North Austin Municipal Utility District No. 1
Water Pressure Study

Date	Hydrant Address	Time of Reading	Pressure
9-1 Su.	13400 GEOT		
9-2 M.	"	HOLIDAY	
9-3 TU	"	1000	41 PSI
9-4 W	"	1530	38 PSI
9-5 TH	"	1140	43 PSI
9-6 FRI	"	1200	38 PSI
9-7 SA	"		
9-8 Su.	"		
9-9 M	"	0920	44 PSI
9-10 TU	"	1341	35 PSI
9-11 W	"	1500	40 PSI
9-12 TU	"	1049	39 PSI
9-13 F	"	1325	37 PSI
9-14 SA.	"		
9-15 SUN	"		
9-16 M	"	1545	40 PSI
9-17 TU	"	1450	39 lbs
9-18 W	"	1440	40-45 HAMMER
9-19 TH	"	1500	40 psi 40 Hyd
9-20 F	"	1446	42 HYD
9-21 SA			
9-22 Su.			
9-23 MON		1531	46 HYD. 42 psi.

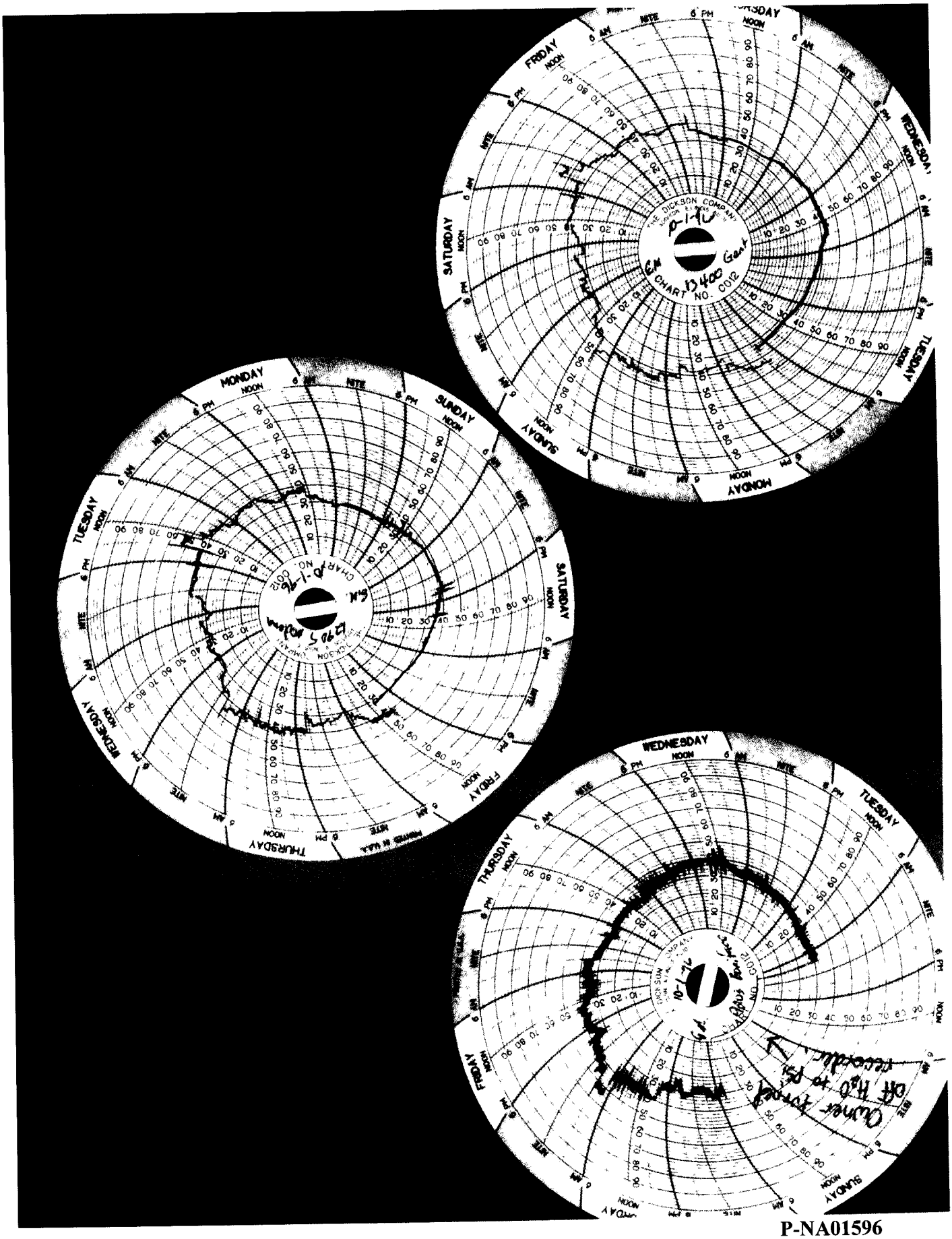
North Austin Municipal Utility District No. 1
Water Pressure Study

PSI RECORDER

Date	~~Hydrant~~ Address	Time of Reading	Pressure
9-1	12705 MODENA		
9-2	"		
9-3	"	1015	34 lbs
9-4	"	1515	34 lbs
9-5	"	1130	40 lbs
9-6	"	1150	32 lbs
9-7	"		
9-8	"		
9-9	"	0946	38 lbs
9-10	"	1300	30 lbs
9-11	"	1230	38 lbs
9-12	"	1030	35 lbs
9-13	"	1300	34 lbs
9-14	"		
9-15	"		
9-16	"	1530	32 lbs
9-17		1430 ~~1032~~	36 lbs
9-18		1601	40 lbs HYD
9-19		1530	38 psi
9-20		1600	38 psi
9-21			
9-22			
9-23		1600	40 psi 40 lbs HYD

North Austin Municipal Utility District No. 1
Water Pressure Study

Date	1996	~~Hydrant Address~~ PSI RECORDER ADRESS	Time of Reading	Pressure
9-1	SUN	7203 BONIFACE		
9-2	MON	" HOLIDAY		
9-3	TUE	"	1030	38 lbs
9-4	W	"	1500	32 lbs
9-5	TH	"	1120	36 lbs
9-6	F	"	1145	32 lbs
9-7	SAT.	"		
9-8	SUN.	"		
9-9	M	"	0934	40 PSI
9-10	TU.	"	1149	40 PSI
9-11	W	"	1300	42 PSI
9-12	TH	"	1000	36 lbs
9-13	F	"	1215	30 lbs
9-14	SA	"		
9-15	SU	"		
9-16	M	"	1515	34 lbs
9-17	TU	"	1450	36 lbs
9-18	W	"	1615	41 lbs
9-19	TH	"	1620	42 PSI 40 lbs A
9-20	F	"	1615	40 PSI
9-21	SA	"		
9-22	SUN.	"		
9-23	MON	"	1510	36 PSI HYD 40 lbs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North Austin Municipal Utility District No. 1
Water Pressure Study

	Date	Pressure Rec.'d Hydrant Address	Time of Reading	Pressure	Hyd
Tu	10-1	7203 Boniface	1530	36 psi	40 lbs
W	10-2	"	1445	38 psi	42
Th	10-3	"			
F	10-4	"	0825	36 psi	42 lbs
Sa	10-5				
Su	10-6				
M	10-7	"	0925	40 psi	42 lbs
Tu	10-8		1630	38 psi	40
W	10-9		1100	38 psi	40 lbs
Th	10-10				
F	10-11		1110	38 psi	40
Sa	10-12				
Su	10-13				
M	10-14				
Tu	10-15				
W	10-16				
Th	10-17				
F	10-18				
Su	10-19				
Su	10-20				
M	10-21				
Tu	10-22				

North Austin Municipal Utility District No. 1
Water Pressure Study

Date	Pressure Rec. d Hydrant Address	Time of Reading	Pressure	Hyd
10-1 Tu	12705 Modena	1500	36 psi	40
10-2 W		1410	38 psi	40
10-3 Th				
10-4 F		1645	38 psi	40
10-5 Sa				
10-6 Su				
10-7 M		0950	38 psi	40
10-8 Tu		1610	42 psi	45
10-9 W		1610	40 psi	4
10-10 Th			40 psi	42
10-11 F		1600	42 psi	45
10-12 Sa				
10-13 Su				
10-14 M				
10-15 Tu				
10-16 W				
10-17 Th				
10-18 F				
10-19 Sa				
10-20 Su				
10-21 M				
10-22 Tu				

North Austin Municipal Utility District No. 1
Water Pressure Study

Date	Pressure Rec. # Hydrant Address	Time of Reading	Pressure	Hyd
10-1 Tu	13400 Gent	1550	40 psi	410
10-2 W	"	1005	38 psi.	#40
10-3 Th	"			
10-4 F	"	1015	34 psi	401
10-5 Sa	"			
10-6 Su	"			
10-7 M	"	0900	38 psi	40 in
10-8 Tu	"	1545	40 psi	40
10-9 W	"	1030	38 psi	40
10-10 Th	"			
10-11 F	"			
10-12 Sa.	"			
10-13 Su	"			
10-14 M	"			
10-15 Tu	"			
10-16 W	"			
10-17 Th	"			
10-18 F	"			
10-19 Sa	"			
10-20 Su	"			
10-21 M	"			
10-22 Tu	"			

ECO RESOURCES, INC.
9511 Ranch Road 620 North
Austin, TX 78726-2908

FAX: (512) 335-0251

FAX TRANSMISSION

TO: David Malish (Upstairs) **FAX NO.:** 306-9620

Total pages, including cover: _____ **DATE:** 10.21.96

FROM: Gary Sgouris **PHONE:** 512-335-7580

Sender's Comments: NAM 1

North Austin Municipal Utility District No. 1
Water Pressure Study

Psi Recorder
Hydrant Address
13400 Gent

	Date	Time of Reading	Pressure	Hyd
M	10-14		38 psi	42
Tu	10-15		40 psi	42
W	10-16		40 psi	44
Th	10-17		40 psi	42
F	10-18	10:50	42 psi	42
Sa	10-19	—	—	
Su	10-20	—	—	
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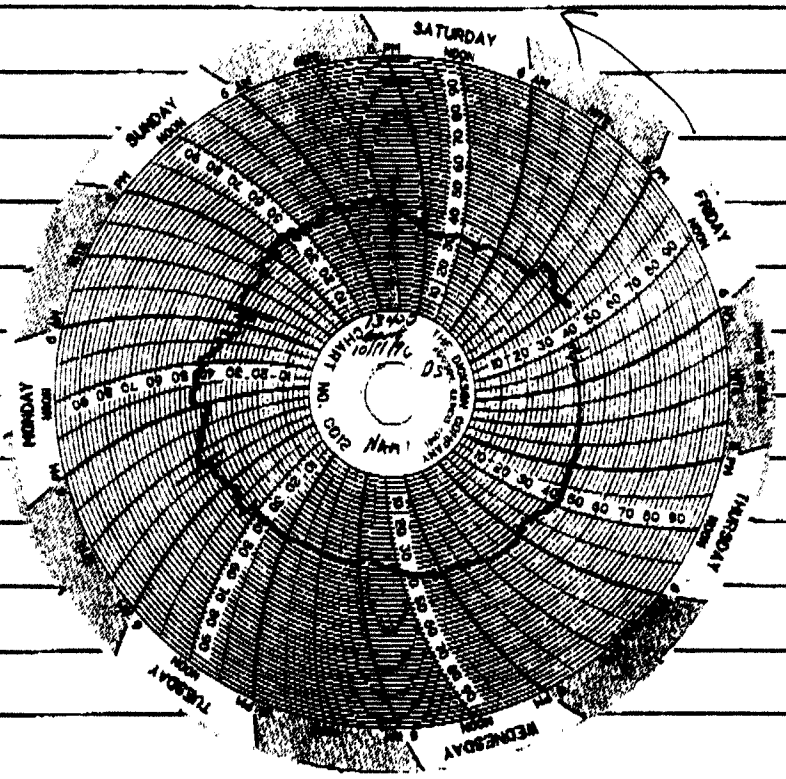
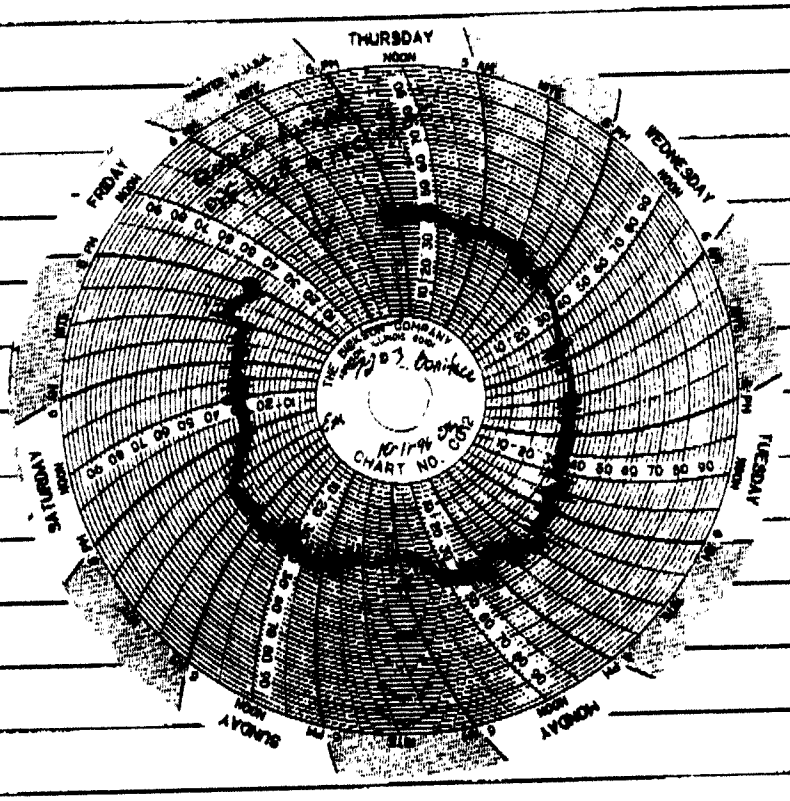
W				
Th				
F				
Sa				
Su				



North Austin Municipal Utility District No. 1
Water Pressure Study

Psi Recorder
Hydrant Address 7205 Boniface

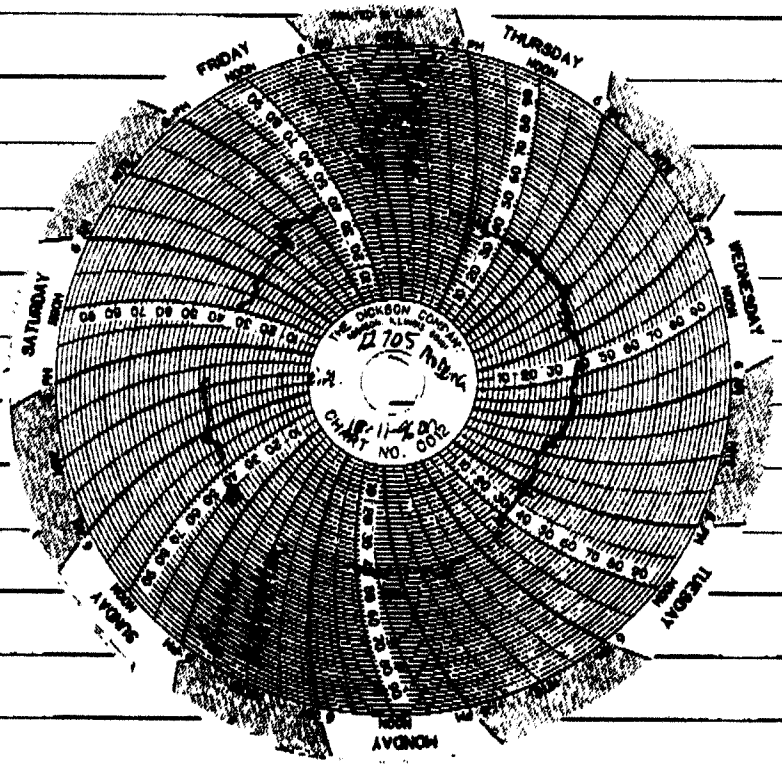
	Date	Time of Reading	Pressure	Hi
M	10-14		40 psi	45
Tu	10-15		38 psi	44
W	10-16		40 psi	44
Th	10-17		40 psi	42
F	10-18	1020	38 psi	41.2
Sa	10-19	—	—	
Su	10-20	—	—	
M				
Tu				
W				
Th				
F				
Sa				
Su				

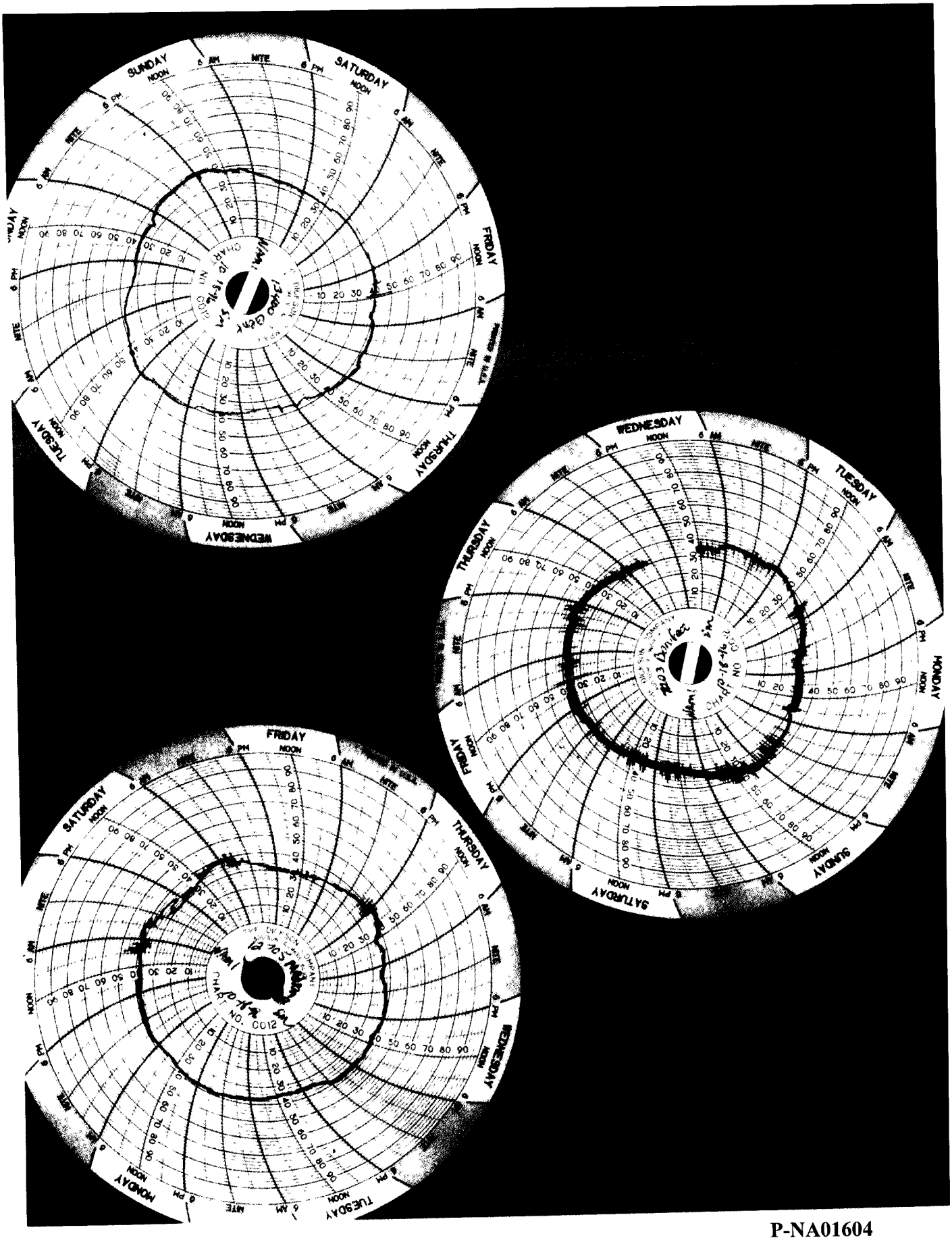


North Austin Municipal Utility District No. 1
Water Pressure Study

Psi Recorder
Hydrant Address 12705 Modena Tr.

	Date	Time of Reading	Pressure	Hyd
M	10-14		42 psi	46
Tu	10-15		36 psi	42
W	10-16		38 psi	42
Th	10-17		38	42
F	10-18	1800	38	42
Sa	10-19			
Su	10-20			
M				
Tu				
W				
Th				
F				
Sa				
Su				

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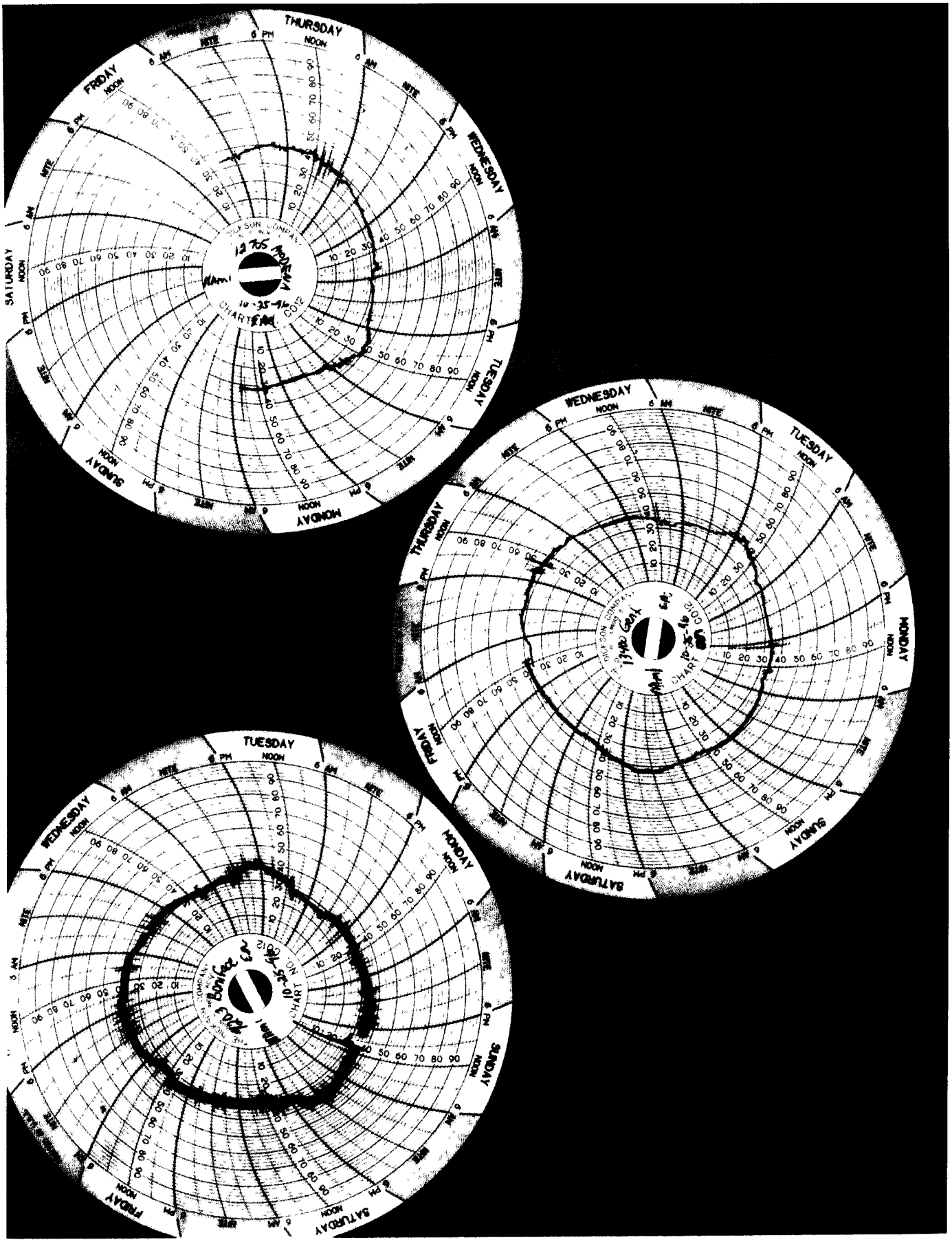
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North Austin Municipal Utility District No. 1
Water Pressure Study

	Date	Psi Recorder Hydrant Address 7205 Boniface	Time of Reading	Pressure	Hyd
M	10-14			40 psi	45
Tu	10-15			38 psi	44
W	10-16			40 psi	44
Th	10-17			40 psi	42
F	10-18		10:20	38 psi	42
Sa	10-19		—	—	—
Su	10-20		—	—	—
M	10-21				
Tu	10-22				
W	10-23			40 psi	42
Th	10-24			38 psi	42
F	10-25			38 psi	42
Sa	10-26		—	—	—
Su	10-27		—	—	—
M	10-28			34 psi	36
Tu	10-29			38 psi	38
W	10-30			36 psi	38
Th	10-31			40 psi	40
F	11-1			38 psi	38
Sa					
Su					
M					

North Austin Municipal Utility District No. 1
Water Pressure Study

	Date	Psi Recorder Hydrant Address	Time of Reading	Pressure	Hyd
		12705 Madera Tr.			
M	10-14			42 psi	46
Tu	10-15			36 psi	42
W	10-16			38 psi	42
Th	10-17			38 psi	42
F	10-18		10 cc	38 psi	42
Sa	10-19				
Su	10-20				
M	10-21				
Tu	10-22				
W	10-23			38 psi	42
Th	10-24			38 psi	42
F	10-25			38 psi	44
Sa	10-26		—	—	—
Su	10-27		—	—	—
M	10-28			32 psi	32
Tu	10-29			38 psi	40
W	10-30			34 psi	36
Th	10-31			40 psi	42
F	11-1			34 psi	34
Sa					
Su					
M					

North Austin Municipal Utility District No. 1
Water Pressure Study

Psi Recorder
Hydrant Address 13400 Gent

	Date	Time of Reading	Pressure	Hyd
M	10-14		38 psi	42
Tu	10-15		40 psi	42
W	10-16		40 psi	44
Th	10-17		40 psi	42
F	10-18	0952	42 psi	42
Sa	10-19	—	—	
Su	10-20	—	—	
M	10-21			
Tu	10-22			
W	10-23		38 psi	42
Th	10-24		40 psi	42
F	10-25		40 psi	42
Sa	10-26	—	—	—
Su	10-27	—	—	—
M	10-28		38 psi	42
Tu	10-29		40 psi	42
W	10-30		38 psi	40
Th	10-31		42 psi	45
F	11-1		40 psi	40
Sa				
Su				
M				

Fild

ECO RESOURCES, INC.
9511 Ranch Road 620 North
Austin, TX 78726-2908

FAX: (512) 335-0251

FAX TRANSMISSION

TO: David Malash **FAX NO.:** 306-9620

Total pages, including cover: _____ **DATE:** 5.27.97

FROM: Mary Lynn Lyons (RP) **PHONE:** 512-335-7580

Sender's Comments: Good morning, David. ☺ B.

Professional services in water supply and wastewater treatment.
A subsidiary of Southwest Water Company.

TEMPORARY METERS
Psi Recorders
NAM-1

READ DATE: 5/19, 5/21, 5/23

House/Psi	Meter Location/Address	Hyd. Read/ Psi
48	7603 Boniface } 5/19	48
48	13400 Gent	48
48	12705 Modena	48
46	7603 Boniface } 5/21	48
48	13400 Gent	48
48	12705 Modena	48
50	7603 Boniface } 5/23/97	49
53	13400 Gent	52
54	12705 Modena	54

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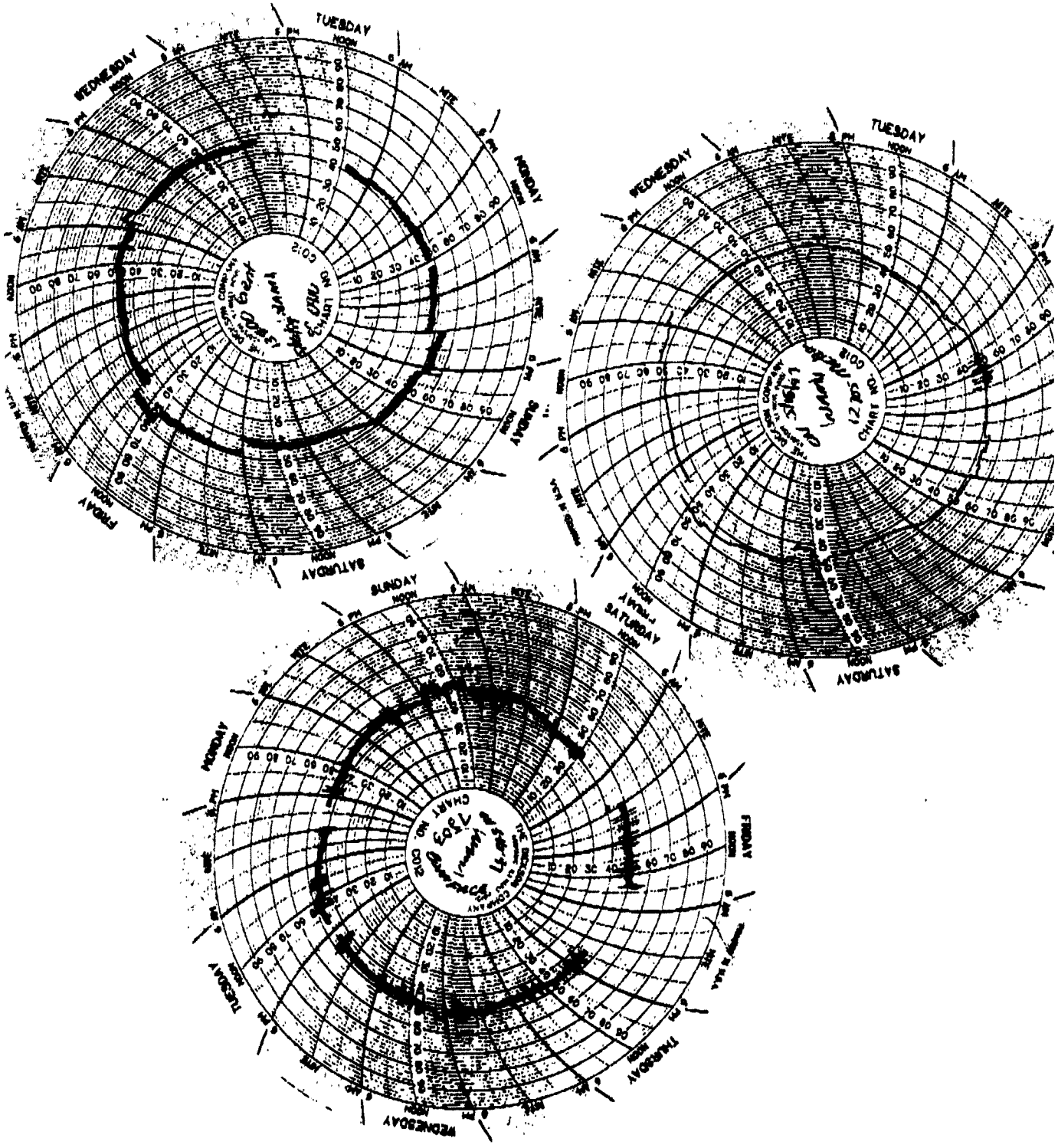
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ECO RESOURCES, INC.
9511 Ranch Road 620 North
Austin, TX 78726-2908

FAX: (512) 335-0251

FAX TRANSMISSION

TO: David Nelson **FAX NO.:** 306-9620

Total pages, including cover: 3 **DATE:** 6/23/97

FROM: Kerry Sparks **PHONE:** 512-335-7580

Sender's Comments:

Attached - weekly pressure review.

TEMPORARY METERS
Psi Recorders
NAM-1

READ DATE: 6/9, 6/12, 6/13

House/Psi	Meter Location/Address	Hyd. Read/ Psi
50	12705 Modena	50
52	7203 Boniface	54
50	13400 Gent	50
46	12705 Modena	48
40	7203 Boniface	48
42	13400 Gent	48
50	12705 Modena	50
40	7203 Boniface	48
52	13400 Gent	50
	* changed per on Modena on 6/16	

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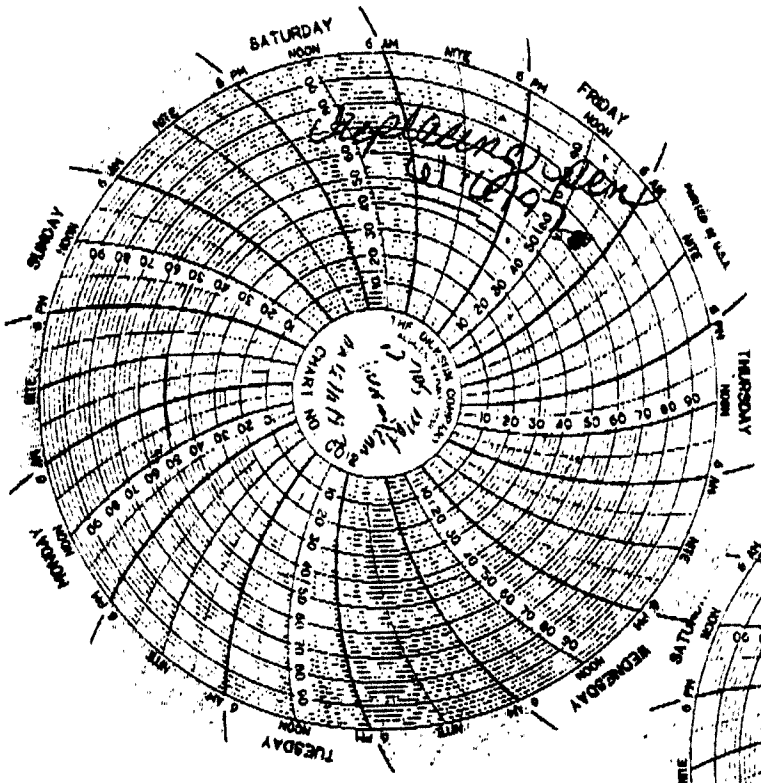
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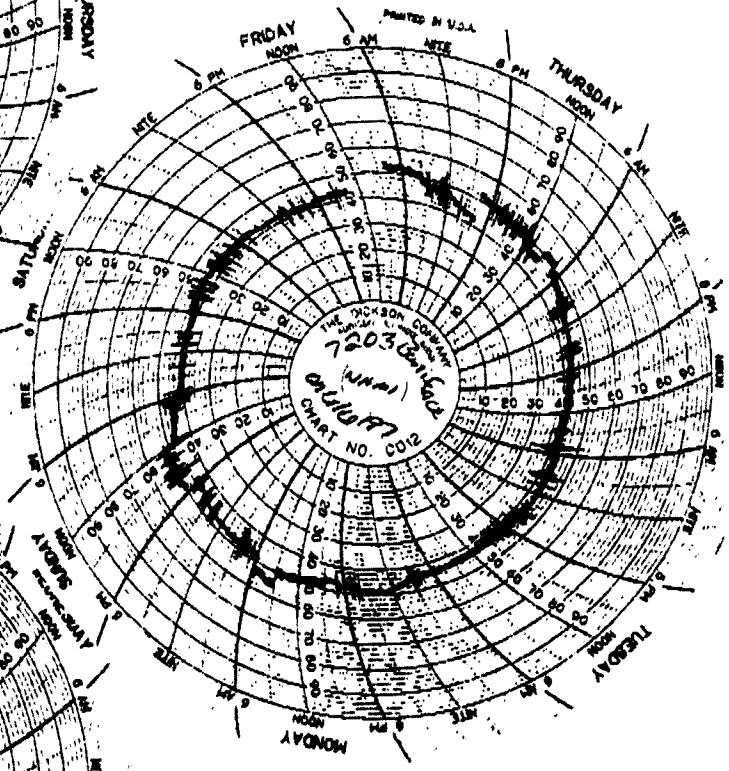
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CHART NO. C012

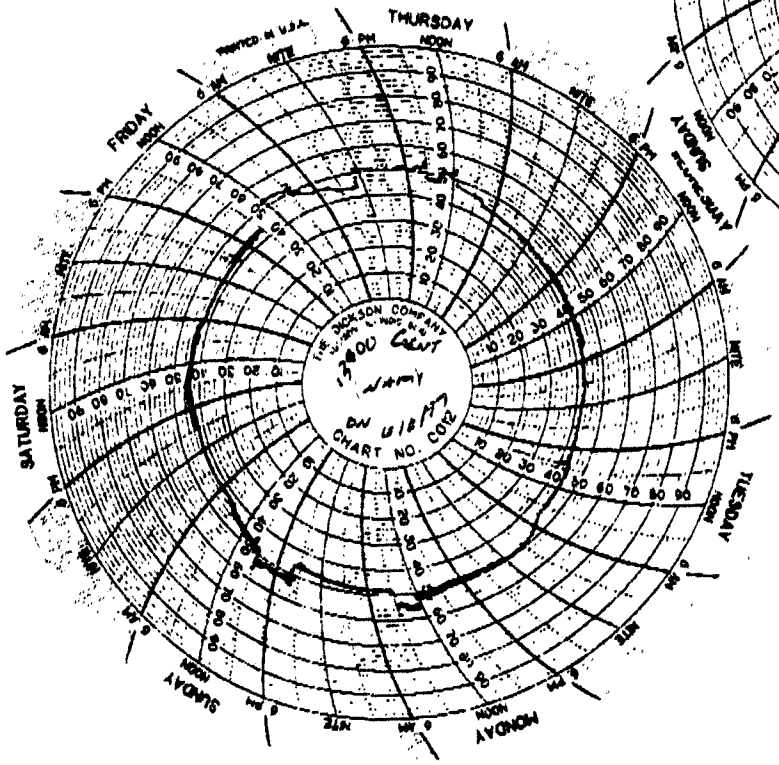
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CHART NO. C012

ECO RESOURCES, INC.
9511 Ranch Road 620 North
Austin, TX 78726-2908

FAX: (512) 335-0251

FAX TRANSMISSION

TO: David Malesky **FAX NO.:** 306-9620

Total pages, including cover: 3 **DATE:** 6.10.97

FROM: Gary Sparks **PHONE:** 512-335-7580

Sender's Comments: NAMI

TEMPORARY METERS
Psi Recorders
NAM-1

READ DATE: 6/2, 6/4, 6/10

House/Psi	Meter Location/Address	Hyd. Read/Psi
48	12705 Modena } 6/2	48
46	7203 Boniface } 6/2	48
46	13400 Gent } 6/2	48
50	12705 Modena } 6/4	50
50	7203 Boniface } 6/4	50
52	13400 Gent } 6/4	54
46	12705 Modena } 6/10	48
48	7203 Boniface } 6/10	48
50	13400 Gent } 6/10	50

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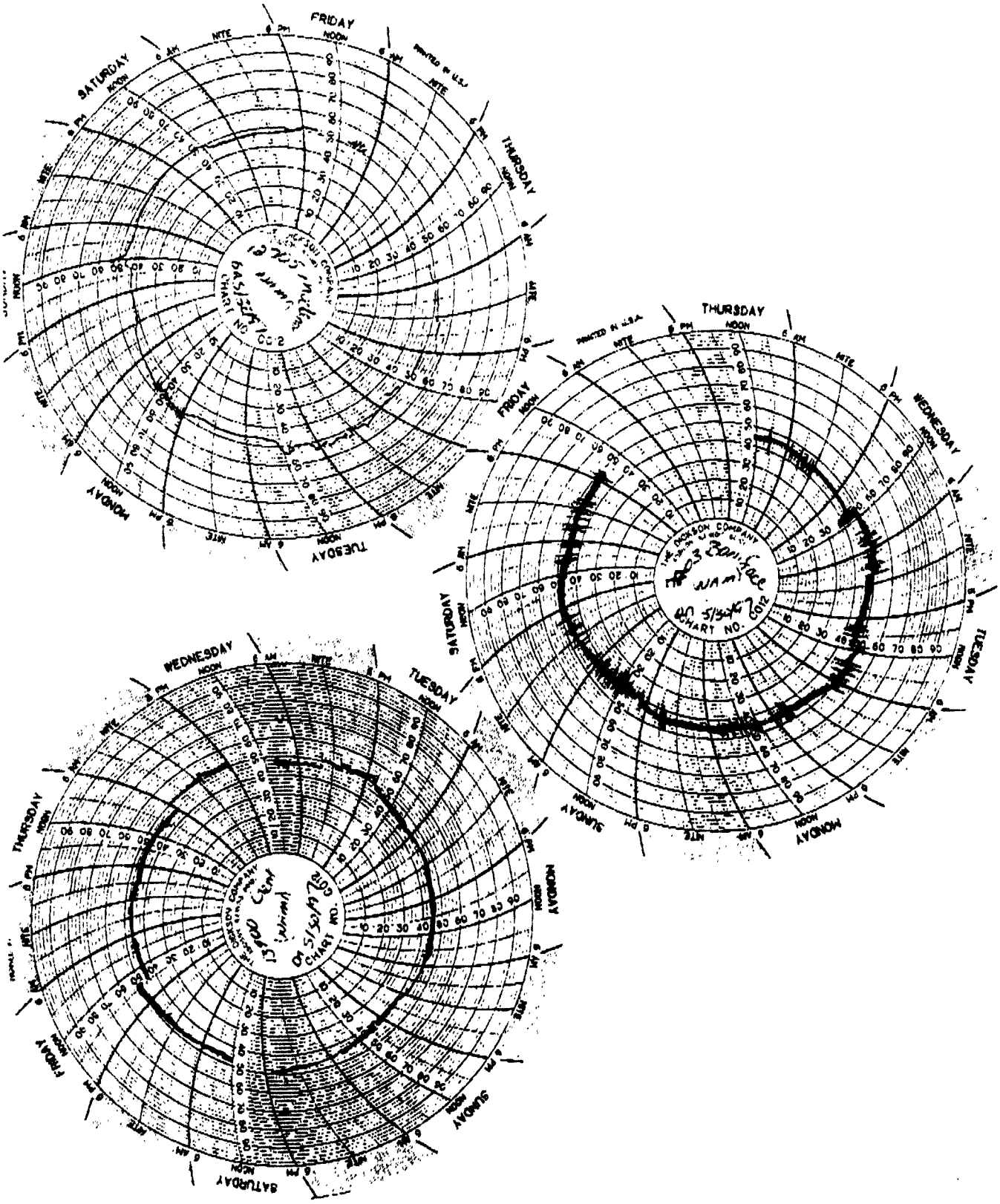
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ECO RESOURCES, INC.
9511 Ranch Road 620 North
Austin, TX 78726-2908

FAX: (512) 335-0251

FAX TRANSMISSION

TO: David Malish **FAX NO.:** 306-9620

Total pages, including cover: 3 **DATE:** 6/30/97

FROM: Linda **PHONE:** 512-335-7580

CONFIDENTIALITY NOTE

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Sender's Comments:

Professional services in water supply and wastewater treatment.
A subsidiary of Southwest Water Company.

TEMPORARY METERS
Psi Recorders
NAM - 1

READ DATE: 6/16, 6/18, 6/20

House/Psr	Meter Location/Address	Hyd. Read/ Psr
48	13400 Gent } 6/16	50
46	12705 Modena } 6/16	50
44	7203 Boniface } 6/16	48
46	13400 Gent } 6/18	50
46	12705 Modena } 6/18	48
44	7203 Boniface } 6/18	50
48	13400 Gent } 6/20	50
42	12705 Modena } 6/20	46
48	7203 Boniface } 6/20	50
46	13400 Gent } 6/23	50
42	12705 Modena } 6/23	46
46	7203 Boniface } 6/23	48
	Changed Chart on Wed 6/25	
	will change on Wed 6/27	
	Future	

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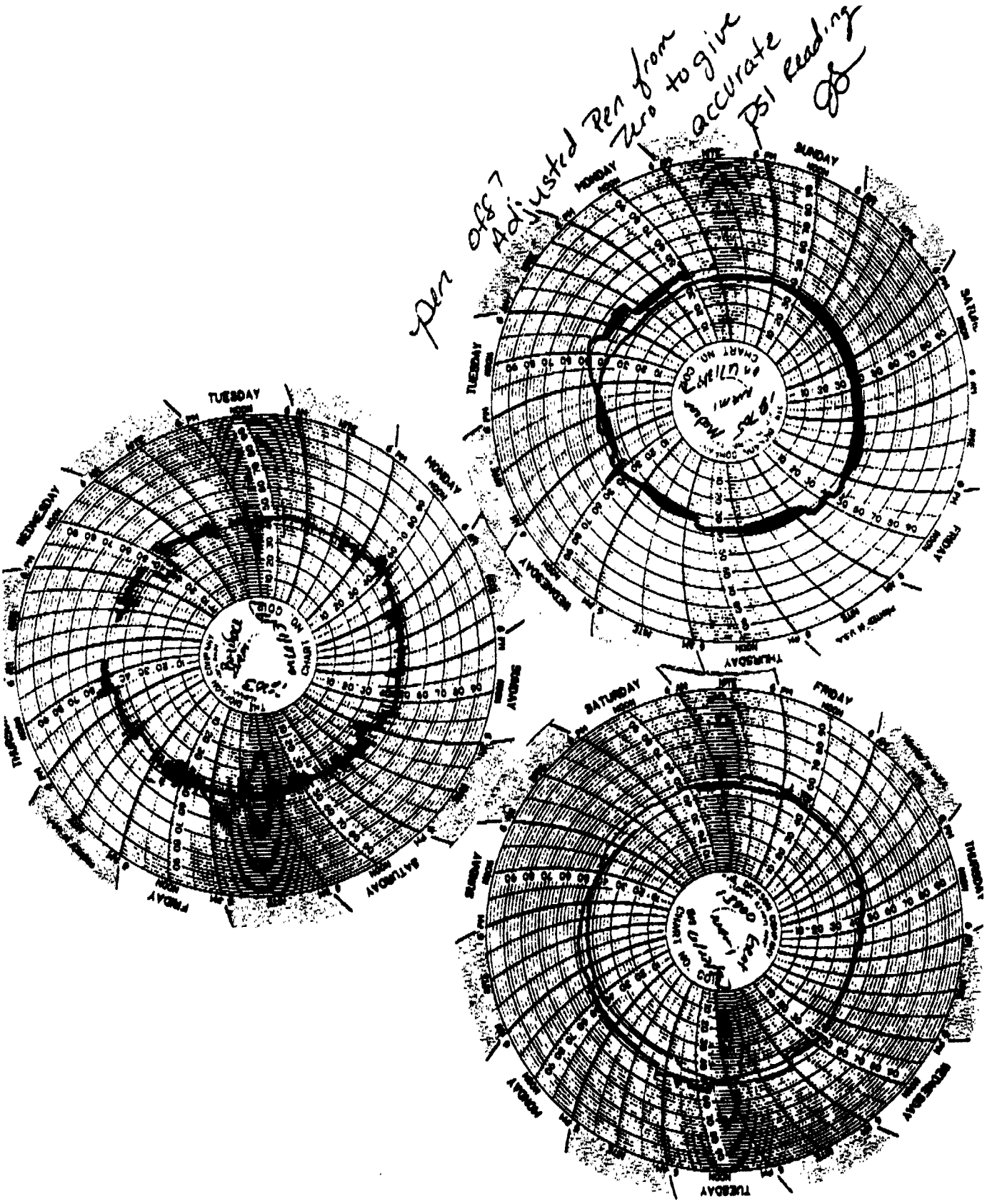
pen off
Adjusted Pen from Zero to give accurate PSI reading
SUNDAY
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THURSDAY
FRIDAY
SATURDAY

MURFEE ENGINEERING COMPANY, INC.
1101 Capital of Texas Highway South
Building D, Suite 110
Austin, Texas 78746
Phone: (512) 327-9204 Fax: (512) 327-2947

MEMORANDUM

DATE: 5/14/2004

TO: TERESA LUTES – CITY OF AUSTIN

CC: SHARLENE COLLINS – ARMBRUST & BROWN, LLP

FROM: DAVID MALISH, P.E.

RE: NORTH AUSTIN MUD NO.1
WATER MODEL & SYSTEM PRESSURE ISSUES
MECI FILE NO. 94002

Enclosed is a copy of a Cybernet 3.1 model for the Northwest 'A' system in North Austin MUD No. 1 along with a map that shows pressures during peak day conditions with the system HGL at 980 ft. The pressures indicated on the map correspond with pressures routinely observed at various locations during peak summer demands indicating a relative degree of calibration. It should be noted that there are several locations where pressure has been observed to drop below 35 psi.

It would be difficult to attempt to isolate the critical low pressure areas for improvement of pressure. It is the District's intent to improve pressures to the deficient areas by increasing pressure to the entire Northwest 'A' system within North Austin MUD No. 1.

Call if you need more information.

5/14/04
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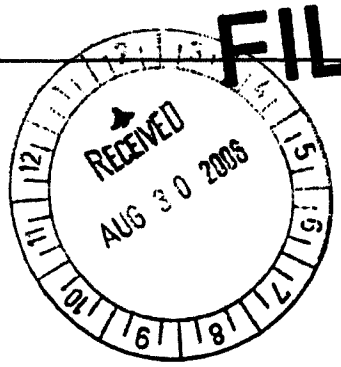
City of Austin

Austin Water Utility, P.O. Box 1088, Austin, TX 78767

FILE



August 28, 2006

Alan McNeil
President
North Austin Municipal Utility District No. 1
9511 Ranch Road 620 North
Austin, TX 78726

Re: North Austin Municipal Utility District No. 1 ("MUD")-Proposed Booster Station

Dear Mr. McNeil:

Thank you for your letter dated August 24, 2006, regarding the MUD's proposed booster station. We congratulate you for working so hard and long in order to find a solution to improve water pressure within the MUD for a portion of its residents.

As noted in your letter, the Austin Water Utility ("Utility") plans to construct a large transmission main that upon its connection to water mains adjacent to the MUD will relieve the need for the MUD to continue to use the proposed temporary booster station. The Utility has proposed, in its FY 2007-2016 Capital Improvement Project plan, the project to be completed by the end of FY 2011-2012. The proposed Capital Improvement Plan is currently being reviewed by the Austin City Council. The Austin City Council will finalize and approve the City of Austin's ("City") budget in mid-September 2006.

In your letter, you requested the waiver of City fees regarding the MUD's booster station project. The Austin City Council's approval is required for any waiver of City fees. The Utility does not believe it can recommend or support a waiver of City fees for the following reasons:

1. The City does not obtain any economic or financial benefit from the MUD constructing the MUD's booster station project;
2. The Utility has already waived the application of the City's design criteria for this project and allowed the MUD to exclusively use the Texas Commission on Environmental Quality ("TCEQ") minimum criteria, which saves the MUD a significant amount of money;
3. In discussions with the MUD in February 2006, the Utility proposed that the MUD would be solely responsible for the expenses related to an interim solution for internal MUD pressure issues and the Utility would assume the $24 million cost for a permanent solution of constructing the large diameter water transmission main and converting the existing 36" water main of the Northwest A pressure zone, located in Parmer Lane, to the Northwest B pressure zone. The Utility is not requiring the MUD to cost participate in the City's project, even though the MUD will benefit from the project; and

4. On May 4, 2006, I spoke to Don Conklin, Vice-President of the MUD, and we finalized the terms of a proposal. This conversation was documented in a letter from me to Mr. Conklin dated May 11, 2006, which states that the MUD will pay all applicable City fees.

We do understand the MUD's desire to minimize the cost of the project and the Utility has already made significant financial concessions to the MUD's benefit.

Since the TCEQ has placed certain conditions on the MUD's construction and use of the in-line booster stations, I believe that it would be to our mutual benefit for your engineer, David Malish, to contact Ron Humphrey, Austin Water Utility, to clarify issues and coordinate the development of the MUD's construction plans. For example, we agree with the TCEQ that the requirements for the installation of automatic cut-off devices and continuous pressure recording devices to deactivate the pumps are essential. The minimum suction pressure setting will need to be tied to the minimum pressure associated with current levels of service at those suction-side device/recording locations. However, the minimum suction pressure setting will need to be in excess of 20 psi to ensure that Utility customers are not harmed by the installation of the MUD's booster pumping facilities.

If you have any further questions or concerns, please call me at 972-0118. Thank you.

Sincerely,

Bart Jennings
Austin Water Utility

cc: Toby Hammett-Futrell, City Manager
Rudy Garza, Assistant City Manager
Chris Lippe, P.E., Director, Austin Water Utility
Teresa Lutes, Austin Water Utility
Ron Humphrey, Austin Water Utility
Sharon Smith, Assistant City Attorney
David Malish, Murfee Engineering Company, Inc.
Gary Spoonts, ECO Resources, Inc.
Sharlene Collins, Armbrust and Brown, LLP

RESPONSE TO REQUEST NO. 24

City of Austin
Water and Wastewater Utility

Water Distribution System Long-Range Planning Guide

February 1994

Produced by Systems Analysis and Planning Services Divisions

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CHAPTER 4

TREATMENT FACILITIES PLANS

Chapter 4 discusses the long-range program recommended by the LRP team for upgrading and expanding treatment facilities to meet demand and comply with regulations. It includes:

- Recommended timing for treatment plant expansions and the corresponding cost estimates.
- Discussion of the impact of aggressive demand management (IWRP) on treatment plant expansion timing (including economic analysis)
- Information on what is involved in bringing Water Treatment Plant 4 and its associated distribution facilities through the design and construction process and into the system.
- Confirmation that winter treatment plant capacity is adequate to allow down-time for maintenance.
- An overview of sludge disposal practices.
- Discussion of the implications of the Safe Drinking Water Act (SDWA) Amendments.

4.1 TREATMENT PLANT EXPANSION TIMING

"Current Trend" Timing

The provision of treatment plant capacity should prove challenging in light of provisions of the Safe Drinking Water Act and site limitations of existing facilities. Upgrades to the treatment facilities will meet Americans with Disabilities Act requirements. Compliance with Occupational Safety and Health Administration regulations may soon be required as a result of pending legislation in the United States Congress. The Engineering Division is proposing to create a Utility Water Treatment Task Force to address all of the complicated treatment plant issues. The LRP Guide team supports the creation of this Task Force.

The City currently operates 3 water treatment plants (WTPs)—Davis, Green, and Ullrich—with a total combined treatment capacity of 225 MGD.

The Davis WTP (120 MGD) occupies a site that limits expansion or major upgrade of processes. This plant is expected to continue functioning at its current capacity throughout the 45-year planning period.

The Green WTP (45 MGD) operates on a site that limits any major expansion or upgrading of treatment processes. Its capacity will eventually be replaced by WTP 4. If the 1998 requirements for the Safe Drinking Water Act (SDWA) Phase II Disinfection/Disinfection By-Products (D/DBP) Rule require expensive space-consuming modifications, the aging Green WTP may need to be replaced by the year 2002. Without the restrictions of this proposed rule, it could continue in service until WTP 4 comes on line (about 2017).

The Ullrich WTP (60 MGD) can be expanded. As demand approaches current capacity limits, the LRP Guide team assumed the Ullrich plant would first be expanded to 100 MGD. The 100 MGD capacity was based on existing CIP projects defined prior to promulgation of the D/DBP Rule. We anticipate the expansion will be needed in the relatively near future (by 1998). Our estimates indicate that the plant will need to be expanded again in about 2008, this time to 140 MGD which is considered to be the limit of its site.

The proposed WTP 4 represents the largest water system investment of the planning period. Together with its associated mains and facilities, WTP 4 will require an investment of $173 million—about half of the total new CIP investment for the 45-year period. WTP 4 will also change the operating strategy for a large part of the system. The LRP team recommends an initial capacity of 100 MGD by the year 2018, with expansion to 160 MGD by the year 2028.

Figure 4-1, Treatment Plant Expansion Timing With "Current Trend" Demand, shows how and when rising demand is projected to trigger the need for the recommended improvements. Table 4-1, Treatment CIP Improvements and Cost Estimates, outlines the corresponding costs. CIP expenditures total $205 million for the 45-year period.

As implied above, growth in demand is the primary factor creating the need for new investment in treatment capacity, although increasingly stringent regulations may also play a role. Each of the recommended major projects provides an increment of capacity sufficient to meet increases in demand for approximately ten years.

If Green WTP is taken off line, due to SDWA regulations, Ullrich WTP needs to be expanded to 140 MGD before Green WTP is decommissioned. Without Green, and with Davis at 120 MGD and Ullrich at 140 MGD, system treatment capacity totals 260 MGD. The maximum-day demand, with the 95 percent confidence limit, reaches 259 MGD in the year 2007. Therefore, WTP 4 would be needed by the year 2008 (9 years earlier than otherwise projected).

Figure 4-1 shows the 225-MGD capacity line meeting the maximum-day 95 percent confidence limit demand line just after the year 1998. Given that Ullrich WTP is the only expandable existing plant and that we are recommending the addition of the Ullrich Medium Service Transmission Main before the year 2000, upgrade of Ullrich WTP is the logical first step to increase treatment capacity. We feel that this capacity will also provide reliability and flexibility of operation in the near term, particularly when SDWA related construction is occurring.

The expansion of Ullrich to 100 MGD has been taken as part of the baseline set of facilities referred to as "existing" in this Guide and our analysis indicates that an expansion should be accomplished by 1998. Projects to expand Ullrich have been under construction for some time. However, the size of the expansion and magnitude of funding have not been determined largely due to issues still under consideration associated with the not yet adopted SDWA Disinfection/Disinfection By-Products Rule.

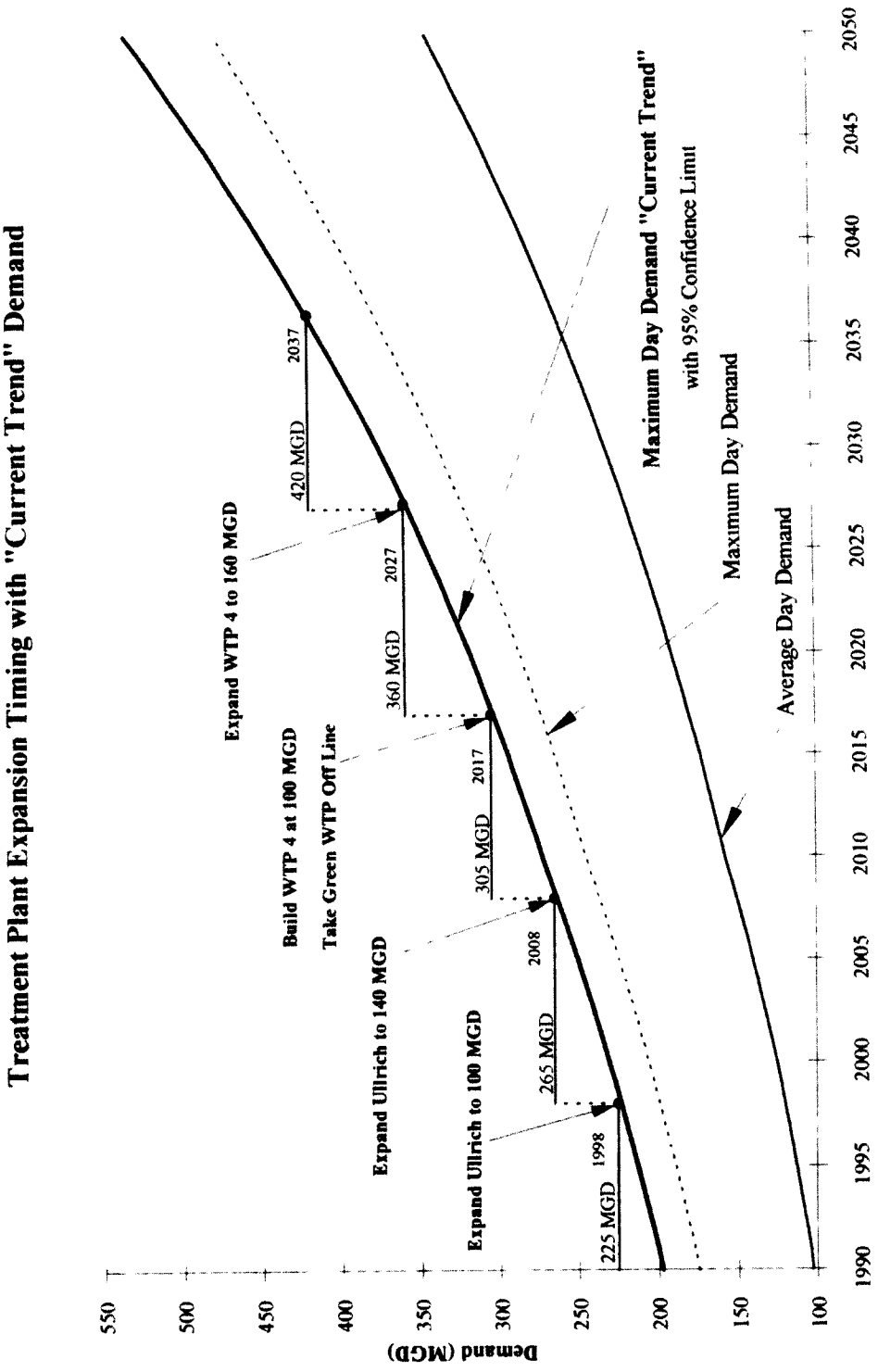
Treatment Plant Expansion Timing with "Current Trend" Demand
Demand (MGD)
550
500
450
400
350
300
250
200
150
100
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Year
225 MGD
1998
Expand Ullrich to 100 MGD
265 MGD
2008
Expand Ullrich to 140 MGD
305 MGD
2017
Build WTP 4 at 100 MGD
Take Green WTP Off Line
360 MGD
2027
Expand WTP 4 to 160 MGD
420 MGD
2037
Maximum Day Demand "Current Trend"
with 95% Confidence Limit
Maximum Day Demand
Average Day Demand

Figure 4-1

Table 4-1

TREATMENT CIP IMPROVEMENTS AND COST ESTIMATES

TREATMENT Description	Treatment Capacity (MGD)	Total Cost Estimate (dollars)	Recommended Before Year
ULLRICH WTP UPGRADE	100 to 140	20,000,000	2010 (2008)
WATER TREATMENT PLANT 4	100	128,000,000	2018
WATER TREATMENT PLANT 4 UPGRADE	100 to 160	57,000,000	2037
TOTAL TREATMENT		*$205,000,000*	

TOTAL WTP CIP IMPROVEMENTS		
	YEAR 2000	$0
	YEAR 2010	$20,000,000
	YEAR 2017	$0
	YEAR 2018	$128,000,000
	YEAR 2037	$57,000,000
	TOTAL	$205,000,000

Note Costs for upgrading Ullrich WTP to 100 MGD are not included in this table

The 265-MGD capacity line meets the demand line just after the year 2008. This triggers expanding the Ullrich WTP to 140 MGD, which is now assumed to be the effective maximum treatment capacity at the Ullrich site. This $20-million improvement will bring the total system treatment capacity to 305 MGD.

The 305-MGD capacity line intersects the demand line just after the year 2017. Since our recommendations would have resulted in the existing sites having been expanded to their maximum limits, a new water treatment plant would be needed at that time. The Utility has already invested in a new plant site and planning and engineering for a fourth plant and associated facilities. The LRP team assumed the Utility would proceed with the proposed WTP 4 facility at the existing site near the intersection of RM 2222 and RM 620 (the Four Points area).

In 2017, Green WTP will be over 90 years old and may encounter increasing difficulty in meeting SDWA requirements. The LRP team recommends that WTP 4 be designed with enough capacity to allow the retirement of Green. Therefore, the Guide recommends designing WTP 4 at a treatment capacity of 100 MGD for the first phase. This treatment capacity addition (minus the Green WTP) brings total capacity to 360 MGD.

The first phase of the plant is currently estimated at about $128 million (see Table 4-1). The associated distribution facilities cost estimates amount to about $45 million for a combined total project cost of $173 million before the year 2018.

The 360-MGD capacity meets the demand line in the year 2027; at this time a WTP 4 treatment capacity upgrade is needed. We recommend an additional 60 MGD at WTP 4 to supply the system through the year 2037 time horizon. This will bring the system total to 420 MGD. The 60 MGD expansion will cost an estimated $57 million. Additional information on WTP 4 appears later in this chapter.

Impacts of Aggressive Demand Management on Treatment Plant Expansion Timing

As discussed in Chapter 3, aggressive demand-side management has the potential to be of great benefit by allowing the postponement of major facilities investments. Figure 4-2, Treatment Plant Expansion Timing And Demand With Effects Of Aggressive Demand Management, shows the two "demand reduction scenario" curves. The figure shows the timing of key treatment plant expansion events under the different demand reduction scenarios.

In this section the deferral timing and economic impact are discussed for each of the following three treatment plant expansion projects:

- The Ullrich WTP Expansion from 100 to 140 MGD
- The Initial Construction of WTP 4 (at 100 MGD) and associated distribution facilities
- The Expansion of WTP 4 from 100 MGD to 160 MGD with associated distribution facilities

Note that the Ullrich WTP expansion from 60 MGD to 100 MGD is also shown on the figure. In the judgment of the LRP team, there is insufficient data on changing usage patterns to justify postponing the Ullrich expansion based on conservation goals being met in the short term. Therefore, prudent planning suggests that the 1998 completion target be used. Also, in the broad scheme covered by this long-range planning Guide, the project is not anticipated to be a major scale investment due to the existing infrastructure in place at the plant. Therefore, the timing and economic impact of the Ullrich Expansion to 100 MGD is not discussed here.

Note that the economic analysis simply shows the benefit of the capital investment deferral. This is only one part of the Integrated Water Resources Planning economic picture. To paint the full picture of the benefits of these deferrals, the loss of revenue, the costs of programs to reduce demands, and the operations and maintenance costs would need to be weighed against the cumulative value of the deferrals. Other less tangible costs and benefits related to environmental impacts, risk management, and reliability would ideally be factored in as well.

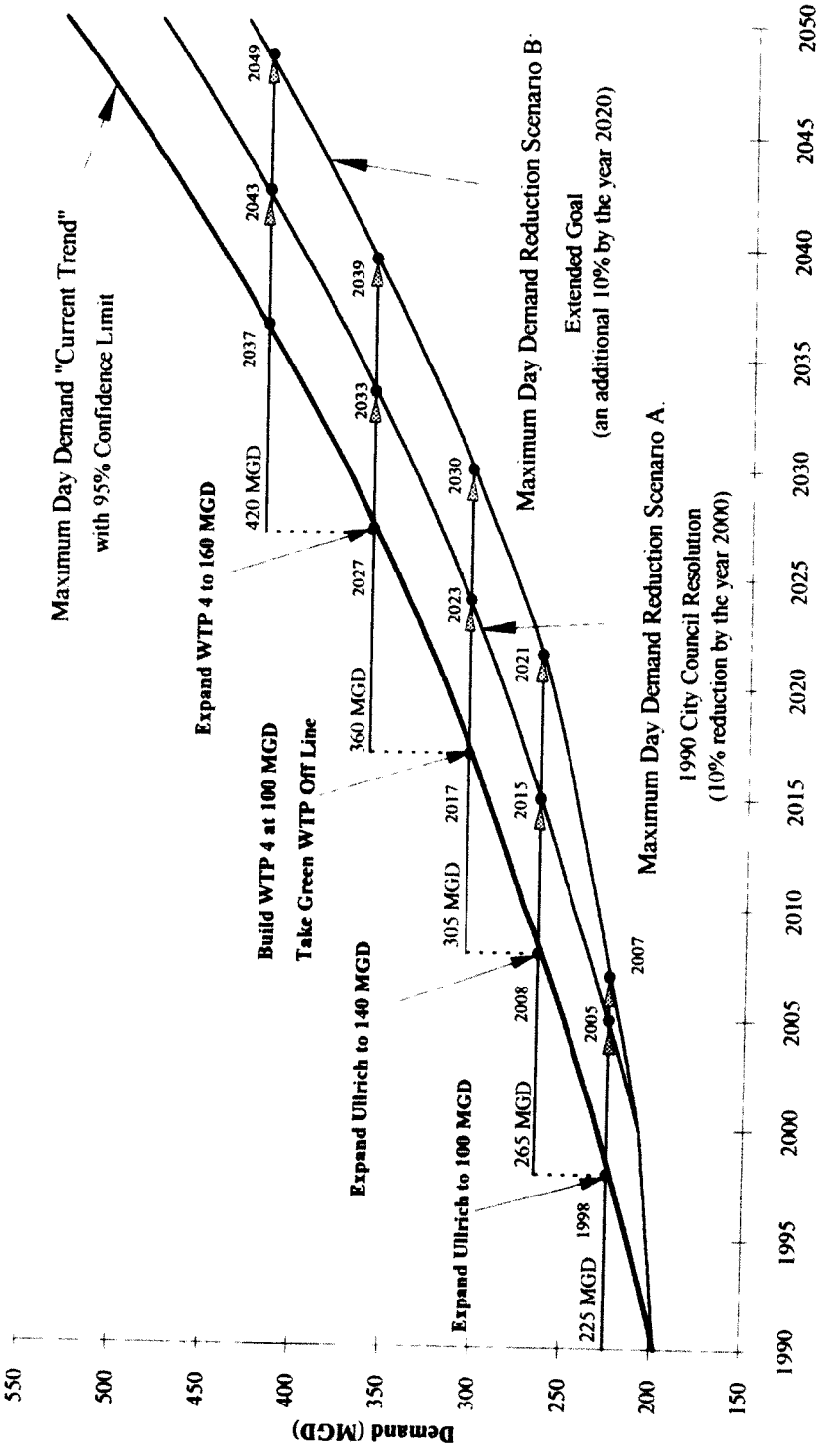
Treatment Plant Expansion Timing and Demand
with Effects of Aggressive Demand Management
Maximum Day Demand "Current Trend"
with 95% Confidence Limit
Expand WTP 4 to 160 MGD
Build WTP 4 at 100 MGD
Take Green WTP Off Line
Expand Ullrich to 140 MGD
Expand Ullrich to 100 MGD
225 MGD
265 MGD
305 MGD
360 MGD
420 MGD
1998
2005
2007
2008
2015
2017
2021
2023
2027
2030
2033
2037
2039
2043
2049
Maximum Day Demand Reduction Scenario A.
1990 City Council Resolution
(10% reduction by the year 2000)
Maximum Day Demand Reduction Scenario B
Extended Goal
(an additional 10% by the year 2020)
Demand (MGD)
Year
550
500
450
400
350
300
250
200
150
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050

Figure 4-2

THE ULLRICH WTP EXPANSION FROM 100 TO 140 MGD

Based on "Current Trend" demand projection, this project is needed in the year 2008. The cost estimate in 1993 dollars is $20 million. Assuming a three year design and construction schedule, the roughly estimated "current trend" project cash flow is as follows:

Year	Cash Amount	
2006	$4 million	(20%)
2007	$8 million	(40%)
2008	$8 million	(40%)
	$20 million	(100%)

As shown on Figure 4-2, the curve for Maximum Day Demand Reduction Scenario A (1990 City Council Goal of 10 percent reduction by the year 2000) indicates the project can be postponed 7 years (from year 2008 to 2015). Therefore, the cash flow for this timing would be over the period of year 2013 to 2015.

As shown on Figure 4-2, the curve for Maximum Day Demand Reduction Scenario B (Extended Goal of an additional 10 percent by the year 2020) indicates the project can be postponed 13 years (from year 2008 to 2021). Therefore, the cash flow for this timing would be over the period of year 2019 to 2021.

The following shows the results of a net present value analysis for the Ullrich WTP expansion (100 to 140 MGD) project showing the value of project deferral (using a 3 percent real discount rate):

	Total Outlays 1993 Dollars	NPV of Outlays 1993 Dollars	NPV of Deferral Savings
Current Trend:	$20 million	$12.8 million	$0.0 million
Scenario A:	$20 million	$10.4 million	$2.4 million
Scenario B:	$20 million	$ 8.7 million	$4.1 million

Source: Utilities Finance Division, Water and Wastewater Utility, January 1994

Note that Scenario A provides $2.4 million in net present value of deferral savings over "current trend" while Scenario B provides $4.1 million.

THE INITIAL CONSTRUCTION OF WTP 4 (AT 100 MGD)
AND ASSOCIATED DISTRIBUTION FACILITIES.

Based on "current trend" demand projection, this project is needed in the year 2017. The cost estimate in 1993 dollars is $173 million. Assuming a five year design and construction schedule, the roughly estimated "current trend" project cash flow is as follows:

Year	Cash Amount	
2013	$17.3 million	(10%)
2014	$17.3 million	(10%)
2015	$43.3 million	(25%)
2016	$51.9 million	(30%)
2017	$43.2 million	(25%)
	$173.0 million	(100%)

As shown on Figure 4-2, the curve for Maximum Day Demand Reduction Scenario A (1990 City Council Goal of 10 percent by the year 2000) indicates the project can be postponed 6 years (from year 2017 to 2023). Therefore, the cash flow for this timing would be over the period of year 2019 to 2023.

As shown on Figure 4-2, the curve for Maximum Day Demand Reduction Scenario B (Extended Goal of an additional 10 percent by the year 2020) indicates the project can be postponed 13 years (from year 2017 to 2030). Therefore, the cash flow for this timing would be over the period of year 2026 to 2030.

The following shows the results of a net present value analysis for the WTP 4 (at 100 MGD) project with associated distribution facilities showing the value of project deferral (using a 3 percent real discount rate):

	Total Outlays 1993 Dollars	NPV of Outlays 1993 Dollars	NPV of Deferral Savings
Current Trend:	$173 million	$86.4 million	$ 0.0 million
Scenario A:	$173 million	$72.4 million	$14.0 million
Scenario B:	$173 million	$58.9 million	$27.6 million

Source: Utilities Finance Division, Water and Wastewater Utility, January 1994

Note that Scenario A provides $14.0 million in net present value of deferral savings over "current trend" while Scenario B provides $27.6 million.

THE EXPANSION OF WTP 4 FROM 100 MGD TO 160 MGD WITH ASSOCIATED DISTRIBUTION FACILITIES

Based on the "current trend" demand projection, this project is needed in the year 2027. The cost estimate in 1993 dollars is $69 million. Assuming a three year design and construction schedule, the roughly estimated "current trend" project cash flow is as follows:

Year	Cash Amount	
2025	$13.8 million	(20%)
2026	$27.6 million	(40%)
2027	$27.6 million	(40%)
	$69.0 million	(100%)

As shown on Figure 4-2, the curve for Maximum Day Demand Reduction Scenario A (1990 City Council Goal of 10 percent by the year 2000) indicates the project can be postponed 6 years (from year 2027 to 2033). Therefore, the cash flow for this timing would be over the period of year 2031 to 2033.

As shown on Figure 4-2, the curve for Maximum Day Demand Reduction Scenario B (Extended Goal of an additional 10 percent by the year 2020) indicates the project can be postponed 12 years (from year 2027 to 2039). Therefore, the cash flow for this timing would be over the period of year 2037 to 2039.

The following shows the results of a net present value analysis for the expansion of WTP 4 (100 to 160 MGD) project with associated distribution facilities showing the value of project deferral (using a 3 percent real discount rate):

	Total Outlays 1993 Dollars	NPV of Outlays 1993 Dollars	NPV of Deferral Savings
Current Trend:	$69 million	$25.1 million	$0.0 million
Demand Reduction Scenario A:	$69 million	$21.0 million	$4.1 million
Demand Reduction Scenario B:	$69 million	$17.6 million	$7.5 million

Source: Utilities Finance Division, Water and Wastewater Utility, January 1994

Note that Scenario A provides $4.1 million in net present value of deferral savings over "current trend" while Scenario B provides $7.5 million.

SUMMARY

The cumulative net present value of deferral savings for Demand Reduction Scenario A is about $21 million and for Scenario B about $39 million as Figure 4-3 illustrates (compare Net Present Value of Outlays). When this benefit is weighed against the various direct and indirect costs and other benefits of achieving these postponements, it will likely be cost effective to make significant investments toward achieving demand reductions.

However, while the outlook for success in causing significant demand reductions is improving, we need to be prudent in planning facilities at this time. Until our observations confirm that our demand reduction efforts significantly affect actual water usage, we should continue to plan for current trends. As we observe new evidence of demand reduction, we will change our investment plans to reflect new trends in usage brought about by aggressive demand management.

Net Present Value of Treatment Plant Expansion Project Deferrals

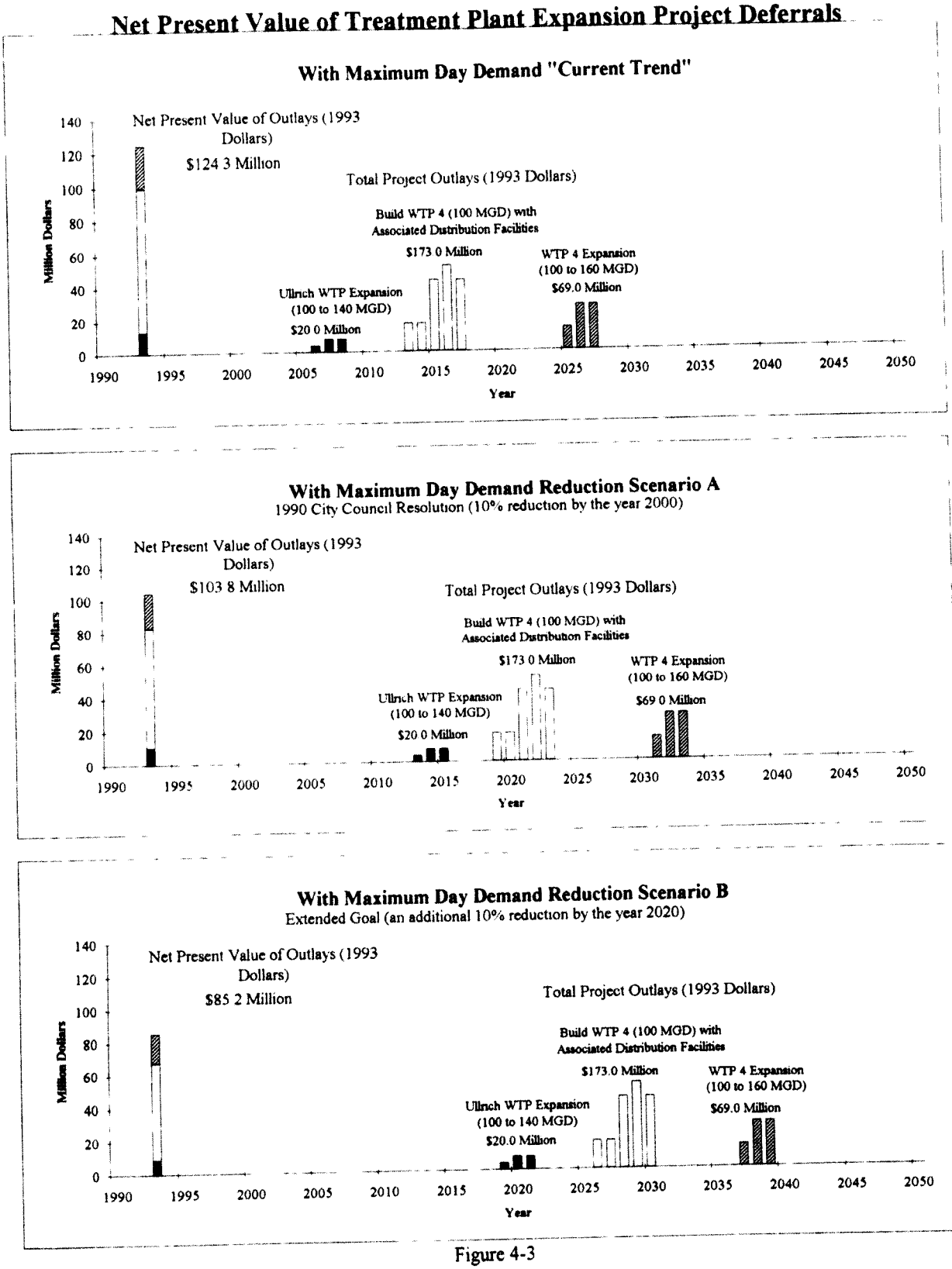

Figure 4-3

4.2 WATER TREATMENT PLANT 4 (WTP 4)

Water Treatment Plant 4 has special significance in long-range planning both because its operation will change the system operating strategy and because of the large investment it represents.

WTP 4 was designed in the early 1980s when growth projections were high. Plans for the plant have been on hold since 1989. For detailed information concerning WTP 4, refer to the SITE SELECTION AND PRELIMINARY DESIGN REPORT: WATER TREATMENT PLANT NUMBER 4 by Lake Travis Consultants, April 1985.

Capacity

We recommend WTP 4 have an initial treatment capacity of 100 MGD. This will provide capacity to allow retirement of the Green WTP and will add about a 10-year increment of supply. Second-phase improvements to bring WTP 4 to 160 MGD are projected to be needed by the year 2028.

The 1987 LCRA agreement stipulates that the capacity of the WTP 4 intake pumps will be limited to 150 MGD. There is a discrepancy between the agreement and the 160-MGD capacity that this Guide suggests will be needed.

Location

The Guide assumes that WTP 4 will be constructed at the existing site near the intersection of RM 2222 and RM 620 (near the Four Points area). This site was purchased in the mid-1980s. It is essentially surrounded by proposed Balcones Canyonlands Conservation Plan (BCCP) land acquisition area. As of this writing, the proposed BCCP arrangement will provide for the location of the plant and transmission main routing out of the facility. However, depending upon the final BCCP arrangements, other sites for WTP 4 may need to be considered. Chapter 6 provides more information on BCCP issues.

Operations

With WTP 4 providing just under one-third of total system demand, the system operation scheme will change. The LRP team recommends keeping operation strategies in the South and Southwest Pressure Zones similar to those of the existing system. Adjustments will be required in the Central Zone, however, to accommodate the absence of the Green WTP and the presence of WTP 4.

The Ullrich and Davis Plants will supply the demands of the Central, South, and Southwest Pressure Zones. They will also supply a portion of the North Pressure Zone. WTP 4 will supply the Northwest Pressure Zones and a portion of the North Pressure Zone. With this operation strategy, Spicewood Springs PS will no longer be needed to routinely move water to the northwest. Instead, water will be moved from the northwest toward the center of the system.

In a balanced maximum-day operations scenario, Davis could contribute 100 MGD, Ullrich 120 MGD and WTP 4 85 MGD (each at 85 percent of capacity), serving a total system demand of 305 MGD. With WTP 4, new system operating strategies will become available.

We recommend supplying WTP 4 water to the North Pressure Zone initially through a Pressure Control Station (PCS) at the Howard Lane Reservoirs. Later, we recommend adding a second WTP 4 water supply point to the North Zone near Spicewood Springs Road and Loop 360 (Spicewood PCS).

Associated Distribution Facilities

Many associated distribution facilities will be needed to integrate WTP 4 into the system. Pump stations will be required to pump the water from the plant into the system. Large transmission mains will be needed to move the pumped water from the plant into the various pressure zones where needed.

The following is a list of facilities associated with WTP 4:

- Water Treatment Plant 4
- Spicewood Springs TM

- WTP 4 NWA PS Discharge TM - Forest Ridge
- WTP 4 NWA PS Discharge TM - Jollyville
- Martin Hill TM
- Howard Lane NWA TM
- WTP 4 NWA Pump Station
- WTP 4 NWB Pump Station
- Howard Lane Pressure Control Station (PCS)
- Flow Control Station/Valve (FCS) at Jollyville Reservoir
- WTP 4 Upgrade
- North Zone TM
- WTP 4 NWB PS Discharge TM
- WTP 4 NWA PS Upgrade
- Spicewood Springs Pressure Control Station (PCS)
- Flow Control Station/Valve (FCS) at Four Points

4.3 WINTER CAPACITY DURING MAINTENANCE

The LRP team reviewed winter treatment plant capacity to establish the system's ability to meet winter demand while some facilities are off line for maintenance. Two of the three plants have routine maintenance scheduled during the winter that reduces the amount of water available to be pumped into the system.

The Davis WTP routinely has three of its conventional sedimentation basins scheduled for maintenance at a time. Some of the basins may be out of service throughout the entire off season. Therefore, the Davis WTP capacity will vary from 80 to 120 MGD depending upon how many basins [illegible] For purposes of this analysis, the Davis WTP winter capacity was established as 80 MGD.

The Green WTP has two conventional sedimentation basins. One of the basins is rated at 15 MGD and the other is rated at 30 MGD. Routinely, a Green basin would be down for approximately two months. Therefore the Green WTP is rated at 15 MGD for winter operation.

The Ullrich WTP is and will continue to be equipped with up-flow solid contact clarifiers. The maintenance schedule on these clarifiers is no different in the winter than in the summer. Additionally, Ullrich is planned to have a standby clarifier available at all times. Therefore, the Ullrich WTP winter capacity is the same as its maximum-day capacity.

We compared the winter treatment capacity of the plants to the average-day demand for each planning period. This is a conservative approach, since demand in many winter months falls below average-day demand. For example, during February demand is typically about 80 percent of average-day usage. Also, the Davis WTP and the Green WTP may have more capacity available at times than their rated winter operating capacity. Table 4-2, Winter Treatment Plant Capacities, shows the relationship between winter capacities and average-day demand.

TABLE 4-2

WINTER TREATMENT PLANT CAPACITIES

Year	2000	2010	2017
Davis Capacity	80 MGD	80 MGD	[redacted]
Green Capacity	15 MGD	15 MGD	15 MGD
Ullrich Capacity	100 MGD	140 MGD	140 MGD
Total Capacity	195 MGD	235 MGD	235 MGD
Average Day Demand	136 MGD	168 MGD	182 MGD
Excess Winter Capacity	59 MGD	67 MGD	[redacted]

The Utility should enjoy a healthy winter demand versus winter capacity relationship throughout the life of the Green WTP. Design and operational considerations for WTP 4 should continue this relationship. System infrastructure that will meet