5
NODE	J-36	RES_5
NODE	J-37	RES_5
NODE	J-38	RES_5
NODE	J-39	RES_5
NODE	J-40	RES_5
NODE	J-41	RES_5
NODE	J-42	RES_5
NODE	J-43	RES_5
NODE	J-44	RES_5
NODE	J-45	RES_5
NODE	J-6	RES_5
NODE	J-7	RES_4
NODE	J-8	RES_2
NODE	J-9	RES_2
NODE	J-10	RES_2
NODE	J-11	RES_2
NODE	J-12	RES_2
NODE	J-18	RES_2
NODE	J-23	RES_2
NODE	J-46	RES_2
NODE	J-47	RES_2
NODE	J-48	RES_2
NODE	J-49	RES_2
NODE	J-50	RES_2
NODE	J-51	RES_2
NODE	J-52	RES_2
NODE	J-53	RES_2
NODE	J-55	RES_2
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NODE	J-57	RES_2
NODE	J-58	RES_2
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NODE	J-69	RES_4
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NODE	J-79	RES_2

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NODE	J-168	RES_3
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NODE	J-178	RES_8

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NODE	J-158	RES_3
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NODE	J-163	RES_3
NODE	J-164	RES_8
NODE	J-185	RES_8
NODE	J-193	RES_3
NODE	J-199	RES_2
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NODE	J-142	RES_2
NODE	J-208	RES_1
NODE	J-222	RES_3
NODE	J-227	RES_2
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LINK	P-64	PVC
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LINK	P-67	STEEL
LINK	P-68	PVC
LINK	P-70	PVC
LINK	P-71	PVC
LINK	P-73	PVC
LINK	P-74	PVC
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LINK	P-150	ACP
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LINK	P-116	STEEL
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LINK	P-113	STEEL
LINK	P-123	STEEL

LINK	P-145	STEEL
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LINK	P-311	STEEL
LINK	P-312	STEEL
LINK	P-313	STEEL
LINK	P-314	STEEL
LINK	P-315	STEEL
LINK	P-316	STEEL

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 LINK        P-82            STEEL
 LINK        P-104           STEEL
 LINK        P-112           STEEL
 LINK        P-140           STEEL
 LINK        P-203           STEEL
 LINK        P-285           STEEL
 LINK        P-317           STEEL
 LINK        P-318           STEEL
 LINK        P-319           STEEL
 LINK        P-320           STEEL
 LINK        P-321           STEEL
 LINK        P-322           STEEL

[DEMANDS]
;Junction          Demand          Pattern          Category

[STATUS]
;ID          Status/Setting
 PMP-T-2_OFF_LINE       Closed
 PMP-T-1_OFF_LINE       Closed
 PMP-TH-3_OFF_LINE      Closed
 PMP-TH-5_OFF_LINE      Closed
 PMP-83-3        Closed

[PATTERNS]
;ID          Multipliers
;HOUSEHOLD DAILY DEMAND
 HOUSE_DAILY         .33      .330             .412             .412             1.287
             1.287
 HOUSE_DAILY         1.452            1.452            1.488            1.488            .975
             .957
 HOUSE_DAILY         .957             .975             1.488            1.488            1.237
             1.237
 HOUSE_DAILY         1.237            1.237            .825             .825             .330
             .330
;

;ALL VALUES=1
 CONST_1        1        1        1        1        1        1
 CONST_1        1        1        1        1        1        1
 CONST_1        1        1        1        1        1        1
 CONST_1        1        1        1        1        1

[CURVES]
;ID          X-Value        Y-Value
;PUMP: GRUNDFOS 60S50-9
 GRUN_60S50-9            0        290
 GRUN_60S50-9            40       252
 GRUN_60S50-9            75       150
;PUMP: GUNDFOS 60S30-5
 GRUN_60S30-5            0        165
 GRUN_60S30-5            40       140
 GRUN_60S30-5            75       85
;PUMP: GRUNDFOUS 60S75-13
 GRUN_60S75-13           0        418
 GRUN_60S75-13           40       365
```

```
 GRUN_60S75-13        75      219
;PUMP: GRUNFOUS 60S20-4
 GRUN_60S20-4         0       130
 GRUN_60S20-4         40      112
 GRUN_60S20-4         75      65
;PUMP: CONSTANT 120 GPM TO SYTEM
 POU           120            1000
 POU           120.001        0

[CONTROLS]

[RULES]

[ENERGY]
 Global Efficiency    75
 Global Price  0
 Demand Charge        0

[EMITTERS]
;Junction      Coefficient

[QUALITY]
;Node          InitQual
 J-17          5
 J-20          5
 J-26          5
 J-27          5
 J-28          5
 J-29          5
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 J-35          5
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 J-42          5
 J-43          5
 J-44          5
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 J-12          2
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 J-23          2
 J-46          2
 J-47          2
 J-48          2
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J-49	2
J-50	2
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J-64	4
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J-81	2
J-84	2
J-86	2
J-88	2
J-89	2
J-91	2
J-92	2
J-93	2
J-AIRPORT	2.1
J-95	2
J-FIRE_FIGHTING	2.1
J-98	1
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J-190	2	
J-197	8	
J-198	8	
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J-207	2	
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J-211	6	
J-212	6	
J-214	2	
J-HOSPITAL		2.1
J-216	7	
J-217	7	
J-219	7	
J-NIEWE_ELEM		5.1
J-SDA_SCHOOL		5.1
J-BLUE_LAG_LAUN		5.1
J-NIEWE_LAUNDRY		5.1
J-MIZPAH_HS		5.1
J-ISLAND_HOTEL		2.1

J-87	2
J-MWAN_ELEMENTRY	2.1
J-TRUK_STOP	2.1
J-TRUK_DEVEL	2.1
J-AWM	2.1
J-SARAMEN_CHUUK_HS	2.1
J-ICE_PLANT	2.1
J-LAUNDRAMAT2	2.1
J-SUSMU_ENT	2.1
J-BEREA_CHRIS_SCHOOL	2.1
J-COM	2.1
J-LAUNDRAMAT_3	2.1
J-AS_MART	2.1
J-POWER-plant	2.1
J-PENTECOST_SCHOOL	2.1
J-LEGISLATURE	2.1
J-IRAS_DEMO_SCHOOL	2.1
J-HIGH_TIDE_HOTEL	2.1
J-RS_PLAZA	2.1
J-142	2
J-PACIFIC_GARD_APT	1.1
J-KURASSA	1.1
J-MECHITIW_ELM_SCHOOL	1.1
J-208	1
J-MINI_MORI_AISEK	1.1
J-ISAUSO_KOWENA	1.1
J-LAUNDRAMAT_5	1.1
J-LAUDRAMAT_6	3.1
J-BOTTLED_WATER_FACTORY	3.1
J-ST_CECELIA_SCHOOL	3.1
J-222	3
J-PENIA_ELEMENTARY_SCHOOL	3.1
J-CHUUK_HIGH_SCHOOL	1.1
J-WENO_JUNIOR_HIGH	8.1
J-LAUNDRAMAT_7	2.1
J-VICTORIA_APT	2.1
J-TRUK_TRADING_COMPANY	2.1
J-SAPUK_ELEM__SCHOOL	3.1
J-WELL_HEAD_ADB-4	1.3
J-KAMINAGA_APTS	2.1
J-NANTAKU_APT	2.1
J-HIS_N_HERS_APT	1.1
J-JESSE_MORI_APT	1.1
J-JOE_SUKA_APT	1.1
J-227	2
J-WELL_HEAD_15	1.3
J-WELL_HEAD_12	1.3
W-83-25	5.2
W-17	5.2
W-83-28	5.2
W-83-26	5.2
W-20	5.2
W-ADB-1	2.2
W-TH-3	4.2
W-TH-5	4.2
W-TH-9	4.2

```
 W-83-7          4.2
 W-ADB-99-1              4.2
 W-83-3          2.2
 W-83-19         2.2
 W-11            2.2
 W-10            2.2
 W-ADB-2         2.2
 W-ADB-4         1.2
 W-15            1.2
 W-ADB-8         3.2
 W-ADB-10        3.2
 W-ADB-14        3.2
 W-9             3.2
 W-7             3.2
 W-14            3.2
 W-12            1.2
 W-4             2.2
 W-13            8.2
 W-3             8.2
 W-2             2.2
 W-1             2.2
 W-83-18         2.2

[SOURCES]
;Node           Type            Quality         Pattern

[REACTIONS]
;Type      Pipe/Tank            Coefficient
 Bulk      P-15        5
 Bulk      P-17        5
 Bulk      P-18        5
 Bulk      P-19        5
 Bulk      P-20        5
 Bulk      P-21        5
 Bulk      P-22        5
 Bulk      P-23        5
 Bulk      P-24        5
 Bulk      P-26        5
 Bulk      P-27        5
 Bulk      P-28        5
 Bulk      P-29        5
 Bulk      P-30        5
 Bulk      P-31        5
 Bulk      P-32        5
 Bulk      P-33        5
 Bulk      P-34        5
 Bulk      P-39        4
 Bulk      P-40        2
 Bulk      P-41        2
 Bulk      P-42        2
 Bulk      P-46        2
 Bulk      P-48        2
 Bulk      P-54        2
 Bulk      P-56        2
 Bulk      P-57        2
 Bulk      P-58        2
```

Bulk	P-62	4
Bulk	P-64	4
Bulk	P-65	4
Bulk	P-66	4
Bulk	P-67	4
Bulk	P-68	4
Bulk	P-70	4
Bulk	P-71	4
Bulk	P-73	4
Bulk	P-74	4
Bulk	P-77	4
Bulk	P-78	4
Bulk	P-79	4
Bulk	P-80	4
Bulk	P-84	2
Bulk	P-87	2
Bulk	P-89	2
Bulk	P-90	2
Bulk	P-91	2
Bulk	P-94	2
Bulk	P-95	2
Bulk	P-96	2
Bulk	P-97	2
Bulk	P-100	2
Bulk	P-102	1
Bulk	P-105	1
Bulk	P-107	1
Bulk	P-108	1
Bulk	P-110	1
Bulk	P-111	1
Bulk	P-114	3
Bulk	P-115	1
Bulk	P-117	3
Bulk	P-118	3
Bulk	P-121	3
Bulk	P-122	3
Bulk	P-125	3
Bulk	P-126	3
Bulk	P-127	3
Bulk	P-128	3
Bulk	P-133	3
Bulk	P-134	3
Bulk	P-135	3
Bulk	P-138	3
Bulk	P-141	3
Bulk	P-142	3
Bulk	P-144	3
Bulk	P-147	3
Bulk	P-148	3
Bulk	P-150	3
Bulk	P-151	3
Bulk	P-152	3
Bulk	P-175	7
Bulk	P-178	3
Bulk	P-179	3
Bulk	P-180	2

Bulk	P-186	2
Bulk	P-187	8
Bulk	P-188	2
Bulk	P-190	8
Bulk	P-195	2
Bulk	P-196	2
Bulk	P-198	2
Bulk	P-206	8
Bulk	P-209	8
Bulk	P-210	8
Bulk	P-211	8
Bulk	P-213	7
Bulk	P-124	6
Bulk	P-129	6
Bulk	P-137	5
Bulk	P-164	3
Bulk	P-165	3
Bulk	P-173	3
Bulk	P-174	3
Bulk	P-194	3
Bulk	P-219	8
Bulk	P-222	8
Bulk	P-223	3
Bulk	P-224	3
Bulk	P-226	2
Bulk	P-227	2
Bulk	P-228	2
Bulk	P-229	6
Bulk	P-230	6
Bulk	P-231	6
Bulk	P-232	6
Bulk	P-233	6
Bulk	P-234	6
Bulk	P-235	6
Bulk	P-238	2
Bulk	P-239	2
Bulk	P-240	7
Bulk	P-241	7
Bulk	P-242	7
Bulk	P-243	7
Bulk	P-10	5
Bulk	P-99	5
Bulk	P-103	5
Bulk	P-130	5
Bulk	P-131	5
Bulk	P-132	5
Bulk	P-136	5
Bulk	P-139	5
Bulk	P-146	5
Bulk	P-149	5
Bulk	P-25	2
Bulk	P-38	2
Bulk	P-43	2
Bulk	P-44	2
Bulk	P-45	2
Bulk	P-182	2

Bulk	P-192	2
Bulk	P-197	2
Bulk	P-199	2
Bulk	P-200	2
Bulk	P-201	2
Bulk	P-202	2
Bulk	P-212	2
Bulk	P-220	2
Bulk	P-244	2
Bulk	P-245	2
Bulk	P-246	2
Bulk	P-247	2
Bulk	P-248	2
Bulk	P-249	2
Bulk	P-250	2
Bulk	P-252	2
Bulk	P-253	2
Bulk	P-254	2
Bulk	P-255	2
Bulk	P-256	2
Bulk	P-257	2
Bulk	P-258	2
Bulk	P-259	2
Bulk	P-260	2
Bulk	P-261	2
Bulk	P-262	2
Bulk	P-263	1
Bulk	P-264	1
Bulk	P-265	1
Bulk	P-266	1
Bulk	P-267	1
Bulk	P-269	1
Bulk	P-270	1
Bulk	P-271	1
Bulk	P-272	1
Bulk	P-273	1
Bulk	P-274	3
Bulk	P-275	3
Bulk	P-276	3
Bulk	P-277	3
Bulk	P-278	3
Bulk	P-279	3
Bulk	P-280	3
Bulk	P-281	3
Bulk	P-282	3
Bulk	P-286	8
Bulk	P-287	1
Bulk	P-288	1
Bulk	P-289	8
Bulk	P-290	8
Bulk	P-291	2
Bulk	P-292	2
Bulk	P-14	2
Bulk	P-47	2
Bulk	P-49	2
Bulk	P-50	2

Bulk	P-51	3
Bulk	P-53	2
Bulk	P-60	2
Bulk	P-81	2
Bulk	P-85	2
Bulk	P-98	2
Bulk	P-101	2
Bulk	P-106	2
Bulk	P-116	1
Bulk	P-86	1
Bulk	P-109	3
Bulk	P-113	3
Bulk	P-123	3
Bulk	P-145	3
Bulk	P-169	3
Bulk	P-171	3
Bulk	P-177	2
Bulk	P-143	2
Bulk	P-181	2
Bulk	P-183	2
Bulk	P-189	2
Bulk	P-221	1
Bulk	P-225	1
Bulk	P-236	1
Bulk	P-237	1
Bulk	P-251	2
Bulk	P-268	2
Bulk	P-293	2
Bulk	P-83	5
Bulk	P-184	5
Bulk	P-204	5
Bulk	P-207	5
Bulk	P-294	2
Bulk	P-295	2
Bulk	P-296	2
Bulk	P-297	2
Bulk	P-298	2
Bulk	P-172	8
Bulk	P-176	8
Bulk	P-191	2
Bulk	P-193	2
Bulk	P-163	3
Bulk	P-299	3
Bulk	P-300	2
Bulk	P-301	2
Bulk	P-302	1
Bulk	P-303	1
Bulk	P-59	8
Bulk	P-61	8
Bulk	P-205	5
Bulk	P-208	5
Bulk	P-214	5
Bulk	P-304	5
Bulk	P-305	5
Bulk	P-306	5
Bulk	P-119	1

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 Bulk           P-215           1
 Bulk           P-307           1
 Bulk           P-308           1
 Bulk           P-93            2
 Bulk           P-185           2
 Bulk           P-309           2
 Bulk           P-310           2
 Bulk           P-311           2
 Bulk           P-312           2
 Bulk           P-313           2
 Bulk           P-314           2
 Bulk           P-315           2
 Bulk           P-316           2
 Bulk           P-82            3
 Bulk           P-104           3
 Bulk           P-112           3
 Bulk           P-140           3
 Bulk           P-203           3
 Bulk           P-285           3
 Bulk           P-317           3
 Bulk           P-318           3
 Bulk           P-319           4
 Bulk           P-320           4
 Bulk           P-321           4
 Bulk           P-322           4


[REACTIONS]
 Order Bulk                     1
 Order Tank                     1
 Order Wall                     1
 Global Bulk                    0
 Global Wall                    0
 Limiting Potential             0
 Roughness Correlation          0

[MIXING]
;Tank                  Model

[TIMES]
 Duration              0
 Hydraulic Timestep             1:00
 Quality Timestep               0:05
 Pattern Timestep               1:00
 Pattern Start         0:00
 Report Timestep                1:00
 Report Start          0:00
 Start ClockTime                12 am
 Statistic             None

[REPORT]
 Status                No
 Summary               No
 Page                  0

[OPTIONS]
```

Units	GPM
Headloss	H-W
Specific Gravity	1
Viscosity	1
Trials	500
Accuracy	0.0001
CHECKFREQ	2
MAXCHECK	10
DAMPLIMIT	0
Unbalanced	Continue 10
Pattern	CONST_1
Demand Multiplier	1.6666667
Emitter Exponent	0.5
Quality	None mg/L
Diffusivity	1
Tolerance	0.01

[COORDINATES]

;Node	X-Coord	Y-Coord
J-1	1228623.25	2696974.25
J-5	1227643.01	2696337.67
J-13	1226984.69	2695747.50
J-14	1226269.81	2694717.96
J-15	1226318.36	2694226.45
J-16	1227317.00	2692542.61
J-17	1226612.08	2692276.82
J-19	1227729.18	2692810.33
J-20	1223052.76	2690004.10
J-21	1226702.60	2692837.30
J-22	1226496.51	2692977.90
J-24	1226276.95	2692966.34
J-25	1226190.27	2692956.71
J-26	1222391.17	2689447.31
J-27	1221660.40	2688981.86
J-28	1221588.51	2689365.48
J-29	1221259.70	2689989.73
J-30	1220612.56	2691164.55
J-31	1221254.72	2692583.28
J-32	1221329.39	2694201.14
J-33	1222949.72	2690299.10
J-34	1222809.73	2690367.71
J-35	1222401.74	2691150.87
J-36	1222330.96	2691723.10
J-37	1222316.26	2691811.32
J-38	1222305.03	2691878.74
J-39	1222229.67	2692080.87
J-40	1222201.90	2692129.88
J-41	1222000.96	2692472.96
J-42	1221866.99	2692820.94
J-43	1221804.91	2693306.14
J-44	1221837.59	2693685.16
J-45	1221558.38	2694141.40
J-2	1227619.81	2696379.73
J-3	1226968.74	2695792.45
J-6	1220429.18	2696109.54
J-7	1221031.52	2696263.86

J-8	1220269.89	2696323.60
J-9	1219887.52	2696902.45
J-10	1219941.82	2697577.95
J-11	1219992.43	2698640.81
J-12	1220250.02	2699165.28
J-18	1221291.74	2703169.48
J-23	1220617.31	2699705.04
J-46	1221075.63	2700422.06
J-47	1221062.85	2701044.86
J-48	1221181.02	2701477.62
J-49	1221335.93	2701862.48
J-50	1221313.57	2702585.88
J-51	1222244.57	2703270.96
J-52	1222796.61	2703384.90
J-53	1221724.50	2703207.80
J-55	1221395.54	2703822.62
J-56	1221670.21	2704073.33
J-57	1222104.57	2704127.63
J-58	1222249.89	2704050.98
J-59	1222287.56	2704100.22
J-60	1221303.05	2696934.02
J-61	1221381.53	2697117.15
J-62	1221619.61	2697569.77
J-63	1221711.18	2697789.54
J-64	1221915.25	2698265.70
J-65	1222137.58	2698783.62
J-66	1222369.13	2699355.32
J-67	1222471.33	2699558.13
J-68	1222725.82	2700319.90
J-69	1223014.28	2701292.38
J-71	1221438.21	2697082.32
J-72	1221707.48	2697547.51
J-74	1222271.46	2698724.32
J-76	1222562.34	2699514.45
J-77	1222936.68	2701333.62
J-78	1223811.15	2702771.12
J-79	1223967.42	2702710.22
J-80	1223943.13	2702677.93
J-81	1223871.78	2702741.63
J-82	1223920.50	2702795.82
J-83	1223852.38	2702822.98
J-84	1223777.61	2702804.66
J-85	1223799.97	2702948.38
J-86	1223715.33	2702833.40
J-88	1223439.06	2703122.44
J-89	1221715.47	2704817.40
J-90	1221702.53	2704812.42
J-91	1221286.95	2705528.12
J-92	1221285.35	2705392.39
J-93	1221304.52	2704822.29
J-AIRPORT	1220969.16	2705073.00
J-95	1221320.48	2704237.81
J-FIRE_FIGHTING	1220646.59	2704799.93
J-98	1222954.60	2707505.40
J-99	1222315.36	2706861.55
J-101	1224541.49	2707882.61

J-102	1226040.59	2707502.15
J-103	1227178.73	2706507.09
J-104	1227116.94	2705629.09
J-105	1226274.28	2705629.36
J-106	1226219.29	2705655.66
J-107	1225817.60	2704150.27
J-108	1226025.27	2704825.19
J-109	1225468.50	2703394.78
J-110	1225351.04	2703415.48
J-111	1225263.66	2702816.70
J-112	1225349.34	2702842.63
J-113	1225428.11	2702803.25
J-114	1225578.49	2702629.59
J-115	1225746.77	2702446.99
J-116	1226919.39	2702454.15
J-117	1226923.43	2702418.66
J-118	1229021.14	2705064.33
J-119	1228160.03	2703839.80
J-120	1231017.26	2705266.63
J-121	1231996.53	2705542.33
J-122	1231133.63	2705085.81
J-123	1231176.59	2704364.34
J-124	1231174.80	2704158.47
J-125	1232660.71	2705417.01
J-126	1233120.80	2704536.21
J-127	1232555.43	2704218.60
J-128	1232414.31	2703739.11
J-129	1231960.34	2703880.41
J-132	1231148.76	2703739.86
J-133	1232731.80	2703607.13
J-134	1233330.67	2703517.49
J-135	1234273.99	2703519.58
J-136	1235333.96	2703253.54
J-137	1236941.73	2702111.37
J-138	1236922.21	2702102.02
J-139	1237173.75	2701867.08
J-141	1238103.42	2701843.51
J-143	1238776.05	2701710.70
J-144	1239437.96	2702569.69
J-145	1241016.69	2702858.87
J-146	1242036.34	2702891.00
J-147	1242383.71	2702478.75
J-148	1242469.39	2701968.93
J-149	1242520.80	2701459.11
J-150	1242090.24	2701047.82
J-151	1241636.11	2700557.28
J-152	1239185.53	2700602.26
J-153	1240661.45	2700101.01
J-154	1238110.20	2700465.17
J-155	1237831.65	2700754.21
J-156	1237240.35	2701114.81
J-157	1236459.91	2701635.10
J-160	1235909.72	2700444.63
J-161	1234300.39	2699638.72
J-162	1233396.56	2698946.34
J-165	1225413.50	2701683.84

J-166	1225704.71	2702006.45
J-167	1225145.13	2702297.67
J-168	1224866.76	2702331.93
J-169	1224751.13	2702340.49
J-170	1224783.80	2702598.66
J-171	1225289.31	2702291.96
J-172	1225123.37	2702435.89
J-173	1225303.26	2702779.46
J-174	1225247.40	2702838.57
J-175	1224699.74	2702787.80
J-176	1224435.29	2702906.89
J-177	1224745.49	2702821.59
J-178	1224722.55	2703165.33
J-179	1224601.86	2703301.93
J-180	1224742.75	2702882.45
J-182	1224628.81	2703262.26
J-183	1224692.65	2703049.82
J-184	1224094.47	2702620.29
J-186	1224701.69	2701662.39
J-187	1224755.93	2701486.81
J-188	1224638.88	2700598.89
J-189	1224763.07	2700578.90
J-190	1224725.44	2701912.24
J-191	1224659.32	2701916.24
J-192	1224742.50	2701693.75
J-195	1224253.85	2703431.77
J-196	1224343.83	2703419.93
J-197	1224444.92	2703096.03
J-198	1224189.92	2703374.94
POU_SOURCE	1224814.46	2700387.62
J-194	1222418.49	2691696.47
J-200	1222411.27	2691905.39
J-201	1222334.23	2692113.55
J-202	1222274.85	2692181.51
J-203	1221998.62	2693687.77
J-181	1236599.74	2701560.31
J-204	1227266.93	2692496.39
J-205	1226190.27	2692914.34
J-206	1226488.81	2692941.30
J-BLU_LAG	1222130.08	2689266.91
J-158	1232386.33	2704007.23
J-159	1231154.31	2703731.64
J-163	1230721.04	2703576.00
J-164	1224776.53	2703015.29
J-185	1224457.68	2703274.81
J-193	1225242.20	2702327.65
J-199	1224711.68	2701693.80
J-207	1224677.42	2701581.02
J-209	1224277.71	2701920.77
J-210	1224262.01	2701134.21
J-211	1224513.17	2701575.00
J-212	1223638.39	2700942.36
J-213	1224160.14	2702390.46
J-214	1224705.45	2702087.82
J-HOSPITAL	1224614.09	2702100.67
J-216	1225780.37	2702311.94

J-217	1225477.74	2701829.44
J-219	1225232.21	2701545.37
J-4	1227334.34	2692513.72
J-54	1227770.59	2692820.76
J-70	1226374.21	2694245.07
J-73	1226327.66	2694701.22
J-75	1227008.34	2695708.03
J-96	1227668.02	2696305.60
J-100	1228653.25	2696946.00
J-NIEWE_ELEM	1224148.68	2690267.96
J-SDA_SCHOOL	1222907.83	2689815.03
J-BLUE_LAG_LAUN	1222295.70	2689361.06
J-NIEWE_LAUNDRY	1222322.93	2691783.65
J-MIZPAH_HS	1220802.53	2695472.36
J-ISLAND_HOTEL	1219976.95	2697806.31
J-87	1219981.96	2697916.12
J-MWAN_ELEMENTRY	1220222.87	2699128.56
J-TRUK_STOP	1220277.17	2699225.97
J-TRUK_DEVEL	1220335.86	2699314.50
J-AWM	1220590.17	2699639.57
J-SARAMEN_CHUUK_HS	1221082.84	2700749.67
J-ICE_PLANT	1221083.61	2701110.33
J-LAUNDRAMAT2	1221149.09	2701412.15
J-SUSMU_ENT	1221332.73	2701800.20
J-BEREA_CHRIS_SCHOOL	1221304.52	2702680.82
J-COM	1221306.11	2702733.52
J-LAUNDRAMAT_3	1221510.52	2703180.66
J-AS_MART	1222189.21	2703249.32
J-POWER-plant	1222657.10	2703517.61
J-PENTECOST_SCHOOL	1222197.19	2704079.72
J-LEGISLATURE	1221980.01	2704355.99
J-IRAS_DEMO_SCHOOL	1221746.86	2704744.04
J-HIGH_TIDE_HOTEL	1221310.90	2704579.55
J-RS_PLAZA	1221296.53	2705643.10
J-142	1221618.09	2706194.91
J-PACIFIC_GARD_APT	1223621.22	2707902.12
J-KURASSA	1224095.99	2707954.15
J-MECHITIW_ELM_SCHOOL	1227113.69	2706650.17
J-208	1226655.18	2707173.71
J-MINI_MORI_AISEK	1225480.03	2703467.43
J-ISAUSO_KOWENA	1225442.43	2703257.97
J-LAUNDRAMAT_5	1225431.69	2703206.05
J-LAUDRAMAT_6	1226070.81	2702455.94
J-BOTTLED_WATER_FACTORY	1229126.76	2705128.78
J-ST_CECELIA_SCHOOL	1229296.83	2705143.10
J-222	1229176.89	2705161.00
J-PENIA_ELEMENTARY_SCHOOL	1234975.38	2703468.93
J-CHUUK_HIGH_SCHOOL	1225127.84	2702755.48
J-WENO_JUNIOR_HIGH	1224440.18	2703304.88
J-LAUNDRAMAT_7	1224750.35	2702282.41
J-VICTORIA_APT	1219986.73	2698078.46
J-TRUK_TRADING_COMPANY	1221071.22	2700884.82
J-SAPUK_ELEM__SCHOOL	1238101.52	2701000.52
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[VERTICES]

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P-280	1232460.38	2703681.83
P-280	1232562.47	2703648.22
P-281	1234854.61	2703529.94
P-283	1238059.82	2700405.95
P-283	1237919.48	2700342.32
P-283	1237769.77	2700310.51
P-283	1237530.25	2700376.01
P-283	1237285.11	2700443.37
P-283	1237118.56	2700478.93
P-283	1236901.49	2700512.61
P-283	1236800.44	2700531.33
P-283	1236665.71	2700535.07
P-283	1236502.91	2700527.58
P-283	1236235.31	2700497.64
P-283	1236014.50	2700456.47
P-284	1234180.63	2699565.74
P-284	1234010.34	2699479.66
P-284	1233864.38	2699419.78
P-284	1233774.56	2699365.51
P-284	1233626.72	2699210.19
P-284	1233523.80	2699097.91
P-284	1233433.98	2698996.86
P-290	1224316.95	2703380.62
P-14	1219973.86	2698545.48
P-14	1219975.10	2698469.95
P-14	1219977.58	2698387.00
P-51	1238645.64	2701417.17
P-51	1238448.09	2701305.51
P-51	1238156.06	2701077.90
PMP-T-2_OFF_LINE	1227544.60	2696419.69

PMP-T-1_OFF_LINE	1226885.36	2695866.24	
PMP-ADB-1	1222320.43	2704069.47	
PMP-TH-3_OFF_LINE	1221508.27	2697157.85	
PMP-TH-5_OFF_LINE	1221737.03	2697653.68	
PMP-TH-9	1222316.06	2698781.09	
PMP-TH-9	1222274.46	2698746.06	
PMP-83-7	1222591.89	2699591.07	
PMP-ADB-99-1_OFF_LINE		1222976.08	2701493.43
PMP-10	1223948.61	2702650.06	
PMP-83-3	1223930.74	2702782.73	
PMP-83-19	1223847.62	2702833.93	
PMP-ADB-2	1221685.61	2704819.39	
PMP-ADB-4	1226187.42	2705723.41	
PMP-15	1225317.26	2703485.07	
PMP-ADB-8	1226998.53	2702403.49	
PMP-ADB-10	1231131.83	2703735.38	
PMP-ADB-14	1236909.02	2702114.36	
PMP-9	1225340.99	2702296.53	
PMP-7	1225089.75	2702437.41	
PMP-14	1225329.05	2702776.32	
PMP-12	1225243.85	2702853.95	
PMP-4	1224861.88	2702827.04	
PMP-3	1224598.68	2703237.77	
PMP-13	1224682.49	2703072.23	
PMP-83-25	1222431.70	2691711.88	
PMP-17	1222410.01	2691893.14	
PMP-83-28	1222311.92	2692070.28	
PMP-83-26	1222269.28	2692223.22	
PMP-20	1222021.79	2693622.89	
PMP-1	1224767.41	2701695.62	
PMP-2	1224655.32	2701946.83	
PMP-83-18	1223951.55	2702764.42	

[LABELS]

;X-Coord	Y-Coord	Label & Anchor Node
1228609.85	2696584.58	"BOUNDARY EPINUP"
1225645.59	2694078.96	"BOUNDARY EPINUP WICHAP"
1221524.59	2691696.89	"BOUNDARY NEIWE AND MWAN"
1220819.79	2691811.09	"BOUNDARY NIEWE AND MWAN"
1225201.27	2690326.59	"BOUNDARY WICHAP NEIWE"
1221141.23	2699054.84	"BOUNDARY MWAN AND NEPUKOS"
1219543.31	2699880.95	"BOUNDARY MWAN AND NUPUKOS"
1220828.13	2703827.08	"BOUNDARY NEPUKOS AND IRA"
1224565.80	2708095.17	"BOUNDARY IRAS AND MECHITIW"
1225119.29	2702389.91	"BOUNDARY MECHITIW AND IRAS"
1225354.87	2702303.91	"BOUNDARY IRAS TUNUK"
1232997.55	2705079.20	"BOUNDARY TUNUK AND PENIESENE"
1232711.29	2703238.98	"BOUNDARY PEIESENE AND PENIA"
1235802.15	2702413.02	"BOUNDARY PENIA AND SAPUK"
1233332.88	2698225.41	"BOUNDARY SAPUK"

[BACKDROP]
DIMENSIONS 1216699.28 2665411.97 1262054.12 2710509.21
UNITS Feet
FILE C:\Users\Leroy\Documents\chuuk water sytem project\GIS DATA 4_22_2012\EPANET WENO FT WGS84 UTM\weno emf for epa net 22 june 12.emf

OFFSET	0.00	0.00

[END]