1998-1999 :

1999 - 2000 : $131,000

2002 Sanitary Sewer Investigations

CC: CT

Addison!

DATE: 13 MARCH 2002

TO: MIKE MURPHY

FROM: JIM PIERCE JWP

SUBJECT: SANITARY SEWER SURCHARGE STATUS REPORT

Sanitary sewage samples were obtained in June, July and August of 2001 from "temporary" sampling sites that were suggested by our Consultant, Freese & Nichols (F&N), and approved by Dallas Water Utilities (DWU).

A summary of the sampling results follows:

MONTH	AVERAGE BOD	AVERAGE SUSPENDED SOLIDS
JUNE	235 mg/l	270 mg/l
JULY	183 mg/l	223 mg/l
AUGUST	245 mg/l	285 mg/l
Average of Averages	234 mg/l	259 mg/l

The "allowable" BOD and Suspended Solids value for DWU is 250 mg/l each. As a result of this sampling, only suspend solids cause a surcharge, and a small one at that (259 mg/l vs. 250 mg/l).

Consequently, the past surcharge amounts were recalculated based on the three-month's sampling results. A summary sheet is attached which shows the recalculations.

Addison had actually paid a total amount of surcharges for July 2001 through September of 2001 of $54,563.23. The sampling results, when applied, gave us a credit of $50,524.50 toward the payment of future surcharge amounts. Surcharge payments were suspended after September 2001, pending the results of the study.

The Town has authorized F&N to design new sampling manholes that will be used for future samplings. This project is about 95% complete and the plans will be sent to DWU for approval in the near future.

In the meantime, DWU has not billed us for any surcharges. It is our understanding that if they do bill us for surcharges, it would be at the much reduced rate that resulted from our sampling.

Therefore, as a result of this process, and based on the last several months of surcharge fees, the Town stands to realize a cost savings of between $20,000 and $30,000 per month.

dallas water utilities
city of dallas

10-4 Changed SAF

November 7, 2001

To: All Wholesale Water Customers

Due to an unforeseen and unavoidable conflict, we regret to inform you that the Conservation Strategy meeting scheduled for November 12, 2001, has had to be rescheduled. The meeting will now be held on December 13, 2001, at 7:45 a.m. at the Radisson Hotel Suites, 2330 W. Northwest Highway, Cambridge/Oxford Meeting Room.

We apologize for any inconvenience this change may cause you.

As before, the general topics of discussion will be:

- Review and Presentation of Dallas Program
- Customer City Involvement
- Discussions/Questions

We encourage you to send a representative to this meeting. It is suggested your representative be knowledgeable about your city's current policy on conservation and have a working knowledge of your city's water system.

Please RSVP by calling Shiva at 214/670-5888 before December 7th. We look forward to seeing you at the meeting.

Randy Stalnaker

Randy Stalnaker
Manager
Wholesale Services Division

dallas water utilities
city of dallas

SE. make Res for:

Mike
Jeff
Keith

Put meeting on Calander 10/29/01
7:30 - 9:30 AM

Left msg on Shiva's LINE

October 22, 2001

To: All Wholesale Water Customers

At the Water and Wastewater Management Advisory Committee meeting held on August 16th, our Director, Mr. Terrace Stewart, outlined the City of Dallas' proposed conservation strategy. During the discussions, the suggestion was made to schedule a meeting to discuss this subject in more detail.

Consequently, a Conservation Strategy meeting has been scheduled for November 12, 2001, at 7:45 a.m. at the Radisson Hotel Suites, 2330 W. Northwest Highway, King George Meeting Room. General topics of discussion will be:

- Review and Presentation of Dallas Program
- Customer City Involvement
- Discussions/Questions

We encourage you to send a representative to this meeting. It is suggested your representative be knowledgeable about your city's current policy on conservation and working knowledge of your city's water distribution system.

Please RSVP by calling Shiva at 214/670-5888 before October 30th.

Randy Stalnaker

Randy Stalnaker
Manager
Wholesale Services Division

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

dallas water utilities
city of dallas

October 8, 2001

Michael E. Murphy, P.E.
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Murphy:

Thank you for your patience in awaiting our analysis of the wastewater sampling results for the City of Addison for the months of June, July and August 2001.

You will recall from our previous correspondence and our meeting of September 17, 2001, that we had agreed to use the sampling results from the three temporary sampling sites for these months and apply them to Addison's surcharges from July 2000 forward if the results were lower than those which had been obtained through our sampling at the time. It was Addison's position that certain characteristics of the permanent sampling sites were leading to artificially high BOD and/or TSS results.

We also agreed that Addison could hold in abeyance the payments for the surcharges from October 2000 forward until the analysis of the three months mentioned above was completed. My staff and I have now spent considerable time analyzing the data and deliberating as to the most equitable method for resolving this matter.

The TSS and BOD results for June were 270 mg/l and 235 mg/l respectively and July were 223 and 183 mg/l respectively. In accordance with your request, we discarded the results for the August 2001 sampling for August 7, 8 and 9 at the Keller Springs site. The results for these days were discarded because your staff felt that the sampling tube was not in the correct position and thus obtaining inaccurate results. After discarding the results for these three days, the TSS for Addison for the month of August was 285 mg/l, which results in a surcharge; BOD results for the month were 245 mg/l, below the threshold for a surcharge. A detailed report of the TSS sampling results for each day and site is enclosed, both with and without the three days results mentioned above.

Averaging the TSS and BOD findings for the months of June, July and August 2001 results in a BOD of 234 mg/l and TSS of 259 mg/l. Thus BOD results will not cause a surcharge, however TSS will.

We have applied the TSS result of 259 mg/l (or the actual result if it was lower) to those months which were disputed (July through October and December 2000 and February through August

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

2001). The amounts due for the TSS surcharge are as follows:

July 2000	$ 353.19
August 2000	$ 344.58
September 2000	$ 345.86
October 2000	$ 381.08
December 2000	$ 399.82
February 2001	$ 413.60
March 2001	$ 403.28
April 2001	$ 302.30
May 2001	$ 379.64
June 2001	$ 316.96
August 2001	$ 398.42
TOTAL	$4,038.73

A summary sheet listing these amounts and comparing them to the previous surcharge amounts is enclosed.

Addison has paid the previously calculated surcharges (based on results at the permanent sampling sites) for the months of July-September 2000. These amounts were:

July 2000	$33,291.19
August 2000	$10,173.02
September 2000	$11,099.02
TOTAL	$54,563.23

This total will be applied toward the surcharges listed above resulting in a credit of $50,524.50. This credit will be applied to future wastewater treatment or surcharge bills.

Because of the surcharge for the month of August, in accordance with the Wastewater Treatment contract between the cities of Dallas and Addison, sampling will continue until the results find two consecutive months without a surcharge. Sampling will then be performed on a semi-annual basis unless sampling results lead to a surcharge, in which case sampling will be performed monthly.

It is our understanding that Addison wishes future sampling be performed at the temporary sites used during June-August 2001 until new permanent sites can be built. While we have no objection to accommodating Addison and sampling at these sites, the nature of our sampling equipment will not allow us to sample at the temporary Branch and Keller Springs sites. We will be able to use the temporary Academy site.

During our meeting on September 19, you indicated that new permanent sampling sites would be built at Addison's expense near the temporary sites. These new sites would then be used for regular sampling. If it is not Addison's intention to construct these new sites, please let us know. Otherwise we will look forward to receiving the plans to review.

If you would like to discuss any of these items further, please call me at 214-670-5887.

Sincerely,

Randy Stalnaker

Randy Stalnaker, Manager
Wholesale Services

Enclosures (3)

cc: Larry Patterson, P.E.
Mike Rickman
Chris Kaakaty
Zachary Peoples
Tonia Lichtenberg
Shiva Peters
Robert McCarthy

Month	TSS	BOD	TSS Revised	BOD Revised	TSS Difference	BOD Difference	Original Surcharge Amount	Revised Surcharge Amount	Difference
Jul-00	890	442	259	234	-631	-208	33,291.19	353.19	-$32,938.00
Aug-00	506	259	259	234	-247	-25	10,173.02	344.58	-$9,828.44
Sep-00	515	272	259	234	-256	-38	11,099.02	345.86	-$10,753.16
*Oct-00	900	231	259	231	-641	0	27,515.15	381.08	-$27,134.07
**Nov-00	213	194	213	194	0	0	0.00	0.00	$0.00
Dec-00	888	751	259	234	-629	-517	52,503.21	399.82	-$52,103.39
**Jan-01	222	205	222	205	0	0	0.00	0.00	$0.00
Feb-01	416	343	259	234	-157	-109	12,267.61	413.60	-$11,854.01
Mar-01	391	279	259	234	-132	-45	7,727.29	403.28	-$7,324.01
Apr-01	390	280	259	234	-131	-46	5,795.40	302.30	-$5,493.10
May-01	925	319	259	234	-666	-85	31,625.91	379.64	-$31,246.27
Jun-01	270	235	259	234	-11	-1	704.16	316.96	-$387.20
**July-01	223	183	223	183	0	0	0.00	0.00	$0.00
Aug-01	285	245	259	234	-26	-11	1,549.15	398.42	-$1,150.73
							194,251.11	4,038.73	-$190,212.38

* October 2000 - Actual BOD lower than Revised BOD
** November 2000, January 2001, July 2001 - No BOD / TSS Surcharge

Addison August Wastewater Sampling Results

	Location	TSS	Flow	%	Contribution	
07-Aug	Branch	726	580	0.069353	50.35035274	
07-Aug	Academy	125	232	0.027741	3.467655148	
08-Aug	Academy	182	201	0.024034	4.374267607	
08-Aug	Branch	198	696	0.083224	16.47829726	
09-Aug	Academy	189	201	0.024034	4.542508669	
10-Aug	Academy	143	185	0.022121	3.163338515	
10-Aug	Branch	203	706	0.084419	17.13715174	
10-Aug	Keller Springs	416	394	0.047112	19.5987086	
11-Aug	Academy	91	185	0.022121	2.0130336	
11-Aug	Branch	196	706	0.084419	16.54621547	
11-Aug	Keller Springs	665	394	0.047112	31.32966639	
12-Aug	Branch	236	706	0.084419	19.92299414	
12-Aug	Academy	473	185	0.022121	10.46335047	
12-Aug	Keller Springs	166	394	0.047112	7.820638527	
13-Aug	Branch	154	667	0.079756	12.28243453	
13-Aug	Keller Springs	389	417	0.049862	19.39650843	
13-Aug	Academy	238	215	0.025708	6.118617721	
14-Aug	Branch	199	667	0.079756	15.87145761	
14-Aug	Academy	227	215	0.025708	5.835824465	
14-Aug	Keller Springs	367	417	0.049862	18.29953366	
		5583	8363	1	285.0125553	Total TSS

Addison August Wastewater Sampling Results

	Location	TSS	Flow	%	Contribution	
07-Aug	Branch	726	580	0.06011	43.63975542	
07-Aug	Academy	125	232	0.024044	3.005492797	
08-Aug	Academy	182	201	0.020831	3.791273707	
08-Aug	Branch	198	696	0.072132	14.28210177	
09-Aug	Academy	189	201	0.020831	3.937091927	
09-Aug	Keller Springs	1026	424	0.043942	45.08487926	
10-Aug	Academy	143	185	0.019173	2.741734895	
10-Aug	Branch	203	706	0.073168	14.8531454	
10-Aug	Keller Springs	416	394	0.040833	16.98663074	
11-Aug	Academy	91	185	0.019173	1.744740388	
11-Aug	Branch	196	706	0.073168	14.34096798	
11-Aug	Keller Springs	665	394	0.040833	27.15410923	
12-Aug	Branch	236	706	0.073168	17.26769613	
12-Aug	Academy	473	185	0.019173	9.068815421	
12-Aug	Keller Springs	166	394	0.040833	6.778318997	
13-Aug	Branch	154	667	0.069126	10.64545549	
13-Aug	Keller Springs	389	417	0.043217	16.81137942	
13-Aug	Academy	238	215	0.022282	5.303140222	
14-Aug	Branch	199	667	0.069126	13.75614053	
14-Aug	Academy	227	215	0.022282	5.058037102	
14-Aug	Keller Springs	367	417	0.043217	15.86060732	
07-Aug	Keller Springs	492	438	0.045393	22.33350606	
08-Aug	Keller Springs	355	424	0.043942	15.59954399	
		7456	9649	1	330.0445642	Total TSS

Dallas Water Utilities
Wholesale Services Division
City Hall, 4AN
Dallas, Texas 75201

FAX COVER SHEET

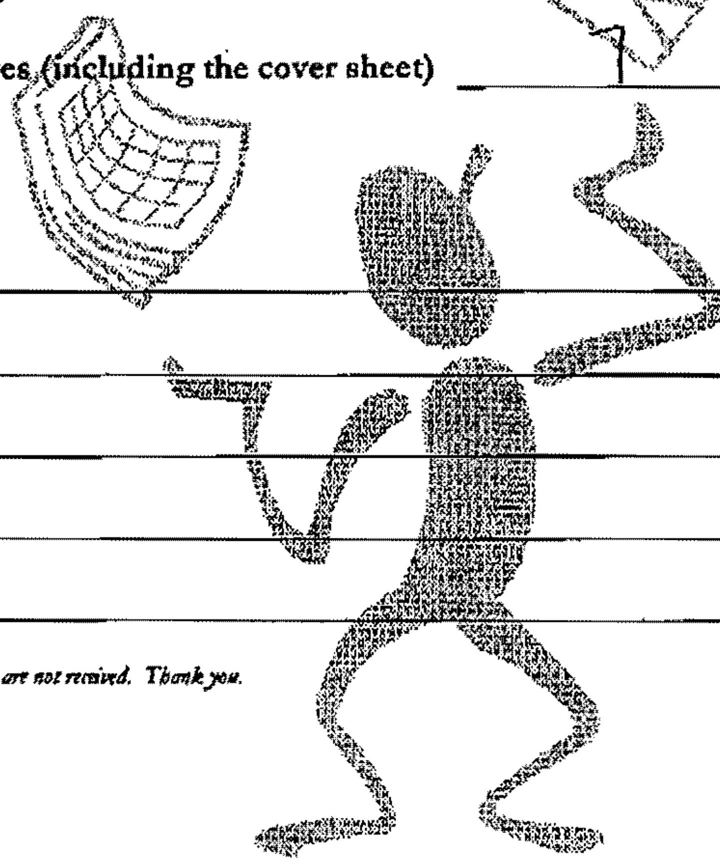
DATE: 10 03 01 **TIME:**

TO: Mike Murphy **FAX:** 972.450.2837

FROM: Randy Stalnaker **PHONE:** 214.670.5887

Total Number of Pages (including the cover sheet) 7

Comments:



Please call 214.670.5888, if all pages are not received. Thank you.

dallas water utilities
city of dallas

October 8, 2001

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Randy Stalnaker, Manager
Wholesale Services

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		7456	9649	1	330.0445642 Total TSS

Before 9/30/01

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: ~~10/12/01~~ 9/30/01   **Claim #** ______   **Check $** <31,782.84>

Vendor No. #00429
Vendor Name DALLAS WATER
Address CITY HALL 4AN
Address DALLAS
Address TX
Zip Code 75201

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
WTR/SWR. 221-1202003001	61	712	56640			18741.66
Surchg. 221-1202003-001	61	712	56520			<50524.50>

TOTAL ~~0.00~~ <$31,782.84>

EXPLANATION Monthly WR. Bills
(SEE ATTACHED LETTER FROM DWU)

Authorized Signature

Finance

61-712 56640

City of Dallas

Utilities and Services

Account Number: 221-1202003-001

Credit Balance - Do Not Pay: -$31,782.84

TOWN OF ADDISON
% UTILITIES DEPARTMENT
P O BOX 9010
ADDISON TX 75001-9010

For services at: 16220 DALLAS PKWY

Billing Date: 10-04-01 Days Served: 31

Service Provided	Meter Number	Read 08-30-01	Read 09-30-01	Usage in 1000 Gals	Total
WASTEWATER	800023	137757	151650	13,893	
Total Volume @ $ 1.3490 / 1000 gallons				13,893	$ 18,741.66

Wastewater/Sewer - 61-712-56640
Surcharge acct. - 61-712-56520

Current Charges	$18,741.66
Previous Balance	-$50,524.50
Total Amount Due	-$31,782.84

OK

WHOLESALE SERVICES 214/670-5888
EMERGENCY 214/670-8064

City of Dallas

Utilities and Services

Keep this portion for your records
Please return this portion with your payment

Amount Due: -$31,782.84

ACCOUNT NUMBER:
221-1202003-001

TOWN OF ADDISON
% UTILITIES DEPARTMENT
P O BOX 9010
ADDISON TX 75001-9010

Make payable to:
City of Dallas
City Hall, 4AN
Dallas TX 75201

TOWN OF
ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

July 25, 2001

Mr. Randy Stalnaker
Manager of Wholesale Services
Dallas Water Utilities
1500 Marilla, Room 4A North
Dallas, TX 75201

Re: Wastewater Surcharge for June 2001

Dear Mr. Stalnaker:

We have received your letter of July 17, 2001 regarding the wastewater surcharge for June 2001.

We are withholding any action on this surcharge payment until we have had a chance to review all of the sampling results from the proposed relocated sampling sites, as per our letter of February 27, 2001.

Please call me at 972-450-2871 if you have any questions.

Very truly yours,

M. E. Murphy

Michael E. Murphy, P.E.
Director of Public Works

Cc: Chris Terry, Assistant City Manager
Jim Pierce, P.E., Assistant Public Works Director
Keith Thompson, Utility Foreman

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

July 17, 2001

Mr. Randy Stalnaker
Manager of Wholesale Services
Dallas Water Utilities
1500 Marilla, Room 4A North
Dallas, TX 75201

Re: Wastewater Surcharge for May 2001

Dear Mr. Stalnaker:

We have received your letter of July 5, 2001 regarding the wastewater surcharge for May 2001.

We are withholding any action on this surcharge payment until we have had a chance to review sampling results from the proposed relocated sampling sites, as per our letter of February 27, 2001.

Please call me at 972-450-2871 if you have any questions.

Very truly yours,

Michael E. Murphy, P.E.
Director of Public Works

Cc: Chris Terry, Assistant City Manager
Jim Pierce, P.E., Assistant Public Works Director
Keith Thompson, Utility Foreman

FACSIMILE

To: Mike Murphy

Of: Town of Addison

Fax: 972.450.2837

Pages: cover sheet only

Date: July 6, 2001

The sampling device set-up for wholesale wastewater point-of-entry sampling by the City of Dallas Water Utilities Department is **scheduled** for Monday, July 9, 2001 with sampling **scheduled** to commence on Tuesday, July 10, 2001.

Please call Wholesale Services Division if you have any questions.

From the desk of...
Shiva L Peters
Dallas Water Utilities
Wholesale Services Division
214/670-5868

FACSIMILE

To: Mike Murphy

Of: Town of Addison

Fax: 972.450.2837

Pages: cover sheet plus 4 pages

Date: July 3, 2001

Enclosed are the results of the May 2001 Wastewater Sampling Survey.

From the desk of...
Wholesale Services Division
Dallas Water Utilities
1500 Marilla - 4AN
Dallas TX 75201
Telephone 214/670-5888

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

Date	05/01/01	05/01/01	05/01/01	05/02/01	05/02/01	05/02/01	05/03/01
Lab Number	54	52	53	9	10	11	18
Volume	421000	252000	450000	252000	450000	421000	450000
pH							
Total Suspended Solids	249	290	515	380	278	2542	656
Biochemical Oxygen Demand	156	195	322	254	360	270	338
Cyanide							
Cadmium							
Chromium							
Copper							
Lead							
Mercury							
Nickel							
Silver							
Zinc							
Total Metals							
Arsenic							
Selenium							
Floatable Oil & Grease							
Acetone							
Benzene							
Ethyl Benzene							
Isopropyl Alcohol							
Methyl Alcohol							
Methyl Ethyl Ketone							
Methylene Chloride							
Phenol							
Toluene							
Xylene							
Flash Cup							
Site	KS	ACAD	BRCH	ACAD	BRCH	KS	BRCH

All results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

Date	05/03/01	05/03/01	05/04/01	05/04/01	05/04/01	05/05/01	05/05/01
Lab Number	19	17	35	34	33	39	40
Volume	421000	252000	450000	252000	421000	450000	421000
pH							
Total Suspended Solids	195	347	2595	891	382	527	485
Biochemical Oxygen Demand	164	225	690	420	232	218	132
Cyanide							
Cadmium							
Chromium							
Copper							
Lead							
Mercury							
Nickel							
Silver							
Zinc							
Total Metals							
Arsenic							
Selenium							
Floatable Oil & Grease							
Acetone							
Benzene							
Ethyl Benzene							
Isopropyl Alcohol							
Methyl Alcohol							
Methyl Ethyl Ketone							
Methylene Chloride							
Phenol							
Toluene							
Xylene							
Flash Cup							
Site	KS	ACAD	BRCH	ACAD	KS	BRCH	KS

All results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

Date	05/05/01	05/06/01	05/06/01	05/06/01	05/07/01	05/07/01	05/07/01
Lab Number	38	43	42	41	56	57	55
Volume	252000	450000	252000	421000	450000	421000	252000
pH							
Total Suspended Solids	556	1028	396	961	2012	514	163
Biochemical Oxygen Demand	102	570	302	565	295	156	139
Cyanide							
Cadmium							
Chromium							
Copper							
Lead							
Mercury							
Nickel							
Silver							
Zinc							
Total Metals							
Arsenic							
Selenium							
Floatable Oil & Grease							
Acetone							
Benzene							
Ethyl Benzene							
Isopropyl Alcohol							
Methyl Alcohol							
Methyl Ethyl Ketone							
Methylene Chloride							
Phenol							
Toluene							
Xylene							
Flash Cup							
Site	ACAD	BRCH	ACAD	KS	BRCH	KS	ACAD

All results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

Date	05/08/01	05/08/01	05/08/01	05/09/01	05/09/01	05/09/01	Average
Lab Number	62	63	64	75	74	73	
Volume	252000	450000	421000	421000	450000	252000	
pH							
Total Suspended Solids	279	3375	350	180	2286	318	925
Biochemical Oxygen Demand	110	938	186	156	450	192	319
Cyanide							
Cadmium							
Chromium							
Copper							
Lead							
Mercury							
Nickel							
Silver							
Zinc							
Total Metals							
Arsenic							
Selenium							
Floatable Oil & Grease							
Acetone							
Benzene							
Ethyl Benzene							
Isopropyl Alcohol							
Methyl Alcohol							
Methyl Ethyl Ketone							
Methylene Chloride							
Phenol							
Toluene							
Xylene							
Flash Cup							
Site	ACAD	BRCH	KS	KS	BRCH	ACAD	

All results, except for pH, are reported in mg/l.

FACSIMILE

To: Mike Murphy

Of: Town of Addison

Fax: 972.450.2837

Pages: cover sheet only

Date: April 27, 2001

The sampling device set-up for wholesale wastewater point-of-entry sampling by the City of Dallas Water Utilities Department is **scheduled** for Monday, April 30, 2001 with sampling **scheduled** to commence on Tuesday, May 1, 2001.

Please call Wholesale Services Division if you have any questions.

From the desk of...
Shiva L Peters
Dallas Water Utilities
Wholesale Services Division
214/670-5868

dallas water utilities
city of dallas

April 25, 2001

Michael E. Murphy, P.E.
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Murphy:

I am writing to you in response to your letter of March 29, 2001. Please excuse this tardy reply; your letter was misrouted to the City's lockbox and delayed in reaching me.

The purpose of this letter is to address the issues regarding Addison's wastewater surcharges and our efforts to reach an agreement for dealing with Addison's outstanding surcharge bills. In response to your proposal, the City of Dallas will agree to the following:

1. The Town of Addison may temporarily relocate its wastewater sampling sites to those locations shown on the map provided by Addison. Addison will construct the concrete sample pads around the manholes at the new sites so that the security boxes can be bolted in place. Addison will construct or acquire the security boxes and place them at the new sites. Construction of sample pads and security boxes will be inspected by and their use subject to approval by DWU. Plans for both the pads and boxes are enclosed. Sampling from the temporary sites will be for three consecutive months.

2. The Town of Addison has paid the wastewater surcharges for the months of July 2000 ($33,291.19), August 2000 ($10,173.02), and September 2000 ($11,099.02). Payment by Addison for surcharge bills for the months beginning in October 2000 may be withheld until the issue of disputed surcharges is resolved. However, any surcharges due in accordance with the outcome of the temporary sampling and this agreement must be paid by Addison before September 30, 2001.

3. Three months of sample history at the temporary sites will be gathered and compared against the disputed surcharge months of July, August, September, October and December 2000. If the sampling results indicate a strength of sewage below 250 mg/l for both TSS and BOD in each of the three months of sampling at the temporary sites, the wastewater surcharge bills for the months of July 2000 forward will be rescinded. Should the results from three months of sampling from the proposed temporary sample sites generally be similar to the prior results from the disputed surcharges, then the full amounts from the months beginning October 2000 will immediately be due from Addison. However, should the results from three

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

months of sampling from the temporary sample sites generally be less than the prior results from the disputed surcharges (but still above 250 mg/l for TSS or BOD), the bills will be adjusted in accordance with the lower sampling results and applied to the disputed surcharges; payment will then immediately be due from Addison.

4. Sampling at the temporary sites will be conducted by City of Dallas Water Utilities personnel in accordance with our usual standards. Addison may split samples or take its own samples at these sites. If Addison chooses to take samples from the temporary sites, sampling and laboratory procedures performed by Addison or its consultants must conform with City of Dallas Water Utilities standards.

5. The decision whether Addison will fund and build new sampling sites or continue to use the existing sites will be deferred until the results are obtained from the temporary sites.

If you agree to these terms, please provide us with a written confirmation so stating. If you do not agree to any portion of them, please let me know so that we can discuss the matter.

We appreciate your continued efforts to arrive at an agreement and look forward to your reply.

Sincerely,

Randy Stalnaker

Randy Stalnaker, Manager
Wholesale Services

cc: Larry Patterson, P.E.
Mike Rickman
Chris Kaakaty
Zachary Peoples
Tonia Lichtenberg

Mike

REGION C WATER PLANNING GROUP

OPEN MEETING

MONDAY, APRIL 23, 2001 AT 1:30 P.M.
THE MEETING WILL BE HELD AT
CENTRAL WASTEWATER TREATMENT PLANT
TRINITY RIVER AUTHORITY
6500 W. SINGLETON BOULEVARD
GRAND PRAIRIE, TEXAS

AGENDA

I. ROLL CALL

II. APPROVAL OF MINUTES - DECEMBER 4, 2000

III. GRANT FUNDING REQUEST FOR ROUND 2 PLANNING SCOPE OF WORK

IV. INSURANCE RENEWAL

V. SENATE BILL 2

VI. REGION C WATER PLAN - REVISION APPROVAL

VII. ROBERT MACE, ASSISTANT DIVISION DIRECTOR, WATER RESOURCES PLANNING, TEXAS WATER DEVELOPMENT BOARD, "GROUNDWATER AVAILABILITY MODELING (GAM)"

VIII. DISCUSSION

a. Confirm Date of Next Meeting
b. Other Discussion
c. Acknowledgement of Guests/Comments

IX. ADJOURNMENT

TRINITY RIVER AUTHORITY OF TEXAS
CENTRAL REGIONAL WASTEWATER SYSTEM
CONTRIBUTED WASTEWATER FLOW BY CONTRACTING PARTIES
JANUARY

CONTRACTING PARTY	FLOW (MGD)	% CONTR.	YTD FY %	PROJ. %	% VAR
ADDISON	2.292	1.585	1.622	1.691	-4.08
ARLINGTON	42.343	29.281	29.614	27.848	6.34
BEDFORD	4.923	3.404	3.441	3.745	-8.12
CARROLLTON	10.238	7.080	7.223	8.524*	-15.26
CEDAR HILL	0.291	0.201	0.188	0.147*	27.89
COLLEYVILLE	2.303	1.593	1.638	1.708	-4.10
COPPELL	3.864	2.672	2.617	2.498	4.76
DALLAS	9.720	6.721	6.534	5.030*	29.90
DFW AIRPORT	2.184	1.510	1.533	1.467	4.50
DUNCANVILLE	0.177	0.122	0.145	0.140	3.57
EULESS	3.111	2.151	2.185	2.795*	-21.82
FARMERS BRANCH	5.937	4.105	4.230	4.541	-6.85
FORT WORTH	1.646	1.138	1.102	0.838*	31.50
GRAND PRAIRIE	18.673	12.913	12.069	11.102	8.71
GRAPEVINE	1.911	1.321	1.317	1.903*	-30.79
HURST	0.205	0.142	0.141	0.122*	15.57
IRVING	27.564	19.061	19.390	20.890	-7.18
KELLER	1.896	1.311	1.287	1.292	-0.39
MANSFIELD	2.781	1.923	1.992	2.159	-7.74
N. RICHLAND HILLS	0.991	0.685	0.674	0.377*	78.78
SOUTHLAKE	1.564	1.081	1.058	1.183*	-10.57
TOTALS	144.614	100.000	100.000	100.000	

* Fiscal year average deviates from the projected average by 10% or more.
** Minor variations may occur due to rounding.

CITY OF ADDISON
JANUARY

METERING STATION SUMMARY

METER I.D.	FLOW (MGD)	TOTAL GALLONS (X 1000)
13_1E	1.762	54623
13_2E	0.301	9331
13_3E	0.229	7109
TOTAL	2.292	71063

OBLIGATION SUMMARY

Y-T-D PROJECTED OBLIGATION	$137,336.69
Y-T-D ACTUAL OBLIGATION	$131,732.77
Y-T-D VARIANCE	$5,603.92

* Based upon monthly metered flows, projected monthly flows and projected cost of service.

** Minor variations may occur due to rounding.

*** Reflects mid-year adjustment, if any.

4/23/01 Mailed & Faxed

WHOLESALE WASTEWATER CUSTOMER DATA

Calendar Year 2000

ADDISON Unmetered

Total number of accounts feeding into Dallas' wastewater system 266

Classification of Accounts	Number	Percentage
Residential	215	81%
Multi-family	0	0%
Business/Commercial	47	18%
Other	4	2%
TOTAL	266	100%

WINTER MONTH WATER CONSUMPTION DATA

FOR WINTER 2000-2001

Water Consumption (in 1000 gallons)

Customer Class	Dec. '00	Jan. '01	Feb.'01	Mar. '01	TOTAL
Residential	3967	2843	2911	2557	12278
Multi-Family	0	0	0	0	0
Bus/Comm	3821	4014	3394	3610	14839
Other	51	38	51	51	191
TOTAL	7839	6895	6356	6218	27308
					27308

AVERAGE WINTER MONTH 6827 (X1000) GALLONS

AWM= Total / #of billing days x Avg. days per month = gallons per average month 6827

Billing Days	Dec.'99=	Jan.'00=	Feb.'00=	Mar.'00=	Tot. bill days =	123
	31.5	29.5	32	30	Avg. days/month =	30.75

Submitted by: [signature] **Date:** 4/23/01

Please remit to:
Dallas Water Utilities
Wholesale Services Division
1500 Marilla - 4AN
Dallas, TX 75201

WHOLESALE WASTEWATER CUSTOMER DATA

Calendar Year 2000

ADDISON Metered

Total number of accounts feeding into Dallas' wastewater system 347

Classification of Accounts	Number	Percentage
Residential	174	50%
Multi-family	45	13%
Business/Commercial	121	35%
Other	7	2%
TOTAL	347	100%

WINTER MONTH WATER CONSUMPTION DATA

FOR WINTER 2000-2001

Water Consumption (in 1000 gallons)

Customer Class	Dec. '00	Jan. '01	Feb.'01	Mar. '01	TOTAL
Residential	601	594	679	592	2466
Multi-Family	10306	9255	11631	9565	40757
Bus/Comm	14159	9538	12382	11389	47468
Other	261	177	311	260	1009
TOTAL	25327	19564	25003	21806	91700
					91700

AVERAGE WINTER MONTH 22925 (X1000) GALLONS

AWM= Total / #of billing days x Avg. days per month = gallons per average month 22925

Billing Days	Dec.'99=	Jan.'00=	Feb.'00=	Mar.'00=	Tot. bill days =	123
	31.5	29.5	32	30	Avg. days/month =	30.75

Submitted by: [signature] Date: 4/23/01

Please remit to:
Dallas Water Utilities
Wholesale Services Division
1500 Marilla - 4AN
Dallas, TX 75201

Supplement to 2000 **Wholesale Wastewater Customer Data** Report

		STREET NUMBER	STREET	DEC-ODD WATER	JAN-EVEN WATER	FEB-EVEN WATER	MAR-EVEN WATER
ACCT	1528	5600	CELESTIAL	8,730	12,620	2,940	3,120
ACCT	597	5550	CELESTIAL	60,160	51,180	61,370	30,530
ACCT	598	5560	CELESTIAL	11,890	14,160	14,070	14,760
			TOTAL	80,780	77,960	78,380	48,410
		In thousands of gals.		81	78	78	48
		Rounded to nearest 1000.		81,000	78,000	78,000	48,000

Listed above are the winter month's consumptons for the reciprocal services on Celestial Rd.
These accounts are not included in the totals on the **Wholesale Wastewater Customer Data** form
for the unmetered, former Franchise Area.

Dallas Water Utilities
Wholesale Services Division
City Hall, 4AN
Dallas, Texas 75201

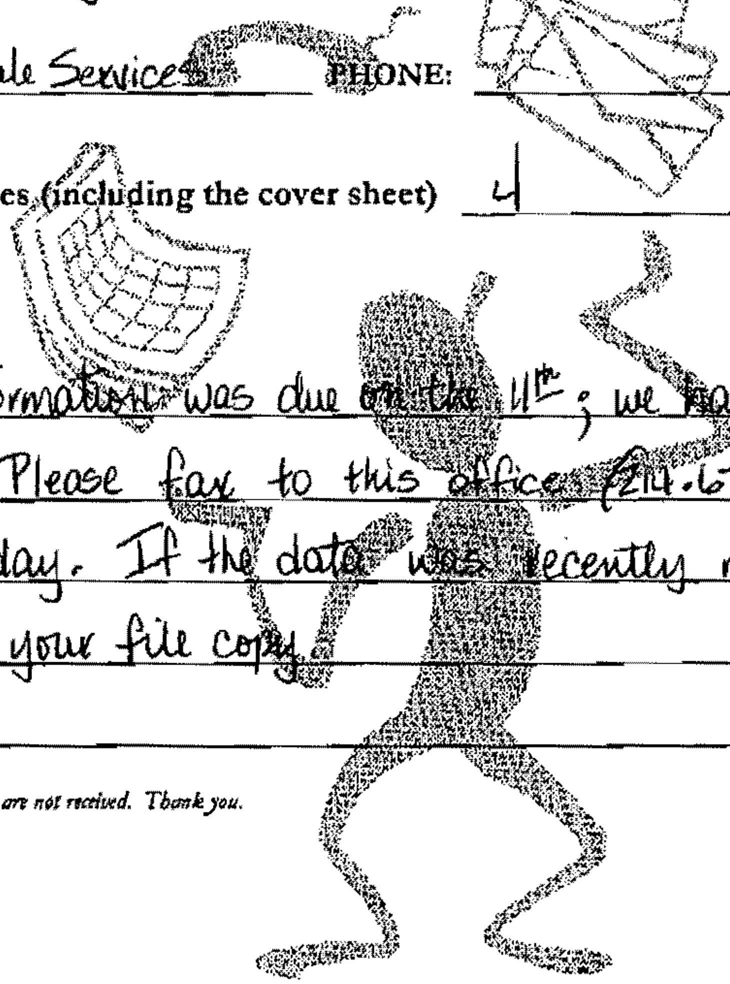
FAX COVER SHEET

DATE: 04-20-01 **TIME:**

TO: Mike Murphy **FAX:** 972.450.2837

FROM: Wholesale Services **PHONE:**

Total Number of Pages (including the cover sheet) 4



Comments:

The following information was due on the 11th; we have not recv'd the data. Please fax to this office (214.670.3154) by the end of the day. If the data was recently mailed, please fax from your file copy.

Please call 214.670.5888, if all pages are not received. Thank you.

dallas water utilities
city of dallas

March 27, 2001

Mr. Mike Murphy
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Murphy:

Please complete the attached wholesale wastewater information forms and return them to me by April 11, 2001.

The requested information is required by the wholesale wastewater contract. It is used in the annual cost of service study and to establish the average winter month's consumption for the wholesale unmetered accounts.

Your assistance is appreciated. If you have any questions or need assistance, please contact me or Tonia at 214/670-5886.

Sincerely,

Randy Stalnaker

Randy Stalnaker
Manager
Wholesale Services Division

attachment

Our Vision: To be an efficient provider of superior water and wastewater service and a leader in the water industry.

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

WHOLESALE WASTEWATER CUSTOMER DATA
(for Calendar year 2000)

ADDISON - Metered

Total number of accounts feeding into Dallas' wastewater system ________

Classification of Accounts	Number	Percentage
Residential		
Multi-family		
Business/Commercial		
Other		
TOTAL		

= =

WINTER MONTH WATER CONSUMPTION DATA
(for winter 2000-2001)

Water Consumption (in 1000 gallons)

Customer Class	December 00	January 01	February 01	March 01	TOTAL
Residential					
Multi-family					
Business/Commercial					
Other					
TOTAL					

AVERAGE WINTER MONTH ________ (X1000) GALLONS
(total divided by 4)

SUBMITTED BY: ____________________________ DATE: ____________

Please remit to:
Dallas Water Utilities
Wholesale Services Division
1500 Marilla - 4AN
Dallas TX 75201

WHOLESALE WASTEWATER CUSTOMER DATA
(for Calendar year 2000)

ADDISON - Unmetered

Total number of accounts feeding into Dallas' wastewater system ________

Classification of Accounts	Number	Percentage
Residential	________	________
Multi-family	________	________
Business/Commercial	________	________
Other	________	________
TOTAL	________	________

WINTER MONTH WATER CONSUMPTION DATA
(for winter 2000-2001)

Water Consumption (in 1000 gallons)

Customer Class	December 00	January 01	February 01	March 01	TOTAL
Residential	________	________	________	________	________
Multi-family	________	________	________	________	________
Business/Commercial	________	________	________	________	________
Other	________	________	________	________	________
TOTAL	________	________	________	________	________

AVERAGE WINTER MONTH ________ (X1000) GALLONS
(total divided by 4)

SUBMITTED BY: ____________________ DATE: ________

Please remit to:
Dallas Water Utilities
Wholesale Services Division
1500 Marilla - 4AN
Dallas TX 75201

TOWN OF ADDISON
PUBLIC WORKS DEPARTMENT (972) 450-2871
Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

April 10, 2001

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

RE: February 2001, Wastewater Sampling Survey

Dear Mr. Stalnaker:

After reviewing the data on the Wastewater Surveys for February, it came to my attention that on February 6 the estimated flow reading for Branch and Academy were switched. The Branch estimated flow shows 9.8, which should be 62.8, and Academy shows 62.8 and should be 9.8.

Based on these errors, I request that the sampling results for February be dismissed.

If you have any questions, Please call me directly at (972) 450-2878

Sincerely,

Michael E. Murphy, PE
Director of Public Works

Cc: Ron Whitehead, City Manager
Chris Terry, Assistant City Manager
Keith Thompson, Utilities Foreman

Summer 2001 Results

Month		DWU	FLOW WEIGHTED RESULTS
June	TSS	270	258
	BOD	235	248
July	TSS	223	211
	BOD	183	193
August	TSS	??	236
	BOD	?	229
AVERAGE	TSS	246.5	235
	BOD	209	223

TSS	Meter Station	6/5/2001	6/6/2001	6
	Branch	254	288	
	Keller Springs	350	335	
	Academy	170	201	

BOD	Meter Station	6/5/2001	6/6/2001	6
	Branch	238	268	
	Keller Springs	218	200	
	Academy	178	195	

TSS	Meter Station	7/10/2001	7/11/2001	7/
	Branch	200	193	
	Keller Springs	327	360	
	Academy	144	259	

BOD	Meter Station	7/10/2001	7/11/2001	7/
	Branch	218	226	
	Keller Springs	180	168	
	Academy	158	146	

TSS	Meter Station	8/7/2001	8/8/2001	8/9
	Branch	258	180	
	Keller Springs	432	278	
	Academy	116	164	

BOD	Meter Station	8/7/2001	8/8/2001	8/9
	Branch	298	292	2
	Keller Springs	252	292	7
	Academy	134	194	1

8/7/2001	8/8/2001	8/9/2
258	180	18
116	164	20

8/7/2001	8/8/2001	8/9/20
298	292	21
134	194	15

Summer 2001 Results

Month		DWU	FLOW WEIGHTED RESULTS
June	TSS	270	258
	BOD	235	248
July	TSS	223	211
	BOD	183	193
August	TSS	??	236
	BOD	?	229
AVERAGE	TSS	246.5	235
	BOD	209	223

TOWN OF ADDISON WASTEWATER SURCHARGES ~~OCT.2000 / MAY~~ 2001

Oct. 2000 T.S.S 900
B.O.D 231
Surcharge
$27,515.15

Nov. 2000 T.S.S 213
B.O.D 194
$0

Dec. 2000 T.S.S 888
B.O.D 751
Surcharge
$52,503.21

Jan. 2001 T.S.S 222
B.O.D 205
$0

Feb. 2001 T.S.S 408
B.O.D 337
Surcharge
$11,600.39

Mar. 2001 T.S.S 391
B.O.D 279
Surcharge
$7,727.29

Apr. 2001 T.S.S 390
B.O.D 280
Surcharge
$5,795.40

May. 2001 T.S.S 925
B.O.D 319
Surcharge
$31,625.91

Surcharge Total $136,767.35

F&N

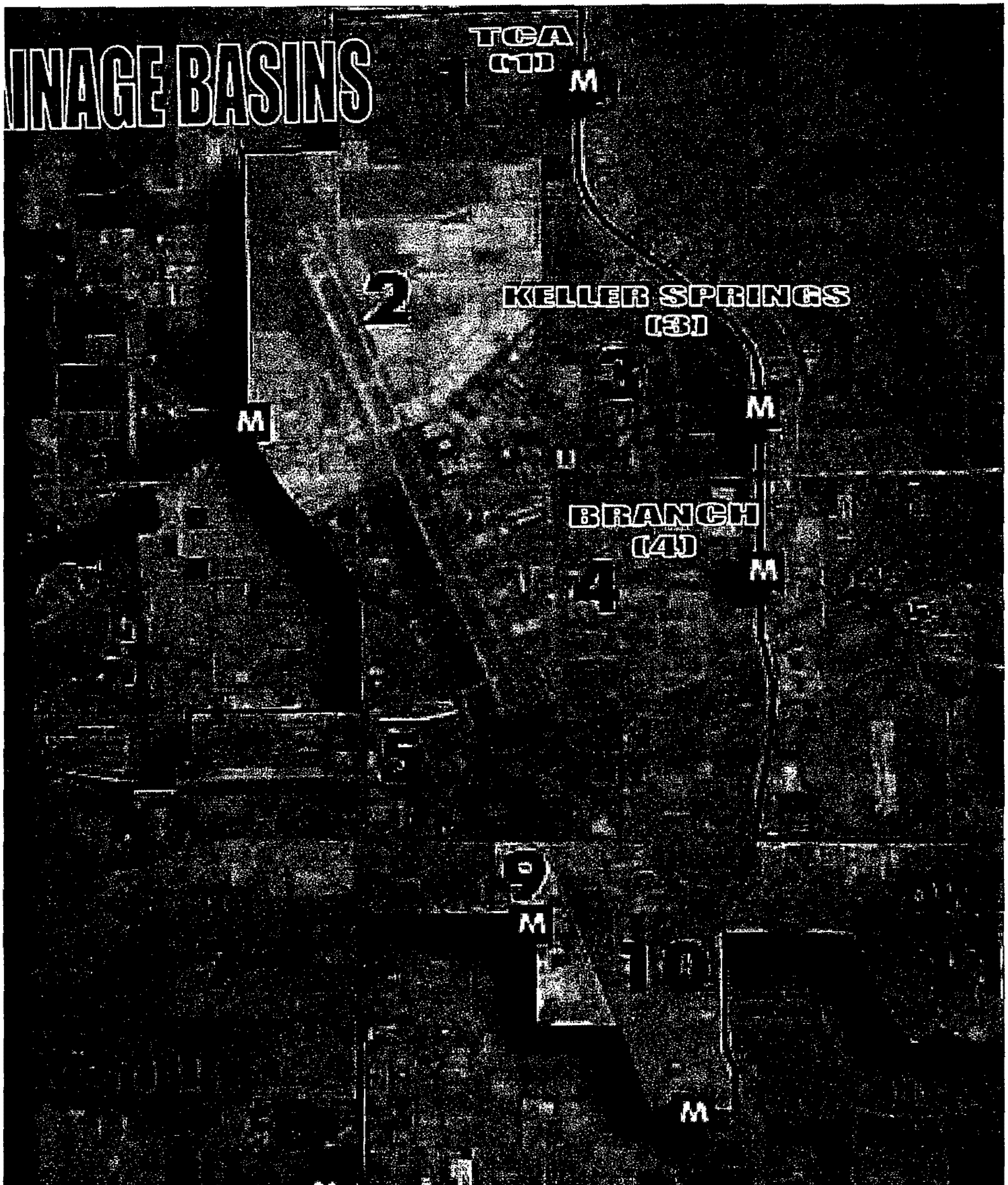
Jun. 2001 T.S.S 270 258
B.O.D 235 248
Surcharge
$704.16

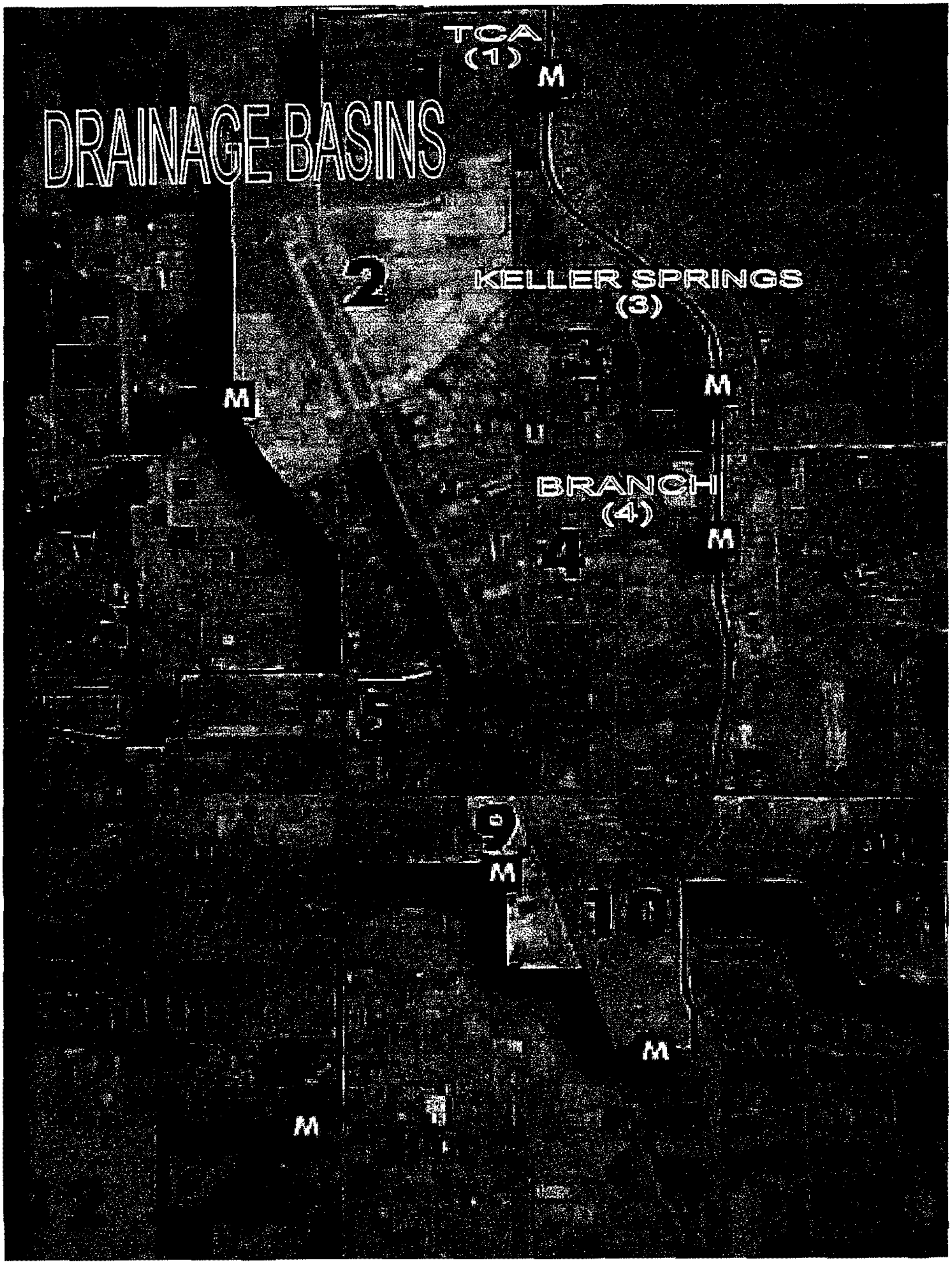
Jul. 2001 T.S.S 183 211
B.O.D 223 193
$0

Aug. 2001 T.S.S 312 236
B.O.D 233 229
Surcharge

T.S.S Average 255
B.O.D Average 231

SAFETY of STAFF


INAGE BASINS
TCA
(1)
M
2
KELLER SPRINGS
(3)
M
M
BRANCH
(4)
M
4
5
9
M
10
M
M


TCA
(1)
M
DRAINAGE BASINS
2
KELLER SPRINGS
(3)
M
M
BRANCH
(4)
M
4
5
9
M
10
M
M

TSS	Meter Station	6/5/2001	6/6/2001	6/7/2001	6/8/2001	6/9/2001	6/10/2001	6/11/2001	6/12/2001	6/13/2001	Average	7/00 ACTUAL FWEIGHTED	
	Branch	254	288	327	244	225	168	169	236	318	**247.7**	163.24	**Average**
	Keller Springs	350	335	434	332	404	153	182	394	584	**352.0**	74.62	**27 samples**
	Academy	170	201	112	147	148	163	184	122	189	**159.6**	20.55	**253.1**
												258.41	

BOD	Meter Station	6/5/2001	6/6/2001	6/7/2001	6/8/2001	6/9/2001	6/10/2001	6/11/2001	6/12/2001	6/13/2001	Average		
	Branch	238	268	310	311	304	266	210	251	311	**274.3**	180.81	**Average**
	Keller Springs	218	200	253	221	276	170	135	255	276	**222.7**	47.21	**27 samples**
	Academy	178	195	118	131	159	160	180	142	120	**153.7**	19.79	**216.9**
												247.81	

TSS	Meter Station	7/10/2001	7/11/2001	7/12/2001	7/13/2001	7/14/2001	7/15/2001	7/16/2001	7/17/2001	7/18/2001	Average	7/00 ACTUAL FWEIGHTED	
	Branch	200	193	189	227	235	172	159	198	189	**195.8**	129.04	**Average**
	Keller Springs	327	360	466	224	348	72	319	290	125	**281.2**	59.62	**27 samples**
	Academy	144	259	173	231		73	133	207	180	**175.0**	22.54	**219.0**
												211.20	

BOD	Meter Station	7/10/2001	7/11/2001	7/12/2001	7/13/2001	7/14/2001	7/15/2001	7/16/2001	7/17/2001	7/18/2001	Average		
	Branch	218	226	268	180	270	161	238	195	163	**213.2**	140.53	**Average**
	Keller Springs	180	168	189	162	168	57	196	172	110	**155.8**	33.02	**27 samples**
	Academy	158	146	138	164		139	185	159	147	**154.5**	19.90	**175.3**
												193.46	

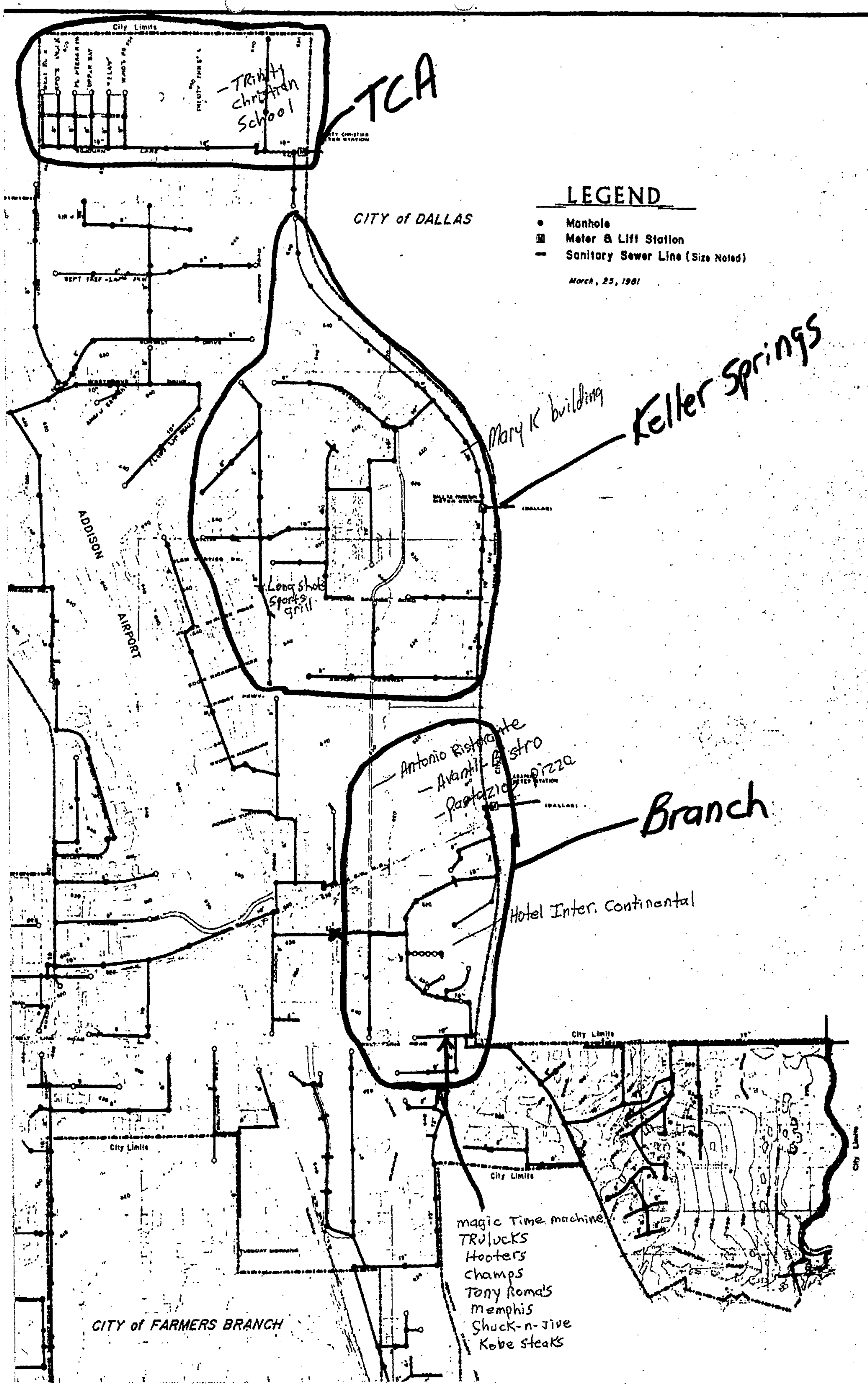
TSS	Meter Station	8/7/2001	8/8/2001	8/9/2001	8/10/2001	8/11/2001	8/12/2001	8/13/2001	8/14/2001	8/15/2001	Average	7/00 ACTUAL FWEIGHTED	
	Branch	258	180	186	204	196	432	160	164		**222.5**	146.65	**Average**
	Keller Springs	432	278	800	368	498	140	278	294		**386.0**	81.83	**27 samples**
	Academy	116	164	200	124	82	332	170	192		**172.5**	22.22	**260.3**
												250.70	

BOD	Meter Station	8/7/2001	8/8/2001	8/9/2001	8/10/2001	8/11/2001	8/12/2001	8/13/2001	8/14/2001	8/15/2001	Average		
	Branch	298	292	215	218	241	286	232	177		**244.9**	161.40	**Average**
	Keller Springs	252	292	762	223	273	150	217	141		**288.8**	61.22	**27 samples**
	Academy	134	194	152	232	146	322	212	139		**191.4**	24.65	**241.7**
												247.26	

Averages without first three (3) days Keller Springs

8/7/2001	8/8/2001	8/9/2001	8/10/2001	8/11/2001	8/12/2001	8/13/2001	8/14/2001	Average	7/00 ACTUAL FWEIGHTED	
258	180	186	204	196	432	160	164	**222.5**	146.6	**Average**
			368	498	140	278	294	**315.6**	66.9072	**24 samples**
116	164	200	124	82	332	170	192	**172.5**	22.22	**225.6**
									235.8	

8/7/2001	8/8/2001	8/9/2001	8/10/2001	8/11/2001	8/12/2001	8/13/2001	8/14/2001	Average		
298	292	215	218	241	286	232	177	**244.9**	161.4	**Average**
			223	273	150	217	141	**200.8**	42.5696	**24 samples**
134	194	152	232	146	322	212	139	**191.4**	24.65	**214.0**
									228.6	



LEGEND
Manhole
Meter & Lift Station
Sanitary Sewer Line (Size Noted)
March, 25, 1981
CITY of DALLAS
ADDISON AIRPORT
CITY of FARMERS BRANCH
City Limits
-Trinity christian School
TCA
Mary K building
Keller Springs
Long shots Sports grill
Antonio Ristorante
-Avanti-Bistro
-Pastazio pizza
Branch
Hotel Inter. Continental
magic Time machine
TRUlucks
Hooters
champs
Tony Roma's
memphis
Shuck-n-Jive
Kobe steaks

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

March 29, 2001

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

RE: Town of Addison Surcharge Issue

Dear Mr. Stalnaker:

In response to your letter of March 19, 2000, it is not our desire to construct new sampling sites until it is determined that site location is a contributing factor toward the excessive surcharge readings. Our proposal is to set up "temporary" sampling sites as described in item #1 of our February 27, 2001 letter:

> *(1) The temporary relocation of sampling sites to those locations shown on the attached site map, subject to DWU's approval of said locations. If the locations shown do not meet with DWU's approval, mutually agreeable sites will be selected. DWU and the Town of Addison will also agree on the sampling method and configuration. The Town of Addison will contribute labor and materials to this effort if appropriate.*

Also, we propose that sampling from the Temporary locations only be for two consecutive months, which we feel should adequately depict the strength of the effluent in question, and from that information move forward with whatever remedy is warranted.

Therefore, if the study holds true and samples taken from the proposed sites result in lower concentrations of BOD and TSS for two consecutive months, Dallas Water Utilities will:

(1) Refund all surcharge payments made through September 2000 based on your proposed adjustments stated in the March 19, 2001 letter; and
(2) Cancel surcharge pay requests for October, November and December of 2000.

The Town of Addison, at its own expense, will then proceed with construction of New "permanent" sampling locations, agreed to by all affected parties, for future sampling.

If sampling continues to show high concentrations of BOD and TSS, the Town of Addison will forward any outstanding surcharge fees to Dallas Water Utilities and continue to determine the cause or source of the surcharge problem.

Please find attached a check for payment of surcharge fees associated with the following months:

July 2000	***$33,291***
August 2000	***$10,173***
September 2000	***$11,099***

Again, thank you for your patience and cooperation in working with us in resolving these issues.

Sincerely,

Michael E. Murphy, PE
Director of Public Works

cc: Ron Whitehead / City Manager
Chris Terry / Asst. City Manager
Randy Moravec / Finance Director
Jim Pierce, PE / Asst. Director of Public Works
Keith Thompson / Water Utilities

TOWN OF ADDISON
PAYMENT AUTHORIZATION MEMO

DATE: 3/27/01 Claim # ______ Check $ 54,563.23

D.O. ck 3/29/01 ck # 115 DWU City Hall 1AN Dallas

Vendor No. ______

Vendor Name City of Dallas

Address City of Dallas

Address City Hall, 1AN

Address Dallas, TX

Zip Code 75277

INVOICE # OR DESCRIPTION	FUND	DEPT	OBJ	PROJ	SAC	AMOUNT
	(00)	(000)	(00000)	(00000)	(000)	($000,000.00)
July 2000						
Aug 2000						
Sept 2000						
Sundry. Total	61	712	56640			54,563.23

TOTAL $54,563.23 0.00

EXPLANATION Sun Charges:

July, 2000 $33,291.19

August, 2000 $10,173.02

September, 2000 $11,099.02

$54,563.23

Mike E. Murphy
Authorized Signature

Finance

DN/AR #72202

City of Dallas

Utilities and Services

Account Number: 221-1202003-001

Amount Due: $115,992.24

Due Date: 01-26-01

TOWN OF ADDISON
% UTILITIES DEPARTMENT
P O BOX 9010
ADDISON TX 75001-9010

For services at: 16220 DALLAS PKWY

Billing Date: 01-08-01 Days Served: 30

Service Provided	Meter Number	Read 11-27-00	Read 12-27-00	Usage in 1000 Gals	Total
WASTEWATER	800023	28940	40680	11740	
Total Volume @ $ 1.3490 / 1000 gallons				11740	$ 15,837.26

Pay this only
Mike G. Murphy

Current Charges	$15,837.26
July 2000 Surcharge	$33,291.19
August 2000 Surcharge	$10,173.02
September 2000 Surcharge	$11,099.02
October 2000 Surcharge	$27,515.15
Previous Balance	$18,076.60
Total Amount Due	$115,992.24

Pay these

$54,563.23

WHOLESALE SERVICES 214/670-5888
EMERGENCY 214/670-8064

City of Dallas

Utilities and Services

Keep this portion for your records
Please return this portion with your payment

Amount Due: $115,992.24

Due Date: 01-26-01

ACCOUNT NUMBER:
221-1202003-001

TOWN OF ADDISON
% UTILITIES DEPARTMENT
P O BOX 9010
ADDISON TX 75001-9010

Make payable to:
City of Dallas
City Hall, 1AN
Dallas TX 75277

HP LaserJet 3200se

TOALASERJET 3200
9724502837
APR-17-2001 15:07

Fax Call Report

Job	Date	Time	Type	Identification	Duration	Pages	Result
284	4/17/2001	15:05:57	Send	92146703154	1:15	3	OK

TOWN OF
ADDISON

PUBLIC WORKS

To: Tonya

Company:

FAX #: 214-670-3154

Date: 4-17-01

No. of pages (including cover): 3

From: Michael E. Murphy, P.E.
Director of Public Works

Phone: 972/450-2878
Fax: 972/450-2837

16801 Westgrove
P.O. Box 9010
Addison, TX 75001-9010

Tonya: This is the letter that is attached to the check for #54563.2
TKS - Steve

Chmer

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

March 29, 2001

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

RE: Town of Addison Surcharge Issue

Dear Mr. Stalnaker:

In response to your letter of March 19, 2000, it is not our desire to construct new sampling sites until it is determined that site location is a contributing factor toward the excessive surcharge readings. Our proposal is to set up "temporary" sampling sites as described in item #1 of our February 27, 2001 letter:

> *(1) The temporary relocation of sampling sites to those locations shown on the attached site map, subject to DWU's approval of said locations. If the locations shown do not meet with DWU's approval, mutually agreeable sites will be selected. DWU and the Town of Addison will also agree on the sampling method and configuration. The Town of Addison will contribute labor and materials to this effort if appropriate.*

Also, we propose that sampling from the Temporary locations only be for two consecutive months, which we feel should adequately depict the strength of the effluent in question, and from that information move forward with whatever remedy is warranted.

Therefore, if the study holds true and samples taken from the proposed sites result in lower concentrations of BOD and TSS for two consecutive months, Dallas Water Utilities will:

(1) Refund all surcharge payments made through September 2000 based on your proposed adjustments stated in the March 19, 2001 letter; and
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The Town of Addison, at its own expense, will then proceed with construction of New "permanent" sampling locations, agreed to by all affected parties, for future sampling.

If sampling continues to show high concentrations of BOD and TSS, the Town of Addison will forward any outstanding surcharge fees to Dallas Water Utilities and continue to determine the cause or source of the surcharge problem.

Please find attached a check for payment of surcharge fees associated with the following months:

July 2000	***$33,291***
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Again, thank you for your patience and cooperation in working with us in resolving these issues.

Sincerely,

Michael E. Murphy, PE
Director of Public Works

cc: Ron Whitehead / City Manager
Chris Terry / Asst. City Manager
Randy Moravec / Finance Director
Jim Pierce, PE / Asst. Director of Public Works
Keith Thompson / Water Utilities

dallas water utilities
city of dallas

March 19, 2001

Michael E. Murphy, P.E.
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Murphy:

This is in response to your letter of February 27, 2001, concerning sanitary sewer surcharge bills that are outstanding. I had also written to you on February 28, 2001 and our letters apparently crossed in the mail. The purpose of this letter is to clarify Dallas' understanding regarding an issue mentioned in your letter and to attempt to reach an agreement concerning it.

Regarding item (3) in your letter, it was our understanding that when construction of the proposed sample sites have been completed and sampling from each site begins, six months of sample history will be gathered and compared against the disputed surcharge months of July, August, September, October and December 2000. Should the results from six months of sampling from the proposed alternate sample sites generally be similar to the prior results from the disputed surcharges, then the full amounts from the disputed months will immediately be due from Addison. However, should the results from six months of sampling from the proposed alternate sample sites generally be lower than the prior results from the disputed surcharges, the adjustments will be calculated and applied to the disputed surcharges and payment will immediately be due from Addison.

If this is not your understanding or it is not acceptable to you, please let me know. This arrangement underpins all the other items proposed in your letter.

We appreciate your cooperation and the time and effort you have spent on this issue. We look forward to a mutually amicable resolution. In the mean time, if you have any questions, please call me directly at 214-670-5887.

Sincerely,

Randy Stalnaker

Randy Stalnaker, Manager
Wholesale Services

cc: Larry N. Patterson, P.E.
Mike Rickman
Chris Kaakaty
Zachary Peoples
Tonia Lichtenberg

TOWN OF ADDISON®
PUBLIC WORKS DEPARTMENT (972) 450-2871
Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

March 29, 2001

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

DRAFT 3/29/01

RE: Town of Addison Surcharge Issue

Dear Randy:

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If sampling continues to show high concentrations of BOD and TSS, the Town of Addison will forward any outstanding surcharge fees to Dallas Water Utilities and continue to determine the cause or source of the surcharge problem.

Also, please note that the following payments have been approved and should immediately follow this letter.

July 2000	***$33,291***
August 2000	***$10,173***
September 2000	***$11,099***

Again, thank you for your patience and cooperation in working with us in resolving these issues.

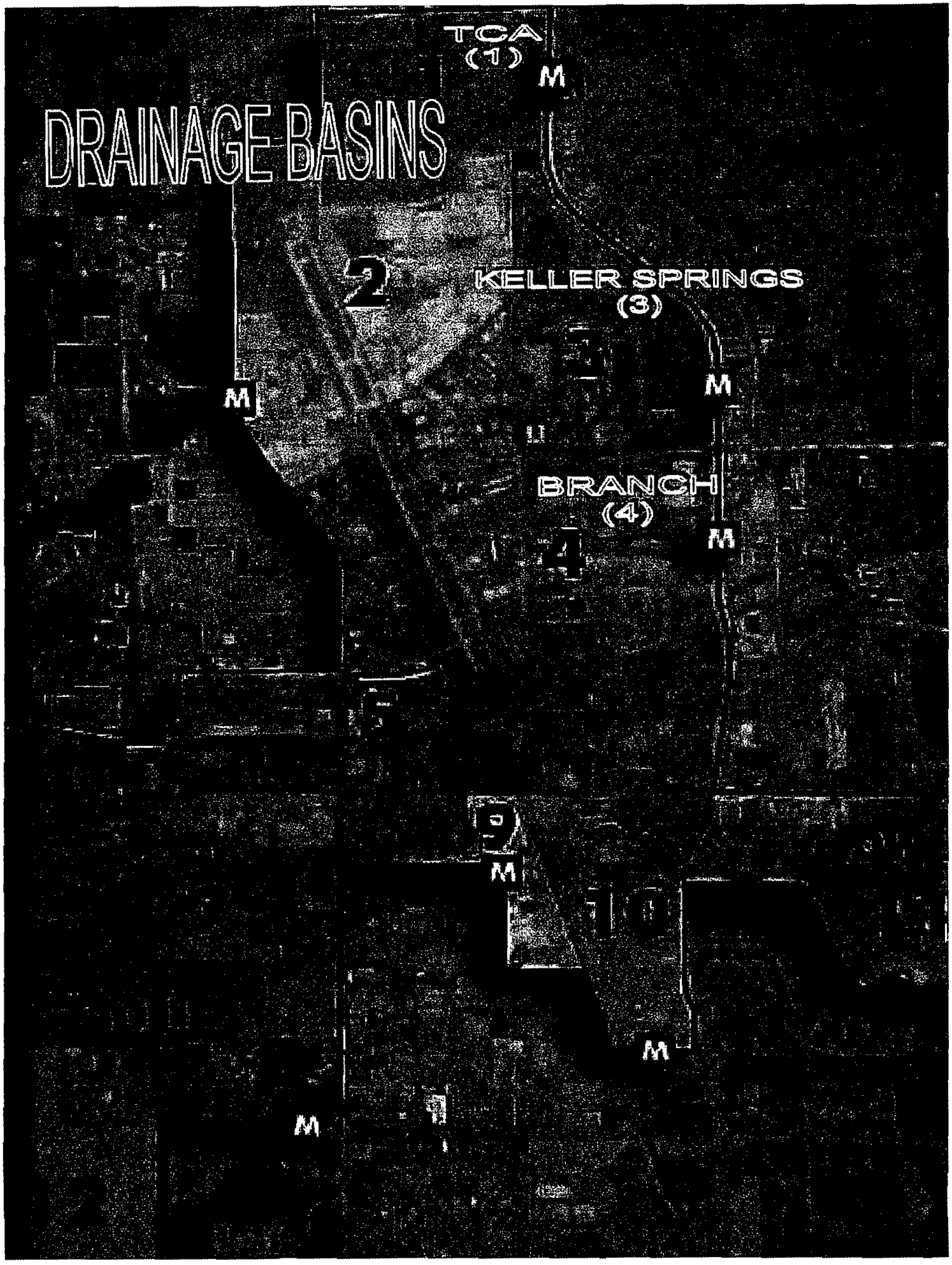
Sincerely,

DRAFT

3/29/01

Michael E. Murphy, PE
Director of Public Works

cc: Ron Whitehead / City Manager
Chris Terry / Asst. City Manager
Randy Moravec / Finance Director
Jim Pierce, PE / Asst. Director of Public Works
Keith Thompson / Water Utilities



DRAINAGE BASINS
TCA
(1)
M
2
KELLER SPRINGS
(3)
M
M
BRANCH
(4)
M
4
9
M
10
M
M

dallas water utilities
city of dallas

March 19, 2001

Michael E. Murphy, P.E.
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Murphy:

This is in response to your letter of February 27, 2001, concerning sanitary sewer surcharge bills that are outstanding. I had also written to you on February 28, 2001 and our letters apparently crossed in the mail. The purpose of this letter is to clarify Dallas' understanding regarding an issue mentioned in your letter and to attempt to reach an agreement concerning it.

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Sincerely,

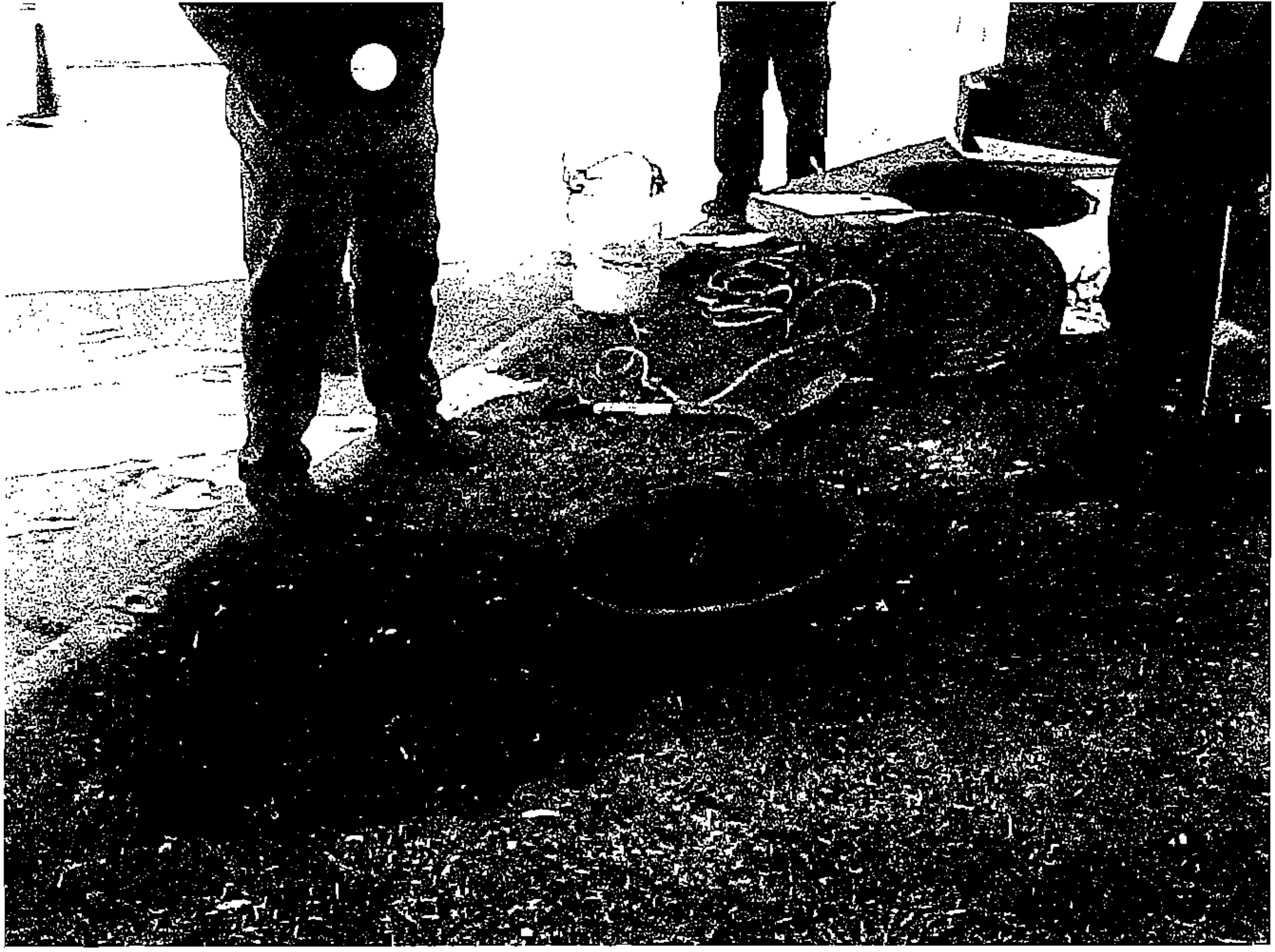
Randy Stalnaker

Randy Stalnaker, Manager
Wholesale Services

cc: Larry N. Patterson, P.E.
Mike Rickman
Chris Kaakaty
Zachary Peoples
Tonia Lichtenberg

Our Vision: To be an efficient provider of superior water and wastewater service and a leader in the water industry.

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

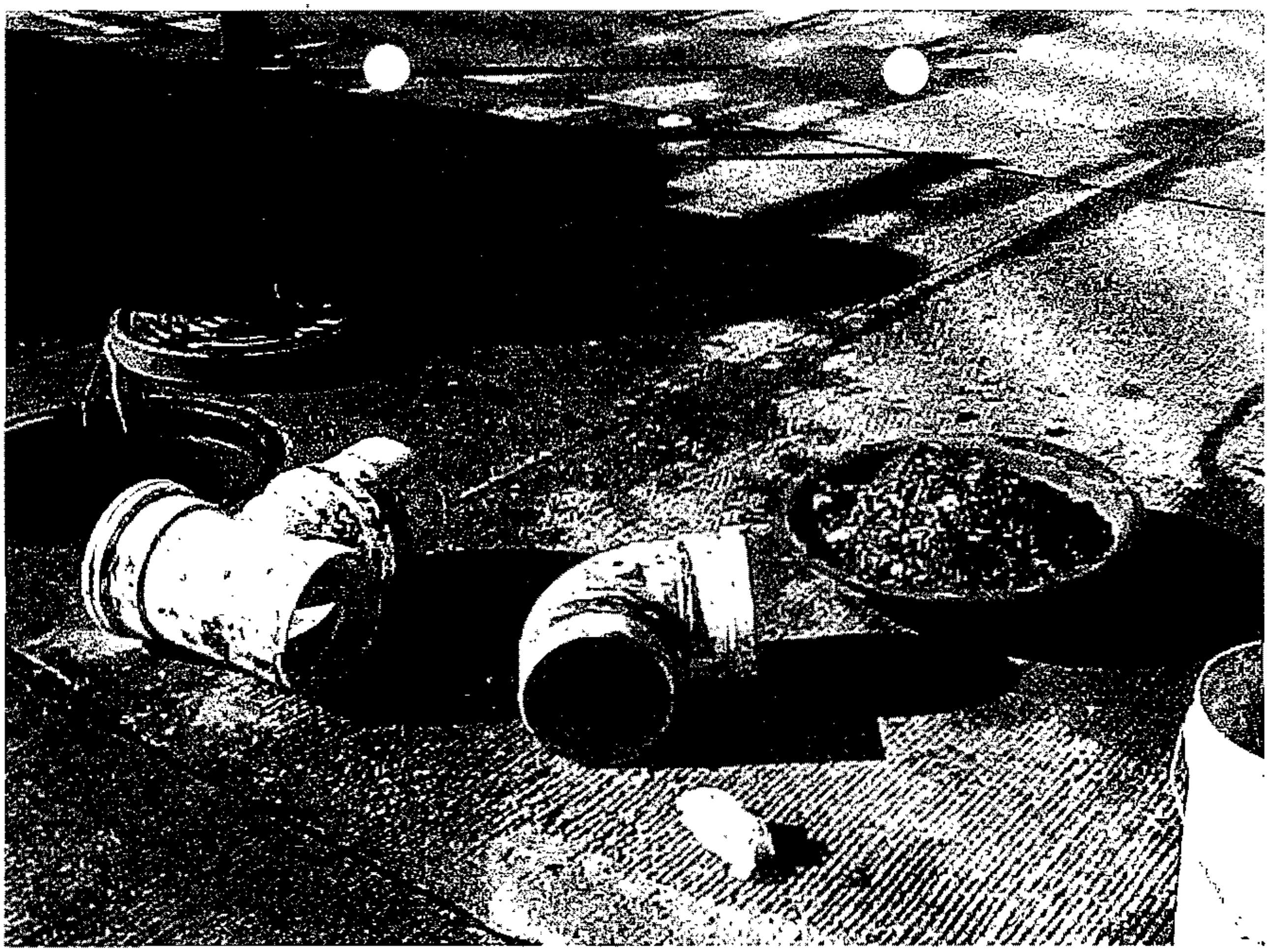


15701 Dallas Parkway
02/04/2001

(2)

16251 Dallas Parkway
Drop Filled with Rocks From the North
Concrete in Main from the West
02/04/2001

(4)



16301 Dallas Parkway
02/04/2001

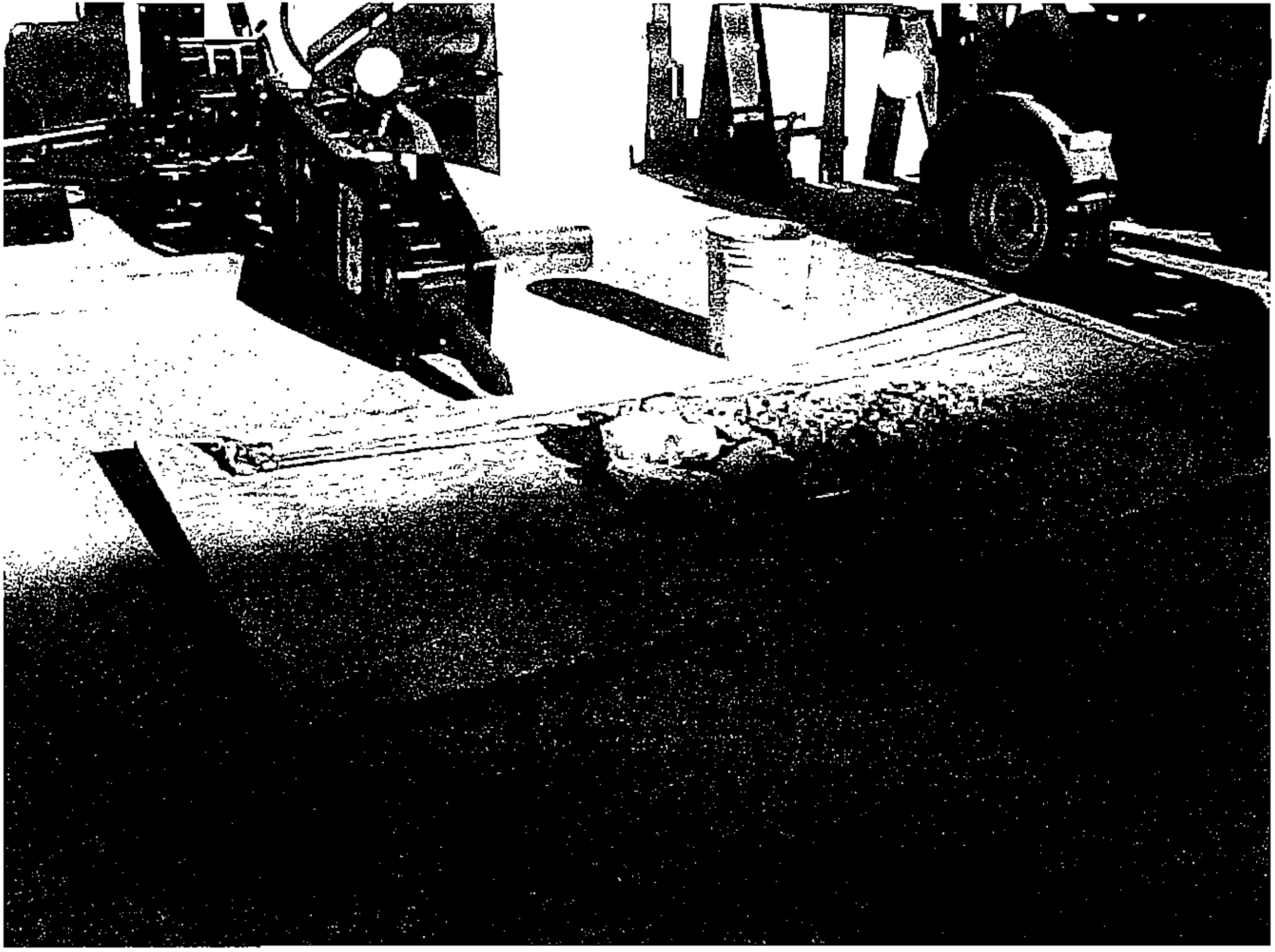
(5)

16401 Dallas Parkway
02/04/2001

(6)

17120 Dallas Parkway
02/04/2001

(7)



15770 Dallas Parkway
01/28/2001

(1)

dallas water utilities
city of dallas

February 28, 2001

Mr. Mike Murphy
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Dear Mr. Murphy:

On February 8th, Dallas Water Utilities staff met with you and various representatives from Addison regarding issues related to wastewater surcharges that have been assessed to Addison. In summary, the following items were agreed to:

- Addison will provide to Dallas for review and approval alternate sampling site information. If the proposed alternate sample sites are agreed to by Dallas, all expenditures related to construction of the proposed alternate sample sites will be borne by the Town of Addison.

- Addison will pay past due surcharges through September 2000 to assist in closing out Fiscal Year 99-00. (July 2000 $33,291.19, August 2000 $10,173.02, and September 2000 $11,099.02; copies attached.)

- When construction of the proposed alternate sample sites have been completed and sampling from each site begins, six months of sample history will be gathered and compared against the disputed surcharge months of July, August, September, October and December 2000. Should the results from six months of sampling from the proposed alternate sample sites generally be similar to the prior results from the disputed surcharges, then the full amounts from the disputed months will immediately be due from Addison. However, should the results from six months of sampling from the proposed alternate sample sites generally be lower than the prior results from the disputed surcharges, then adjustments will be calculated and applied to the disputed surcharges and payment will immediately be due from Addison.

Mike, please forward the payment for July, August and September 2000 as discussed at the meeting. We also look forward to receiving the information regarding the proposed alternate sampling sites. If you have any questions, please feel free to call me at 214/670-5887.

Sincerely,

Randy Stalnaker

Randy Stalnaker
Manager
Wholesale Services Division

C: Larry Patterson, Assistant Director – Wastewater Operations
Chris Kaakaty, Manager – PALS
Zachary Peoples, Manager – Wastewater Collection

dallas water utilities
city of dallas

August 17, 2000

Mr. Mike Murphy
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Re: Wastewater Sampling Survey

Dear Mr. Murphy:

A $33,291.19 surcharge for excess BOD & TSS strength for July 2000 is reflected on the attached bill. This billing is for wastewater surcharge only. July wastewater volume has been billed separately. A copy of the calculation of the charge and the wastewater monitoring report are enclosed.

The wastewater sampling was conducted from July 11 through July 19, 2000. The enclosed monitoring report contains TSS and BOD results for 9 days. The average BOD concentration was 442 mg/L and the average TSS concentration was 890 mg/L.

If you have any questions, please call Shiva L. Peters at 214.670.5888.

Sincerely,

Vonia

for: Randy Stalnaker
Manager
Wholesale Services Division

enclosures
c: Chris Kaakaty, Manager, PALS
Alan Aulenbach, Pretreatment Section Manager

Our Vision: To be an efficient provider of superior water and wastewater service and a leader in the water industry.

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

City of Dallas **Utilities and Services**

Account number: 221-1202003-001

Amount Due: $33,291.19

TOWN OF ADDISON
& UTILITIES DEPARTMENT
PO BOX 9010
ADDISON TX 75001-9010

Service Provided	Total
JULY 2000 SURCHARGE	
BOD = 442, TSS = 890	$33,291.19
Total Amount Due	$33,291.19

WHOLESALE SERVICES 214/670-5888
EMERGENCY 214/670-8064

Keep this portion for your records
Please return this portion with your payment

City of Dallas **Utilities and Services**

Amount Due: $33,291.19

ACCOUNT NUMBER:
221-1202003-001

TOWN OF ADDISON
% UTILITIES DEPARTMENT
PO BOX 9010
ADDISON TX 75001-9010

Make payable to:
City of Dallas
City Hall, 1AN
Dallas TX 75277

CITY OF ADDISON

ACCOUNT NO: 221-1202003,221-1202250,221-1202359
CALCULATION OF BILLING FOR EXCESS STRENGTH
WASTEWATER DISCHARGE FOR
JULY 2000 BILLING PERIOD

Cost Factors for Excess Strength

C_B = \$1.24154

C_s = \$1.14303

S_w = Cost per Million Gallons

Point of Entry Sampling Results

BOD = 442 mg/L > 250 mg/L allowable discharge strength
TSS = 890 mg/L > 250 mg/L allowable discharge strength

Calculation of Cost for Excess BOD & TSS

$S_w = C_B(BOD-250) + C_s(TSS-250)$

= \$1.24154 (442 - 250) + \$1.14303 (890 - 250)

= \$1.24154 (192) + \$1.14303 (640)

= \$238.38 + \$731.54

= \$969.91 per Million Gallons

= \$0.96991 per Thousand Gallons

Total Wastewater Volume in Billing Period

Acct: 221-1202003-001	9,861	(x1000) gal.
Acct: 221-1202250-001	6,321	(x1000) gal.
Acct: 221-1202359-001	18,142	(x1000) gal.
TOTAL	34,324	

Calculation of Charge for Excess Strength

Charge for Excess Strength = Total Volume (Calculated Cost)
= 34,324 (\$0.96991)
= \$33,291.19

DALLAS WATER UTILITIES - Report of Analysis

dison, Town Of

te	07/11/00	07/11/00	07/11/00	07/12/00	07/12/00	07/12/00	07/13/00
b Number	0022	0021	0023	0034	0036	0035	0049
lume	62.80	9.80	27.40	9.80	27.40	62.80	9.80
tal Suspended Solids	696	398	714	558	494	569	830
ochemical Oxygen Demand	430	272	410	401	285	480	270
anide							
dmium							
romium							
r							
ad							
ercury							
ckel							
lver							
nc							
tal Metals							
senic							
lenium							
oatable Oil & Grease							
etone							
nzene							
hyl Benzene							
opropyl Alcohol							
thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
luene							
lene							
ash Cup							
te	BRCH	ACAD	KS	ACAD	KS	BRCH	ACAD

l results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town Of

te	07/13/00	07/13/00	07/14/00	07/14/00	07/14/00	07/15/00	07/15/00
b Number	0051	0050	0072	0071	0070	0097	0098
lume	27.40	62.80	27.40	62.80	9.80	62.80	27.40
tal Suspended Solids	436	1320	3110	925	844	1064	1092
ochemical Oxygen Demand	240	742	1750	720	735	258	144
anide							
dmium							
romium							
r							
a							
rcury							
ckel							
lver							
nc							
tal Metals							
senic							
lenium							
oatable Oil & Grease							
etone							
nzene							
hyl Benzene							
opropyl Alcohol							
thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
luene							
lene							
ash Cup							
te	KS	BRCH	KS	BRCH	ACAD	BRCH	KS

l results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES -- Report of Analysis

Addison, Town Of

te	07/15/00	07/16/00	07/16/00	07/16/00	07/17/00	07/17/00	07/17/00
b Number	0096	0104	0106	0107	0113	0115	0114
lume	9.80	9.80	62.80	27.40	9.80	27.40	62.80
tal Suspended Solids	1510	1010	335	992	553	1902	283
ochemical Oxygen Demand	360	470	300	435	295	712	318
anide							
dmium							
romium							
[illegible]							
[illegible]							
rcury							
ckel							
lver							
nc							
tal Metals							
senic							
lenium							
oatable Oil & Grease							
etone							
nzene							
hyl Benzene							
opropyl Alcohol							
thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
luene							
lene							
ash Cup							
te	ACAD	ACAD	BRCH	KS	ACAD	KS	BRCH

l results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town Of

te	07/18/00	07/18/00	07/18/00	07/19/00	07/19/00	07/19/00	Average
b Number	0124	0122	0123	0152	0151	0153	
lume	27.40	9.80	62.80	62.80	9.80	27.40	
tal Suspended Solids	3665	1610	249	222	1088	834	890
ochemical Oxygen Demand	480	1120	165	145	320	401	442
anide							
dmium							
romium							
or r							
a_							
ercury							
ckel							
lver							
nc							
tal Metals							
senic							
elenium							
oatable Oil & Grease							
etone							
nzene							
hyl Benzene							
sopropyl Alcohol							
ethyl Alcohol							
ethyl Ethyl Ketone							
ethylene Chloride							
enol							
luene							
lene							
ash Cup							
te	KS	ACAD	BRCH	BRCH	ACAD	KS	

l results, except for pH, are reported in mg/l.

dallas water utilities
city of dallas

September 13, 2000

Mr. Mike Murphy
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Re: Wastewater Sampling Survey

Dear Mr. Murphy:

A $10,173.02 surcharge for excess BOD & TSS strength for August 2000 is reflected on the attached bill. This billing is for wastewater surcharge only. August wastewater volume has been billed separately. A copy of the calculation of the charge and the wastewater monitoring report are enclosed.

The wastewater sampling was conducted from August 2 through August 10, 2000. The enclosed monitoring report contains TSS and BOD results for 9 days. The average BOD concentration was 259 mg/L and the average TSS concentration was 506 mg/L.

If you have any questions, please call Shiva L. Peters at 214.670.5888.

Sincerely,

Randy Stalnaker

Randy Stalnaker
Manager
Wholesale Services Division

enclosures
c: Chris Kaakaty, Manager, PALS
Alan Aulenbach, Pretreatment Section Manager

Our Vision: To be an efficient provider of superior water and wastewater service and a leader in the water industry.

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

City of Dallas **Utilities and Services**

Account Number: 221-1202003-001

Amount Due: $10,173.02

TOWN OF ADDISON
& UTILITIES DEPARTMENT
PO BOX 9010
ADDISON TX 75001-9010

Service Provided	Total
AUGUST 2000 SURCHARGE	
BOD = 259, TSS = 506	$10,173.02
Total Amount Due	$10,173.02

WHOLESALE SERVICES 214/670-5888
EMERGENCY 214/670-8064

Keep this portion for your records
Please return this portion with your payment

City of Dallas **Utilities and Services**

Amount Due: $10,173.02

ACCOUNT NUMBER:
221-1202003-001

TOWN OF ADDISON
% UTILITIES DEPARTMENT
PO BOX 9010
ADDISON TX 75001-9010

Make payable to:
City of Dallas
City Hall, 1AN
Dallas TX 75277

CITY OF ADDISON

ACCOUNT NO: 221-1202003,221-1202250,221-1202359
CALCULATION OF BILLING FOR EXCESS STRENGTH
WASTEWATER DISCHARGE FOR
AUGUST 2000 BILLING PERIOD

Cost Factors for Excess Strength

C_B = $1.24154

C_S = $1.14303

S_W = Cost per Million Gallons

Point of Entry Sampling Results

BOD = 259 mg/L > 250 mg/L allowable discharge strength
TSS = 506 mg/L > 250 mg/L allowable discharge strength

Calculation of Cost for Excess BOD & TSS

S_W = C_B(BOD-250) + C_S(TSS-250)

= $1.24154 (259 - 250) + $1.14303 (506 - 250)

= $1.24154 (9) + $1.14303 (256)

= $11.17 + $292.62

= $303.79 per Million Gallons

= $0.30379 per Thousand Gallons

Total Wastewater Volume in Billing Period

Acct: 221-1202003-001	9,686	(x1000) gal.
Acct: 221-1202250-001	6,266	(x1000) gal.
Acct: 221-1202359-001	17,535	(x1000) gal.
TOTAL	33,487	

Calculation of Charge for Excess Strength

Charge for Excess Strength = Total Volume (Calculated Cost)
= 33,487 ($0.30379)
= $10,173.02

DALLAS WATER UTILITIES - Report of Analysis

dison, Town of

te	08/02/00	08/02/00	08/02/00	08/03/00	08/03/00	08/03/00	08/04/00
b Number	0021	0019	0020	0029	0028	0030	0047
lume	27.40	9.80	62.80	62.80	9.80	27.40	62.80
tal Suspended Solids	372	328	406	369	214	622	277
ochemical Oxygen Demand	148	136	310	338	191	305	228
anide							
dmium							
romium							
pper							
rcury							
ckel							
lver							
nc							
tal Metals							
senic							
lenium							
oatable Oil & Grease							
etone							
nzene							
hyl Benzene							
opropyl Alcohol							
thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
luene							
lene							
ash Cup							
te	KS	ACAD	BRCH	BRCH	ACAD	KS	BRCH

l results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

ate	08/04/00	08/04/00	08/05/00	08/05/00	08/05/00	08/06/00	08/06/00
ab Number	0048	0046	0066	0064	0065	0158	0160
olume	27.40	9.80	27.40	9.80	62.80	9.80	27.40
I							
otal Suspended Solids	411	303	315	351	533	50	94
iochemical Oxygen Demand	176	191	238	264	368	117	120
yanide							
admium							
hromium							
opper							
ercury							
ickel							
ilver							
inc							
otal Metals							
rsenic							
elenium							
loatable Oil & Grease							
cetone							
enzene							
thyl Benzene							
sopropyl Alcohol							
ethyl Alcohol							
ethyl Ethyl Ketone							
ethylene Chloride							
henol							
oluene							
ylene							
lash Cup							
ite	KS	ACAD	KS	ACAD	BRCH	ACAD	KS

ll results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

te	08/06/00	08/07/00	08/07/00	08/07/00	08/08/00	08/08/00	08/08/00
b Number	0159	0078	0076	0077	0097	0096	0098
lume	62.80	27.40	9.80	62.80	62.80	9.80	27.40
tal Suspended Solids	684	254	412	1974	414	275	315
ochemical Oxygen Demand	236	134	252	313	353	210	260
anide							
dmium							
romium							
pper							
rcury							
ckel							
lver							
nc							
tal Metals							
senic							
lenium							
oatable Oil & Grease							
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opropyl Alcohol							
thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
luene							
lene							
ash Cup							
te	BRCH	KS	ACAD	BRCH	BRCH	ACAD	KS

l results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

te	08/09/00	08/09/00	08/09/00	08/10/00	08/10/00	08/10/00	Average
b Number	0122	0120	0121	0133	0135	0134	
lume	27.40	9.80	62.80	9.80	27.40	62.80	
tal Suspended Solids	336	162	273	329	344	603	506
ochemical Oxygen Demand	279	144	264	195	240	210	259
anide							
dmium							
romium							
pper							
rcury							
ckel							
lver							
nc							
tal Metals							
senic							
lenium							
oatable Oil & Grease							
etone							
nzene							
hyl Benzene							
opropyl Alcohol							
thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
luene							
lene							
ash Cup							
te	KS	ACAD	BRCH	ACAD	KS	BRCH	

l results, except for pH, are reported in mg/l.

dallas water utilities
city of dallas

October 25, 2000

Mr. Mike Murphy
Director of Public Works
Town of Addison
P.O. Box 9010
Addison, Texas 75001-9010

Re: Wastewater Sampling Survey

Dear Mr. Murphy:

A $11,099.02 surcharge for excess BOD & TSS strength for September 2000 is reflected on the attached bill. This billing is for wastewater surcharge only. September wastewater volume has been billed separately. A copy of the calculation of the charge and the wastewater monitoring report are enclosed.

The wastewater sampling was conducted from September 6 through September 25, 2000. The enclosed monitoring report contains TSS and BOD results for 8 days. The average BOD concentration was 272 mg/L and the average TSS concentration was 515 mg/L.

If you have any questions, please call Shiva L. Peters at 214.670.5888.

Sincerely,

Randy Stalnaker

Randy Stalnaker
Manager
Wholesale Services Division

enclosures
c: Chris Kaakaty, Manager, PALS
Alan Aulenbach, Pretreatment Section Manager

Our Vision: To be an efficient provider of superior water and wastewater service and a leader in the water industry.

Wholesale Services • 1500 Marilla, Room 4AN Dallas, Texas 75201
Telephone: (214) 670-5888 • Fax: (214) 670-3154

City of Dallas **Utilities and Services**

Account Number: 221-1202003-001

Amount Due: $11,099.02

TOWN OF ADDISON
& UTILITIES DEPARTMENT
PO BOX 9010
ADDISON TX 75001-9010

Service Provided	Total
SEPTEMBER 2000 SURCHARGE	
BOD = 272, TSS = 515	$11,099.02
Total Amount Due	$11,099.02

WHOLESALE SERVICES 214/670-5888
EMERGENCY 214/670-8064

Keep this portion for your records
Please return this portion with your payment

City of Dallas **Utilities and Services**

Amount Due: $11,099.02

ACCOUNT NUMBER:
221-1202003-001

TOWN OF ADDISON
% UTILITIES DEPARTMENT
PO BOX 9010
ADDISON TX 75001-9010

Make payable to:
City of Dallas
City Hall, 1AN
Dallas TX 75277

<u>CITY OF ADDISON</u>
ACCOUNT NO: 221-1202003,221-1202250,221-1202359
CALCULATION OF BILLING FOR EXCESS STRENGTH
WASTEWATER DISCHARGE FOR
SEPTEMBER 2000 BILLING PERIOD

<u>Cost Factors for Excess Strength</u>

C_s = $1.24154

C_s = $1.14303

S_v = Cost per Million Gallons

<u>Point of Entry Sampling Results</u>

BOD =	272 mg/L	>	250 mg/L allowable discharge strength
TSS =	515 mg/L	>	250 mg/L allowable discharge strength

<u>Calculation of Cost for Excess BOD & TSS</u>

S_v = C_s(BOD-250) + C_s(TSS-250)

= $1.24154 (272 - 250) + $1.14303 (515 - 250)

= $1.24154 (22) + $1.14303 (265)

= $27.31 + $302.90

= $330.22 per Million Gallons

= $0.33022 per Thousand Gallons

<u>Total Wastewater Volume in Billing Period</u>

Acct: 221-1202003-001	9,577	(x1000) gal.
Acct: 221-1202250-001	6,397	(x1000) gal.
Acct: 221-1202359-001	<u>17,637</u>	(x1000) gal.
TOTAL	33,611	

<u>Calculation of Charge for Excess Strength</u>

Charge for Excess Strength = Total Volume (Calculated Cost)

= 33,611 ($0.33022)

= $11,099.02

DALLAS WATER UTILITIES - Report of Analysis

dison, Town of

te	09/06/00	09/06/00	09/06/00	09/07/00	09/07/00	09/07/00	09/08/00
b Number	0036	0035	0037	0059	0060	0061	0095
lume	62.8	9.8	27.4	9.8	62.8	27.4	27.4
tal Suspended Solids	265	234	782	1476	834	1554	406
ochemical Oxygen Demand	158	64	285	252	318	269	140
anide							
dmium							
romium							
pper							
rcury							
ckel							
lver							
nc							
tal Metals							
senic							
lenium							
oatable Oil & Grease							
etone							
nzene							
hyl Benzene							
opropyl Alcohol							
thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
luene							
lene							
ash Cup							
te	BRCH	ACAD	KS	ACAD	BRCH	KS	KS

l results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

ate	09/08/00	09/08/00	09/09/00	09/09/00	09/09/00	09/11/00	09/11/00
ab Number	0093	0094	0108	0106	0107	0120	0122
olume	9.8	62.8	27.4	9.8	62.8	27.4	9.8
!							
otal Suspended Solids	395	482	971	644	861	120	381
iochemical Oxygen Demand	140	292	410	308	330	132	210
yanide							
admium							
hromium							
opper							
ercury							
ickel							
ilver							
inc							
otal Metals							
senic							
elenium							
loatable Oil & Grease							
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sopropyl Alcohol							
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ethyl Ethyl Ketone							
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henol							
oluene							
ylene							
lash Cup							
ite	ACAD	BRCH	KS	ACAD	BRCH	KS	ACAD

ll results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

.e	09/11/00	09/12/00	09/12/00	09/12/00	09/13/00	09/13/00	09/13/00
) Number	0123	0154	0153	0155	0159	0156	0158
lume	62.8	9.8	62.8	27.4	62.8	9.8	27.4
.al Suspended Solids	470	582	205	369	272	1066	230
ochemical Oxygen Demand	380	360	238	250	312	402	205
anide							
dmium							
romium							
pper							
rcury							
ckel							
lver							
nc							
tal Metals							
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lenium							
oatable Oil & Grease							
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thyl Alcohol							
thyl Ethyl Ketone							
thylene Chloride							
enol							
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lene							
ash Cup							
te	BRCH	ACAD	BRCH	KS	BRCH	ACAD	KS

l results, except for pH, are reported in mg/l.

DALLAS WATER UTILITIES - Report of Analysis

Addison, Town of

ie	09/15/00	09/15/00	09/15/00	Average
Number	0238	0240	0239	
lume	9.8	27.4	62.8	
tal Suspended Solids	829	244	250	515
ochemical Oxygen Demand	400	245	245	272
anide				
dmium				
romium				
pper				
rcury				
ckel				
lver				
nc				
tal Metals				
senic				
lenium				
oatable Oil & Grease				
etone				
nzene				
hyl Benzene				
opropyl Alcohol				
thyl Alcohol				
thyl Ethyl Ketone				
thylene Chloride				
enol				
luene				
lene				
ash Cup				
te	ACAD	KS	BRCH	

l results, except for pH, are reported in mg/l.

file

TOWN OF ADDISON
PUBLIC WORKS DEPARTMENT (972) 450-2871
Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

February 27, 2001

RE: Joint Town of Addison and Dallas Water Utilities Meeting (February 8, 2001)

Dear Randy:

I would like to once again express my appreciation to you on behalf of the Town of Addison for meeting with us on February 8, 2001, and for you and your staff's attention to the surcharge situation that we are trying to resolve. To reiterate our concerns, as a result of a preliminary study prepared by Freese and Nichols, we feel there is a possibility that the locations where samples are currently being taken are affecting the quality and accuracy of the representative system samples.

To address this concern, the Town of Addison proposes the following:

(1) The temporary relocation of sampling sites to those locations shown on the attached site map, subject to DWU's approval of said locations. If the locations shown do not meet with DWU's approval, mutually agreeable sites will be selected. DWU and the Town of Addison will also agree on the sampling method and configuration. The Town of Addison will contribute labor and materials to this effort if appropriate.

(2) The Town of Addison will pay the following surcharge amounts:

(a) July 2000 - $33,291
(b) August 2000 - $10,173
(c) September 2000 - $11,099

(3) If the study holds true and samples taken from the proposed sites result in lower concentrations of BOD and TSS for two consecutive months, Dallas Water Utilities will:

(a) refund all surcharge payments made through September 2000; and
(b) cancel surcharge pay requests for October, November and December of 2000.

(4) The Town of Addison, at its own expense, will then proceed with construction of new "permanent" sampling locations (agreed to by all affected parties) for future sampling.

(5) If sampling continues to show concentrations of BOD and TSS above the 250mg/1 threshold, the Town of Addison will forward any outstanding surcharge fees to Dallas Water Utilities and continue to determine the cause or source of the surcharge problem.

If Dallas Water Utilities agrees to the terms stated herein, please return a signed copy of this letter at your earliest convenience.

UNDERSTOOD AND AGREED TO:

M.E. Murphy

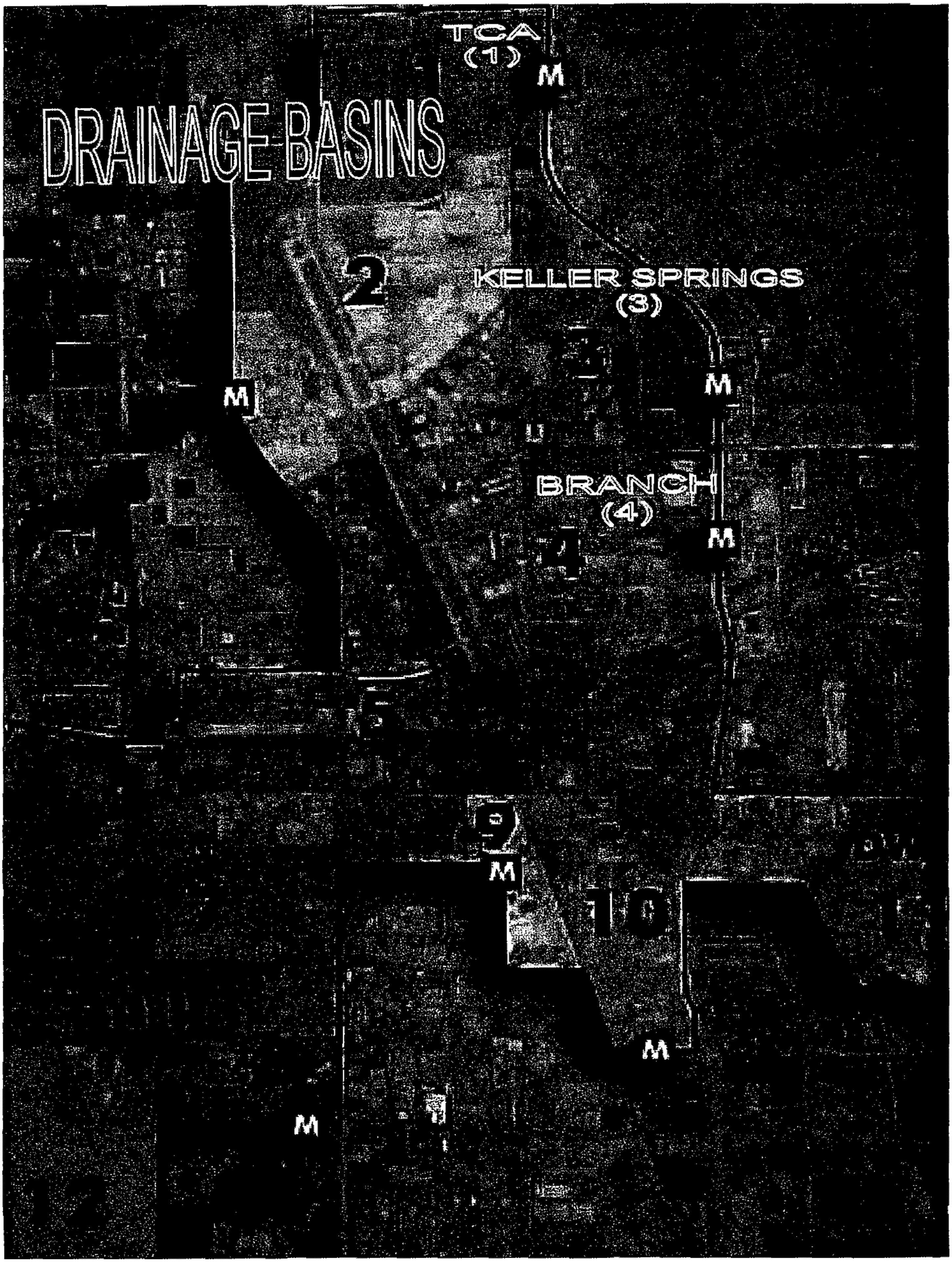
Michael E. Murphy, PE
Director of Public Works
Town of Addison
Date: 2/27/2001

Randy Stalnaker
Manager/Wholesale Services
Dallas Water Utilities
Date: ____________

Attached per your request are:

1. Location Maps showing drainage basins
2. Requested testing methods and procedures
3. Temporary Test Site Location Descriptions

Xc: Ron Whitehead – City Mgr. Addison
Chris Terry – Asst. City Mgr. Addison
Alan Greer, PE – Freese and Nichols/Manager


TCA
(1)
M
DRAINAGE BASINS
2
KELLER SPRINGS
(3)
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BRANCH
(4)
M
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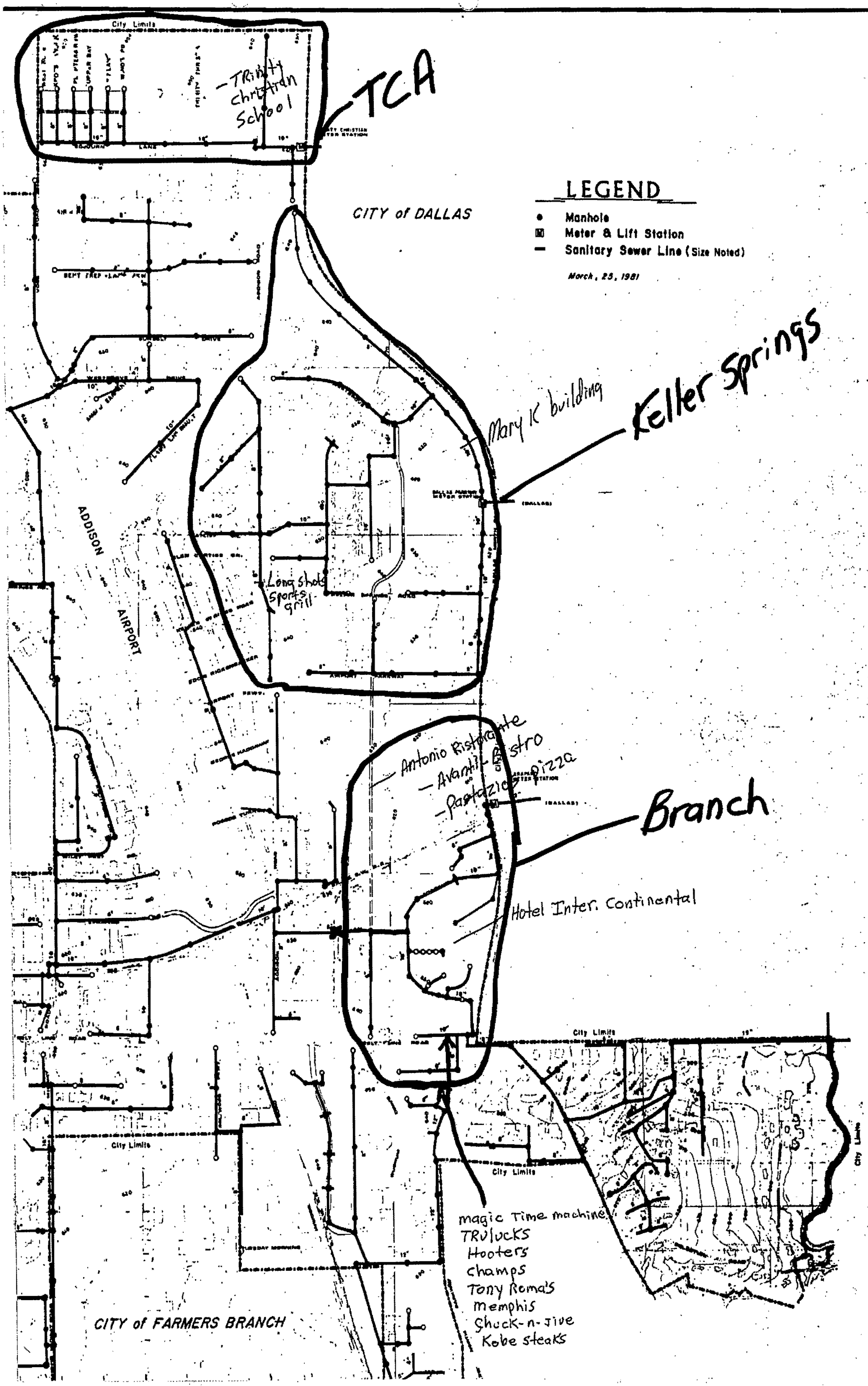
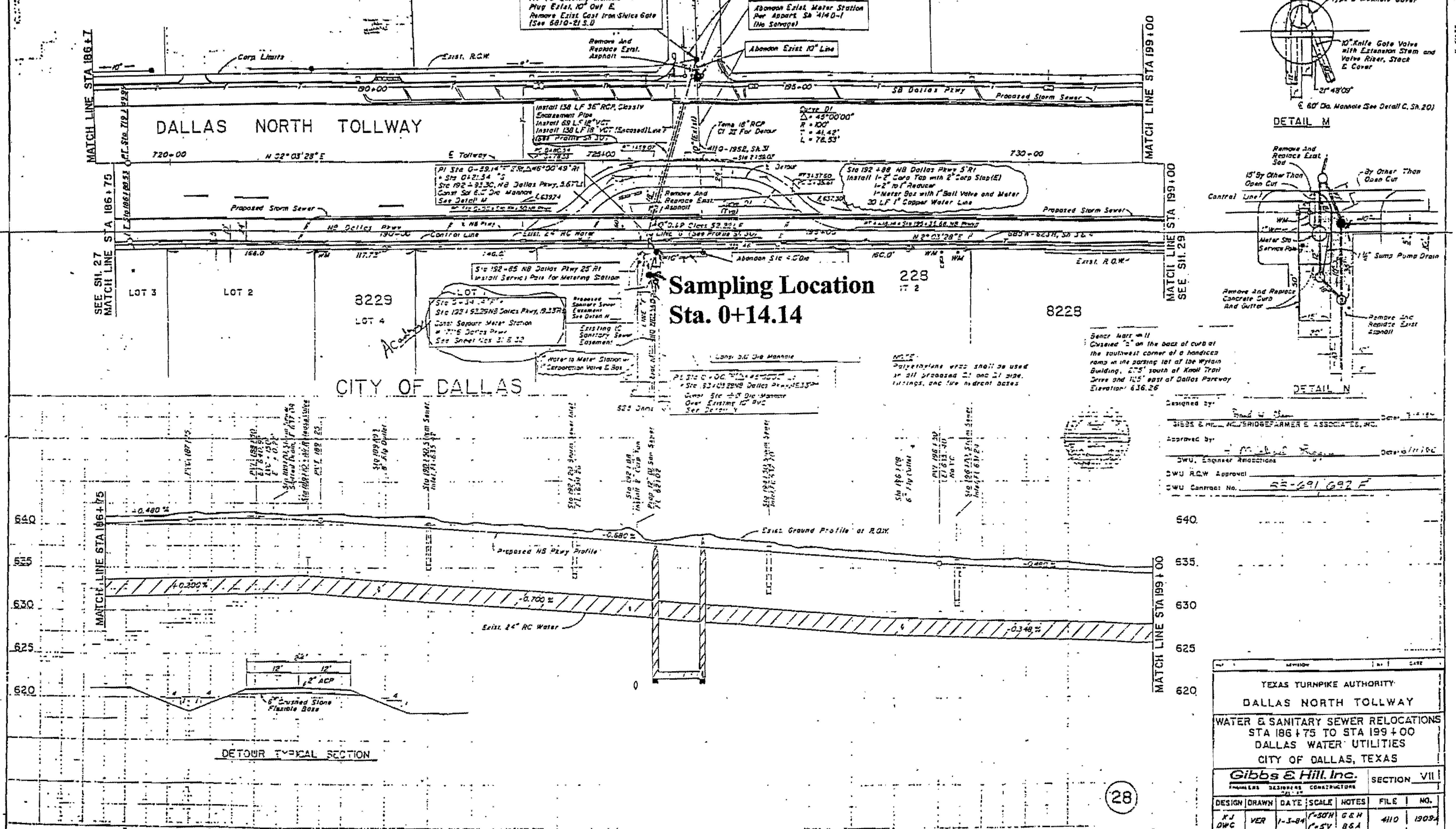
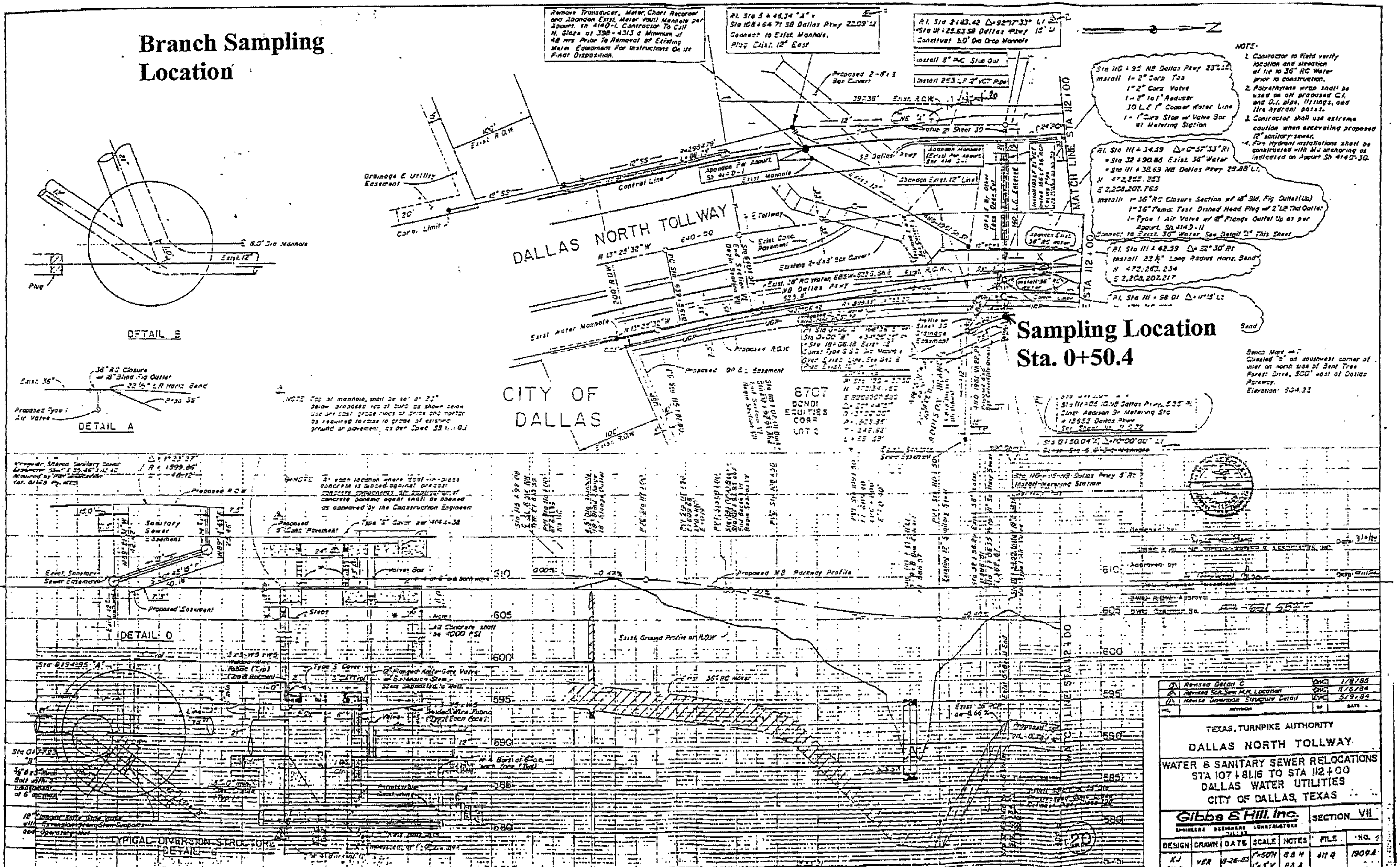
M
M

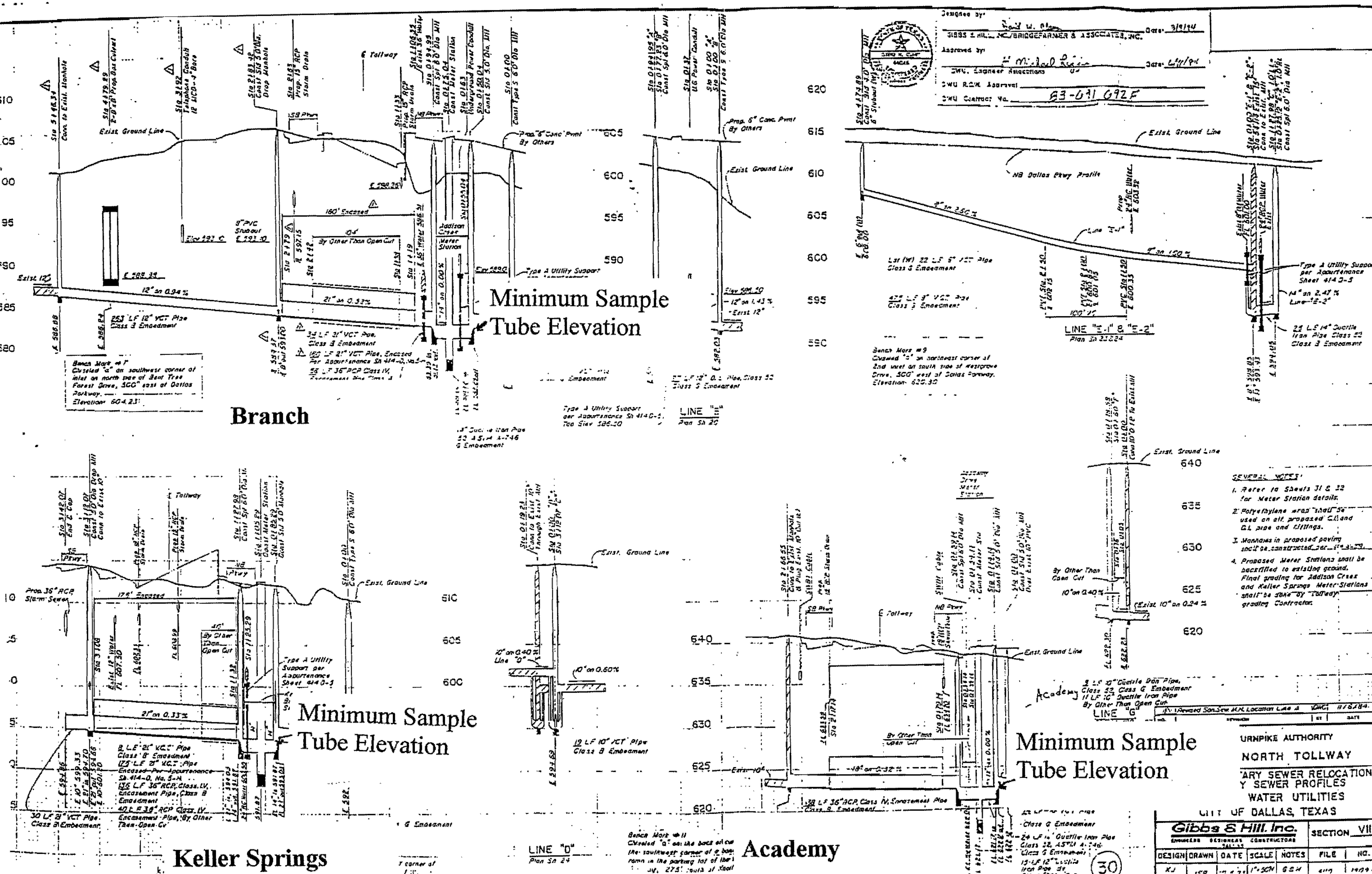


LEGEND
Manhole
Meter & Lift Station
Sanitary Sewer Line (Size Noted)
March, 25, 1981
CITY of DALLAS
ADDISON AIRPORT
CITY of FARMERS BRANCH
City Limits
TCA
-Trinity christian School
Keller Springs
Mary K building
Long shots Sports grill
Branch
Antonio Ristorante
-Avanti Bistro
-Pastazio pizza
Hotel Inter. Continental
magic Time machine
TRUlucks
Hooters
champs
Tony Roma's
memphis
Shuck-n-Jive
Kobe steaks

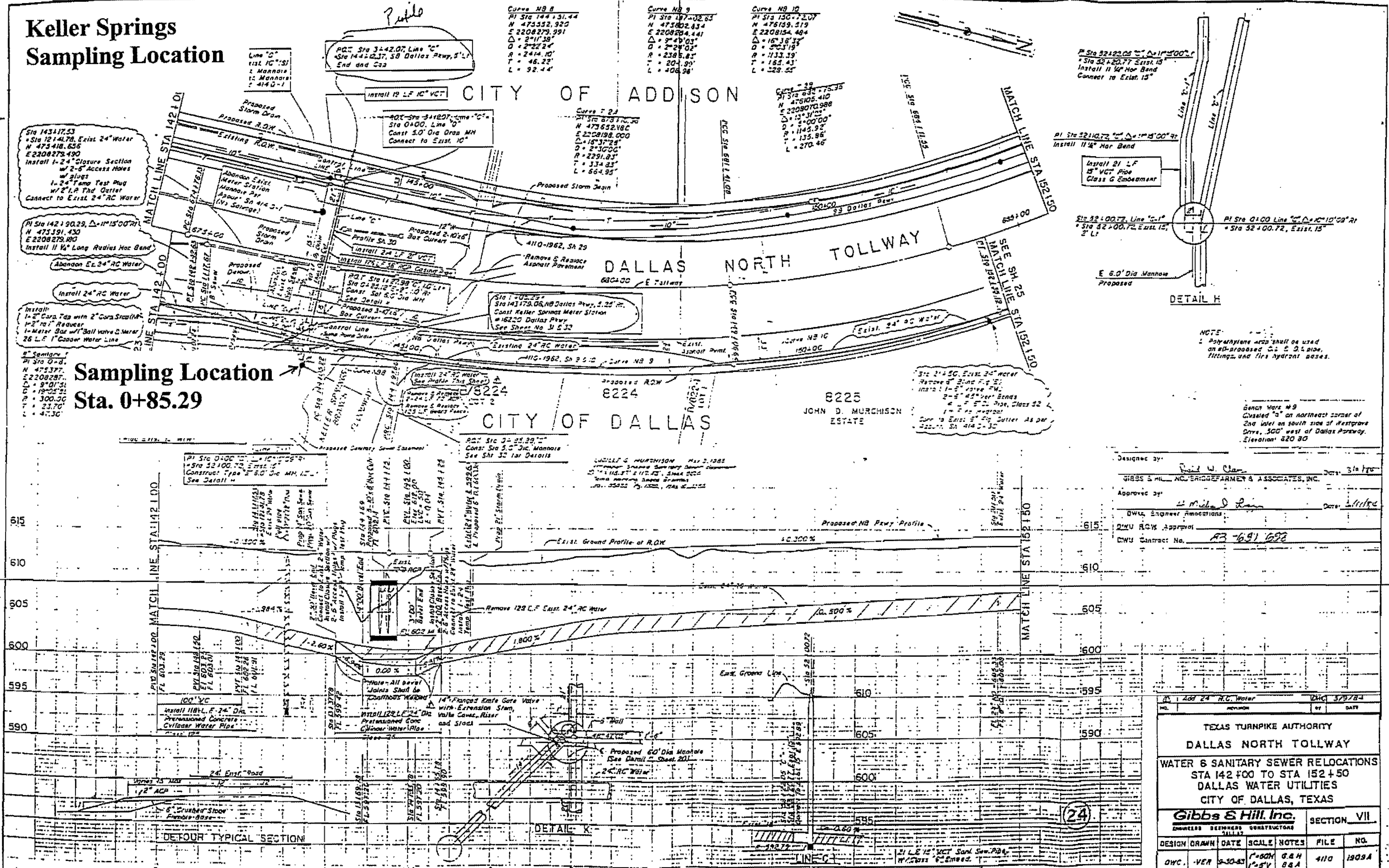
Academy Sampling Location



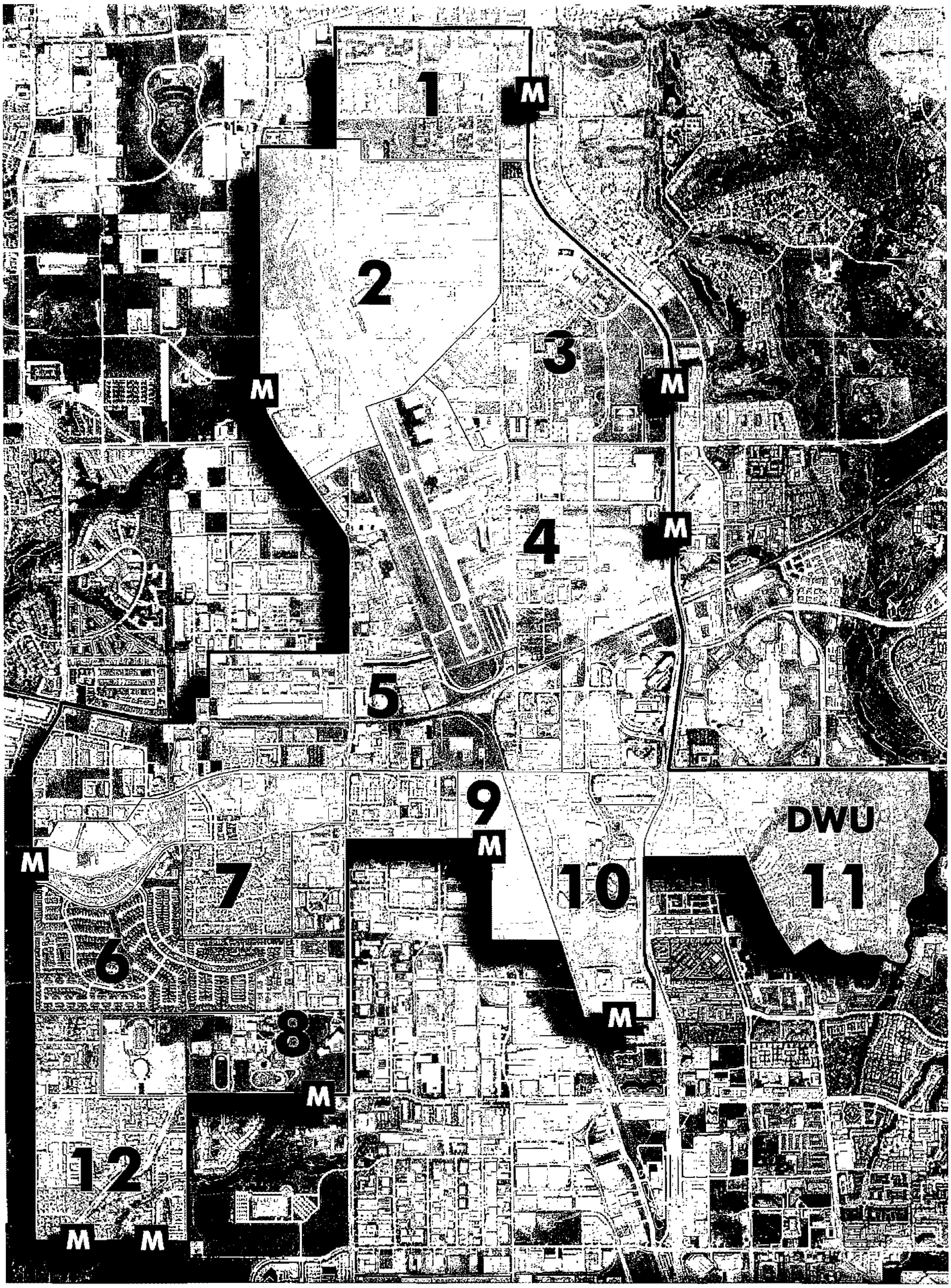

Branch Sampling Location
Sampling Location
Sta. 0+50.4
DALLAS NORTH TOLLWAY
CITY OF DALLAS
DETAIL B
DETAIL A
DETAIL D
TYPICAL DIVERSION STRUCTURE DETAIL C
MATCH LINE STA 112+00
TEXAS TURNPIKE AUTHORITY
DALLAS NORTH TOLLWAY
WATER & SANITARY SEWER RELOCATIONS
STA 107+81.16 TO STA 112+00
DALLAS WATER UTILITIES
CITY OF DALLAS, TEXAS
Gibbs & Hill, Inc.
SECTION VII



Branch
Minimum Sample Tube Elevation
Keller Springs
Minimum Sample Tube Elevation
Academy
Minimum Sample Tube Elevation
Exist. Ground Line
GENERAL NOTES:
1. Refer to Sheets 31 & 32 for Meter Station details.
NORTH TOLLWAY
WATER UTILITIES
CITY OF DALLAS, TEXAS
Gibbs & Hill, Inc.
SECTION VII
30



Keller Springs Sampling Location
Sampling Location Sta. 0+85.29
CITY OF ADDISON
CITY OF DALLAS
DALLAS NORTH TOLLWAY
MATCH LINE STA 142+00
MATCH LINE STA 152+50
SEE SH. 25
DETAIL H
DETAIL K
DETOUR TYPICAL SECTION
JOHN D. MURCHISON ESTATE
Install 24" RC Water
Abandon Ex. 24" RC Water
Const Keller Springs Meter Station
Existing 24" RC Water
Remove 123 L.F. Exist. 24" RC Water
Exist. Ground Profile at R.O.W.
Proposed NB Pkwy Profile
14" Flanged Knife Gate Valve with Extension Stem, Valve Cover, Riser and Stack
Proposed 60" Dia Manhole
LINE C-1
TEXAS TURNPIKE AUTHORITY
DALLAS NORTH TOLLWAY
WATER & SANITARY SEWER RELOCATIONS
STA 142+00 TO STA 152+50
DALLAS WATER UTILITIES
CITY OF DALLAS, TEXAS
Gibbs & Hill, Inc.
SECTION VII
24



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Summary of Issues
Addison Sanitary Sewer Investigation
(Surcharges)

Laboratory Issues

- Request ERMI furnish their laboratory procedures for receiving samples through analysis Frank & Nichols.

- Request ERMI furnish QA/QC data for analysis performed Donna Will Provide Protocall information

Sampling Issues

- Request RJN's written procedures for collection and preservation of samples

- Request RJN's written procedures for flow monitoring

Sample Site Issues

- Cleaning to be performed each month by Addison prior to sampling

- Sample sites were chosen with Addison's concurrence

- Relocation of sampling sites would be at Addison's expense

FREESE • NICHOLS

Ma… :-Ross • 1701 N. Market Street, Suit… 00 LB 51, Dallas, Texas 75202
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FAX TRANSMITTAL SHEET

To: Michael Murphy

Fax No.: 972-450-2837

From: Jim Boddaker

Date:

Total number of pages, including transmittal sheet: ~~30~~ 30

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February 17, 2001

Michael Murphy, P.E.
Town of Addison
16801 Westgrove Drive
Addison, Tx 75001-9010

Re: DWU Issues

Dear Mr. Murphy

As a result of our meeting last week with Dallas Water Utilities concerning our report on the sanitary sewer investigation we respond as follows:

Laboratory Issues-
- Laboratory procedures- attached are the ERMI procedures used on the project.
- The QA/QC data was included in volume 2 of the report. Each laboratory result report included a quality control section. We are not sure what else is needed. We made multiple phone calls to Lee Davis at DWU and were unable to contact him for clarification.

Sampling Issues
- RJN's written procedures for collection and preservation of samples are attached.
- RJN's written procedures for installation, calibration, and maintenance of the flow metering equipment during the monitoring period are attached.

With regards to the sampling locations we considered inserting a stinger in the flat section of pipe in the meter vaults. However, when the minimum and maximum flow velocities were calculated using our flow monitoring data for each site, we found the following:

	ACADEMY	BRANCH	KELLER SPRINGS
MIN VELOCITY IN METER (f/sec)	0.11	0.007	0.17
MAX VELOCITY IN METER (f/sec)	0.56	2.70	0.81

These velocities are too low for representative sampling purposes. The maximum velocities at the Branch meter are acceptable but the diurnal low flow velocities drop significantly below 1 foot/sec.

There will be no perfect or utopian sampling points because of the nature of the system and available technology. However, there are good and better sampling points. We would recommend that the sampling take place at the first manhole downstream of each meter. For the Branch meter this is the manhole at station 0+50.4 on line A (DWU plans), the Keller Springs recommended sampling manhole is at station 0+85.29 on Line B (DWU plans), and the Academy recommended sampling manhole is at station 0+14.14 on Line C (DWU plans). These are the sampling points that were used for the study purposes. Although all three locations exhibited some surcharging during our

monitoring period, flow conditions are much better then upstream of the meters.

The sampling tube at all sampling points should be set so that it does not rest on the bottom of the manhole. According to the drawings, the outlet pipe invert is, in all instances, at least 1 foot above the manhole invert. We would prefer that the sampling tube be set at or slightly above the outlet pipe invert. The low diurnal flows during our monitoring had depths of 1.75", 3.8", and 4.29" above the outlet pipe inverts respectively for Academy, Branch, and Keller Springs sampling locations.

In addition, the DWU suggestion about cleaning the piping immediately upstream of the meters should be implemented. It was also apparent during the meeting that some of the DWU staff took offense to our observation about the sampling tube being located at the very bottom of the manhole. Unfortunately, we do not have pictures to back up our observations. We would suggest that during the sampling periods your staff take date stamped pictures of the sampling setup in order to document the sample tube configuration on a daily basis during the sampling periods.

Should you need any additional information please let us know.

Sincerely,

FREESE AND NICHOLS, INC.

Jim Baddaker

J.R. Baddaker P.E.

February 17, 2001

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16801 Westgrove Drive
Addison, Tx 75001-9010

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MAX VELOCITY IN METER (f/sec)	0.56	2.70	0.61

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Should you need any additional information please let us know.

Sincerely,

FREESE AND NICHOLS, INC.

J.R. Baddaker P.E.

Addison, Texas – Flow Monitoring and Sampling

Procedures for collecting and preserving samples:
RJN collected hourly samples at each of the sampling points using American Sigma 900 portable samplers. Samples were collected from each of the three samplers, one time each day and transferred to the sample bottles provided by ERMI. ERMI provided bottles with the appropriate preservative included. RJN used containers (ice chest) provided by EMRI and ensured the samples were iced at all times. The samples were transported to EMRI immediately upon collection.

Flow weighted samples were composited based on the flow monitoring results. The collection and preservation for flow weighted samples followed the procedure described above.

Flow Monitoring:
RJN installed three American Sigma 950 portable flow meters, one at each of the three sites. The meters were calibrated in the office and checked at the site performing a velocity profile using a portable velocity meter and taking a manual depth reading. The results were compared to the meter readings. This procedure was performed daily during sample collection. No adjustment were made as the results of the manual tests verified the meters were working properly during the sampling period.

Flow meter probes were cleaned each day to ensure proper measurements were being collected.

BIOCHEMICAL OXYGEN DEMAND

Method 405.1 (5 Days, 20°C)

STORET NO. 00310
Carbonaceous 80082

1. Scope and Application
   1.1 The biochemical oxygen demand (BOD) test is used for determining the relative oxygen requirements of municipal and industrial wastewaters. Application of the test to organic waste discharges allows calculation of the effect of the discharges on the oxygen resources of the receiving water. Data from BOD tests are used for the development of engineering criteria for the design of wastewater treatment plants.
   1.2 The BOD test is an empirical bioassay-type procedure which measures the dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter present. The standard test conditions include dark incubation at 20°C for a specified time period (often 5 days). The actual environmental conditions of temperature, biological population, water movement, sunlight, and oxygen concentration cannot be accurately reproduced in the laboratory. Results obtained must take into account the above factors when relating BOD results to stream oxygen demands.
2. Summary of Method
   2.1 The sample of waste, or an appropriate dilution, is incubated for 5 days at 20°C in the dark. The reduction in dissolved oxygen concentration during the incubation period yields a measure of the biochemical oxygen demand.
3. Comments
   3.1 Determination of dissolved oxygen in the BOD test may be made by use of either the Modified Winkler with Full-Bottle Technique or the Probe Method in this manual.
   3.2 Additional information relating to oxygen demanding characteristics of wastewaters can be gained by applying the Total Organic Carbon and Chemical Oxygen Demand tests (also found in this manual).
   3.3 The use of 60 ml incubation bottles in place of the usual 300 ml incubation bottles, in conjunction with the probe, is often convenient.
4. Precision and Accuracy
   4.1 Eighty-six analysts in fifty-eight laboratories analyzed natural water samples plus an exact increment of biodegradable organic compounds. At a mean value of 2.1 and 175 mg/l BOD, the standard deviation was ±0.7 and ±26 mg/l, respectively (EPA Method Research Study 3).
   4.2 There is no acceptable procedure for determining the accuracy of the BOD test.

Approved for NPDES CBOD: pending approval for Section 304(h), CWA
Issued 1971
Editorial revision 1974

5. **References**

5.1 The procedure to be used for this determination is found in:
Standard Methods for the Examination of Water and Wastewater, 15th Edition, p. 483, Method 507 (1980).

5.2 Young, J. C., "Chemical Methods for Nitrification Control," J. Water Poll. Control Fed., 45, p. 637 (1973).

CHEMICAL OXYGEN DEMAND

Method 410.4 (Colorimetric, Automated; Manual)

STORET NO. 00340

1. Scope and Application
   1.1 This method covers the determination of COD in surface waters, domestic and industrial wastes.
   1.2 The applicable range of the automated method is 3–900 mg/l and the range of the manual method is 20 to 900 mg/l.
2. Summary of Method
   2.1 Sample, blanks and standards in sealed tubes are heated in an oven or block digestor in the presence of dichromate at 150°C. After two hours, the tubes are removed from the oven or digestor, cooled and measured spectrophotometrically at 600 nm.
3. Sample Handling and Preservation
   3.1 Collect the samples in glass bottles if possible. Use of plastic containers is permissible if it is known that no organic contaminants are present in the containers.
   3.2 Samples should be preserved with sulfuric acid to a pH < 2 and maintained at 4°C until analysis.
4. Interferences
   4.1 Chlorides are quantitatively oxidized by dichromate and represent a positive interference. Mercuric sulfate is added to the digestion tubes to complex the chlorides.
5. Apparatus
   5.1 Drying oven or block digestor, 150°C
   5.2 Corning culture tubes, 16 x 100 mm or 25 x 150 mm with Teflon lined screw cap
   5.3 Spectrophotometer or Technicon AutoAnalyzer
   5.4 Muffle furnace, 500°C.
6. Reagents
   6.1 Digestion solution: Add 10.2 g $K_2Cr_2O_7$, 167 ml conc. H_2SO_4 and 33.3 g $HgSO_4$ to 500 ml of distilled water, cool and dilute to 1 liter.
   6.2 Catalyst solution: Add 22 g Ag_2SO_4 to a 4.09kg bottle of conc. H_2SO_4. Stir until dissolved.
   6.3 Sampler wash solution: Add 500 ml of conc H_2SO_4 to 500 ml of distilled water.
   6.4 Stock potassium acid phthalate: Dissolve 0.850 g in 800 ml of distilled water and dilute to 1 liter. 1 ml = 1 mg COD
      6.4.1 Prepare a series of standard solutions that cover the expected sample concentrations by diluting appropriate volumes of the stock standard.
7. Procedure
   7.1 Wash all culture tubes and screw caps with 20% H_2SO_4 before their first use to prevent contamination. Trace contamination may be removed from the tubes by igniting them in a muffle oven at 500°C for 1 hour.

Pending approval for Section 304(h), CWA
Issued 1978

7.2 Automated

7.2.1 Add 2.5 ml of sample to the 16 x 100 mm tubes.

7.2.2 Add 1.5 ml of digestion solution (6.1) and mix.

7.2.3 Add 3.5 ml of catalyst solution (6.2) carefully down the side of the culture tube.

7.2.4 Cap tightly and shake to mix layers.

7.2.5 Process standards and blanks exactly as the samples.

7.2.6 Place in oven or block digestor at 150°C for two hours.

7.2.7 Cool, and place standards in sampler in order of decreasing concentration. Complete filling sampler tray with unknown samples.

7.2.8 Measure color intensity on AutoAnalyzer at 600 nm.

7.3 Manual

7.3.1 The following procedure may be used if a larger sample is desired or a spectrophotometer is used in place of an AutoAnalyzer.

7.3.2 Add 10 ml of sample to 25 x 150 mm culture tube.

7.3.3 Add 6 ml of digestion solution (6.1) and mix.

7.3.4 Add 14 ml of catalyst solution (6.2) down the side of culture tube.

7.3.5 Cap tightly and shake to mix layers.

7.3.6 Place in oven or block digestor at 150°C for 2 hours.

7.3.7 Cool, allow any precipitate to settle and measure intensity in spectrophotometer at 600 nm. Use only optically matched culture tubes or a single cell for spectrophotometric measurement.

8. Calculation

8.1 Prepare a standard curve by plotting peak height or percent transmittance against known concentrations of standards.

8.2 Compute concentration of samples by comparing sample response to standard curve.

9. Precision and Accuracy

9.1 Precision and accuracy data are not available at this time.

Bibliography

1. Jirka, A. M., and M. J. Carter, "Micro-Semi-Automated Analysis of Surface and Wastewaters for Chemical Oxygen Demand." Anal. Chem. 47:1397, (1975).

RESIDUE, NON-FILTERABLE

Method 160.2 (Gravimetric, Dried at 103–105°C)

STORET NO. 00530

1. Scope and Application
   1.1 This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes.
   1.2 The practical range of the determination is 4 mg/1 to 20,000 mg/1.
2. Summary of Method
   2.1 A well-mixed sample is filtered through a glass fiber filter, and the residue retained on the filter is dried to constant weight at 103–105°C.
   2.2 The filtrate from this method may be used for Residue, Filterable.
3. Definitions
   3.1 Residue, non-filterable, is defined as those solids which are retained by a glass fiber filter and dried to constant weight at 103–105°C.
4. Sample Handling and Preservation
   4.1 Non-representative particulates such as leaves, sticks, fish, and lumps of fecal matter should be excluded from the sample if it is determined that their inclusion is not desired in the final result.
   4.2 Preservation of the sample is not practical; analysis should begin as soon as possible. Refrigeration or icing to 4°C, to minimize microbiological decomposition of solids, is recommended.
5. Interferences
   5.1 Filtration apparatus, filter material, pre-washing, post-washing, and drying temperature are specified because these variables have been shown to affect the results.
   5.2 Samples high in Filterable Residue (dissolved solids), such as saline waters, brines and some wastes, may be subject to a positive interference. Care must be taken in selecting the filtering apparatus so that washing of the filter and any dissolved solids in the filter (7.5) minimizes this potential interference.
6. Apparatus
   6.1 Glass fiber filter discs, without organic binder, such as Millipore AP-40, Reeves Angel 934-AH, Gelman type A/E, or equivalent.
   NOTE: Because of the physical nature of glass fiber filters, the absolute pore size cannot be controlled or measured. Terms such as "pore size", collection efficiencies and effective retention are used to define this property in glass fiber filters. Values for these parameters vary for the filters listed above.
   6.2 Filter support: filtering apparatus with reservoir and a coarse (40–60 microns) fritted disc as a filter support.

Approved for NPDES
Issued 1971

NOTE: Many funnel designs are available in glass or porcelain. Some of the most common are Hirsch or Buchner funnels, membrane filter holders and Gooch crucibles. All are available with coarse fritted disc.

6.3 Suction flask.

6.4 Drying oven, 103–105°C.

6.5 Desiccator.

6.6 Analytical balance, capable of weighing to 0.1 mg.

7. Procedure

7.1 Preparation of glass fiber filter disc: Place the glass fiber filter on the membrane filter apparatus or insert into bottom of a suitable Gooch crucible with wrinkled surface up. While vacuum is applied, wash the disc with three successive 20 ml volumes of distilled water. Remove all traces of water by continuing to apply vacuum after water has passed through. Remove filter from membrane filter apparatus or both crucible and filter if Gooch crucible is used, and dry in an oven at 103–105°C for one hour. Remove to desiccator and store until needed. Repeat the drying cycle until a constant weight is obtained (weight loss is less than 0.5 mg). Weigh immediately before use. After weighing, handle the filter or crucible/filter with forceps or tongs only.

7.2 Selection of Sample Volume

For a 4.7 cm diameter filter, filter 100 ml of sample. If weight of captured residue is less than 1.0 mg, the sample volume must be increased to provide at least 1.0 mg of residue. If other filter diameters are used, start with a sample volume equal to 7 ml/cm^2 of filter area and collect at least a weight of residue proportional to the 1.0 mg stated above.

NOTE: If during filtration of this initial volume the filtration rate drops rapidly, or if filtration time exceeds 5 to 10 minutes, the following scheme is recommended: Use an unweighed glass fiber filter of choice affixed in the filter assembly. Add a known volume of sample to the filter funnel and record the time elapsed after selected volumes have passed through the filter. Twenty-five ml increments for timing are suggested. Continue to record the time and volume increments until fitration rate drops rapidly. Add additional sample if the filter funnel volume is inadequate to reach a reduced rate. Plot the observed time versus volume filtered. Select the proper filtration volume as that just short of the time a significant change in filtration rate occurred.

7.3 Assemble the filtering apparatus and begin suction. Wet the filter with a small volume of distilled water to seat it against the fritted support.

7.4 Shake the sample vigorously and quantitatively transfer the predetermined sample volume selected in 7.2 to the filter using a graduated cylinder. Remove all traces of water by continuing to apply vacuum after sample has passed through.

7.5 With suction on, wash the graduated cylinder, filter, non-filterable residue and filter funnel wall with three portions of distilled water allowing complete drainage between washing. Remove all traces of water by continuing to apply vacuum after water has passed through.

NOTE: Total volume of wash water used should equal approximately 2 ml per cm^2. For a 4.7 cm filter the total volume is 30 ml.

7.6 Carefully remove the filter from the filter support. Alternatively, remove crucible and filter from crucible adapter. Dry at least one hour at 103–105°C. Cool in a desiccator and weigh. Repeat the drying cycle until a constant weight is obtained (weight loss is less than 0.5 mg).

8. Calculations

8.1 Calculate non-filterable residue as follows:

$$\text{Non-filterable residue, mg/l} = \frac{(A - B) \times 1{,}000}{C}$$

where:

A = weight of filter (or filter and crucible) + residue in mg
B = weight of filter (or filter and crucible) in mg
C = ml of sample filtered

9. Precision and Accuracy

9.1 Precision data are not available at this time.

9.2 Accuracy data on actual samples cannot be obtained.

Bibliography

1. NCASI Technical Bulletin No. 291, March 1977. National Council of the Paper Industry for Air and Stream Improvement, Inc., 260 Madison Ave., NY.

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-In	Page: 1 of 18
Approved By LM:		Revision: 6-6-96

Detection Limit: See Appendix B

Sampling, Containers,
Preservations, Holding Times: See Appendix C

RECEIVED FEB 16 2001

1.0 GENERAL DISCUSSION

ERMI is an environmental chemistry laboratory. The results of nearly all the analyses we perform are used to satisfy some regulatory requirement imposed by federal, state or local environmental agencies. Because of this, our results are sometimes scrutinized in regulatory proceedings or in courts-of-law. Therefore, they must be appropriate for the purpose intended and defensible. To meet these criteria, samples must be handled and analyzed according to certain regulatory agency protocols, usually EPA, and complete records stored for easy retrieval. These records must demonstrate appropriate handling and analysis protocols were used and substantiate the results obtained when they are questioned. ***Be very careful of customer samples.*** Very often they are one-of-a-kind and cannot be replaced or can only be replaced at great expense. Also, some samples contain pollutants that produce obnoxious odors, unhealthful fumes, are corrosive or ignitable or have some other undesirable or dangerous property. ***Handle them with great care and do not drop or break them.***

Sample log-in is the initiation of the sample analysis process and is one of the more critical steps. During log-in, the chain-of-custody for the sample is signed officially receiving the sample into the laboratory, analysis parameters and methods of analysis are definitively determined and assigned to the sample, samples are checked to ensure they have been preserved appropriately for the desired parameters, a unique laboratory identification number is assigned to the sample and the sample and list(s) of parameters to be analyzed are transferred to the laboratory for analysis.

It is not at all unusual for customers not to know exactly what they want or need to analyze from a particular sample. For example, a customer may need to determine if their waste is hazardous but not know this requires tests for reactivity, corrosivity, ignitability and toxicity analysis using TCLP methodology or the various analyses making up these testing procedures. However, with our experience and knowledge of environmental regulations, we are usually successful in helping customers make these type of determinations. This is part of the standard service we offer.

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-In	Page: 2 of 18
Approved By LM:		Revision: 6-6-96

Almost all environmental chemistry parameters are very time sensitive (must be analyzed within a specified holding time or period from the time of sample collection). As well, they require certain preservation techniques unique to the sample matrix (water, soil, sludge, biological tissue etc.) being tested to stabilize the parameter(s) of interest and to keep them from degrading. It is critical that samples be preserved in the appropriate manner and they be analyzed within the appropriate holding period specified by the EPA or regulatory agency requiring the analysis. Results of analyses from samples not preserved in the appropriate manner and/or not analyzed within stated holding times are not acceptable to satisfy regulatory requirements.

A good practice in an environmental chemistry laboratory, and one required by EPA, is "blind sample analysis." Blind sample analysis is the assigning of a unique identification number to a sample and cross-referencing this number to the customer. In this way, the sample is tracked throughout the laboratory and analyzed without analysts knowing who the customer is or what sample location it came from. In this way, biases in the analyses associated with this knowledge are averted.

Log-in is comprised of the following tasks:

Officially accepting the sample for the laboratory by signing the chain-of-custody, initiating a Field Data Form and documenting the date and time this was done, as appropriate, on each of the forms. Also, at the time of sample receipt, part of the log-in process is determining the customers turnaround time expectations and desires and ensuring these can be accomplished for the submitted samples. If the customer is new to **ERMI**, determining a method of payment for the first sample submission and providing a credit application to them if they will be repeat customers is also considered a part of the log-in process.

Determining the parameters of analysis, analysis methods and detection limits required for each sample based on the specific environmental regulation(s) being addressed.

Determining and documenting on the Sample Preservation Form whether each sample has been correctly preserved for the type of analyses requested and the matrix of the sample and arrived in the proper sampling container.

Assigning a unique laboratory sample identification number to each sample and cross referencing this number to the customer, sample location, date and time of sample collection, etc.

Preparing laboratory work orders to advise the laboratory of the analyses required on each sample and to provide a vehicle for the laboratory to transmit the analysis results to the Customer Service area for report preparation.

Delivering the sample and work orders to the laboratory.

2.0 INTERFERENCES

Interferences are not a consideration during log-in since no specific chemical analyses are performed during this process. Great care must be taken at this time, however, to ensure that samples are not contaminated or cross contaminated with each other by introducing utensils or media into the sample when preservation levels are checked. You must be assured that anything (pH paper) introduced into the sample container is analytically clean or contamination may occur. If you have any doubt whatsoever, clean the item appropriately before introducing it. The quantities of the parameters analyzed for in the laboratory are extremely small and any contamination of the sample with other sample materials such as soil, sludge, sample water, industrial chemicals, etc. could alter the analysis results.

The following should be avoided due to potential contamination:

Nail polish remover near samples.
Do not spray cleaning agents or disinfectants in the area of open samples.
Do not physically touch samples (i.e. Na analysis).

3.0 APPARATUS

Apparatus required for sample log-in includes computer, protective gloves, safety glasses, laboratory coat, pH paper, Sharpie markers, sample labels, color coded labels, ink pens, sample cart and the various forms and logs used to document information as described more fully in the following sections.

4.0 REAGENTS

No reagents are used in the log-in process. If a sample is not preserved upon receipt, it should be properly preserved by log-in personnel, Field Services or by personnel from the laboratory where the sample or sample aliquot will be analyzed.

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-in	Page: 4 of 18
Approved By LM:		Revision: 6-6-96

5.0 PROCEDURE

5.1 Sample Receiving

Samples are delivered to the laboratory in a number of different ways. Some of these are: customer walk-ins, overnight services such as Airborne, Federal Express and Lone Star, Greyhound bus, U.S. Postal Service, United Parcel Service and Roadway Package Service, trucking companies, air parcel or freight and **ERMI** personnel. Samples delivered by **ERMI** personnel include those picked up at the Greyhound bus station and airports, from customer locations and those collected by Field Services employees themselves. All samples must be kept in the container (cooler, box, etc.) they were delivered in until it is time to check the sample containers and preservation levels. ***Do not attempt to log-in more than one submission of samples at a time.*** This will ensure customer samples are not mixed up during the log-in process.

When multiple submissions are received from separate customers, it is necessary to prioritize the log-in of the samples based on holding times, turnaround time requested and condition of samples upon arrival. Deficiencies must be noted on the Sample Preservation Documentation sheet for inclusion on the customer report (i.e. received out of holding time or not enough sample).

Samples are received into the laboratory by signing the chain-of-custody for the submission, completing the Field Receiving Information on a Field Data Form (Appendix A) and documenting the date and time this was done at the appropriate locations on the two (2) forms. If no chain-of-custody was provided with the submission, initiate one using **ERMI**'s Chain-of-Custody form (Appendix A). Note that for samples brought to the laboratory by **ERMI** personnel, the Field Receiving Information provides for documentation of transfer of the samples from Field Services personnel or other **ERMI** personnel to the laboratory. As well as documenting the

transfer of samples, the Field Data Form serves as a point of attachment for all laboratory information generated for the submission keeping it in one location for report preparation and later, filing in the customer's project folder.

Review the chain-of-custody to ensure all information is legible and complete. A telephone number must be provided for a contact to answer questions about the samples should they develop, an address to send the completed report and invoice to, a fax number if the report and invoice are to be faxed, a purchase order number for billing purposes, descriptive information on the project and samples the customer would like included on the final report, the name of the person who collected the samples, the date and time the samples were collected, notation as to what the customer's expected and desired turnaround time (TAT) are and the parameters of analysis. ***All of this information is essential and must be documented upon receipt of the samples.*** If this information is not on the chain-of-custody or in the customer's project file, it must be gleaned from the individual delivering the samples or from the provided or known customer contact. ***All customer contacts must be documented on a Communications Form (Appendix A), a copy of this form placed in the customer file and copies routed to all individuals with a need to know. Copies must be delivered promptly so any necessary actions can be rapidly taken. Know and be sure of the customers' TAT expectation, be sure we can meet them and contact the customer for instructions if we cannot!***

If the customer is new to **ERMI**, method of payment for the first submission of samples must be determined. New customers and/or customers' with questionable credit ratings may pay for the services provided in advance when they submit the samples, upon receipt of the final report or according to **ERMI**'s payment terms upon credit approval. The time to complete the credit approval process after receiving the completed application depends upon how quickly the listed credit references respond to standard information inquiries. Also, if the customer is new to **ERMI**, document how they found out about us, which laboratory they were using previously and why they changed on a communications form and route it to the President and the Business Development Manager. If they were referred by an existing customer, we will want to contact that customer and thank them. If they were drawn to **ERMI** though our Business Development efforts, we would like to know by which method to enable us to evaluate our marketing and sales techniques.

5.2 Parameters of Analysis

ERMI's and most customers' chain-of-custody forms provide space for recording what parameters are to be analyzed from each sample submitted. ***It is incumbent upon us to ensure that we understand what parameters the customer wants to analyze from each sample, what detection limits are required and, if necessary, determine which methods of analysis are appropriate to meet these needs.*** Often, customers have their own acronyms or jargon for certain analyses which may be different from ours or those generally accepted. As well, the customer may know they need to analyze the sample for a particular parameter or suite of parameters but not know what method of analysis should be used or the detection limit(s) required to satisfy the regulation being addressed. If any of this information is unclear from the documentation provided with the samples or project, ***make no assumptions***, contact one of **ERMI**'s technical personnel and/or the customer for further guidance before proceeding with the log-in process! ***Be absolutely sure of what the customer wants and document this on a Communications Form if it was necessary to contact them!*** If verbal instructions regarding the sample are given, note them on the Chain-of-Custody and initial and date this information and indicate who gave these instructions.

One of the more frequent determinations required during the log-in process is what method of analysis must be used to meet the customers needs. Most customers are not environmental chemists and they depend upon us to make or help them make the right decision. The ***single factor*** most influencing this decision is what regulation(s) the customer is addressing with the analyses from the samples, RCRA or solid waste, Clean Water Act, Safe Drinking Water Act and/or Clean Air Act regulations. Each regulation calls for analyses using methodologies specific to that regulation. For example, metals in a water sample are analyzed by method 200.7 to address Clean Water Act regulations and by method 6010 to address RCRA or solid waste regulations. Within these categories, there is often a choice of methods that can be applied depending upon the detection limit requirements necessary to satisfy the regulation. Lead for example can be analyzed by method 200.7, ICP, yielding a detection limit of 0.01 mg/l to satisfy Clean Water Act requirements but must be analyzed by furnace using method 239.2 to obtain a detection limit of 0.001 to satisfy Safe Drinking Water Act requirements. For purposes of the Clean Air Act, lead must be analyzed by flame AA using method 239.1 which has a detection limit of 0.1 mg/l.

As you can see, it is ***imperative*** to know the regulation being addressed to make the proper determination of which method(s) is appropriate for the analysis. Making this more difficult is the fact that customers do not always know what regulation is being addressed. They may only know they are trying to determine if the waste is hazardous, whether they are out of compliance on their wastewater discharge or whether their water is safe to drink. This type of information is a definitive clue as to what regulation the customer is addressing and, therefore, what methods of analysis and detection limit requirements must be met to satisfy their needs. Knowledge of the various environmental regulations, the regulatory limits imposed by them and the sample analysis capabilities of the laboratory is very important. Information on the methods of analysis and detection limits for each parameter analyzed by **ERMI** is presented in Appendix B. The information is grouped by laboratory of analysis (Metal, Wet, GC and GC/MS) and regulation.

If an unfamiliar organic parameter is requested there are various sources to obtain information from -- the on-line Chem-Crosser program, the Merck index and similar reference books located in the semivolatile laboratory, regulatory publications in **ERMI**'s library, etc. Do not guess what something is, verify it.

5.3 Sample Containers and Preservation

After determining what parameters are to be analyzed from each sample, remove all samples from a particular customer's submission. Place the samples on a work surface where only samples from the submission being logged-in are present. Arrange the samples as ordered on the chain-of-custody and verify the label against the information on the chain-of-custody. A sample can be comprised of one or a number of different containers with each containing a subsample or sample aliquot (a representative portion of sample). This is necessary because each parameter or group of parameters must be placed into a container of the appropriate type, preserved in a specified manner, capped with a specific type of lid and analyzed within a specified holding period. Holding period is the time from sample collection until initiation of the analysis, completion of the analysis, or completion of a specific part of the analysis as specified in the pertinent regulation. Generally speaking, all chemical parameters begin to degrade or change form from the time they are collected. Some parameters can be stabilized for a period of time using various chemical agents and/or cooling but this only retards the degradation or change. It

does not stop it. There is still a finite period during which time the analyses are considered acceptable. It goes without saying then, the sooner a sample is analyzed the better. If samples are not analyzed within the appropriate holding period, the results of these analyses are not acceptable for satisfying regulatory requirements.

Knowing the parameters to be analyzed, check each sample or sample aliquot to ensure they are in the correct type of container and are preserved in the manner specified by the regulation. Document your findings for each sample on a Sample Preservation Documentation form (Appendix A). Information on the correct sample container and lids, preservatives and holding times are presented in Appendix C.

Almost all parameters require cooling the sample to 4°C as one or part of the appropriate method of preservation. A few exceptions to this are samples for analysis of metals, chloride, hardness and fluoride or solid waste samples for all analyses where the physical or chemical character of the sample is changed upon cooling. It is not necessary to cool these parameters and types of samples. If the sample was received on ice, make this notation on the Sample Preservation

Documentation form. It is assumed the sample(s) was appropriately cooled if it arrived at the laboratory on ice. This is because some samples collected a short distance from the laboratory may not be chilled to 4°C upon arrival at the laboratory but they were placed on ice immediately after collection and cooled such that this criteria probably would have been met if left long enough. If a sample is not cooled upon arrival and it should have been, make a notation at the bottom of the Sample Preservation Form to this effect.

Check the pH of each sample or sample aliquot (exclusive of VOA vials, samples known or suspected to require special handling, samples for solid waste or air analysis, soil and sludge, or samples customers have requested not be opened until time of analysis) using pH indicator strips to assess whether the pH level is indicative of a correctly preserved sample or a sample that should not have been preserved (BOD, TSS, Chloride, etc.). ***It is important to remove the lid from only one sample container at a time to ensure the lids are not mixed up and put on the wrong container.*** This could cross contaminate the sample(s) and invalidate or

result in erroneous results. Document these findings in the pH column on the Sample Preservation Documentation form for each parameter or parameter group. It is not necessary to determine the exact pH, only whether the sample was below or above the necessary pH. Record the sample number(s) (Section 5.4) on the form and check it thoroughly for completeness. Immediately sign the form and record the current date and time.

5.4 Sample Identification Number

A unique sample identification number is assigned to each sample. This sample number is a consecutive number maintained in the sample log (Appendix A). Each sample is ***treated individually*** to prevent labeling the wrong sample with the identifying number. Select the first sample on the submission chain-of-custody. Select the next unused consecutive number from the Sample Log and assign the number to this sample. This is done by recording the customer name, project number, date received, sample description and due date for the sample in the Log on the line or row corresponding to the sample number and by writing the number beside the description for the sample on the submission chain-of-custody. Also included on each line in the Log is a break out of parameters by laboratory and a notation of how the sample arrived at the laboratory.

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: RLC	Sample Log-In	Page: 9 of 18
Approved By LM:		Revision: 6-6-96

Label the sample container with the sample identification number. Write the number in the appropriate place on the existing container label or, in the absence of a label, write the number on an **ERMI** container label designed specifically for this purpose and affix it to the side of the sample container(s). ***Be very careful*** not to deface any information on the customer label during this process. The sample number should also be written on the lid of each container using a Sharpie marker or a plain white label. Containers are often cold and wet making them difficult to write on or label. Wiping the container with a paper towel just prior to labeling often helps. If the container has moisture on the outside when you are trying to write on it, the Sharpie marker will absorb moisture and not write or will write improperly. Touch the end of the marker to a dry paper towel several times making ink blots on the towel. This will return the flow of ink and the pen should work properly again. ***Make sure the sample identification number is clearly legible and labels are tightly affixed.*** This is the only means of identifying the sample after log-in.

There are three (3) special cases that affect how a sample is labeled. These are when a sample has a ***RUSH*** TAT, when a sample has a short holding time (48 hours or less), and/or when a sample is to be analyzed for what we refer to as ***"low level"*** parameters. Sample analyses requiring RUSH turnaround times and those that have short holding times are labeled with a fluorescent red or red/orange label so they are easily identified as samples with quick TATs. Samples requiring low level analyses are labeled with a fluorescent yellow label for this same purpose. A sample can have three different labels: a customer label, a red RUSH or short holding time label and a yellow label for low level analysis. If a sample has a special hazard associated with it, contact the Safety Officer for proper handling and special log-in procedures.

After completing one sample proceed to the next following the same procedures until all samples in the submission have been logged-in.

In the case where limited sample volume is encountered and the sample must be subsampled for various parameters or laboratories, contact the inorganic or organic team leader or the QA Manager for assistance. In the case where an unpreserved sample is received and the sample must be analyzed for parameters that must be preserved in different ways, contact the applicable inorganic or organic team leader or the QA Manager.

5.5 Work Order Preparation

An Analytical Services Work Order is a form comprised of one or more pages of descriptive information to tell the analysts what parameters are to be analyzed from each sample. One work order is prepared for each individual sample for each laboratory (Metals, Wet, GC and GC/MS laboratories) that will participate in performing the analyses required. Customer and location specific work orders are already prepared for current customers and for all the typical analyses performed. Only work orders signed by the President should be used. Custom work orders are used for new customers requiring special combinations of analyses or current customers requiring other than their or our standard analyses. Appendix A contains an example of the Analytical Services Work Order form.

Work orders are completed by recording the sample identification number and due date or to be completed by date for the sample at the top of the form. The standard TAT for most parameters is four (4) ***working*** days. Exceptions to this are samples for BOD, TCLPs, seven (7) day leachate and BTEX/TPH analyses. The TAT for BODs and TCLPs is five (5) working days, for the seven (7) day leachate test about 12 to 15 working days (check with the inorganic supervisor to determine a reasonable due date upon receipt of these samples) and for BTEX/TPH 48 hours. All samples except BTEX/TPH and RUSH samples are counted as being received the next day if they are received after 2:00 PM in the afternoon by **ERMI** personnel. If the samples arrive after 2:00 PM at the laboratory but were received earlier in the day by Field Services or other **ERMI** personnel, the TAT begins from the earlier time.

Under parameter, list the parameters of analysis to be analyzed from the sample in the order in which they will appear on the report. This order is the same order the parameters are presented in the publication "Methods for Chemical Analysis of Water and Wastes" EPA-600/4-79-020, revised 1983 with the exception of physical characters which are always listed last. A copy of the table of contents of this document is presented in Appendix D for referral. List the desired method of analysis and detection limits in the corresponding location on the form for each parameter. Fill in the box at the bottom of the form corresponding to the laboratory where the work order will be delivered. Note the other laboratories where analyses will be performed on the same sample by placing an X in the box beside the laboratory name. Indicate the matrix of the sample by circling one or more of the classifications under sample description or write in the matrix after "other" if none of the listed matrices are suitable. Any information on hazards associated with handling the sample should be noted under comments and made very obvious with a brightly colored highlighter.

Any special instructions for processing the sample should be documented in the "Special Instruction" location on the form.

On the work order note whether the sample was received out of holding time in the comments section. Also note the NLT (no later than time) for parameters with short holding times – turbidity, BOD, nitrate, coliforms, etc.

After completing the work order, carefully check it over to be sure all instructions and documentation are complete and legible. ***Note: The work order is the vehicle used by the laboratories to report the results of their analyses and other information to Customer Service for report preparation.***

Certain circumstances and parameters dictate some modification or exceptions to the above procedures. When samples with RUSH TATs are to be analyzed, a bright orange work order is used. If the work order is multi-page, it is only necessary that the top page of the work order be prepared on orange paper. The remaining pages can be the normal white paper. Again, the purpose of the colored work order is to alert individuals in the laboratories that these analyses are RUSH and must be processed quickly. When samples for pH, BOD, nitrate, hexavalent chromium and others with short holding times, or TPH are logged in, a special label is affixed to the work order to provide a place for the analyst(s) to sign for the sample in recognition the sample was brought into the laboratory and delivered to him or her. Because semivolatile organics, pesticides and herbicides are prepared in one location and analyzed in another, a copy of the first page of all of these work orders is made. The original goes to the preparation laboratory and the copy to the instrument laboratory. After the sample is prepped, the original work order and the sample are transferred by laboratory personnel to the instrument laboratory and the copy of the work order is replaced by the original and the copy discarded.

Upon completion of the log-in process for a submission, the chain-of-custody, the completed Sample Preservation Documentation form and any information regarding the submission are stapled to the Field Data Form. Unless the individual completing the log in process has considerable experience, this package must be reviewed for clarity and completeness by someone other than the individual logging in the samples.

Occasionally we receive samples to be analyzed for parameters that we do not perform such as asbestos, radioactivity, etc. These parameters are subcontracted to a third party laboratory. A file is maintained in the Log-In area of the current laboratories we subcontract to. Check with the Customer Services Manager to verify which laboratory to use. When such a sample is received, a Subcontracting Chain-of-custody is completed with all applicable information including a request to fax data

to **ERMI** upon completion. The only exception in requesting the information to be faxed is whole effluent toxicity data; these reports are quite lengthy. Examples are in the file for each subcontract laboratory. The COC is relinquished to the Field Service technician transporting the sample. If there is no information on the sample to identify our customer or give unnecessary information to the third party laboratory, the original container we received the sample in may be sent to the sublab. Clearly put the **ERMI** sample number on the container and on the lid of each sample to be transported. If it is necessary to subsample the sample, contact the inorganic or organic team leader or the QA Manager for assistance. Unless the sample is dried paint, drywall, etc., it must be refrigerated. Samples not needing refrigeration may be placed on the Log-In counter along with the completed COC while awaiting transport. Place all sublaboratory samples needing refrigeration on the top left hand shelf in the organic prep laboratory.

At the end of each day Field Data forms, along with all attachments, are filed numerically in the "Samples In-House" file in the Customer Service area. Also at the end of each day, a count is made of incoming samples (excluding Q.C. samples) for the day and the number written on a post-it note and given to the President.

5.6 Wastewater Work Orders

Most monthly wastewater samples are composite samples collected over a 24-hour period. Specific parameters such as volatiles, cyanide and oil and grease must be collected as grab samples and are in-house before the composite portion of the sample. Field Service technicians collecting these samples will request sample identification numbers after the sampler is set out if it contains grab sample parameters. If there are no grab samples, the Field Service Technicians will request a sample identification number after the complete sample is in-house. Occasionally, due to sampler malfunctions or other problems, a sample is not collected and the sampler must be reset. By waiting until the sample is in-house, voided sample numbers can be avoided.

When the work orders containing grab samples are completed, they are placed in the "Grabs Here - Composites There" file in the Log-In area. This means the grab portion of the sample will be in-house before the remainder of the sample. When the complete sample is in-house, the Field Service technicians will retrieve these work

orders and place them into the appropriate laboratory work order books or, for the Wet Lab, in the appropriate hanging files on their wall. At this time they complete the Field Data Sheet and relinquish it to Log-In personnel. Log-In personnel then signs and puts the date and time on the Field Data Sheet. Check to make sure the Field Service technicians have written the due date in yellow hiliter in the upper right hand corner of the Field Data Sheet. Also check to be sure a pH was collected and it is within regulatory limits -- generally between 6 and 10.5 but varies from city to city. If the pH is not within these limits, a second pH must be collected.

In the Sample Log Book, the samples are considered in-house the next working day following collection. Example: If a sampler is set out on Monday to collect a composite sample but is not in-house until late Tuesday afternoon, it would be considered in-house on Wednesday. This allows the laboratory personnel adequate time to complete the requested analysis.

The Field Data Sheets contain the information used to program the automated samplers. The Model 800 Sigmas have a feature that allows information to be downloaded via a data device and printed out by the Field Service technicians. This information is then attached to the Field Data Sheets and contains valuable quality control information such as missed samples, date and time the samples were collected, etc. Discrepancies or any problems noted with sample collection should be reported to the Customer Services Manager.

5.7 Sample Distribution

After completing all work orders, the samples are transferred to a cart and the aliquots distributed, as appropriate, to the various laboratories. Each laboratory has it own storage refrigerator for samples. The shelves of each refrigerator are labeled with the parameters to be stored on them. The exceptions to this are the Metals Laboratory and samples for BOD analysis. Liquid samples for metal analysis do not require refrigeration so they are stored on a shelf for this purpose in the digestion or sample preparation area within the Metals laboratory. Soil and sludge for metals analysis, however, do require refrigeration. These are maintained in the refrigerator in the volatile organic instrument laboratory. Upon delivery to the Wet Laboratory, BOD samples are placed on the work surface in the laboratory where the analysis is performed and the analyst signature to that effect obtained. BOD samples have a red labeled area in the refrigerator for after hour placement of samples.

When delivering samples to the laboratories, deliver those requiring volatile organic analyses to this laboratory first. ***Never take volatile organic samples into the Organic Preparation or Wet laboratories.*** These laboratories use methylene chloride, chloroform, acetone and other volatile chemicals for sample extraction and glassware decontamination which can easily infiltrate and contaminate samples even with the lids tightly secured. These solvents are some of the parameters analyzed for in the volatile laboratory. Upon delivery of the samples to each laboratory, put the work orders for each laboratory in their work order book. The exception to this procedure is the Wet Laboratory where work orders are placed in the appropriate section in the hanging files just inside the Wet laboratory on the east side. Wet Laboratory personnel will place the work orders in their book. Arrange the work orders in the books such that the largest sample identification number is the first page of the book when opened. The exception to this is volatile organics where new work orders are placed last in the work order book at the analyst request.

6.0 CALCULATIONS

No specific calculations are required for the sample log-in phase of sample processing. Remember, TATs are based on working days, not calendar days.

7.0 SOIL AND SLUDGE MODIFICATIONS

No modifications other than those listed above are required to log-in soils and sludges. No preservative other than cool to 4°C is required for these sample matrices. Soils and sludges for metals analysis are stored in the volatile refrigerator and should be put there first before delivering other samples on the cart to other laboratories.

8.0 QUALITY CONTROL

All log-in documentation is checked for clarity and completeness and verified by a second individual knowledgeable and experienced in the log-in process.

9.0 SAFETY AND HYGIENE

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-in	Page: 15 of 18
Approved By LM:		Revision: 6-6-96

Safety relates to both the safety of log-in and surrounding personnel and to the safety of customers' samples while under the care of the log-in personnel.

Safety and proper hygiene must be foremost in the minds of all sample log-in personnel when handling samples or working in the log-in area. All samples have the potential to contain some sort of contaminant at high concentrations or at levels deleterious to your health and/or physical well being. In addition, some samples are preserved and are therefore acidic or basic. It is our business to measure the concentrations or characteristics of certain of these contaminants. As well as the contaminants we normally think of, some samples may also contain bacteria, viruses or other disease causing agents along with the chemical contaminants we may suspect. For these reasons, ***it is imperative*** log-in personnel wear the supplied proper personal protection equipment, be knowledgeable with regard to the safe handling of samples, know how to handle the safety equipment in their area and use it properly and maintain good personal hygiene practices. Be careful with the pH paper after checking the sample and dispose of it properly.

Proper safety attire for log-in personnel is safety glasses, latex or vinyl gloves and a laboratory coat. These items ***must be*** worn when in the log-in area. Bare or exposed skin should be minimized when working with samples. Cloth, tennis or open style shoes should be avoided. No eating or drinking is allowed in the log-in area and hand to mouth, eye, face or bare skin should be avoided when working with samples or when samples are in the log-in area. When log-in is completed, immediately ***wash your hands*** and any bodily area that was splashed or came into contact with sample using the antibacterial soap provided in the rest rooms and at other locations throughout the laboratory. Advise the Safety Officer of any rash or irritation or other adverse effect from coming into contact with a sample. Wash your laboratory coat frequently, at least once a week.

The safety of samples is a concern whenever they are handled. Always work with one sample at a time and make sure the lid is on tight and your hold is secure. Always work with samples over a work surface and make a conscious effort to minimize the distance the sample is held above the surface to decrease the potential for breakage should the sample slip and fall. Store all samples securely when they are transported on the

laboratory cart and pay particular attention when crossing the bumps caused by the union of carpet and tile between the laboratory and offices. In no circumstance is a sample to be carried by hand to the laboratories, they should always be in a crate or on the laboratory cart for secondary spill containment.

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-In	Page: 16 of 18
Approved By LM:		Revision: 6-6-96

10.0 WASTE DISPOSAL

No waste other than used pH strips and normal office waste is generated during the log-in process. These can be discarded in the regular office trash receptacles and disposed of in the dumpster.

11.0 CLEAN UP AND MAINTENANCE

A clean, well organized work area is essential for safety purposes and also projects a professional image to our customers, minimizes the potential for inadvertently contaminating samples, promotes smooth and efficient work since the area is free from clutter and demonstrates the genuine concern log-in personnel have for the importance of and factors affecting their particular job.

The work surfaces of the log-in area must be kept free of spilled sample(s), paper and other trash. The counters and the sample cart should be wiped down periodically to remove or reduce the contamination on surfaces. The bottom tray of the cart should be kept orderly. Transfer bubble pack, netting, etc. to the Field Office area on a routine basis. Sample bottle cabinets must be kept stocked with bottles and supplies of VOA vials, labels, chain-of-custody forms and labeled soil jars maintained to give to customers when needed without them having to wait while they are retrieved from the Field Office or warehouse.

All empty coolers must be returned to the warehouse for cleaning and shipment back to the customer, if applicable. As incoming coolers are emptied, those needing to be returned should have a note attached instructing Field Service personnel where the cooler is to be returned and how many and what kind of bottles need to be returned. Each cooler belonging to ERMI must be logged in the Shipping Log if it is incoming or if it is given to a customer or leaves the premises for any reason. Each cooler is assigned a number and there is a page in the Log by number for each cooler.

Copies of all forms and work orders should be checked during periods when all samples are logged in and these supplies replenished to reduce disruption to the log-in process. Maintain a constant awareness of stocks of purchased supplies used in the log-in

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-In	Page: 17 of 18
Approved By LM:		Revision: 6-6-96

process such as labels, orange colored paper, Sharpie markers, pH paper, etc. Complete a purchase requisition for supplies needed from outside vendors well in advance of when they are required. Maintain your computer in good operating order. Make it a practice to run scandisk and defrag at least once a week to keep your files compressed and speed maximized.

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Effective Date: January 1, 1994	Subject	Method: 405.1
Approved By QAM:	5 DAY BIOCHEMICAL OXYGEN DEMAND	Page 1 of 16
Approved By LM:		Revision: 6-22-95

Detection Limit: 2.0 mg/L

Sampling : Composite
Container : 1000ml Plastic/Glass
Preservation : Cool 4°C
Holding Time: 48 Hours from time of collection

1.0 GENERAL DISCUSSION

EPA Method 405.1 is the reported method for BOD determinations. However, Standard Methods details all the requirements and procedures for this parameter and the following procedure is based on these criteria.

Biochemical Oxygen Demand (BOD) is an empirical measurement of the oxygen requirements of municipal and industrial wastewaters and sewage. The test results are used to calculate the effect of waste discharges on the oxygen resources of the receiving waters. The BOD test is of limited value in measuring the actual oxygen demand in the environment because temperature change, biological population, water movement, sunlight, oxygen concentration and other environmental factors cannot be reproduced accurately in a laboratory. BOD is performed by incubating a sealed sample for the standard five day period at 20°C in the dark, then determining the change in dissolved oxygen content.

2.0 INTERFERENCES

Residual Chlorine can have a toxic effect on the bacteria used in the BOD analysis. To eliminate small amounts of residual chlorine, allow the sample to stand for one to two hours at room temperature. Cold samples may be supersaturated with oxygen. If a DO reading of over 9.15 at 20°C or 8.78 at 22°C is obtained, remove excess oxygen by agitating the sample before beginning.

To reduce the effect of phenols, heavy metals or cyanide, and other potentially toxic agents, dilute the sample with nutrient water and use the most dilute result which has valid QC values.

3.0 APPARATUS

- 300ml BOD Bottle with Glass Stoppers
- Plastic Caps for BOD bottles
- Pipets and Pipet Bulb
- Volumetric Flask, 1000ml
- Beaker, 1000ml
- Pipettor, 5ml
- Graduated Cylinders, 50ml,100ml,500ml
- COD Reactor
- Magnetic Stirrer Plates and Bars
- Incubators
- Orion Model 840 BOD Meter
- Air Pumps, 2

4.0 REAGENTS

4.1 BOD Standard (Glucose Glutamic Acid), Hach 14865-10

4.2 BOD Nutrient Hach 6L 14862-98 3L-14861-98 See section 5.1.2.

4.3 Sodium Hydroxide (NaOH), 1N Dissolve 40 g NaOH in 1000ml of deionized water.

4.4 Sulfuric Acid (H_2SO4), 1N Add 48g (or 30ml) of concentrated H_2SO_4 to 800ml of deionized water. Adjust the volume to 1000ml with deionized water.

4.5 Nitrification Inhibitor Hach 2533-35.

4.6 Polyseed See section 5.1.3.

4.7 Distilled Water This is purchased locally and is Ozarka brand. No Other brands are acceptable.

5.0 PROCEDURE

5.1 Preparation

NOTE: FOR THIS PROCEDURE TO WORK PROPERLY, THE SAMPLES, POLYSEED, AND NUTRIENT WATER **MUST BE** AT THE SAME TEMPERATURE, **20-22°C ± 2°C** OR ROOM TEMPERATURE AT THE TIME OF SAMPLE PREPARATION.

5.1.1 Initial Sample Preparation Remove the BOD samples to be analyzed from the sample storage refrigerator upon arriving at the laboratory in the morning. **Samples must be at room temperature (approximately 20°C-22°C) prior to analysis.** Group the samples by batches containing 10 samples each.

5.1.2 Nutrient Buffer Preparation Begin preparation at least three (3) hours before samples are to be analyzed.

5.1.2.1 Use only Ozarka Distilled Water (9.46 Liters). This amount will fill 32 to 33 BOD bottles.

5.1.2.2 Cut a hole in top rear of the container.

5.1.2.3 Drain 560ml of distilled H_2O from container.

5.1.2.4 Add one 6 liter BOD Nutrient Buffer pillow (4.2) and one 3 liter Nutrient Buffer pillow to the Ozarka container.

5.1.2.5 Rinse the emptied pillows with approximately 90ml of the 560ml distilled H_2O drained from container and pour the rinses into Ozarka container.

5.1.2.6 Save 460ml of the initial 560mls and pour the rest back into the container. This will adjust the original 9.46 liters down to 9.00 liters.

5.1.2.7 Add the large Teflon stirring bar (dedicated to the BOD analysis) into the container. Use part of the 460ml distilled water to rinse out the BOD bottles prior to use.

5.1.2.8 Connect the air pump and bubbler and place bubbler into the distilled water container through the hole which was cut in the container.

5.1.2.9 Bubble and stir the nutrient solution for at least 2 hours. Remove the nutrient water from the stirring plate, remove the aerator, remove the stirring bar and allow this solution to stand at least 15 minutes before using.

5.1.3 Polyseed Preparation

5.1.3.1 Withdraw 500ml of nutrient water after it has aerated for the two (2) hour preparation period, collecting it in a 500ml graduated cylinder.

5.1.3.2 Rinse the 1000ml beaker (dedicated to the BOD analysis) with laboratory DI water and place the contents of one (1) Polyseed capsule into the beaker.

5.1.3.3 Rinse the capsule with a portion of the 500ml nutrient water and pour the rinses into the beaker. Do not put the capsule covering into the beaker.

5.1.3.4 Pour the remaining 500mls of nutrient water into the beaker with the Polyseed.

5.1.3.4 Add the stirring bar used for the BOD seed, stir at a moderate speed, and aerate with the bubbler apparatus for a minimum of one (1) hour before use. Allow the seed to stir during the entire sample preparation procedure. Do not allow seed to stand longer than 30 minutes or the bacteria could die from oxygen depletion.

5.1.4 Sample Preparation

5.1.4.1 Run a pH check on an aliquot of each sample and record the sample pH in the data book.

5.1.4.2 If necessary, adjust an aliquot of the sample between pH 6.5 and 7.5. Record the final pH in the data book. ***Never adjust the pH of the entire sample contained in the sample bottle.***

5.1.4.3 Use 1N H_2SO_4 (Section 4.4) if the pH is >7.5. Use 1N NaOH (Section 4.3) if the pH is <6.5.

5.1.4.4 To determine the dilutions necessary for the samples to be analyzed, use the following procedure

- Perform a COD analysis (Method 410.4) on each BOD sample.
- Using a pre-prepared COD vial, pipet 2ml of homogenized sample into the vial. This homogenization must be done in a blender on any sample which contains particles which settle rapidly or cannot be drawn readily into a pipet.
- Cap the vial tightly and shake it vigorously. ***Note: The vial will become hot, so take precautions.***

- Digest the COD vial in the block digester for two (2) hours at 150°C. Read the COD and estimate the BOD concentration by dividing the COD value by two (2).
- Determine the dilution for the BOD analysis, refer to Table 405.1-1. For dilutions needing less than 1ml of sample, the sample must first be serially diluted with nutrient water. For example, if Table 405.1-1 indicates that a sample volume of 0.01ml should be used, the sample is first diluted 1ml to 100ml, then one ml of this dilution is used for the test.
- The total number of dilutions required per sample is three to six. (For higher BOD values, at least one dilution will be too concentrated, at least two dilutions will be in the valid concentration range and at least two values will be more dilute than needed to cover the range). If there is limited sample volume, the minimum number of dilutions run per sample is 3.
- Obtain BOD bottles and arrange in numerical order and record the bottle number, sample number, dilution, and COD value on the data sheet in the BOD data book.

5.2 Calibrating the BOD probe

5.2.1 The probe is stored in the BOD storage sleeve inside the BOD meter. The small sponge in the bottom of this sleeve must be kept moist with water, but all excess water must be poured out of this sleeve.

5.2.2 Begin calibrating the BOD probe at least one hour before sample analysis.

5.2.3 Dry off probe membrane with the soft side of a paper towel before beginning calibration. Place the probe back into the storage sleeve.

5.2.4 Push the "Mode" button until the display is in the CAL position.

5.2.5 Push the Mode button once more. The meter will then calibrate itself. This should take between 20sec. to one minute.

5.2.6 If an E1 message appears, push the Mode button once more. Repeat a third time if the E1 reappears.

5.2.7 Check the probe membrane or the probe tip if the meter fails to calibrate the third time. Sometimes moistening the membrane prior to calibration will help.

5.3 Analytical Procedure

5.3.1 Initial Set Up

5.3.1.1 Rinse each BOD bottle with a portion of the 460ml of original distilled water removed from the 9.46 liter container. Record all bottle numbers and sample numbers in the data book.

5.3.1.2 Record nutrient water, Polyseed and sample temperature in data book before analysis. The temperatures must be the same ± 2°C. If not, dissolved oxygen equilibrium in the analysis components will not be achieved and the analysis will not pass the QC requirements.

5.3.2 Nutrient Blanks (4 Required)

5.3.2.1 Fill the first bottle with nutrient water, place the bottle on the magnetic stirrer and place the probe in the bottle. The stirrer on the probe holder will stir the nutrient over the membrane, thus measuring the initial dissolved oxygen content. Read the DO, and record the value in the data book. Discard this bottle after taking its DO reading.

5.3.2.2 The second bottle is treated the same as above.

5.3.2.3 The third and fourth bottles are filled with nutrient water, stopped and capped. **DON'T READ THE D.O. until after incubation is complete.**

5.3.2.4 Gently tap on the sides of all filled bottles to release any entrapped air bubbles before stoppering.

5.3.3 Seed Correction (3 Required)

5.3.3.1 Add 10ml of Polyseed to a BOD bottle and fill it with nutrient water.

5.3.3.2 Add 15ml of Polyseed to second bottle and fill it with nutrient water..

5.3.3.3 Add 20ml of Polyseed to third bottle and fill it with nutrient water..

5.3.3.4 Read the DO_0 in each bottle, record the value in the data book. Gently tap on the sides of all filled bottles to release any entrapped air bubbles before stoppering. Ensure that all stoppered bottles have a water seal before putting on the plastic caps.

5.3.4 Standards (4 Required)

5.3.4.1 The Hach BOD Standard Solution is provided in a Voluette Ampoule. Simply break the top of the ampoule off at the etched line on the neck. The solution is now ready for immediate use. ***Caution: Always wrap the voluette with a towel, rag or other protective cover before attempting to break the top off, to avoid cutting yourself.***

5.3.4.2 With Class A volumetric pipets, deposit the following volumes of the Hach standard into separate BOD bottles: 1ml, 2ml, 3ml, 4ml.

5.3.4.3 Add 3ml of Polyseed solution to each bottle.

5.3.4.4 Fill bottles with nutrient water. Tap the sides of the bottle to displace the air bubbles that may cling to the inside surface, then read and record the sample DO. Immediately stopper each bottle and verify that a water seal is present before capping.

5.3.5 Samples

5.3.5.1 For samples needing dilution, fill the BOD bottles half full with nutrient water.

5.3.5.2 Add 3ml of Polyseed solution to each bottle using an autopipetor

5.3.5.3 Using volumetric glassware, add the pre-determined amount of sample to be used into the appropriate bottle.

5.3.5.4 Finish filling the bottle with nutrient water.

5.3.5.6 Place the probe in the BOD bottle and allow it to come to equilibrium. Once the probe stabilizes, the reading displayed is ppm dissolved oxygen. Record this value in the BOD Data Book in the initial DO_0 column and then stopper the bottle. Be sure there are no air bubbles in the bottle. Add dilution water so that the reservoir around the stopper is filled. Cap the bottle.

5.3.5.6 Run a duplicate BOD on each batch by duplicating the entire series for a sample.

5.3.5.7 Place all capped bottles in an incubator for five (5) days ±2 hours at 20°C±1°C. Record the time the bottles were placed in the incubator, the shelf they were place on, and the number of the incubator in the data book.

5.3.6 Nitrification Inhibition Samples for Carbonaceous Biochemical Oxygen Demand (CBOD) Analysis This analysis is similar to the BOD analysis except that an extra step (Section 5.3.6.3) is required.

5.3.6.1 Fill the BOD bottles half full of nutrient water.

5.3.6.2 Add 3ml of Polyseed solution to each bottle.

5.3.6.3 Using the dispensor provided by Hach, add 0.6 g of Hach Nitrification Inhibitor to each BOD bottle needing a $CBOD_5$ analysis. This includes nutrient blanks, seed corrections, standards, and samples.

5.3.6.4 Using volumetric glassware, add the pre-determined amount of sample to be used into the appropriate bottle.

5.3.6.5 Finish filling the bottle with nutrient water.

5.3.6.6 Place the probe in the BOD bottle and allow it to come to equilibrium. Once the probe stabilizes, the reading displayed is ppm dissolved oxygen. Record this value in the BOD Data Book in the initial DO_0 column and then stopper the bottle. Be sure there are no air bubbles in the bottle. Add dilution water so that the reservoir around the stopper is filled. Cap the bottle.

5.3.6.7 Run a duplicate BOD on each batch by duplicating the entire series for a sample.

5.3.6.8 Place all capped bottles in an incubator for five (5) days ±2 hours at 20°C±1°C. Record the time the bottles were placed in the incubator, the shelf they were place on, and the number of the incubator in the data book.

5.4 Determining DO after Incubating 5 days

5.4.1 When the five day ±2 hours incubation period is complete, remove all bottles from the incubator and record the time the bottles were taken out.

5.4.2 The DO probe should be calibrated at least one (1) hour before the sample BOD bottles are removed from incubator, and the calibration checked immediately prior to analysis (see section 5.2).

5.4.3 Remove all caps from the bottles, but keep the bottles stoppered until the final DO is to be read.

5.4.4 Calibrate the probe in the same manner as described in Section 5.2.

5.4.5 Place the probe in a BOD bottle and allow it to come to equilibrium. Once the probe stabilizes, the reading displayed is ppm dissolved oxygen. Record this value in the BOD Data Book in the DO_5 column.

5.4.6 Calculate, evaluate, and record all BOD data as soon as the last sample has been analyzed. Submit all work orders to Customer Service. Complete and distribute a Non-Conformance Report if any data doesn't meet the QC criteria.

6.0 CALCULATIONS

6.1 Seed Correction Calculation

The DO uptake of seeded dilution water incubated for five (5) days should be between 0.6 and 1.0 mg/L. It must not be >1.0 mg/L; if it is, this is an indication of a contamination. Since there must be a DO uptake >2.0 ($\Delta DO>2$) for the analysis to be valid, larger volumes of seed must be used in the seed correction samples than in the standards and samples. The following steps correct for this difference:

6.1.1 The seed correction should be calculated as in the following example when 10 ml of Polyseed is used in the Seed Correction bottle and only 3ml of seed is used in the sample bottles:

$$\text{Seed Correction for 10ml Polyseed} = (DO_0 - DO_5) \times \frac{\text{ml of seed in sample}}{\text{ml of seed used in seed correction}}$$

$$= (8.73 - 5.84) \times \frac{3ml}{10ml} = 0.867 \text{ mg/L}$$

6.1.2 The seed correction using 15ml of Polyseed:

$$= (8.76 - 4.81) \times \frac{3mL}{15ml} = 0.79 \text{ mg/L}$$

6.1.3 The seed correction using 20ml of Polyseed:

$$= (8.76 - 3.81) \times \frac{3ml}{20ml} = 0.7425 \text{ mg/L}$$

6.2.4 Average Seed Correction Factor for 3ml of seed:

Seed Correction = (0.867 + 0.79 + 0.7425) / 3 = 0.800 mg/L.

6.2 Standards

6.2.1 An acceptable BOD_5 value for the 300 mg/L glucose and glutamic acid standard is 198 ± 30.5 mg/L or between 167.5 and 228.5mg/L. ***Note: Because the BOD standard prepared by Hach contains 300 mg/L each of glucose and glutamic acid, the BOD value determined must be divided by two.***

6.2.2 Calculate the BOD of the standards the same way as it is calculated for the samples. The average of all valid data points must fall within the allowable limits (198±30.5 mg/L) for the batch to pass the QC requirements.

6.2.3 If the standard does not fall within these limits then all samples associated with this batch need to be re-sampled and re-analyzed. Continue taking BOD readings on the samples in case a sample can not be resubmitted and the data must be submitted with a qualification. Follow ERMI protocols on submitting a Non-Conformance Report to the Quality Assurance Officer and with the sample data.

6.3 Sample Concentration Determination

Note: For a BOD dilution to be valid, the DO_5 must be >1.0 mg/L and the Δ DO or DO uptake between initial and final value must be >2.0mg/L.

6.3.1 Determine the Δ DO by subtracting the Initial DO from the Final DO. Record in the Δ DO column of the data sheet.

$$\Delta DO = DO_0 - DO_5$$

6.3.2 BOD Concentration

$$\text{BOD mg/L} = \Delta DO - \text{Seed Correction} \times \frac{\text{Total Volume in BOD bottles (ml)}}{\text{Sample Volume (ml)}}$$

For example: The sample has three (3) dilutions: 2ml, 5ml, 10ml.

Samp.Vol	DO_0	DO_5	Δ DO	Seed Corr	BOD_5
2ml	8.77	6.74	2.03	0.85	177
5ml	8.73	5.39	3.34	0.85	149
10ml	8.68	2.57	6.11	0.85	158

6.3.3 Report all BOD values using two significant figures. If more than one sample dilution meets the criteria of a residual DO of at least 1 mg/L and a DO depletion of at least 2 mg/L and there is no evidence of toxicity (BOD value drops dramatically with increasing concentration) or the existence of an obvious anomaly (one value significantly out of line with the rest of the data), average the results of all acceptable BOD values.

$$(177 + 149 + 158) \div 3 = 161 \text{ mg/L BOD.}$$

6.4 Detection Limit Calculation

$$\text{Det. Limit} = (2\text{mg/L} - \text{Seed Correction}) \times \frac{\text{Total Volume in Bottle (300ml)}}{\text{Largest Valid Volume of Sample}}$$

For example: Seed Correction = 0.85mg/L

Highest Valid Volume of sample = 50ml

Detection Limit = (2mg/L - 0.85mg/L) x 300ml / 50ml
= 1.15ml/L x 6 = 6.90mg/L

7.0 SOIL AND SLUDGE MODIFICATIONS

This method is not appropriate for soils or sludges.

8.0 QUALITY CONTROL

8.1 Definitions

8.1.1 Batch A batch of samples of like matrix made up of from one (1) to ten (10) samples plus at least one duplicate sample along with the appropriate QC (Sections 8.1.2, 8.1.3, and 8.1.4). Separate batches must be run for BOD Samples requiring Nitrification Inhibition ($CBOD_5$).

8.1.2 Nutrient Blank Four BOD bottles filled with a volume of nutrient water treated in the same manner as the samples, but DO NOT contain seed. Two of the bottles are read for the initial DO. The other two are capped and read at the end of five (5) days of incubation.

8.1.3 Seed Correction A volume of nutrient water containing 10ml, 15ml, 20ml of seed. The seed is incubated with the samples for five (5) days. The calculated seed correction must fall within 0.6 to 1.0 mg/L.

8.1.4 Standards A series of known standard solutions used by the analyst to determine the accuracy of the BOD analysis. This series consists of a volume of nutrient water, standard solution and seed treated in the same manner as the samples. The standard must be 198 ± 30.5 mg/L (Standard Methods).

8.1.5 Duplicate Sample At least one sample chosen at random within each batch of samples is run in duplicate. Each duplicate must have identical dilutions. Duplicate samples are used to document the precision of the method. The Standard Deviation and Coefficient of Variation are calculated from the duplicate values.

8.2 Quality Control Limits

8.2.1 Minimum Depletion: A dilution must have at least a 2mg/l drop in the DO (ΔDO) for the analysis to be valid.

8.2.2 Maximum Depletion: A dilution must not reduce the oxygen content below 1mg/l for the analysis to be valid.

8.2.3 The duplicate values must have a CV of less than 10%.

8.2.4 The percent recovery on the standard must be within the limits of 198 ± 30.5 mg/L.

8.2.5 Nutrient Blanks are run to check the quality of the dilution water. The DO uptake in a sample incubated for five (5) days at 20±1°C should not be more than 0.2 mg/L and preferably not more than 0.1 mg/L.

8.3 Quality Control Calculations

The following calculations are used to illustrate the BOD quality control calculations. A summary of the data used is given below:

Sample	3.87
Duplicate	3.99

8.3.1 Mean ($\overline{X}$) is the arithmetic sum of all the duplicate values in a batch divided by the total number of duplicate samples.

$$\overline{X} = (x_1 + x_2)/2$$

$$\overline{X} = (3.87 + 3.99)/2$$

$$\overline{X} = 3.93 \text{ mg/L}$$

8.3.2 Standard Deviation (SD) represents the dispersion of the samples around the mean. It is estimated by making a number of replicate measurements of a given sample. This value may be calculated using a calculator and following the manufacturer's instructions, or by using the simplified formula below if only two data points are collected.

$$SD = |x_2 - x_1| / 1.4142$$

$$SD = (3.99-3.87) / 1.4142$$

$$SD = 0.08485$$

8.3.4 Coefficient of Variation (CV)

$$CV = \frac{\text{Standard Deviation (SD)}}{\text{Mean } (\overline{x})} \times 100$$

$$CV = \frac{0.08485}{3.93} \times 100$$

$$CV = 2.1\%$$

9.0 SAFETY AND HYGIENE

9.1 Use Safety glasses and gloves, and a lab coat.

9.2 Read the MSDS sheets for further safety information. An MSDS sheet is attached for the Polyseed. Do not breath the dust from the capsule.

9.3 The contents of the nutrient pillows and standard are harmless.

9.4 Use care in opening the standard vials. Wrap the top of the ampoule in a paper towel and then snap it open; this should prevent cuts.

10.0 WASTE DISPOSAL

- After neutralization, dispose of all BOD wastes in the sanitary sewer system.

Effective Date: January 1, 1994	Subject	Method: 405.1
Approved By QAM:	5 DAY BIOCHEMICAL OXYGEN DEMAND	Page 15 of 16
Approved By LM:		Revision: 6-22-95

11.0 Clean Up and Maintenance

11.1 BOD bottles must be emptied out and refilled with hot, soapy (Alconox) water immediately after analysis. Allow the bottles to soak for at least 24 hours. After soaking, shake out the soapy water and wash in dishwasher. Run the bottles through three to five cycles. Rinse thoroughly with deionized water. Put the bottles in the drying oven and allow to dry completely.

11.2 ***Do not deviate from this cleaning regime. These bottles will become easily contaminated if they are not cleaned properly.***

11.3 Caps and stoppers are washed in hot, soapy water. Stoppers are dried in the oven. Store caps and stoppers in the drawers.

11.4 Once a week, add a small amount of DI water to the BOD probe sleeve on the Orion meter housing, then pour out any water not absorbed by the sponge.

Effective Date: January 1, 1994	Subject	Method: 405.1
Approved By QAM:	5 DAY BIOCHEMICAL OXYGEN DEMAND	Page 16 of 16
Approved By LM:		Revision: 6-22-95

Table 405.1-1
BOD Dilutions

COD Value	Theoretical BOD Value	Theoretical Sample Volumes
<20	<10	300ml, 150ml
20-50	10-25	100ml, 50ml, 25ml
50-100	25-50	50ml, 25ml, 10ml
100-200	50-100	25ml, 10ml, 5ml
200-400	100-200	10ml, 5ml, 2ml
400-800	200-400	10ml, 5ml, 2ml, 1ml
800-1600	400-800	4ml, 2ml, 1ml, 0.5ml
1600-3000	800-1600	2ml, 1ml, 0.5ml, 0.3ml, 0.2
3000-6000	1500-3000	1ml, 0.5ml, 0.3ml, 0.2ml, 0.1ml
6000-12000	3000-6000	1ml, 0.5ml, 0.3ml, 0.2ml, 0.1ml, 0.05ml
12000-24000	6000-12000	0.4ml, 0.2ml, 0.1ml, 0.05ml, 0.03ml, 0.02ml
24000-48000	12000-24000	0.2ml,0.1ml,0.05ml,0.03ml,0.02ml,0.01ml
48000-96000	24000-48000	0.1ml,0.05ml,0.03ml,0.02ml,0.01ml,0.005ml

This table is designed so that, for higher BOD values, at least one dilution will be too concentrated, at least two dilutions will be in the valid concentration range and at least two values will be more dilute than needed to cover the range.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 1 of 8
Approved By LM:		Revision: 8-14-95

Detection Limit: 1.0 mg/L on 500ml Samples. See Section 6.2

Sampling : Composite
Container : 500ml Plastic/Glass
Preservation : Cool 4°C
Holding Time : 7 Days

1.0 GENERAL DISCUSSION

This method is based on EPA Method 160.2 and is applicable to total suspended solids in drinking, surface, and saline waters, domestic and industrial wastes. The procedure involves taking a well-mixed sample and filtering it through a dried, pre-weighed, standard glass fiber filter and the residue retained on the filter is dried to a constant weight. The increase in weight of the filter represents the total suspended solids (TSS). Samples must be collected in clean plastic or glass bottles. They must be analyzed as soon as possible after collection, but can be stored up to seven days when cooled to 4°C.

2.0 INTERFERENCES

The filtration apparatus, filter material, pre-washing, post-washing and drying temperature are specified because these variables have been shown to affect the results.

Samples high in Filterable Residue (dissolved solids), such as saline waters, brines and some wastes, may be subject to positive interference. For samples high in dissolved solids, thoroughly wash the filter to ensure removal of the dissolved material.

Excessive residue on the filter may form a water entrapping crust, so limit the sample size to that yielding no more than 200mg of residue.

Non-representative particulates such as leaves, sticks, fish and rocks may be removed before analysis.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 2 of 8
Approved By LM:		Revision: 8-14-95

3.0 APPARATUS

- Aluminum weighing boats
- Tweezers
- 47 mm Glass fiber filter disc (Whatman 934-AH)
- Graduated cylinder, 100ml
- Volumetric flask, 1000ml
- Analytical balance
- Desiccator
- Filter holder, 47mm
- Drying oven
- Suction flask, or filtering apparatus

4.0 REAGENTS

4.1 Deionized Water Obtain DI water from our in-house system which is checked daily to insure the water quality.

4.2 Standard Weigh out between 200-400mg of cellulose (Sigmacell) on the analytical balance and add it to 900ml of DI water in a 1 Liter volumetric flask. Stir with a magnetic stirrer for about one-half hour or until no clumps of cellulose are present, then dilute to 1000ml.

5.0 PROCEDURE

5.1 Preparation Of Filter Disc

5.1.1 Place a 47 mm filter disc in a filter holder with the wrinkled surface of the filter upward.

5.1.2 Place the filter holder assembly in a filtering flask and apply vacuum.

5.1.3 Wash the disc with three successive 20ml volumes of deionized water.

5.1.4 Remove all traces of water by continuing to apply vacuum after the water has passed through.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 3 of 8
Approved By LM:		Revision: 8-14-95

5.1.5 Remove the disc from the filter holder with tweezers and transfer it to a numbered aluminum weighing boat.

5.1.6 Place the boats in a drying oven at 103°C for one hour.

5.1.7 Remove the boats from the oven and place in a desiccator until cooled to room temperature.

5.2 Sample Volume

5.2.1 On clear samples, a minimum of 100ml of sample should be filtered. If this yields less than 1mg of residue, a larger sample must be used. Up to 500ml may be filtered for clear or easily filtered samples. Excessive residue on the filter may form a water entrapping crust, so limit the sample size to that yielding no more than 200mg of residue.

5.2.2 If during filtration of this initial volume, the filtration stops, or if the filtration time exceeds five minutes, a smaller sample size is required. Start with a fresh filter paper and another (smaller) aliquot of sample.

5.3 Sample Filtration

NOTE: ALL SAMPLES MUST BE AT ROOM TEMPERATURE BEFORE ANALYSIS.

5.3.2 At the time of analysis, take the appropriate number of prepared filters out of the desiccator. Using a pair of tweezers, weigh each glass fiber filter with an analytical balance to the nearest 0.0001g. Record the weight of the filter and the number of the aluminum boat in the TSS data book. Return the filter to its respective boat.

5.3.3 Utilizing a pair of tweezers, place the previously weighed glass fiber filter disc into the filter holder flask assembly.

5.3.4 Wet filter disc with deionized water to ensure adhesion to the holder.

5.3.5 Shake the sample <u>vigorously</u> and immediately quantitatively transfer a volume of sample as determined in Section 5.2 to the filter using a graduated cylinder and apply vacuum.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 4 of 8
Approved By LM:		Revision: 8-14-95

5.3.6 Remove traces of water by continuing to apply vacuum after the sample has passed through the filter.

5.3.7 With vacuum applied, rinse the graduated cylinder, filter, non-filterable residue, and filter holder wall with three separate portions of distilled water allowing complete drainage between washings.

5.3.8 Slowly release the vacuum from filtering system by removing the hose connection and carefully remove the filter disc from the holder.

5.3.9 Place the disc in its respective pre-numbered aluminum weighing boat.

5.3.11 Pre-heat the oven to103°C-105°C prior to drying the prepared samples.

5.3.10 Place the boat with filter in a drying oven for at least one hour at this temperature or until filters are dried to a constant weight.

5.3.12 Remove the samples from the oven and place in a desiccator until cooled to room temperature.

5.3.13 Remove the disc with a pair of tweezers and weigh to nearest 0.1 mg on the analytical balance. Record final weight in the TSS data book.

CAUTION: If the filters have not been dried to a constant weight or they have not equilibrated to room temperature, the analytical balance read out will fluctuate abnormally.

6.0 CALCULATIONS

6.1 Sample Calculation

$$\text{TSS in mg/L} = \frac{(B - A)\ \cancel{(g)}}{\text{Vol sample filtered}\ \cancel{(ml)}} \times \frac{1000mg}{1g} \times \frac{1000\cancel{ml}}{1L}$$

or

$$\text{TSS in mg/L} = \frac{(B - A)}{\text{Vol sample filtered}} \times 1{,}000{,}000$$

A = weight of filter disc (in grams)
B = weight of residue plus filter disc after drying (in grams)

Example: The initial weight of the filter was 0.1076g and the final weight of the filter plus residue was 0.1307g. A sample volume of 100ml was used.

$$\text{TSS in mg/L} = \frac{(0.1307 - 0.1076)}{100} \times 1{,}000{,}000 = 231\text{mg/L}$$

6.2 Detection Limits The detection limit is limited by the requirement that the filters be dried to a constant weight which differs by no more than 0.5mg from the previous weight. The detection limit is calculated by the following formula:

$$DL = \frac{0.5\text{mg}}{\text{Sample Vol (L)}}$$

Sample Vol (ml)	Det Limit
25	20
50	10
100	5
200	2.5
500	1

7.0 SOIL AND SLUDGE MODIFICATIONS

This parameter is not performed on soil or sludge samples.

8.0 QUALITY CONTROL

For each set of ten (10) samples, a blank, a duplicate sample, and a standard are to be analyzed.

8.1 Definitions

8.1.1 Batch A batch of samples is made up of one (1) to ten (10) samples of like matrix plus at least one duplicate sample and one standard sample.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 6 of 8
Approved By LM:		Revision: 8-14-95

8.1.2 Reagent Blank Deionized water is added in the same volumes or proportions as used in the sample preparation. It must be carried through the complete analytical procedures. The Reagent Blank is used to document the concentration of TSS that is inherent in the analytical process. It is mandatory that a Reagent Blank be run with each batch of samples.

8.1.3 Standard A solution of known TSS concentration is taken through the same steps as the samples. This sample is used to evaluate the percent recovery.

8.1.3 Duplicate Sample The analysis of an additional aliquot of at least one (1) random sample in the batch. This sample is treated the same as the other samples and undergoes the same procedures. Duplicate samples are used to document the precision of the method. The Standard Deviation and Coefficient of Variation are calculated from the duplicate data.

8.2 Quality Control Limits Before any data is submitted, it must meet the following QC Criteria. A Non-Conformance form must be completed for any batches not passing one or more of the QC Criteria, the problem(s) resolved, and the batch reanalyzed to achieve quality results. If insufficient sample exists for reanalysis, the client needs to be contacted and either more sample obtained or approval given to report results outside ERMI QC Limits. Any results with QC outside ERMI QC Limits must be documented on the final report.

8.2.1 The absolute value of the Reagent Blank must less than 0.5mg

8.2.2 The CV must be less than or equal to 10% for the batch to pass this ERMI QC requirement.

8.2.3 The percent recovery of the standard must be within the limits of 100±10% for the batch to pass this ERMI QC requirement.

8.3 Quality Control Calculations

The following calculations illustrate the QC Calculations. A summary of typical data is given below:

Sample	125mg/L
Sample Dup	119mg/L

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 7 of 8
Approved By LM:		Revision: 8-14-95

8.3.1 **Mean ($\overline{X}$)** is the arithmetic sum of all the duplicate values in a batch divided by the total number of duplicate samples.

$$\overline{X} = (x_1 + x_2) / 2$$

$$\overline{X} = (125 + 119) / 2$$

$$\overline{X} = 122 \text{mg/L}$$

8.3.2 **Standard Deviation (SD)** represents the dispersion of the samples around the mean. It is estimated by making a number of replicate measurements of a given sample. This value may be calculated using a calculator and following the manufacturer's instructions, or by using the simplified formula below if only two data points are collected.

8.3.3 **Standard Deviation for two data points:**

$$SD = | x_2 - x_1 | / 1.4142$$

$$= | 125 - 119 | / 1.4142$$

$$= 4.2426$$

8.3.4 **Coefficient of Variation (CV)**

$$CV = \frac{\text{Standard Deviation (SD)}}{\text{Mean } (\overline{X})} \times 100$$

$$= \frac{4.2426}{122} \times 100$$

$$= 3.478\%$$

8.3.6 **Percent Spike Recovery (% Recovery)**

$$\%\text{Rec.} = \frac{\text{Standard Conc.}}{\text{Known Std Concentration}} \times 100$$

$$\%\text{Rec.} = \frac{255\text{mg/L}}{265\text{mg/L}} \times 100 = 96$$

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 8 of 8
Approved By LM:		Revision: 8-14-95

9.0 SAFETY AND HYGIENE

9.1 Use safety glasses, gloves, and a lab coat.

9.2 Read the MSDS sheet for more safety information on the reagent used in this procedure.

9.3 Filter and dry any smelly samples in the hood room.

10.0 WASTE DISPOSAL

10.1 Neutralize and dispose of filtrate in sanitary sewer if no other hazardous components are found.

10.2 Dispose of the filter and TSS in the trash if no other hazardous components are found.

11.0 CLEAN UP AND MAINTENANCE

Glassware is washed with laboratory grade detergent then rinsed three times with tap water, followed by three rinses with DI water.

Effective Date: August 5, 1993	Subject	Method: EPA 410.4
Approved By QAM: GH	COD COLORIMETRIC ANALYSIS using BLOCK DIGESTION	Page 1 of 10
Approved By LM: LB		Revision 8-11-95

Detection Limit: High Range 20mg/L
Low Range ~~5~~mg/L 4.0

Sampling : Composite/Grab
Container : Plastic/Glass
Preservative : Cool @ 4°C / H_2SO_4 to pH <2
Holding Time : 28 days

1.0 GENERAL DISCUSSION

This method measures the quantity of Oxygen required to oxidize the organic matter in surface water, and domestic or industrial wastes under specific oxidizing conditions, at a set temperature and time. Samples are collected in glass or plastic containers and preserved with 1:1 sulfuric acid to a pH<2. Samples are kept at 4°C until analysis.

Samples, blanks and standards are placed in sealed tubes with a strong oxidizing agent and heated at 150°C for 2 hours. After this time, they are allowed to cool and the absorbance is read using the Spectronic 20, set at 600nm.

2.0 INTERFERENCES

Chlorides are quantitatively oxidized by dichromate and represent a positive interference. Mercuric sulfate is added to the digestion tube to complex the chloride and reduce this interference.

3.0 APPARATUS

- Hach COD reactor set at 150°C
- Glass culture tubes with Teflon screw caps (do not mix brands)
- Spectronic 20D set at 600nm
- Volumetric pipets, 1ml, 2ml, and 10ml
- Volumetric pipettor, 100µl
- Automatic pipettor, 5ml adjustable
- Volumetric flask, 100ml, 1000ml
- Analytical balance

Effective Date: August 5, 1993	Subject	Method: EPA 410.4
Approved By QAM: *GH*	COD COLORIMETRIC ANALYSIS using BLOCK DIGESTION	Page 2 of 10
Approved By LM: *[signature]*		Revision 8-11-95

4.0 REAGENTS All reagents must be labeled with Contents, Concentration, Preparer, Preparation Date, and Expiration Date. The preparation data must be recorded in the Standard Preparation Log or the Reagent Preparation Log.

4.1 Digestion Solution Add 167ml conc. H_2SO_4 to 500ml distilled water. While the solution is still hot, dissolve 33.3g Mercuric Sulfate ($HgSO_4$) and 10.2g Potassium Dichromate ($K_2Cr_2O_7$) in this solution. Cool and dilute to 1 liter in a volumetric flask.

4.2 Catalyst Solution Add 22g of Silver Sulfate (Ag_2SO_4) to a 4.09Kg (2.5 liters) bottle of conc. H_2SO_4. Stir until dissolved.

4.3 COD Standard, 800mg/L Dissolve 0.680g of primary grade potassium acid phthalate in 800ml of DI water and dilute to 1000ml in a volumetric flask. This standard is stable for 6 months.

4.4 Laboratory Control Sample Stock, 1000mg/L Dissolve 0.850g of primary grade potassium acid phthalate in 800ml of DI water and dilute to 1000ml in a volumetric flask. This standard is stable for 6 months. A different source of potassium acid phthalate must be used in this preparation than in the standard.

5.0 PROCEDURE

5.1 Preparation of COD Tubes When preparing COD tubes, prepare as many as possible at the same time. Verify and document the accuracy of the pipettor at the beginning and end of the dispensing process.

5.1.1 Wash all culture tubes with hot soapy water and rinse ***extremely thoroughly*** with distilled water. Allow to air dry or dry in oven.

5.1.2 Using an automatic pipettor, set at 2.8mls, add catalyst solution to each COD tube.

5.1.3 Using a second pipettor, set at 1.2mls, add digestion solution to each tube.

CAUTION: TUBES WILL BECOME HOT. THESE SOLUTIONS ARE EXTREMELY CORROSIVE!!! WEAR SAFETY GLASSES, GLOVES AND A LAB COAT WHEN HANDLING THESE CHEMICALS.

5.1.4 Before running samples with the new batch of tubes, run a standard. Document on a data [illegible] the standards recovery

5.2 Preparation of Standards

Vol COD Std (ml)	Vol D.I. Water (ml)	Conc. of Std (mg/L)
0.00	2.00	0
0.10	1.90	40
1.00	1.00	400
2.00	0.00	800

CAUTION: ALL TUBES MUST BE SHAKEN PRIOR TO GOING INTO COD REACTOR TO PREVENT THEM FROM EXPLODING. PLACE IN BLOCK DIGESTOR GENTLY TO AVOID BREAKING TUBES.

5.3 Preparation of Samples Place enough COD tubes in a test tube rack to prepare a complete batch including all QC specified in Section 8.0 plus a few extras to use if dilutions are needed.

5.3.1 Be sure that the sample is mixed completely. If it contains solids which will not suspend easily, mix with a blender before sampling. The sample should be able to easily pass through a pipet tip without clogging.

5.3.2 Add 2ml of sample to a COD tube using a volumetric pipet.

5.3.3 For each spike add 1ml COD standard and 1ml sample to a COD tube using volumetric pipets or calibrated pipettors. Cap and shake well.

5.3.4 Prepare an LCS by pipeting 1ml of LCS stock and 1ml of DI water into a COD tube.

5.3.5 Some samples will have a high COD content and the tube will turn green or aqua immediately upon adding sample. If this happens, a dilution will need to be made.

5.3.5.1 Try a 1:1 dilution first. If a 1:1 dilution turns tube green, then try a 1 to 10 dilution. Use a volumetric pipet to add 10ml of sample into a 100ml graduated cylinder, then dilute to 100ml using deionized water.

5.3.5.2 If a 1:10 dilution turns green, then run a 1:100 dilution by using a volumetric pipet to add 1ml of the original sample into a 100ml graduated cylinder and diluting to volume with deionized water.

NOTE: All dilutions must be made before the digestion. Recheck the tubes after 15 minutes to see if any have turned green and need further dilution.

5.3.6 When all of the samples and dilutions have been prepared, place the tubes in the preheated COD block digester. Remember to shake tubes well before heating. Allow the tubes to digest for 2 hours.

5.3.7 After 2 hours, take the tubes out of block digester and allow them to cool.

5.4 Low Level Modifications The following modifications to this SOP are needed for samples requiring analysis at levels below 20ppm.

5.4.1 Special low level COD tubes from HACH are required.

5.4.2 Dilute the 800ppm standard 1:10 to get a 80ppm standard. Prepare the standard COD tubes as follows:

Vol 80ppm Std (ml)	Vol D.I. Water (ml)	Conc. of Std (mg/L)
0.00	2.00	0
0.25	1.75	10
0.50	1.50	20
1.00	1.00	40
2.00	0.00	80

5.4.3 To prepare an LCS, use only 0.100ml of the 1000ppm LCS concentrate plus 1.900ml of DI water.

5.4.4 Use the Spec 20 rather than the Spec 20D and set the wavelength to 420nm. After a 15min. warm-up, adjust the needle to 0% transmittance.

5.4.5 For this colorimetric low level analysis, you will be measuring the decrease in yellow color rather than the increase in green color. Insert the blank and adjust the needle to 0.5 absorbance units. Each increase in concentration will yield a smaller absorbance value.

5.5 Photometric Analysis

5.5.1 Turn on the Spec 20D. Allow a 15 minute warm-up.

5.5.2 Use the visible photocell and the red filter.

5.5.3 Set the wavelength with the dial on top of the Spec 20D to 600nm.

5.5.4 Using the knob on the left, zero the machine to the zero on the left side of the scale.

5.5.5 Insert the calibration blank (Section 8.1.2) and set full scale absorbance at zero. Repeat the above procedure to be sure the Spec 20D is correctly zeroed and stabilized.

5.5.6 Wipe each tube clean before inserting it into the Spec 20D. Insert the standard and sample tubes and read the absorbance on the lower (Absorbance) scale. Record this value in the data book.

6.0 CALCULATIONS

6.1 Standard Curve Calculations (mg/L)

Prepare a standard curve by plotting the absorbance values of the standards versus COD concentration of that standard. Obtain the concentration value of the samples directly from the standard curve. The curve is prepared and concentrations may be calculated using a calculator, computer, or by hand plotting and graphing the analytical results.

6.2 Dilution Factor Calculation

Dilution Factor (DF) = (C + B) /C
Sample Concentration (mg/L) = A [(C + B) /C] = A x DF

Where: A = mg/L of COD in diluted aliquot from standard curve
B = ml of deionized water used for dilution
C = ml of sample aliquot

DF = (10ml + 90ml) /10ml = 10
Sample Concentration = 108.33 mg/L x 10 = 1083.3mg/L

6.3 **Detection Limit Calculation** A new detection limit must to be calculated any time there is a dilution. This is done by multiplying the normal detection limit times the dilution factor.

Det Limit = 20ppm X 10 = 200ppm

7.0 SOILS AND SLUDGE MODIFICATIONS

This method is not suitable for soils or sludges.

8.0 QUALITY CONTROL

Each BATCH, of no more than 10 samples of like matrix must meet certain ERMI QC Criteria before the batch data can be released and the final report prepared.

8.1 Definitions

8.1.1 Batch A batch of samples is made up of one (1) to ten (10) samples of like matrix plus a Matrix Spike Sample, a Matrix Spike Duplicate Sample, and a Laboratory Control Sample.

8.1.2 Calibration Blank A volume of deionized water treated in the same manner and containing the same reagents as the samples used in the spectrophotometric analysis (Section 5.0).

8.1.3 Calibration Standards A series of known standard solutions used by the analyst to prepare a standard curve. This series consists of a volume of deionized water and standard solution treated in the same manner and containing the same reagents as the samples. The calibration blank and the calibration standards are analyzed at the beginning of the run. If there are continual batches for the same parameter being run at the same time, one set of calibration standards will suffice for all batches run.

8.1.4 Matrix Spike Sample A known concentration of standard is added to a separate aliquot of sample prior to adding the reagents. Spike concentration levels should be selected by considering sensitivity and detection limits. The Matrix Spike Sample is used to document the accuracy of the method.

8.1.5 Matrix Spike Duplicate Sample This sample is a duplicate analysis of the Matrix Spike Sample, spiked at the same concentration. Matrix Spike Duplicate Samples are used to document the precision of the method. The standard deviation and coefficient of variation are calculated using the spike and the spike duplicate data.

8.1.6 Laboratory Control Sample This sample is a standard from a different source than the calibration standards which must be taken through the complete analytical procedure. It is used to check the accuracy of the standardization.

8.2 Quality Control Limits Before any data is submitted, it must meet the following QC Criteria. A Non-Conformance form must be completed for any batches not passing one or more of the QC Criteria, the problem(s) must be resolved, and the batch reanalyzed to achieve quality results. If insufficient sample exists for reanalysis, the customer needs to be contacted and either more sample obtained or approval given to report results outside **ERMI** QC Limits. Any results with QC outside **ERMI** QC Limits must be documented on the final report.

8.2.1 Recovery The reported recovery is the average recovery of the Matrix Spike and Matrix Spike Duplicate analyses. This value must not exceed 100±10% to pass **ERMI** QC requirements. The entire batch must be reanalysed if this value is exceeded.

8.2.2 Coefficient of Variation The coefficient of variation is calculated using the Matrix Spike and Matrix Spike Duplicate analyses. This value must not exceed 10% for the batch to pass **ERMI** QC requirements.

8.2.3 Laboratory Control Sample The recovery of this QC sample must not exceed 100±10% for the batch to pass **ERMI** QC requirements.

8.2.3 Absorbance Verification The absorbance of the 400ppm standard must be within 10% of the average of the last four 400ppm standards for it to pass this **ERMI** QC requirement.

8.3 Quality Control Calculations

Example Data:

Spike	345.8
Spike Dup	355.8

8.3.1 Mean ($\overline{X}$) is the arithmetic sum of all the duplicate values in a batch divided by the total number of duplicate samples.

$$\overline{X} = (x_1 + x_2)/2$$

$$\overline{x} = (345.8 + 355.8)/2$$

$$\overline{X} = 350.8\text{mg/L}$$

8.3.2 Standard Deviation (SD) represents the dispersion of the samples around the mean. It is estimated by making a number of replicate measurements of a given sample. This value may be calculated using a calculator and following the manufacturer's instructions, or by using the simplified formula below if only two data points are collected.

8.3.3 Standard Deviation for two data points

$$SD = | x_2 - x_1 | / 1.4142$$

$$SD = | 345.8 - 355.8 | / 1.4142$$

$$SD = 7.071$$

8.3.4 Coefficient of Variation (CV)

$$CV = \frac{\text{Standard Deviation (SD)}}{\text{Mean } (\overline{X})} \times 100$$

$$CV = \frac{7.071}{350.8} \times 100$$

$$CV = 2.02\%$$

8.3.5 Percent Spike Recovery (% Recovery) For example, the concentration of a sample is 701.6mg/L and the spiked sample is 760.5mg/L. This sample was spiked with 1ml of 800mg/L standard.

$$\text{Spike Conc. (mg/L)} = \frac{\text{Vol of Spike (ml)} \times \text{Conc. of Spike (mg/L)}}{\text{Vol of Sample (ml)}}$$

$$= \frac{1\text{ml} \times 800\text{mg/L}}{2\text{ml}}$$

$$= 400 \text{ mg/L}$$

$$\%\text{Recovery} = \frac{\text{Spiked Sample Conc.} - \tfrac{1}{2}\text{Original Sample Conc.}}{\text{Known Spike Concentration}} \times 100$$

$$= \frac{760.5 - 350.8}{400 \text{ mg/L}} \times 100 = 102.4$$

9.0 SAFETY AND HYGIENE

9.1 Wear safety glasses, gloves, and a lab coat.

9.2 Read the MSDS sheets for additional safety and hygiene information on the chemicals used in this procedure.

9.3 Be aware that the tubes become very hot and build up pressure while the digestion is proceeding.

9.4 Use the safety shield on the block digestor.

10.0 WASTE DISPOSAL

10.1 All digested samples and standards must be treated as hazardous wastes. They are composited and turned in to the Hazardous Waste Coordinator for disposal according to our Hazardous Waste Disposal Plan.

10.2 Unused sample which has no toxic properties should be neutralized and poured down the sanitary sewer.

Effective Date: August 5, 1993	Subject	Method: EPA 410.4
Approved By QAM:	COD COLORIMETRIC ANALYSIS using BLOCK DIGESTION	Page 10 of 10
Approved By LM:		Revision 8-11-95

11.0 CLEAN UP AND MAINTENANCE

Wash glassware with a laboratory grade detergent then rinse three times with tap water. Allow to soak in DI water for several hours, then rinse three times with DI water. ***Be sure to rinse all glassware extremely well. Any residue of soap will be measured by this test.***

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

February 19, 2001

RE: ***Joint Town of Addison and Dallas Water Utilities Meeting (February 8, 2001)***

Dear Randy:

I would like to once again express my appreciation on behalf of the Town of Addison for meeting with us on February 8, 2001, and for you and your staff's attention to the surcharge situation that we are trying to resolve. To reiterate our concerns, as a result of a preliminary study prepared by Freese and Nichols, we feel there is a possibility that the locations where samples are currently being taken are affecting the quality and accuracy of the representative system samples.

To address this concern, ~~Dallas Water Utilities and the~~ the Town of Addison ~~agreed to~~ proposes the following: ~~at the joint meeting held February 8, 2001.~~

(1) Sampling sites will be temporarily relocated to the locations shown on the attached site map, subject to your approval of said locations. DWU and the Town of Addison will also agree on the sampling method and configuration. The Town of Addison will contribute labor and materials to this effort if appropriate.

(2) The Town of Addison will pay the following surcharge amounts:

(a) July 2000 - $33,291
(b) August 2000 - $10,173
(c) September 2000 - $11,099

(3) If the study holds true and samples taken from the proposed sites result in lower concentrations of BOD and TSS for two consecutive months, Dallas Water Utilities will:

(a) Refund all surcharge payments made through September 2000; and
(b) Cancel surcharge pay requests for October, November and December of 2000.

(4) The Town of Addison, at its own expense, will then proceed with construction of new "permanent" sampling locations (agreed to by all affected parties) for future sampling.

(5) If sampling continues to show ~~high~~ concentrations of BOD and TSS above the 250mg/l threshold, the Town of Addison will forward any outstanding surcharge fees to Dallas Water Utilities and continue to determine the cause or source of the surcharge problem.

If our understanding of the agreement, as set forth herein, meets with that of Dallas Water Utilities, please return a signed copy of this letter at your earliest convenience.

UNDERSTOOD AND AGREED TO:

____
Michael E. Murphy, PE
Director of Public Works
Town of Addison
Date: ____________

____
Randy Stalnaker
Manager/Wholesale Services
Dallas Water Utilities
Date: ____________

Attached per your request are:

1. Location Maps showing drainage basins.
2. Requested testing methods and procedures.
3. Temporary Test Site Location Map.

Xc: Ron Whitehead – City Manager / Addison
Chris Terry – Asst. City Manager / Addison
Terrace Stewart – Director / DWU
Larry Patterson, PE – Asst. Director / DWU
Alan Greer PE, - Freese and Nichols / Manager

Dn - Surcharge

DRAFT

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

February 19, 2001

RE: Joint Town of Addison and Dallas Water Utilities Meeting (February 8, 2001)

Dear Randy:

I would like to once again express my appreciation on behalf of the Town of Addison for for meeting with us on Feb 8, 2001, and for you and your staff's attention to the surcharge situation that we are trying to resolve. To reiterate our concerns, as a result of a preliminary study prepared by Freese and Nichols, we feel there is a possibility that the locations where samples are currently being taken are affecting the quality and accuracy of the representative system samples.

To address this concern, ~~Dallas Water Utilities and~~ the Town of Addison proposes ~~agreed to~~ the following: ~~at the joint meeting held February 8, 2001:~~

(1) Sampling sites will be temporarily relocated to the locations shown on the attached site map, subject to your approval of said locations. DWU and TOA will also agree on the sampling method & configuration. TOA will contribute labor and materials to this effort if appropriate.

(2) The Town of Addison will pay the following surcharge amounts:

(a)	July 2000	-	$33,291
(b)	August 2000	-	$10,173
(c)	September 2000	-	$11,099

(3) If the study holds true and samples taken from the proposed sites result in lower concentrations of BOD and TSS for two consecutive months, Dallas Water Utilities will:

(a) Refund all surcharge payments made from July 2000 through September 2000; and
(b) Cancel surcharge pay requests for October, November and December of 2000.

250

(4) The Town of Addison, at its own expense, will then proceed with construction of new "permanent" sampling locations (agreed to by all affected parties) for future sampling.

(5) If sampling continues to show ~~high~~ concentrations of BOD and TSS, above 250 mg/l, the Town of Addison will forward any outstanding surcharge fees to Dallas Water Utilities and continue to determine the cause or source of the surcharge problem.

If our understanding of the agreement, as set forth herein, meets with that of Dallas Water Utilities, please return a signed copy of this letter at your earliest convenience.

This agreement does not preclude The TOA ability to recover other past surcharge fees that have been paid.

UNDERSTOOD AND AGREED TO:

Michael E. Murphy, PE	Randy Stalnaker
Director of Public Works	Manager/Wholesale Services
Town of Addison	Dallas Water Utilities
Date: ______________	Date: ______________

Attached per your request are:

1. Location Maps showing drainage basins.
2. Requested testing methods and procedures.
3. Temporary Test Site Location Map.

Xc: Ron Whitehead – City Manager / Addison
Chris Terry – Asst. City Manager / Addison
Terrace Stewart – Director / DWU
Larry Patterson – Asst. Director / DWU
Alan Greer PE / - Freese and Nichols / Manager

P.E. ?

DRAFT

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

City of Dallas
Randy Stalnaker
Wholesale Services Division/DWU
1500 Marilla – Room 4AN
Dallas, TX 75201

February 19, 2001

RE: ***Joint Town of Addison and Dallas Water Utilities Meeting (February 8, 2001)***

Dear Randy:

I would like to once again express my appreciation on behalf of the Town of Addison for you and your staff's attention to the surcharge situation that we are trying to resolve. To reiterate our concerns, as a result of a preliminary study prepared by Freese and Nichols, we feel there is a possibility that the locations where samples are currently being taken are affecting the quality and accuracy of the representative system samples.

To address this concern, Dallas Water Utilities and the Town of Addison agreed to the following at the joint meeting held February 8, 2001:

(1) Sampling sites will be temporarily relocated to the locations shown on the attached site map, subject to your approval of said locations.

(2) The Town of Addison will pay the following surcharge amounts:

(a) July 2000 - $33,291
(b) August 2000 - $10,173
(c) September 2000 - $11,099

(3) If the study holds true and samples taken from the proposed sites result in lower concentrations of BOD and TSS for two consecutive months, Dallas Water Utilities will:

(a) Refund all surcharge payments made through September 2000; and
(b) Cancel surcharge pay requests for October, November and December of 2000.

(4) The Town of Addison, at its own expense, will then proceed with construction of new "permanent" sampling locations (agreed to by all affected parties) for future sampling.

(5) If sampling continues to show high concentrations of BOD and TSS, the Town of Addison will forward any outstanding surcharge fees to Dallas Water Utilities and continue to determine the cause or source of the surcharge problem.

If our understanding of the agreement, as set forth herein, meets with that of Dallas Water Utilities, please return a signed copy of this letter at your earliest convenience.

UNDERSTOOD AND AGREED TO:

Michael E. Murphy, PE	Randy Stalnaker
Director of Public Works	Manager/Wholesale Services
Town of Addison	Dallas Water Utilities
Date: ______________	Date: ______________

Attached per your request are:

1. Location Maps showing drainage basins.
2. Requested testing methods and procedures. DELIVERED
3. Temporary Test Site Location Map.

Xc: Ron Whitehead – City Manager / Addison
Chris Terry – Asst. City Manager / Addison
Terrace Stewart – Director / DWU
Larry Patterson – Asst. Director / DWU
Alan Greer PE - Freese and Nichols / Manager

P.E. ?

DRAFT

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

City of Dallas
Randy Stalnaker
Wholesale Services Division //DWU
1500 Marilla - Room 4AN
Dallas, Tx. 75201

February 14, 2001

RE: Joint Town of Addison and Dallas Water Utility Meeting (February 8, 2001)

Dear Randy,

I would like to once again express my appreciation on behalf of the Town of Addison for you and your staff's attention to the Surcharge situation that we are trying to resolve.

As a result of the referenced meeting, and with your approval, sampling sites will be temporally relocated to the ~~following~~ locations shown on the attached site map. As you know, it is our contention that as a result of a preliminary study prepared by Freese and Nichols, we feel there is a possibility that the locations of where samples are currently being taken are affecting the quality and accuracy of the representative system samples.

Therefore, if the study holds true and samples taken from the proposed sites results in lower concentrations of BOD and TSS for two consecutive months, Dallas Water Utilities (DWU) agrees to refund all surcharge payments made through September 2000 and would cancel surcharge pay requests for Oct, November and December of 2000. The Town of Addison~~, at its own expense~~, agrees to then proceed with ~~construction~~ of new "permanent" sampling locations (agreed to by all affected parties) for future sampling.

location

TO REMAIN

GOE PAY FISCAL YEAR 2000 (5TH - SEPT)

If sampling continues to show high concentrations of BOD and TSS, the Town of Addison will forward any outstanding surcharge fees to DWU and continue to determine the cause/source of the surcharge problem.

Michael E. Murphy, PE
Director of Public Works
Town of Addison

Randy Stalnaker
Manager/Wholesale Services
Dallas Water Utilities

Attached per your request are:

1. Location Maps showing drainage basins
2. Requested testing information
3. Temporary Test Site Map

xc: Ron Whitehead – City Mgr. Addison
Chris Terry – Asst. City Mgr. Addison
Terrace Stewart – Dir. DWU
Larry Patterson – Asst. Dir DWU

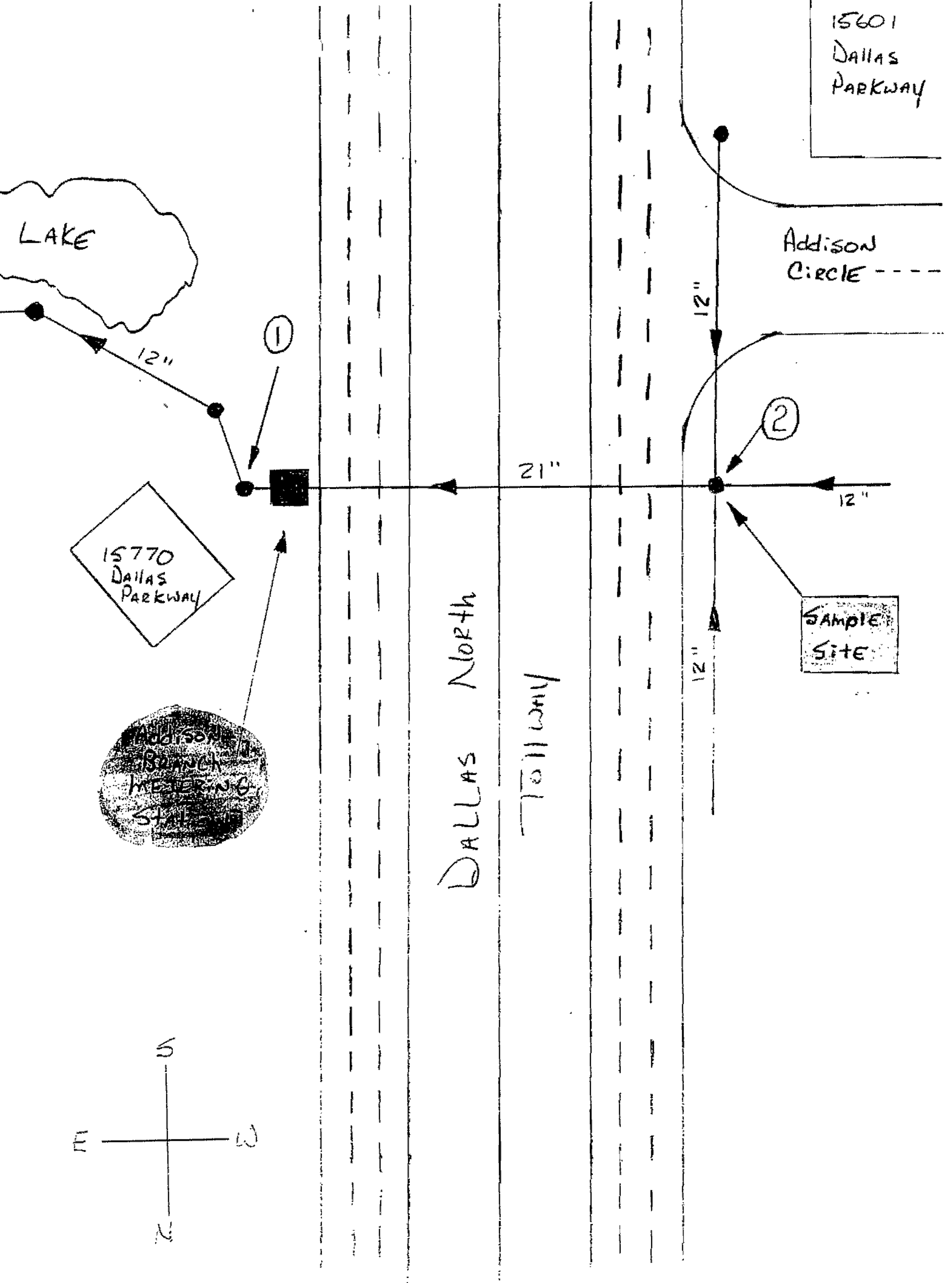
Sanitary Sewer Surcharge Payments/Assessments

Jan-96	$1,890.34
Feb-96	$869.30
Mar-96	$19,141.79
Apr-96	No Surcharge
May-96	$4,594.24
Jun-96	$618.00
Jul-96	$6,239.97
Aug-96	No Surcharge
Sep-96	$14,019.78
Oct-96	No Surcharge
Nov-96	No Surcharge
Dec-96	No Survey
Jan-97	No Survey
Feb-97	No Survey
Mar-97	No Surcharge
Apr-97	No Surcharge
May-97	$1,241.20
Jun-97	$4,081.12
Jul-97	$6,601.03
Aug-97	No Surcharge
Sep-97	$5,629.04
Oct-97	$3,999.62
Nov-97	$4,805.13
Dec-97	$3,824.68
Jan-98	$2,170.43
Feb-98	
Mar-98	$9,592.29
Apr-98	$19,142.76
May-98	$10,581.02
Jun-98	$2,084.61
Jul-98	$1,334.82
Aug-98	$7,480.46
Sep-98	$25,302.94
Oct-98	
Nov-98	
Dec-98	$70,000.00
Jan-99	
Feb-99	
Mar-99	
Apr-99	$22,471.39
May-99	$11,185.56
Jun-99	$6,138.45
Jul-99	$1,465.91
Aug-99	$3,762.05
Sep-99	
Oct-99	$13,088.50
Nov-99	$2,637.05
Dec-99	$7,594.37
Jan-00	$6,586.70
Feb-00	$8,788.32
Mar-00	$11,469.20
Apr-00	$4,263.86

May-00	$19,475.61
Jun-00	$13,676.65
Jul-00	$33,291.19
Aug-00	$10,173.02
Sep-00	$11,099.02
Oct-00	$27,515.15
Nov-00	No Surcharge
Dec-00	$52,503.21

Surcharges not paid

TOTAL	**$492,429.78**


15601
Dallas
Parkway
LAKE
Addison
Circle
12"
1
2
21"
12"
15770
Dallas
Parkway
Sample
Site
12"
Addison
Branch
Metering
Station
Dallas North
Tollway
S
E
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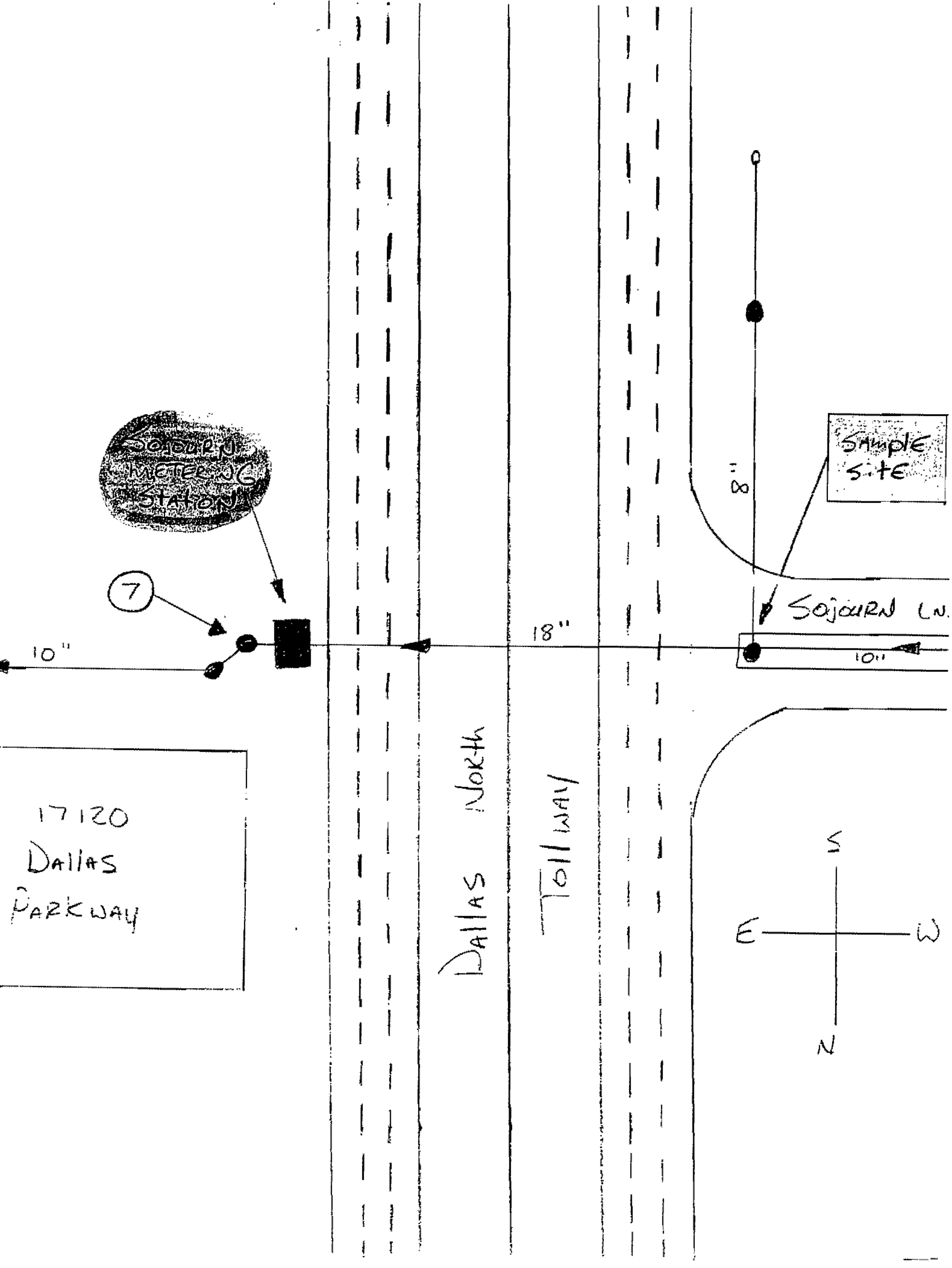

Sojourn Metering Station
7
10"
18"
Sample site
8"
Sojourn Ln.
10"
17120
Dallas
Parkway
Dallas North Tollway
S
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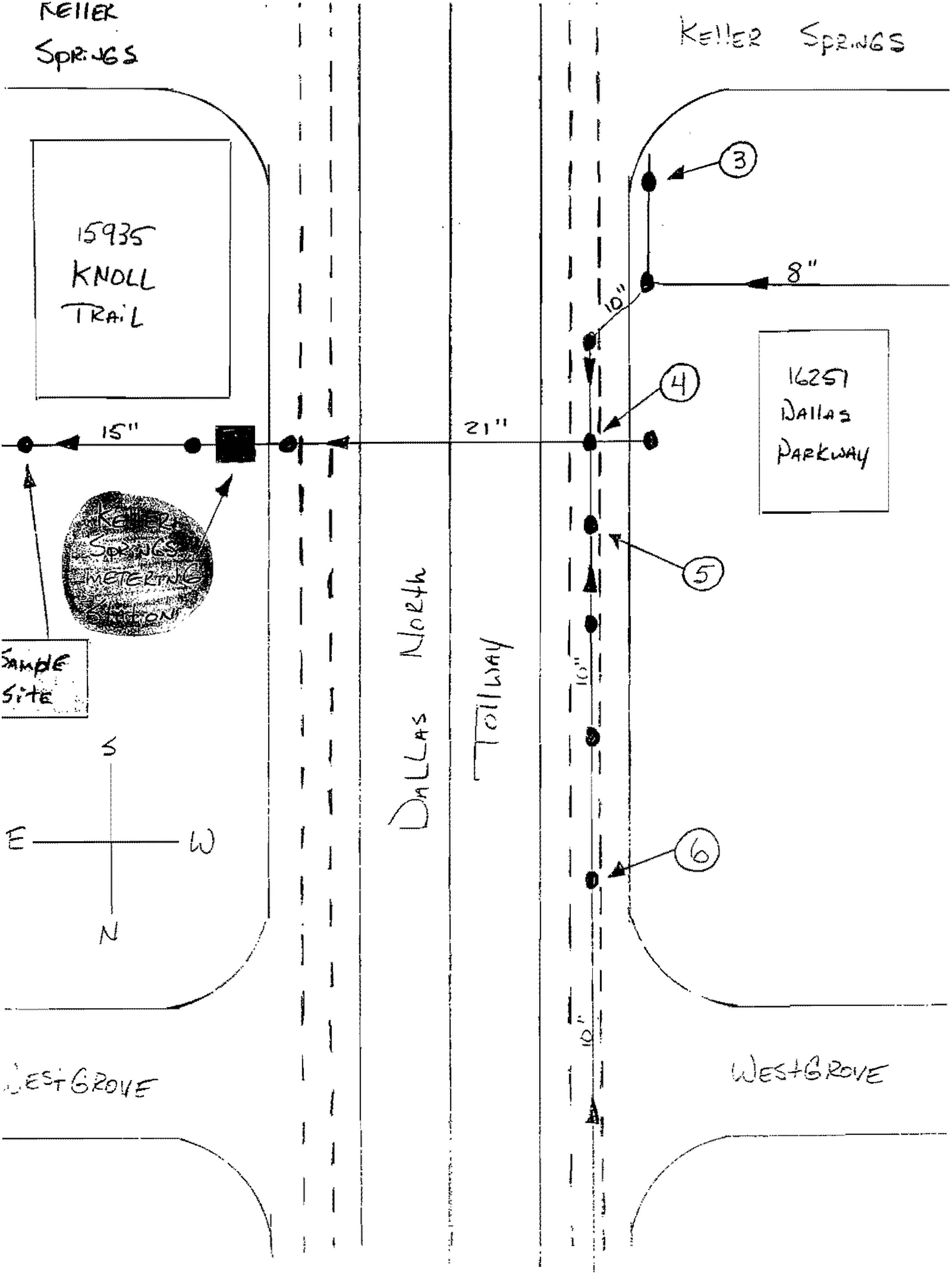

KELLER SPRINGS
KELLER SPRINGS
15935 KNOLL TRAIL
16251 DALLAS PARKWAY
3
8"
10"
4
15"
21"
5
KELLER SPRINGS METERING STATION
DALLAS NORTH TOLLWAY
SAMPLE SITE
10"
S
E
W
N
6
10"
WESTGROVE
WESTGROVE

FREESE • NICHOLS

mon W. Freese, P.E. 1900-1990
Marvin C. Nichols, P.E. 1896-1969

LETTER OF TRANSMITTAL

TO: **City of Addison**
16801 Westgrove Drive
Addison, Tx 75001-9010
ATTENTION: **Michael Murphy, P.E.**

DATE: **February 17, 2001**
PROJECT :
Sewer Study
Response to DWU

We are sending you ☑ Attached ☐ Under Separate Cover VIA ____
the following items:
☐ Plans ☐ Specifications ☐ Shop Dwg. ______
☑ Reports ☐ Diskette(s) ☐ Other ________

COPIES	DESCRIPTION
1	**letter of recommendation and referenced protocols**

These are transmitted for your:
☑ Use ☐ Review & Comment ☐ Response
☐ Approval ☐ Distribution to Parties
☐ Record ☐ Other ________

Remarks:

Copies to:

	ADD00356-3.1

By: [signature] J.R. Baddaker P.E.

FREESE•NICHOLS

February 17, 2001

Michael Murphy, P.E.
Town of Addison
16801 Westgrove Drive
Addison, Tx 75001-9010

Re: DWU Issues

Dear Mr. Murphy

As a result of our meeting last week with Dallas Water Utilities concerning our report on the sanitary sewer investigation we respond as follows:

Laboratory Issues-

- Laboratory procedures- attached are the ERMI procedures used on the project.
- The QA/QC data was included in volume 2 of the report. Each laboratory result report included a quality control section. We are not sure what else is needed. We made multiple phone calls to Lee Davis at DWU and were unable to contact him for clarification.

Sampling Issues

- RJN's written procedures for collection and preservation of samples are attached.
- RJN's written procedures for installation, calibration, and maintenance of the flow metering equipment during the monitoring period are attached.

With regards to the sampling locations we considered inserting a stinger in the flat section of pipe in the meter vaults. However, when the minimum and maximum flow velocities were calculated using our flow monitoring data for each site, we found the following:

	ACADEMY	BRANCH	KELLER SPRINGS
MIN VELOCITY IN METER (f/sec)	0.11	0.007	0.17
MAX VELOCITY IN METER (f/sec)	0.56	2.70	0.81

These velocities are too low for representative sampling purposes. The maximum velocities at the Branch meter are acceptable but the diurnal low flow velocities drop significantly below 1 foot/sec.

There will be no perfect or utopian sampling points because of the nature of the system and available technology. However, there are good and better sampling points. We would recommend that the sampling take place at the first manhole downstream of each meter. For the Branch meter this is the manhole at station 0+50.4 on line A (DWU plans), the Keller Springs recommended sampling manhole is at station 0+85.29 on Line B (DWU plans), and the Academy recommended sampling manhole is at station 0+14.14 on Line C (DWU plans). These are the sampling points that were used for the study purposes. Although all three locations exhibited some surcharging during our

monitoring period, flow conditions are much better then upstream of the meters.

The sampling tube at all sampling points should be set so that it does not rest on the bottom of the manhole. According to the drawings, the outlet pipe invert is, in all instances, at least 1 foot above the manhole invert. We would prefer that the sampling tube be set at or slightly above the outlet pipe invert. The low diurnal flows during our monitoring had depths of 1.75", 3.8", and 4.29" above the outlet pipe inverts respectively for Academy, Branch, and Keller Springs sampling locations.

In addition, the DWU suggestion about cleaning the piping immediately upstream of the meters should be implemented. It was also apparent during the meeting that some of the DWU staff took offense to our observation about the sampling tube being located at the very bottom of the manhole. Unfortunately, we do not have pictures to back up our observations. We would suggest that during the sampling periods your staff take date stamped pictures of the sampling setup in order to document the sample tube configuration on a daily basis during the sampling periods.

Should you need any additional information please let us know.

Sincerely,

FREESE AND NICHOLS, INC.

Jim Baddaker

J.R. Baddaker P.E.

February 17, 2001

Michael Murphy, P.E.
Town of Addison
16801 Westgrove Drive
Addison, Tx 75001-9010

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Sincerely,

FREESE AND NICHOLS, INC.

J.R. Baddaker P.E.

Addison, Texas – Flow Monitoring and Sampling

Procedures for collecting and preserving samples:
RJN collected hourly samples at each of the sampling points using American Sigma 900 portable samplers. Samples were collected from each of the three samplers, one time each day and transferred to the sample bottles provided by ERMI. ERMI provided bottles with the appropriate preservative included. RJN used containers (ice chest) provided by EMRI and ensured the samples were iced at all times. The samples were transported to EMRI immediately upon collection.

Flow weighted samples were composited based on the flow monitoring results. The collection and preservation for flow weighted samples followed the procedure described above.

Flow Monitoring:
RJN installed three American Sigma 950 portable flow meters, one at each of the three sites. The meters were calibrated in the office and checked at the site performing a velocity profile using a portable velocity meter and taking a manual depth reading. The results were compared to the meter readings. This procedure was performed daily during sample collection. No adjustment were made as the results of the manual tests verified the meters were working properly during the sampling period.

Flow meter probes were cleaned each day to ensure proper measurements were being collected.

BIOCHEMICAL OXYGEN DEMAND

Method 405.1 (5 Days, 20°C)

STORET NO. 00310
Carbonaceous 80082

1. Scope and Application
   1.1 The biochemical oxygen demand (BOD) test is used for determining the relative oxygen requirements of municipal and industrial wastewaters. Application of the test to organic waste discharges allows calculation of the effect of the discharges on the oxygen resources of the receiving water. Data from BOD tests are used for the development of engineering criteria for the design of wastewater treatment plants.
   1.2 The BOD test is an empirical bioassay-type procedure which measures the dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter present. The standard test conditions include dark incubation at 20°C for a specified time period (often 5 days). The actual environmental conditions of temperature, biological population, water movement, sunlight, and oxygen concentration cannot be accurately reproduced in the laboratory. Results obtained must take into account the above factors when relating BOD results to stream oxygen demands.
2. Summary of Method
   2.1 The sample of waste, or an appropriate dilution, is incubated for 5 days at 20°C in the dark. The reduction in dissolved oxygen concentration during the incubation period yields a measure of the biochemical oxygen demand.
3. Comments
   3.1 Determination of dissolved oxygen in the BOD test may be made by use of either the Modified Winkler with Full-Bottle Technique or the Probe Method in this manual.
   3.2 Additional information relating to oxygen demanding characteristics of wastewaters can be gained by applying the Total Organic Carbon and Chemical Oxygen Demand tests (also found in this manual).
   3.3 The use of 60 ml incubation bottles in place of the usual 300 ml incubation bottles, in conjunction with the probe, is often convenient.
4. Precision and Accuracy
   4.1 Eighty-six analysts in fifty-eight laboratories analyzed natural water samples plus an exact increment of biodegradable organic compounds. At a mean value of 2.1 and 175 mg/l BOD, the standard deviation was ±0.7 and ±26 mg/l, respectively (EPA Method Research Study 3).
   4.2 There is no acceptable procedure for determining the accuracy of the BOD test.

Approved for NPDES CBOD: pending approval for Section 304(h), CWA
Issued 1971
Editorial revision 1974

5. References

5.1 The procedure to be used for this determination is found in:
Standard Methods for the Examination of Water and Wastewater, 15th Edition, p. 483, Method 507 (1980).

5.2 Young, J. C., "Chemical Methods for Nitrification Control," J. Water Poll. Control Fed., 45, p. 637 (1973).

CHEMICAL OXYGEN DEMAND

Method 410.4 (Colorimetric, Automated; Manual)

STORET NO. 00340

1. Scope and Application
   1.1. This method covers the determination of COD in surface waters, domestic and industrial wastes.
   1.2 The applicable range of the automated method is 3–900 mg/1 and the range of the manual method is 20 to 900 mg/1.
2. Summary of Method
   2.1 Sample, blanks and standards in sealed tubes are heated in an oven or block digestor in the presence of dichromate at 150°C. After two hours, the tubes are removed from the oven or digestor, cooled and measured spectrophotometrically at 600 nm.
3. Sample Handling and Preservation
   3.1 Collect the samples in glass bottles if possible. Use of plastic containers is permissible if it is known that no organic contaminants are present in the containers.
   3.2 Samples should be preserved with sulfuric acid to a pH <2 and maintained at 4°C until analysis.
4. Interferences
   4.1 Chlorides are quantitatively oxidized by dichromate and represent a positive interference. Mercuric sulfate is added to the digestion tubes to complex the chlorides.
5. Apparatus
   5.1 Drying oven or block digestor, 150°C
   5.2 Corning culture tubes, 16 x 100 mm or 25 x 150 mm with Teflon lined screw cap
   5.3 Spectrophotometer or Technicon AutoAnalyzer
   5.4 Muffle furnace, 500°C.
6. Reagents
   6.1 Digestion solution: Add 10.2 g $K_2Cr_2O_7$, 167 ml conc. H_2SO_4 and 33.3 g $HgSO_4$ to 500 ml of distilled water, cool and dilute to 1 liter.
   6.2 Catalyst solution: Add 22 g Ag_2SO_4 to a 4.09kg bottle of conc. H_2SO_4. Stir until dissolved.
   6.3 Sampler wash solution: Add 500 ml of conc H_2SO_4 to 500 ml of distilled water.
   6.4 Stock potassium acid phthalate: Dissolve 0.850 g in 800 ml of distilled water and dilute to 1 liter. 1 ml = 1 mg COD
      6.4.1 Prepare a series of standard solutions that cover the expected sample concentrations by diluting appropriate volumes of the stock standard.
7. Procedure
   7.1 Wash all culture tubes and screw caps with 20% H_2SO_4 before their first use to prevent contamination. Trace contamination may be removed from the tubes by igniting them in a muffle oven at 500°C for 1 hour.

Pending approval for Section 304(h), CWA
Issued 1978

7.2 Automated

7.2.1 Add 2.5 ml of sample to the 16 x 100 mm tubes.

7.2.2 Add 1.5 ml of digestion solution (6.1) and mix.

7.2.3 Add 3.5 ml of catalyst solution (6.2) carefully down the side of the culture tube.

7.2.4 Cap tightly and shake to mix layers.

7.2.5 Process standards and blanks exactly as the samples.

7.2.6 Place in oven or block digestor at 150°C for two hours.

7.2.7 Cool, and place standards in sampler in order of decreasing concentration. Complete filling sampler tray with unknown samples.

7.2.8 Measure color intensity on AutoAnalyzer at 600 nm.

7.3 Manual

7.3.1 The following procedure may be used if a larger sample is desired or a spectrophotometer is used in place of an AutoAnalyzer.

7.3.2 Add 10 ml of sample to 25 x 150 mm culture tube.

7.3.3 Add 6 ml of digestion solution (6.1) and mix.

7.3.4 Add 14 ml of catalyst solution (6.2) down the side of culture tube.

7.3.5 Cap tightly and shake to mix layers.

7.3.6 Place in oven or block digestor at 150°C for 2 hours.

7.3.7 Cool, allow any precipitate to settle and measure intensity in spectrophotometer at 600 nm. Use only optically matched culture tubes or a single cell for spectrophotometric measurement.

8. Calculation

8.1 Prepare a standard curve by plotting peak height or percent transmittance against known concentrations of standards.

8.2 Compute concentration of samples by comparing sample response to standard curve.

9. Precision and Accuracy

9.1 Precision and accuracy data are not available at this time.

Bibliography

1. Jirka, A. M., and M. J. Carter, "Micro-Semi-Automated Analysis of Surface and Wastewaters for Chemical Oxygen Demand." Anal. Chem. 47:1397. (1975).

RESIDUE, NON-FILTERABLE

Method 160.2 (Gravimetric, Dried at 103–105°C)

STORET NO. 00530

1. Scope and Application
   1.1 This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes.
   1.2 The practical range of the determination is 4 mg/1 to 20,000 mg/1.
2. Summary of Method
   2.1 A well-mixed sample is filtered through a glass fiber filter, and the residue retained on the filter is dried to constant weight at 103–105°C.
   2.2 The filtrate from this method may be used for Residue, Filterable.
3. Definitions
   3.1 Residue, non-filterable, is defined as those solids which are retained by a glass fiber filter and dried to constant weight at 103–105°C.
4. Sample Handling and Preservation
   4.1 Non-representative particulates such as leaves, sticks, fish, and lumps of fecal matter should be excluded from the sample if it is determined that their inclusion is not desired in the final result.
   4.2 Preservation of the sample is not practical; analysis should begin as soon as possible. Refrigeration or icing to 4°C, to minimize microbiological decomposition of solids, is recommended.
5. Interferences
   5.1 Filtration apparatus, filter material, pre-washing, post-washing, and drying temperature are specified because these variables have been shown to affect the results.
   5.2 Samples high in Filterable Residue (dissolved solids), such as saline waters, brines and some wastes, may be subject to a positive interference. Care must be taken in selecting the filtering apparatus so that washing of the filter and any dissolved solids in the filter (7.5) minimizes this potential interference.
6. Apparatus
   6.1 Glass fiber filter discs, without organic binder, such as Millipore AP-40, Reeves Angel 934-AH, Gelman type A/E, or equivalent.
   NOTE: Because of the physical nature of glass fiber filters, the absolute pore size cannot be controlled or measured. Terms such as "pore size", collection efficiencies and effective retention are used to define this property in glass fiber filters. Values for these parameters vary for the filters listed above.
   6.2 Filter support: filtering apparatus with reservoir and a coarse (40–60 microns) fritted disc as a filter support.

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Issued 1971

NOTE: Many funnel designs are available in glass or porcelain. Some of the most common are Hirsch or Buchner funnels, membrane filter holders and Gooch crucibles. All are available with coarse fritted disc.

6.3 Suction flask.

6.4 Drying oven, 103–105°C.

6.5 Desiccator.

6.6 Analytical balance, capable of weighing to 0.1 mg.

7. Procedure

7.1 Preparation of glass fiber filter disc: Place the glass fiber filter on the membrane filter apparatus or insert into bottom of a suitable Gooch crucible with wrinkled surface up. While vacuum is applied, wash the disc with three successive 20 ml volumes of distilled water. Remove all traces of water by continuing to apply vacuum after water has passed through. Remove filter from membrane filter apparatus or both crucible and filter if Gooch crucible is used, and dry in an oven at 103–105°C for one hour. Remove to desiccator and store until needed. Repeat the drying cycle until a constant weight is obtained (weight loss is less than 0.5 mg). Weigh immediately before use. After weighing, handle the filter or crucible/filter with forceps or tongs only.

7.2 Selection of Sample Volume

For a 4.7 cm diameter filter, filter 100 ml of sample. If weight of captured residue is less than 1.0 mg, the sample volume must be increased to provide at least 1.0 mg of residue. If other filter diameters are used, start with a sample volume equal to 7 ml/cm^2 of filter area and collect at least a weight of residue proportional to the 1.0 mg stated above.

NOTE: If during filtration of this initial volume the filtration rate drops rapidly, or if filtration time exceeds 5 to 10 minutes, the following scheme is recommended: Use an unweighed glass fiber filter of choice affixed in the filter assembly. Add a known volume of sample to the filter funnel and record the time elapsed after selected volumes have passed through the filter. Twenty-five ml increments for timing are suggested. Continue to record the time and volume increments until fitration rate drops rapidly. Add additional sample if the filter funnel volume is inadequate to reach a reduced rate. Plot the observed time versus volume filtered. Select the proper filtration volume as that just short of the time a significant change in filtration rate occurred.

7.3 Assemble the filtering apparatus and begin suction. Wet the filter with a small volume of distilled water to seat it against the fritted support.

7.4 Shake the sample vigorously and quantitatively transfer the predetermined sample volume selected in 7.2 to the filter using a graduated cylinder. Remove all traces of water by continuing to apply vacuum after sample has passed through.

7.5 With suction on, wash the graduated cylinder, filter, non-filterable residue and filter funnel wall with three portions of distilled water allowing complete drainage between washing. Remove all traces of water by continuing to apply vacuum after water has passed through.

NOTE: Total volume of wash water used should equal approximately 2 ml per cm^2. For a 4.7 cm filter the total volume is 30 ml.

7.6 Carefully remove the filter from the filter support. Alternatively, remove crucible and filter from crucible adapter. Dry at least one hour at 103–105°C. Cool in a desiccator and weigh. Repeat the drying cycle until a constant weight is obtained (weight loss is less than 0.5 mg).

8. Calculations

8.1 Calculate non-filterable residue as follows:

$$\text{Non-filterable residue, mg/l} = \frac{(A - B)\times 1{,}000}{C}$$

where:

A = weight of filter (or filter and crucible) + residue in mg
B = weight of filter (or filter and crucible) in mg
C = ml of sample filtered

9. Precision and Accuracy

9.1 Precision data are not available at this time.

9.2 Accuracy data on actual samples cannot be obtained.

Bibliography

1. NCASI Technical Bulletin No. 291, March 1977. National Council of the Paper Industry for Air and Stream Improvement, Inc., 260 Madison Ave., NY.

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-In	Page: 1 of 18
Approved By LM:		Revision: 6-6-96

Detection Limit: See Appendix B

Sampling, Containers,
Preservations, Holding Times: See Appendix C

RECEIVED FEB 16 2001

1.0 GENERAL DISCUSSION

ERMI is an environmental chemistry laboratory. The results of nearly all the analyses we perform are used to satisfy some regulatory requirement imposed by federal, state or local environmental agencies. Because of this, our results are sometimes scrutinized in regulatory proceedings or in courts-of-law. Therefore, they must be appropriate for the purpose intended and defensible. To meet these criteria, samples must be handled and analyzed according to certain regulatory agency protocols, usually EPA, and complete records stored for easy retrieval. These records must demonstrate appropriate handling and analysis protocols were used and substantiate the results obtained when they are questioned. ***Be very careful of customer samples.*** Very often they are one-of-a-kind and cannot be replaced or can only be replaced at great expense. Also, some samples contain pollutants that produce obnoxious odors, unhealthful fumes, are corrosive or ignitable or have some other undesirable or dangerous property. ***Handle them with great care and do not drop or break them.***

Sample log-in is the initiation of the sample analysis process and is one of the more critical steps. During log-in, the chain-of-custody for the sample is signed officially receiving the sample into the laboratory, analysis parameters and methods of analysis are definitively determined and assigned to the sample, samples are checked to ensure they have been preserved appropriately for the desired parameters, a unique laboratory identification number is assigned to the sample and the sample and list(s) of parameters to be analyzed are transferred to the laboratory for analysis.

It is not at all unusual for customers not to know exactly what they want or need to analyze from a particular sample. For example, a customer may need to determine if their waste is hazardous but not know this requires tests for reactivity, corrosivity, ignitability and toxicity analysis using TCLP methodology or the various analyses making up these testing procedures. However, with our experience and knowledge of environmental regulations, we are usually successful in helping customers make these type of determinations. This is part of the standard service we offer.

Almost all environmental chemistry parameters are very time sensitive (must be analyzed within a specified holding time or period from the time of sample collection). As well, they require certain preservation techniques unique to the sample matrix (water, soil, sludge, biological tissue etc.) being tested to stabilize the parameter(s) of interest and to keep them from degrading. It is critical that samples be preserved in the appropriate manner and they be analyzed within the appropriate holding period specified by the EPA or regulatory agency requiring the analysis. Results of analyses from samples not preserved in the appropriate manner and/or not analyzed within stated holding times are not acceptable to satisfy regulatory requirements.

A good practice in an environmental chemistry laboratory, and one required by EPA, is "blind sample analysis." Blind sample analysis is the assigning of a unique identification number to a sample and cross-referencing this number to the customer. In this way, the sample is tracked throughout the laboratory and analyzed without analysts knowing who the customer is or what sample location it came from. In this way, biases in the analyses associated with this knowledge are averted.

Log-in is comprised of the following tasks:

Officially accepting the sample for the laboratory by signing the chain-of-custody, initiating a Field Data Form and documenting the date and time this was done, as appropriate, on each of the forms. Also, at the time of sample receipt, part of the log-in process is determining the customers turnaround time expectations and desires and ensuring these can be accomplished for the submitted samples. If the customer is new to **ERMI**, determining a method of payment for the first sample submission and providing a credit application to them if they will be repeat customers is also considered a part of the log-in process.

Determining the parameters of analysis, analysis methods and detection limits required for each sample based on the specific environmental regulation(s) being addressed.

Determining and documenting on the Sample Preservation Form whether each sample has been correctly preserved for the type of analyses requested and the matrix of the sample and arrived in the proper sampling container.

Assigning a unique laboratory sample identification number to each sample and cross referencing this number to the customer, sample location, date and time of sample collection, etc.

Preparing laboratory work orders to advise the laboratory of the analyses required on each sample and to provide a vehicle for the laboratory to transmit the analysis results to the Customer Service area for report preparation.

Delivering the sample and work orders to the laboratory.

2.0 INTERFERENCES

Interferences are not a consideration during log-in since no specific chemical analyses are performed during this process. Great care must be taken at this time, however, to ensure that samples are not contaminated or cross contaminated with each other by introducing utensils or media into the sample when preservation levels are checked. You must be assured that anything (pH paper) introduced into the sample container is analytically clean or contamination may occur. If you have any doubt whatsoever, clean the item appropriately before introducing it. The quantities of the parameters analyzed for in the laboratory are extremely small and any contamination of the sample with other sample materials such as soil, sludge, sample water, industrial chemicals, etc. could alter the analysis results.

The following should be avoided due to potential contamination:

Nail polish remover near samples.
Do not spray cleaning agents or disinfectants in the area of open samples.
Do not physically touch samples (I.e. Na analysis).

3.0 APPARATUS

Apparatus required for sample log-in includes computer, protective gloves, safety glasses, laboratory coat, pH paper, Sharpie markers, sample labels, color coded labels, ink pens, sample cart and the various forms and logs used to document information as described more fully in the following sections.

4.0 REAGENTS

No reagents are used in the log-in process. If a sample is not preserved upon receipt, it should be properly preserved by log-in personnel, Field Services or by personnel from the laboratory where the sample or sample aliquot will be analyzed.

5.0 PROCEDURE

5.1 Sample Receiving

Samples are delivered to the laboratory in a number of different ways. Some of these are: customer walk-ins, overnight services such as Airborne, Federal Express and Lone Star, Greyhound bus, U.S. Postal Service, United Parcel Service and Roadway Package Service, trucking companies, air parcel or freight and **ERMI** personnel. Samples delivered by **ERMI** personnel include those picked up at the Greyhound bus station and airports, from customer locations and those collected by Field Services employees themselves. All samples must be kept in the container (cooler, box, etc.) they were delivered in until it is time to check the sample containers and preservation levels. ***Do not attempt to log-in more than one submission of samples at a time.*** This will ensure customer samples are not mixed up during the log-in process.

When multiple submissions are received from separate customers, it is necessary to prioritize the log-in of the samples based on holding times, turnaround time requested and condition of samples upon arrival. Deficiencies must be noted on the Sample Preservation Documentation sheet for inclusion on the customer report (i.e. received out of holding time or not enough sample).

Samples are received into the laboratory by signing the chain-of-custody for the submission, completing the Field Receiving Information on a Field Data Form (Appendix A) and documenting the date and time this was done at the appropriate locations on the two (2) forms. If no chain-of-custody was provided with the submission, initiate one using **ERMI**'s Chain-of-Custody form (Appendix A). Note that for samples brought to the laboratory by **ERMI** personnel, the Field Receiving Information provides for documentation of transfer of the samples from Field Services personnel or other **ERMI** personnel to the laboratory. As well as documenting the transfer of samples, the Field Data Form serves as a point of attachment for all laboratory information generated for the submission keeping it in one location for report preparation and later, filing in the customer's project folder.

Review the chain-of-custody to ensure all information is legible and complete. A telephone number must be provided for a contact to answer questions about the samples should they develop, an address to send the completed report and invoice to, a fax number if the report and invoice are to be faxed, a purchase order number for billing purposes, descriptive information on the project and samples the customer would like included on the final report, the name of the person who collected the samples, the date and time the samples were collected, notation as to what the customer's expected and desired turnaround time (TAT) are and the parameters of analysis. ***All of this information is essential and must be documented upon receipt of the samples.*** If this information is not on the chain-of-custody or in the customer's project file, it must be gleaned from the individual delivering the samples or from the provided or known customer contact. ***All customer contacts must be documented on a Communications Form (Appendix A), a copy of this form placed in the customer file and copies routed to all individuals with a need to know. Copies must be delivered promptly so any necessary actions can be rapidly taken. Know and be sure of the customers' TAT expectation, be sure we can meet them and contact the customer for instructions if we cannot!***

If the customer is new to **ERMI**, method of payment for the first submission of samples must be determined. New customers and/or customers' with questionable credit ratings may pay for the services provided in advance when they submit the samples, upon receipt of the final report or according to **ERMI**'s payment terms upon credit approval. The time to complete the credit approval process after receiving the completed application depends upon how quickly the listed credit references respond to standard information inquiries. Also, if the customer is new to **ERMI**, document how they found out about us, which laboratory they were using previously and why they changed on a communications form and route it to the President and the Business Development Manager. If they were referred by an existing customer, we will want to contact that customer and thank them. If they were drawn to **ERMI** though our Business Development efforts, we would like to know by which method to enable us to evaluate our marketing and sales techniques.

5.2 Parameters of Analysis

ERMI's and most customers' chain-of-custody forms provide space for recording what parameters are to be analyzed from each sample submitted. ***It is incumbent upon us to ensure that we understand what parameters the customer wants to analyze from each sample, what detection limits are required and, if necessary, determine which methods of analysis are appropriate to meet these needs.*** Often, customers have their own acronyms or jargon for certain analyses which may be different from ours or those generally accepted. As well, the customer may know they need to analyze the sample for a particular parameter or suite of parameters but not know what method of analysis should be used or the detection limit(s) required to satisfy the regulation being addressed. If any of this information is unclear from the documentation provided with the samples or project, ***make no assumptions***, contact one of ERMI's technical personnel and/or the customer for further guidance before proceeding with the log-in process! ***Be absolutely sure of what the customer wants and document this on a Communications Form if it was necessary to contact them!*** If verbal instructions regarding the sample are given, note them on the Chain-of-Custody and initial and date this information and indicate who gave these instructions.

One of the more frequent determinations required during the log-in process is what method of analysis must be used to meet the customers needs. Most customers are not environmental chemists and they depend upon us to make or help them make the right decision. The ***single factor*** most influencing this decision is what regulation(s) the customer is addressing with the analyses from the samples, RCRA or solid waste, Clean Water Act, Safe Drinking Water Act and/or Clean Air Act regulations. Each regulation calls for analyses using methodologies specific to that regulation. For example, metals in a water sample are analyzed by method 200.7 to address Clean Water Act regulations and by method 6010 to address RCRA or solid waste regulations. Within these categories, there is often a choice of methods that can be applied depending upon the detection limit requirements necessary to satisfy the regulation. Lead for example can be analyzed by method 200.7, ICP, yielding a detection limit of 0.01 mg/l to satisfy Clean Water Act requirements but must be analyzed by furnace using method 239.2 to obtain a detection limit of 0.001 to satisfy Safe Drinking Water Act requirements. For purposes of the Clean Air Act, lead must be analyzed by flame AA using method 239.1 which has a detection limit of 0.1 mg/l.

As you can see, it is ***imperative*** to know the regulation being addressed to make the proper determination of which method(s) is appropriate for the analysis. Making this more difficult is the fact that customers do not always know what regulation is being addressed. They may only know they are trying to determine if the waste is hazardous, whether they are out of compliance on their wastewater discharge or whether their water is safe to drink. This type of information is a definitive clue as to what regulation the customer is addressing and, therefore, what methods of analysis and detection limit requirements must be met to satisfy their needs. Knowledge of the various environmental regulations, the regulatory limits imposed by them and the sample analysis capabilities of the laboratory is very important. Information on the methods of analysis and detection limits for each parameter analyzed by ERMI is presented in Appendix B. The information is grouped by laboratory of analysis (Metal, Wet, GC and GC/MS) and regulation.

If an unfamiliar organic parameter is requested there are various sources to obtain information from – the on-line Chem-Crosser program, the Merck index and similar reference books located in the semivolatile laboratory, regulatory publications in **ERMI**'s library, etc. Do not guess what something is, verify it.

5.3 Sample Containers and Preservation

After determining what parameters are to be analyzed from each sample, remove all samples from a particular customer's submission. Place the samples on a work surface where only samples from the submission being logged-in are present. Arrange the samples as ordered on the chain-of-custody and verify the label against the information on the chain-of-custody. A sample can be comprised of one or a number of different containers with each containing a subsample or sample aliquot (a representative portion of sample). This is necessary because each parameter or group of parameters must be placed into a container of the appropriate type, preserved in a specified manner, capped with a specific type of lid and analyzed within a specified holding period. Holding period is the time from sample collection until initiation of the analysis, completion of the analysis, or completion of a specific part of the analysis as specified in the pertinent regulation. Generally speaking, all chemical parameters begin to degrade or change form from the time they are collected. Some parameters can be stabilized for a period of time using various chemical agents and/or cooling but this only retards the degradation or change. It

does not stop it. There is still a finite period during which time the analyses are considered acceptable. It goes without saying then, the sooner a sample is analyzed the better. If samples are not analyzed within the appropriate holding period, the results of these analyses are not acceptable for satisfying regulatory requirements.

Knowing the parameters to be analyzed, check each sample or sample aliquot to ensure they are in the correct type of container and are preserved in the manner specified by the regulation. Document your findings for each sample on a Sample Preservation Documentation form (Appendix A). Information on the correct sample container and lids, preservatives and holding times are presented in Appendix C.

Almost all parameters require cooling the sample to 4°C as one or part of the appropriate method of preservation. A few exceptions to this are samples for analysis of metals, chloride, hardness and fluoride or solid waste samples for all analyses where the physical or chemical character of the sample is changed upon cooling. It is not necessary to cool these parameters and types of samples. If the sample was received on ice, make this notation on the Sample Preservation

Documentation form. It is assumed the sample(s) was appropriately cooled if it arrived at the laboratory on ice. This is because some samples collected a short distance from the laboratory may not be chilled to 4°C upon arrival at the laboratory but they were placed on ice immediately after collection and cooled such that this criteria probably would have been met if left long enough. If a sample is not cooled upon arrival and it should have been, make a notation at the bottom of the Sample Preservation Form to this effect.

Check the pH of each sample or sample aliquot (exclusive of VOA vials, samples known or suspected to require special handling, samples for solid waste or air analysis, soil and sludge, or samples customers have requested not be opened until time of analysis) using pH indicator strips to assess whether the pH level is indicative of a correctly preserved sample or a sample that should not have been preserved (BOD, TSS, Chloride, etc.). ***It is important to remove the lid from only one sample container at a time to ensure the lids are not mixed up and put on the wrong container.*** This could cross contaminate the sample(s) and invalidate or

result in erroneous results. Document these findings in the pH column on the Sample Preservation Documentation form for each parameter or parameter group. It is not necessary to determine the exact pH, only whether the sample was below or above the necessary pH. Record the sample number(s) (Section 5.4) on the form and check it thoroughly for completeness. Immediately sign the form and record the current date and time.

5.4 Sample Identification Number

A unique sample identification number is assigned to each sample. This sample number is a consecutive number maintained in the sample log (Appendix A). Each sample is ***treated individually*** to prevent labeling the wrong sample with the identifying number. Select the first sample on the submission chain-of-custody. Select the next unused consecutive number from the Sample Log and assign the number to this sample. This is done by recording the customer name, project number, date received, sample description and due date for the sample in the Log on the line or row corresponding to the sample number and by writing the number beside the description for the sample on the submission chain-of-custody. Also included on each line in the Log is a break out of parameters by laboratory and a notation of how the sample arrived at the laboratory.

Label the sample container with the sample identification number. Write the number in the appropriate place on the existing container label or, in the absence of a label, write the number on an **ERMI** container label designed specifically for this purpose and affix it to the side of the sample container(s). ***Be very careful*** not to deface any information on the customer label during this process. The sample number should also be written on the lid of each container using a Sharpie marker or a plain white label. Containers are often cold and wet making them difficult to write on or label. Wiping the container with a paper towel just prior to labeling often helps. If the container has moisture on the outside when you are trying to write on it, the Sharpie marker will absorb moisture and not write or will write improperly. Touch the end of the marker to a dry paper towel several times making ink blots on the towel. This will return the flow of ink and the pen should work properly again. ***Make sure the sample identification number is clearly legible and labels are tightly affixed.*** This is the only means of identifying the sample after log-in.

There are three (3) special cases that affect how a sample is labeled. These are when a sample has a ***RUSH*** TAT, when a sample has a short holding time (48 hours or less), and/or when a sample is to be analyzed for what we refer to as ***"low level"*** parameters. Sample analyses requiring RUSH turnaround times and those that have short holding times are labeled with a fluorescent red or red/orange label so they are easily identified as samples with quick TATs. Samples requiring low level analyses are labeled with a fluorescent yellow label for this same purpose. A sample can have three different labels: a customer label, a red RUSH or short holding time label and a yellow label for low level analysis. If a sample has a special hazard associated with it, contact the Safety Officer for proper handling and special log-in procedures.

After completing one sample proceed to the next following the same procedures until all samples in the submission have been logged-in.

In the case where limited sample volume is encountered and the sample must be subsampled for various parameters or laboratories, contact the inorganic or organic team leader or the QA Manager for assistance. In the case where an unpreserved sample is received and the sample must be analyzed for parameters that must be preserved in different ways, contact the applicable inorganic or organic team leader or the QA Manager.

5.5 Work Order Preparation

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-In	Page: 10 of 18
Approved By LM:		Revision: 6-6-96

An Analytical Services Work Order is a form comprised of one or more pages of descriptive information to tell the analysts what parameters are to be analyzed from each sample. One work order is prepared for each individual sample for each laboratory (Metals, Wet, GC and GC/MS laboratories) that will participate in performing the analyses required. Customer and location specific work orders are already prepared for current customers and for all the typical analyses performed. Only work orders signed by the President should be used. Custom work orders are used for new customers requiring special combinations of analyses or current customers requiring other than their or our standard analyses. Appendix A contains an example of the Analytical Services Work Order form.

Work orders are completed by recording the sample identification number and due date or to be completed by date for the sample at the top of the form. The standard TAT for most parameters is four (4) ***working*** days. Exceptions to this are samples for BOD, TCLPs, seven (7) day leachate and BTEX/TPH analyses. The TAT for BODs and TCLPs is five (5) working days, for the seven (7) day leachate test about 12 to 15 working days (check with the inorganic supervisor to determine a reasonable due date upon receipt of these samples) and for BTEX/TPH 48 hours. All samples except BTEX/TPH and RUSH samples are counted as being received the next day if they are received after 2:00 PM in the afternoon by **ERMI** personnel. If the samples arrive after 2:00 PM at the laboratory but were received earlier in the day by Field Services or other **ERMI** personnel, the TAT begins from the earlier time.

Under parameter, list the parameters of analysis to be analyzed from the sample in the order in which they will appear on the report. This order is the same order the parameters are presented in the publication "Methods for Chemical Analysis of Water and Wastes" EPA-600/4-79-020, revised 1983 with the exception of physical characters which are always listed last. A copy of the table of contents of this document is presented in Appendix D for referral. List the desired method of analysis and detection limits in the corresponding location on the form for each parameter. Fill in the box at the bottom of the form corresponding to the laboratory where the work order will be delivered. Note the other laboratories where analyses will be performed on the same sample by placing an X in the box beside the laboratory name. Indicate the matrix of the sample by circling one or more of the classifications under sample description or write in the matrix after "other" if none of the listed matrices are suitable. Any information on hazards associated with handling the sample should be noted under comments and made very obvious with a brightly colored highlighter.

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-in	Page: 11 of 18
Approved By LM:		Revision: 6-6-96

Any special instructions for processing the sample should be documented in the "Special Instruction" location on the form.

On the work order note whether the sample was received out of holding time in the comments section. Also note the NLT (no later than time) for parameters with short holding times – turbidity, BOD, nitrate, coliforms, etc.

After completing the work order, carefully check it over to be sure all instructions and documentation are complete and legible. ***Note: The work order is the vehicle used by the laboratories to report the results of their analyses and other information to Customer Service for report preparation.***

Certain circumstances and parameters dictate some modification or exceptions to the above procedures. When samples with RUSH TATs are to be analyzed, a bright orange work order is used. If the work order is multi-page, it is only necessary that the top page of the work order be prepared on orange paper. The remaining pages can be the normal white paper. Again, the purpose of the colored work order is to alert individuals in the laboratories that these analyses are RUSH and must be processed quickly. When samples for pH, BOD, nitrate, hexavalent chromium and others with short holding times, or TPH are logged in, a special label is affixed to the work order to provide a place for the analyst(s) to sign for the sample in recognition the sample was brought into the laboratory and delivered to him or her. Because semivolatile organics, pesticides and herbicides are prepared in one location and analyzed in another, a copy of the first page of all of these work orders is made. The original goes to the preparation laboratory and the copy to the instrument laboratory. After the sample is prepped, the original work order and the sample are transferred by laboratory personnel to the instrument laboratory and the copy of the work order is replaced by the original and the copy discarded.

Upon completion of the log-in process for a submission, the chain-of-custody, the completed Sample Preservation Documentation form and any information regarding the submission are stapled to the Field Data Form. Unless the individual completing the log in process has considerable experience, this package must be reviewed for clarity and completeness by someone other than the individual logging in the samples.

Occasionally we receive samples to be analyzed for parameters that we do not perform such as asbestos, radioactivity, etc. These parameters are subcontracted to a third party laboratory. A file is maintained in the Log-In area of the current laboratories we subcontract to. Check with the Customer Services Manager to verify which laboratory to use. When such a sample is received, a Subcontracting Chain-of-custody is completed with all applicable information including a request to fax data

to **ERMI** upon completion. The only exception in requesting the information to be faxed is whole effluent toxicity data; these reports are quite lengthy. Examples are in the file for each subcontract laboratory. The COC is relinquished to the Field Service technician transporting the sample. If there is no information on the sample to identify our customer or give unnecessary information to the third party laboratory, the original container we received the sample in may be sent to the sublab. Clearly put the **ERMI** sample number on the container and on the lid of each sample to be transported. If it is necessary to subsample the sample, contact the inorganic or organic team leader or the QA Manager for assistance. Unless the sample is dried paint, drywall, etc., it must be refrigerated. Samples not needing refrigeration may be placed on the Log-In counter along with the completed COC while awaiting transport. Place all sublaboratory samples needing refrigeration on the top left hand shelf in the organic prep laboratory.

At the end of each day Field Data forms, along with all attachments, are filed numerically in the "Samples In-House" file in the Customer Service area. Also at the end of each day, a count is made of incoming samples (excluding Q.C. samples) for the day and the number written on a post-it note and given to the President.

5.6 Wastewater Work Orders

Most monthly wastewater samples are composite samples collected over a 24-hour period. Specific parameters such as volatiles, cyanide and oil and grease must be collected as grab samples and are in-house before the composite portion of the sample. Field Service technicians collecting these samples will request sample identification numbers after the sampler is set out if it contains grab sample parameters. If there are no grab samples, the Field Service Technicians will request a sample identification number after the complete sample is in-house. Occasionally, due to sampler malfunctions or other problems, a sample is not collected and the sampler must be reset. By waiting until the sample is in-house, voided sample numbers can be avoided.

When the work orders containing grab samples are completed, they are placed in the "Grabs Here - Composites There" file in the Log-In area. This means the grab portion of the sample will be in-house before the remainder of the sample. When the complete sample is in-house, the Field Service technicians will retrieve these work

orders and place them into the appropriate laboratory work order books or, for the Wet Lab, in the appropriate hanging files on their wall. At this time they complete the Field Data Sheet and relinquish it to Log-In personnel. Log-In personnel then signs and puts the date and time on the Field Data Sheet. Check to make sure the Field Service technicians have written the due date in yellow hiliter in the upper right hand corner of the Field Data Sheet. Also check to be sure a pH was collected and it is within regulatory limits -- generally between 6 and 10.5 but varies from city to city. If the pH is not within these limits, a second pH must be collected.

In the Sample Log Book, the samples are considered in-house the next working day following collection. Example: If a sampler is set out on Monday to collect a composite sample but is not in-house until late Tuesday afternoon, it would be considered in-house on Wednesday. This allows the laboratory personnel adequate time to complete the requested analysis.

The Field Data Sheets contain the information used to program the automated samplers. The Model 800 Sigmas have a feature that allows information to be downloaded via a data device and printed out by the Field Service technicians. This information is then attached to the Field Data Sheets and contains valuable quality control information such as missed samples, date and time the samples were collected, etc. Discrepancies or any problems noted with sample collection should be reported to the Customer Services Manager.

5.7 Sample Distribution

After completing all work orders, the samples are transferred to a cart and the aliquots distributed, as appropriate, to the various laboratories. Each laboratory has it own storage refrigerator for samples. The shelves of each refrigerator are labeled with the parameters to be stored on them. The exceptions to this are the Metals Laboratory and samples for BOD analysis. Liquid samples for metal analysis do not require refrigeration so they are stored on a shelf for this purpose in the digestion or sample preparation area within the Metals laboratory. Soil and sludge for metals analysis, however, do require refrigeration. These are maintained in the refrigerator in the volatile organic instrument laboratory. Upon delivery to the Wet Laboratory, BOD samples are placed on the work surface in the laboratory where the analysis is performed and the analyst signature to that effect obtained. BOD samples have a red labeled area in the refrigerator for after hour placement of samples.

When delivering samples to the laboratories, deliver those requiring volatile organic analyses to this laboratory first. ***Never take volatile organic samples into the Organic Preparation or Wet laboratories.*** These laboratories use methylene chloride, chloroform, acetone and other volatile chemicals for sample extraction and glassware decontamination which can easily infiltrate and contaminate samples even with the lids tightly secured. These solvents are some of the parameters analyzed for in the volatile laboratory. Upon delivery of the samples to each laboratory, put the work orders for each laboratory in their work order book. The exception to this procedure is the Wet Laboratory where work orders are placed in the appropriate section in the hanging files just inside the Wet laboratory on the east side. Wet Laboratory personnel will place the work orders in their book. Arrange the work orders in the books such that the largest sample identification number is the first page of the book when opened. The exception to this is volatile organics where new work orders are placed last in the work order book at the analyst request.

6.0 CALCULATIONS

No specific calculations are required for the sample log-in phase of sample processing. Remember, TATs are based on working days, not calendar days.

7.0 SOIL AND SLUDGE MODIFICATIONS

No modifications other than those listed above are required to log-in soils and sludges. No preservative other than cool to 4°C is required for these sample matrices. Soils and sludges for metals analysis are stored in the volatile refrigerator and should be put there first before delivering other samples on the cart to other laboratories.

8.0 QUALITY CONTROL

All log-in documentation is checked for clarity and completeness and verified by a second individual knowledgeable and experienced in the log-in process.

9.0 SAFETY AND HYGIENE

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-in	Page: 15 of 18
Approved By LM:		Revision: 6-6-96

Safety relates to both the safety of log-in and surrounding personnel and to the safety of customers' samples while under the care of the log-in personnel.

Safety and proper hygiene must be foremost in the minds of all sample log-in personnel when handling samples or working in the log-in area. All samples have the potential to contain some sort of contaminant at high concentrations or at levels deleterious to your health and/or physical well being. In addition, some samples are preserved and are therefore acidic or basic. It is our business to measure the concentrations or characteristics of certain of these contaminants. As well as the contaminants we normally think of, some samples may also contain bacteria, viruses or other disease causing agents along with the chemical contaminants we may suspect. For these reasons, ***it is imperative*** log-in personnel wear the supplied proper personal protection equipment, be knowledgeable with regard to the safe handling of samples, know how to handle the safety equipment in their area and use it properly and maintain good personal hygiene practices. Be careful with the pH paper after checking the sample and dispose of it properly.

Proper safety attire for log-in personnel is safety glasses, latex or vinyl gloves and a laboratory coat. These items ***must be*** worn when in the log-in area. Bare or exposed skin should be minimized when working with samples. Cloth, tennis or open style shoes should be avoided. No eating or drinking is allowed in the log-in area and hand to mouth, eye, face or bare skin should be avoided when working with samples or when samples are in the log-in area. When log-in is completed, immediately ***wash your hands*** and any bodily area that was splashed or came into contact with sample using the antibacterial soap provided in the rest rooms and at other locations throughout the laboratory. Advise the Safety Officer of any rash or irritation or other adverse effect from coming into contact with a sample. Wash your laboratory coat frequently, at least once a week.

The safety of samples is a concern whenever they are handled. Always work with one sample at a time and make sure the lid is on tight and your hold is secure. Always work with samples over a work surface and make a conscious effort to minimize the distance the sample is held above the surface to decrease the potential for breakage should the sample slip and fall. Store all samples securely when they are transported on the

laboratory cart and pay particular attention when crossing the bumps caused by the union of carpet and tile between the laboratory and offices. In no circumstance is a sample to be carried by hand to the laboratories, they should always be in a crate or on the laboratory cart for secondary spill containment.

10.0 WASTE DISPOSAL

No waste other than used pH strips and normal office waste is generated during the log-in process. These can be discarded in the regular office trash receptacles and disposed of in the dumpster.

11.0 CLEAN UP AND MAINTENANCE

A clean, well organized work area is essential for safety purposes and also projects a professional image to our customers, minimizes the potential for inadvertently contaminating samples, promotes smooth and efficient work since the area is free from clutter and demonstrates the genuine concern log-in personnel have for the importance of and factors affecting their particular job.

The work surfaces of the log-in area must be kept free of spilled sample(s), paper and other trash. The counters and the sample cart should be wiped down periodically to remove or reduce the contamination on surfaces. The bottom tray of the cart should be kept orderly. Transfer bubble pack, netting, etc. to the Field Office area on a routine basis. Sample bottle cabinets must be kept stocked with bottles and supplies of VOA vials, labels, chain-of-custody forms and labeled soil jars maintained to give to customers when needed without them having to wait while they are retrieved from the Field Office or warehouse.

All empty coolers must be returned to the warehouse for cleaning and shipment back to the customer, if applicable. As incoming coolers are emptied, those needing to be returned should have a note attached instructing Field Service personnel where the

cooler is to be returned and how many and what kind of bottles need to be returned. Each cooler belonging to ERMI must be logged in the Shipping Log if it is incoming or if it is given to a customer or leaves the premises for any reason. Each cooler is assigned a number and there is a page in the Log by number for each cooler.

Copies of all forms and work orders should be checked during periods when all samples are logged in and these supplies replenished to reduce disruption to the log-in process. Maintain a constant awareness of stocks of purchased supplies used in the log-in

Effective Date: May 30, 1996	Subject	Method: ERMI
Approved By QAM: PLC	Sample Log-in	Page: 17 of 18
Approved By LM:		Revision: 6-6-96

process such as labels, orange colored paper, Sharpie markers, pH paper, etc. Complete a purchase requisition for supplies needed from outside vendors well in advance of when they are required. Maintain your computer in good operating order. Make it a practice to run scandisk and defrag at least once a week to keep your files compressed and speed maximized.

****************** -COMM. URNAL- *********************** DATE FEB-19-200. ***** TIME 15:33 ********

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Effective Date: January 1, 1994	Subject	Method: 405.1
Approved By QAM:	5 DAY BIOCHEMICAL OXYGEN DEMAND	Page 1 of 16
Approved By LM:		Revision: 6-22-95

Detection Limit: 2.0 mg/L

Sampling : Composite
Container : 1000ml Plastic/Glass
Preservation : Cool 4°C
Holding Time: 48 Hours from time of collection

1.0 GENERAL DISCUSSION

EPA Method 405.1 is the reported method for BOD determinations. However, Standard Methods details all the requirements and procedures for this parameter and the following procedure is based on these criteria.

Biochemical Oxygen Demand (BOD) is an empirical measurement of the oxygen requirements of municipal and industrial wastewaters and sewage. The test results are used to calculate the effect of waste discharges on the oxygen resources of the receiving waters. The BOD test is of limited value in measuring the actual oxygen demand in the environment because temperature change, biological population, water movement, sunlight, oxygen concentration and other environmental factors cannot be reproduced accurately in a laboratory. BOD is performed by incubating a sealed sample for the standard five day period at 20°C in the dark, then determining the change in dissolved oxygen content.

2.0 INTERFERENCES

Residual Chlorine can have a toxic effect on the bacteria used in the BOD analysis. To eliminate small amounts of residual chlorine, allow the sample to stand for one to two hours at room temperature. Cold samples may be supersaturated with oxygen. If a DO reading of over 9.15 at 20°C or 8.78 at 22°C is obtained, remove excess oxygen by agitating the sample before beginning.

To reduce the effect of phenols, heavy metals or cyanide, and other potentially toxic agents, dilute the sample with nutrient water and use the most dilute result which has valid QC values.

Effective Date: January 1, 1994	Subject	Method: 405.1
Approved By QAM:	5 DAY BIOCHEMICAL OXYGEN DEMAND	Page 2 of 16
Approved By LM:		Revision: 6-22-95

3.0 APPARATUS

- 300ml BOD Bottle with Glass Stoppers
- Plastic Caps for BOD bottles
- Pipets and Pipet Bulb
- Volumetric Flask, 1000ml
- Beaker, 1000ml
- Pipettor, 5ml
- Graduated Cylinders, 50ml,100ml,500ml
- COD Reactor
- Magnetic Stirrer Plates and Bars
- Incubators
- Orion Model 840 BOD Meter
- Air Pumps, 2

4.0 REAGENTS

4.1 BOD Standard (Glucose Glutamic Acid), Hach 14865-10

4.2 BOD Nutrient Hach 6L 14862-98 3L-14861-98 See section 5.1.2.

4.3 Sodium Hydroxide (NaOH), 1N Dissolve 40 g NaOH in 1000ml of deionized water.

4.4 Sulfuric Acid (H_2SO4), 1N Add 48g (or 30ml) of concentrated H_2SO_4 to 800ml of deionized water. Adjust the volume to 1000ml with deionized water.

4.5 Nitrification Inhibitor Hach 2533-35.

4.6 Polyseed See section 5.1.3.

4.7 Distilled Water This is purchased locally and is Ozarka brand. No Other brands are acceptable.

5.0 PROCEDURE

5.1 Preparation

NOTE: FOR THIS PROCEDURE TO WORK PROPERLY, THE SAMPLES, POLYSEED, AND NUTRIENT WATER **MUST** BE AT THE SAME TEMPERATURE, **20-22°C ± 2°C** OR ROOM TEMPERATURE AT THE TIME OF SAMPLE PREPARATION.

5.1.1 Initial Sample Preparation Remove the BOD samples to be analyzed from the sample storage refrigerator upon arriving at the laboratory in the morning. **Samples must be at room temperature (approximately 20°C-22°C) prior to analysis.** Group the samples by batches containing 10 samples each.

5.1.2 Nutrient Buffer Preparation Begin preparation at least three (3) hours before samples are to be analyzed.

5.1.2.1 Use only Ozarka Distilled Water (9.46 Liters). This amount will fill 32 to 33 BOD bottles.

5.1.2.2 Cut a hole in top rear of the container.

5.1.2.3 Drain 560ml of distilled H_2O from container.

5.1.2.4 Add one 6 liter BOD Nutrient Buffer pillow (4.2) and one 3 liter Nutrient Buffer pillow to the Ozarka container.

5.1.2.5 Rinse the emptied pillows with approximately 90ml of the 560ml distilled H_2O drained from container and pour the rinses into Ozarka container.

5.1.2.6 Save 460ml of the initial 560mls and pour the rest back into the container. This will adjust the original 9.46 liters down to 9.00 liters.

5.1.2.7 Add the large Teflon stirring bar (dedicated to the BOD analysis) into the container. Use part of the 460ml distilled water to rinse out the BOD bottles prior to use.

5.1.2.8 Connect the air pump and bubbler and place bubbler into the distilled water container through the hole which was cut in the container.

5.1.2.9 Bubble and stir the nutrient solution for at least 2 hours. Remove the nutrient water from the stirring plate, remove the aerator, remove the stirring bar and allow this solution to stand at least 15 minutes before using.

5.1.3 Polyseed Preparation

5.1.3.1 Withdraw 500ml of nutrient water after it has aerated for the two (2) hour preparation period, collecting it in a 500ml graduated cylinder.

5.1.3.2 Rinse the 1000ml beaker (dedicated to the BOD analysis) with laboratory DI water and place the contents of one (1) Polyseed capsule into the beaker.

5.1.3.3 Rinse the capsule with a portion of the 500ml nutrient water and pour the rinses into the beaker. Do not put the capsule covering into the beaker.

5.1.3.4 Pour the remaining 500mls of nutrient water into the beaker with the Polyseed.

5.1.3.4 Add the stirring bar used for the BOD seed, stir at a moderate speed, and aerate with the bubbler apparatus for a minimum of one (1) hour before use. Allow the seed to stir during the entire sample preparation procedure. Do not allow seed to stand longer than 30 minutes or the bacteria could die from oxygen depletion.

5.1.4 Sample Preparation

5.1.4.1 Run a pH check on an aliquot of each sample and record the sample pH in the data book.

5.1.4.2 If necessary, adjust an aliquot of the sample between pH 6.5 and 7.5. Record the final pH in the data book. ***Never adjust the pH of the entire sample contained in the sample bottle.***

5.1.4.3 Use 1N H_2SO_4 (Section 4.4) if the pH is >7.5. Use 1N NaOH (Section 4.3) if the pH is <6.5.

5.1.4.4 To determine the dilutions necessary for the samples to be analyzed, use the following procedure

- Perform a COD analysis (Method 410.4) on each BOD sample.
- Using a pre-prepared COD vial, pipet 2ml of homogenized sample into the vial. This homogenization must be done in a blender on any sample which contains particles which settle rapidly or cannot be drawn readily into a pipet.
- Cap the vial tightly and shake it vigorously. ***Note: The vial will become hot, so take precautions.***

- Digest the COD vial in the block digester for two (2) hours at 150°C. Read the COD and estimate the BOD concentration by dividing the COD value by two (2).
- Determine the dilution for the BOD analysis, refer to Table 405.1-1. For dilutions needing less than 1ml of sample, the sample must first be serially diluted with nutrient water. For example, if Table 405.1-1 indicates that a sample volume of 0.01ml should be used, the sample is first diluted 1ml to 100ml, then one ml of this dilution is used for the test.
- The total number of dilutions required per sample is three to six. (For higher BOD values, at least one dilution will be too concentrated, at least two dilutions will be in the valid concentration range and at least two values will be more dilute than needed to cover the range). If there is limited sample volume, the minimum number of dilutions run per sample is 3.
- Obtain BOD bottles and arrange in numerical order and record the bottle number, sample number, dilution, and COD value on the data sheet in the BOD data book.

5.2 Calibrating the BOD probe

5.2.1 The probe is stored in the BOD storage sleeve inside the BOD meter. The small sponge in the bottom of this sleeve must be kept moist with water, but all excess water must be poured out of this sleeve.

5.2.2 Begin calibrating the BOD probe at least one hour before sample analysis.

5.2.3 Dry off probe membrane with the soft side of a paper towel before beginning calibration. Place the probe back into the storage sleeve.

5.2.4 Push the "Mode" button until the display is in the CAL position.

5.2.5 Push the Mode button once more. The meter will then calibrate itself. This should take between 20sec. to one minute.

5.2.6 If an E1 message appears, push the Mode button once more. Repeat a third time if the E1 reappears.

5.2.7 Check the probe membrane or the probe tip if the meter fails to calibrate the third time. Sometimes moistening the membrane prior to calibration will help.

5.3 Analytical Procedure

5.3.1 Initial Set Up

5.3.1.1 Rinse each BOD bottle with a portion of the 460ml of original distilled water removed from the 9.46 liter container. Record all bottle numbers and sample numbers in the data book.

5.3.1.2 Record nutrient water, Polyseed and sample temperature in data book before analysis. The temperatures must be the same ± 2°C. If not, dissolved oxygen equilibrium in the analysis components will not be achieved and the analysis will not pass the QC requirements.

5.3.2 Nutrient Blanks (4 Required)

5.3.2.1 Fill the first bottle with nutrient water, place the bottle on the magnetic stirrer and place the probe in the bottle. The stirrer on the probe holder will stir the nutrient over the membrane, thus measuring the initial dissolved oxygen content. Read the DO, and record the value in the data book. Discard this bottle after taking its DO reading.

5.3.2.2 The second bottle is treated the same as above.

5.3.2.3 The third and fourth bottles are filled with nutrient water, stopped and capped. **DON'T READ THE D.O. until after incubation is complete.**

5.3.2.4 Gently tap on the sides of all filled bottles to release any entrapped air bubbles before stoppering.

5.3.3 Seed Correction (3 Required)

5.3.3.1 Add 10ml of Polyseed to a BOD bottle and fill it with nutrient water.

5.3.3.2 Add 15ml of Polyseed to second bottle and fill it with nutrient water..

5.3.3.3 Add 20ml of Polyseed to third bottle and fill it with nutrient water..

5.3.3.4 Read the DO_0 in each bottle, record the value in the data book. Gently tap on the sides of all filled bottles to release any entrapped air bubbles before stoppering. Ensure that all stoppered bottles have a water seal before putting on the plastic caps.

5.3.4 Standards (4 Required)

5.3.4.1 The Hach BOD Standard Solution is provided in a Voluette Ampoule. Simply break the top of the ampoule off at the etched line on the neck. The solution is now ready for immediate use. ***Caution: Always wrap the voluette with a towel, rag or other protective cover before attempting to break the top off, to avoid cutting yourself.***

5.3.4.2 With Class A volumetric pipets, deposit the following volumes of the Hach standard into separate BOD bottles: 1ml, 2ml, 3ml, 4ml.

5.3.4.3 Add 3ml of Polyseed solution to each bottle.

5.3.4.4 Fill bottles with nutrient water. Tap the sides of the bottle to displace the air bubbles that may cling to the inside surface, then read and record the sample DO. Immediately stopper each bottle and verify that a water seal is present before capping.

5.3.5 Samples

5.3.5.1 For samples needing dilution, fill the BOD bottles half full with nutrient water.

5.3.5.2 Add 3ml of Polyseed solution to each bottle using an autopipetor

5.3.5.3 Using volumetric glassware, add the pre-determined amount of sample to be used into the appropriate bottle.

5.3.5.4 Finish filling the bottle with nutrient water.

5.3.5.6 Place the probe in the BOD bottle and allow it to come to equilibrium. Once the probe stabilizes, the reading displayed is ppm dissolved oxygen. Record this value in the BOD Data Book in the initial DO_0 column and then stopper the bottle. Be sure there are no air bubbles in the bottle. Add dilution water so that the reservoir around the stopper is filled. Cap the bottle.

5.3.5.6 Run a duplicate BOD on each batch by duplicating the entire series for a sample.

5.3.5.7 Place all capped bottles in an incubator for five (5) days ±2 hours at 20°C±1°C. Record the time the bottles were placed in the incubator, the shelf they were place on, and the number of the incubator in the data book.

5.3.6 Nitrification Inhibition Samples for Carbonaceous Biochemical Oxygen Demand (CBOD) Analysis This analysis is similar to the BOD analysis except that an extra step (Section 5.3.6.3) is required.

5.3.6.1 Fill the BOD bottles half full of nutrient water.

5.3.6.2 Add 3ml of Polyseed solution to each bottle.

5.3.6.3 Using the dispensor provided by Hach, add 0.6 g of Hach Nitrification Inhibitor to each BOD bottle needing a $CBOD_5$ analysis. This includes nutrient blanks, seed corrections, standards, and samples.

5.3.6.4 Using volumetric glassware, add the pre-determined amount of sample to be used into the appropriate bottle.

5.3.6.5 Finish filling the bottle with nutrient water.

5.3.6.6 Place the probe in the BOD bottle and allow it to come to equilibrium. Once the probe stabilizes, the reading displayed is ppm dissolved oxygen. Record this value in the BOD Data Book in the initial DO_0 column and then stopper the bottle. Be sure there are no air bubbles in the bottle. Add dilution water so that the reservoir around the stopper is filled. Cap the bottle.

5.3.6.7 Run a duplicate BOD on each batch by duplicating the entire series for a sample.

5.3.6.8 Place all capped bottles in an incubator for five (5) days ±2 hours at 20°C±1°C. Record the time the bottles were placed in the incubator, the shelf they were place on, and the number of the incubator in the data book.

5.4 Determining DO after Incubating 5 days

5.4.1 When the five day ±2 hours incubation period is complete, remove all bottles from the incubator and record the time the bottles were taken out.

5.4.2 The DO probe should be calibrated at least one (1) hour before the sample BOD bottles are removed from incubator, and the calibration checked immediately prior to analysis (see section 5.2).

5.4.3 Remove all caps from the bottles, but keep the bottles stoppered until the final DO is to be read.

5.4.4 Calibrate the probe in the same manner as described in Section 5.2.

5.4.5 Place the probe in a BOD bottle and allow it to come to equilibrium. Once the probe stabilizes, the reading displayed is ppm dissolved oxygen. Record this value in the BOD Data Book in the DO_5 column.

5.4.6 Calculate, evaluate, and record all BOD data as soon as the last sample has been analyzed. Submit all work orders to Customer Service. Complete and distribute a Non-Conformance Report if any data doesn't meet the QC criteria.

6.0 CALCULATIONS

6.1 Seed Correction Calculation

The DO uptake of seeded dilution water incubated for five (5) days should be between 0.6 and 1.0 mg/L. It must not be >1.0 mg/L; if it is, this is an indication of a contamination. Since there must be a DO uptake >2.0 ($\Delta DO>2$) for the analysis to be valid, larger volumes of seed must be used in the seed correction samples than in the standards and samples. The following steps correct for this difference:

6.1.1 The seed correction should be calculated as in the following example when 10 ml of Polyseed is used in the Seed Correction bottle and only 3ml of seed is used in the sample bottles:

$$\text{Seed Correction for 10ml Polyseed} = (DO_0 - DO_5) \times \frac{\text{ml of seed in sample}}{\text{ml of seed used in seed correction}}$$

$$= (8.73 - 5.84) \times \frac{3\text{ml}}{10\text{ml}} = 0.867 \text{ mg/L}$$

6.1.2 The seed correction using 15ml of Polyseed:

$$= (8.76 - 4.81) \times \frac{3ml}{15ml} = 0.79 \text{ mg/L}$$

6.1.3 The seed correction using 20ml of Polyseed:

$$= (8.76 - 3.81) \times \frac{3ml}{20ml} = 0.7425 \text{ mg/L}$$

6.2.4 Average Seed Correction Factor for 3ml of seed:

Seed Correction = (0.867 + 0.79 + 0.7425) / 3 = 0.800 mg/L.

6.2 Standards

6.2.1 An acceptable BOD_5 value for the 300 mg/L glucose and glutamic acid standard is 198 ± 30.5 mg/L or between 167.5 and 228.5mg/L. ***Note: Because the BOD standard prepared by Hach contains 300 mg/L each of glucose and glutamic acid, the BOD value determined must be divided by two.***

6.2.2 Calculate the BOD of the standards the same way as it is calculated for the samples. The average of all valid data points must fall within the allowable limits (198±30.5 mg/L) for the batch to pass the QC requirements.

6.2.3 If the standard does not fall within these limits then all samples associated with this batch need to be re-sampled and re-analyzed. Continue taking BOD readings on the samples in case a sample can not be resubmitted and the data must be submitted with a qualification. Follow ERMI protocols on submitting a Non-Conformance Report to the Quality Assurance Officer and with the sample data.

6.3 Sample Concentration Determination

Note: For a BOD dilution to be valid, the DO_5 must be >1.0 mg/L and the Δ DO or DO uptake between initial and final value must be >2.0mg/L.

6.3.1 Determine the Δ DO by subtracting the Initial DO from the Final DO. Record in the Δ DO column of the data sheet.

$$\Delta\, DO = DO_0 - DO_5$$

6.3.2 BOD Concentration

$$\text{BOD mg/L} = \Delta\, DO - \text{Seed Correction} \times \frac{\text{Total Volume in BOD bottles (ml)}}{\text{Sample Volume (ml)}}$$

For example: The sample has three (3) dilutions: 2ml, 5ml, 10ml.

Samp.Vol	DO_0	DO_5	Δ DO	Seed Corr	BOD_5
2ml	8.77	6.74	2.03	0.85	177
5ml	8.73	5.39	3.34	0.85	149
10ml	8.68	2.57	6.11	0.85	158

6.3.3 Report all BOD values using two significant figures. If more than one sample dilution meets the criteria of a residual DO of at least 1 mg/L and a DO depletion of at least 2 mg/L and there is no evidence of toxicity (BOD value drops dramatically with increasing concentration) or the existence of an obvious anomaly (one value significantly out of line with the rest of the data), average the results of all acceptable BOD values.

$$(177 + 149 + 158) \div 3 = 161 \text{ mg/L BOD.}$$

6.4 Detection Limit Calculation

$$\text{Det. Limit} = (2\text{mg/L} - \text{Seed Correction}) \times \frac{\text{Total Volume in Bottle (300ml)}}{\text{Largest Valid Volume of Sample}}$$

For example: Seed Correction = 0.85mg/L

Highest Valid Volume of sample = 50ml

Detection Limit = (2mg/L - 0.85mg/L) x 300ml / 50ml
= 1.15ml/L x 6 = 6.90mg/L

7.0 SOIL AND SLUDGE MODIFICATIONS

This method is not appropriate for soils or sludges.

8.0 QUALITY CONTROL

8.1 Definitions

8.1.1 Batch A batch of samples of like matrix made up of from one (1) to ten (10) samples plus at least one duplicate sample along with the appropriate QC (Sections 8.1.2, 8.1.3, and 8.1.4). Separate batches must be run for BOD Samples requiring Nitrification Inhibition ($CBOD_5$).

8.1.2 Nutrient Blank Four BOD bottles filled with a volume of nutrient water treated in the same manner as the samples, but DO NOT contain seed. Two of the bottles are read for the initial DO. The other two are capped and read at the end of five (5) days of incubation.

8.1.3 Seed Correction A volume of nutrient water containing 10ml, 15ml, 20ml of seed. The seed is incubated with the samples for five (5) days. The calculated seed correction must fall within 0.6 to 1.0 mg/L.

8.1.4 Standards A series of known standard solutions used by the analyst to determine the accuracy of the BOD analysis. This series consists of a volume of nutrient water, standard solution and seed treated in the same manner as the samples. The standard must be 198 ± 30.5 mg/L (Standard Methods).

8.1.5 Duplicate Sample At least one sample chosen at random within each batch of samples is run in duplicate. Each duplicate must have identical dilutions. Duplicate samples are used to document the precision of the method. The Standard Deviation and Coefficient of Variation are calculated from the duplicate values.

8.2 Quality Control Limits

8.2.1 Minimum Depletion: A dilution must have at least a 2mg/l drop in the DO (ΔDO) for the analysis to be valid.

8.2.2 Maximum Depletion: A dilution must not reduce the oxygen content below 1mg/l for the analysis to be valid.

8.2.3 The duplicate values must have a CV of less than 10%.

8.2.4 The percent recovery on the standard must be within the limits of 198 ± 30.5 mg/L

8.2.5 Nutrient Blanks are run to check the quality of the dilution water. The DO uptake in a sample incubated for five (5) days at 20±1°C should not be more than 0.2 mg/L and preferably not more than 0.1 mg/L.

8.3 Quality Control Calculations

The following calculations are used to illustrate the BOD quality control calculations. A summary of the data used is given below:

Sample	3.87
Duplicate	3.99

8.3.1 Mean ($\overline{x}$) is the arithmetic sum of all the duplicate values in a batch divided by the total number of duplicate samples.

$$\overline{x} = (x_1 + x_2)/2$$

$$\overline{x} = (3.87 + 3.99)/2$$

$$\overline{x} = 3.93 \text{ mg/L}$$

8.3.2 Standard Deviation (SD) represents the dispersion of the samples around the mean. It is estimated by making a number of replicate measurements of a given sample. This value may be calculated using a calculator and following the manufacturer's instructions, or by using the simplified formula below if only two data points are collected.

$$SD = |x_2 - x_1| / 1.4142$$

$$SD = (3.99 - 3.87) / 1.4142$$

$$SD = 0.08485$$

8.3.4 Coefficient of Variation (CV)

$$CV = \frac{\text{Standard Deviation (SD)}}{\text{Mean } (\overline{X})} \times 100$$

$$CV = \frac{0.08485}{3.93} \times 100$$

$$CV = 2.1\%$$

9.0 SAFETY AND HYGIENE

9.1 Use Safety glasses and gloves, and a lab coat.

9.2 Read the MSDS sheets for further safety information. An MSDS sheet is attached for the Polyseed. Do not breath the dust from the capsule.

9.3 The contents of the nutrient pillows and standard are harmless.

9.4 Use care in opening the standard vials. Wrap the top of the ampoule in a paper towel and then snap it open; this should prevent cuts.

10.0 WASTE DISPOSAL

- After neutralization, dispose of all BOD wastes in the sanitary sewer system.

Effective Date: January 1, 1994	Subject	Method: 405.1
Approved By QAM:	5 DAY BIOCHEMICAL OXYGEN DEMAND	Page 15 of 16
Approved By LM:		Revision: 6-22-95

11.0 Clean Up and Maintenance

11.1 BOD bottles must be emptied out and refilled with hot, soapy (Alconox) water immediately after analysis. Allow the bottles to soak for at least 24 hours. After soaking, shake out the soapy water and wash in dishwasher. Run the bottles through three to five cycles. Rinse thoroughly with deionized water. Put the bottles in the drying oven and allow to dry completely.

11.2 Do not deviate from this cleaning regime. These bottles will become easily contaminated if they are not cleaned properly.

11.3 Caps and stoppers are washed in hot, soapy water. Stoppers are dried in the oven. Store caps and stoppers in the drawers.

11.4 Once a week, add a small amount of DI water to the BOD probe sleeve on the Orion meter housing, then pour out any water not absorbed by the sponge.

Effective Date: January 1, 1994	Subject	Method: 405.1
Approved By QAM:	5 DAY BIOCHEMICAL OXYGEN DEMAND	Page 16 of 16
Approved By LM:		Revision: 6-22-95

Table 405.1-1
BOD Dilutions

COD Value	Theoretical BOD Value	Theoretical Sample Volumes
<20	<10	300ml, 150ml
20-50	10-25	100ml, 50ml, 25ml
50-100	25-50	50ml, 25ml, 10ml
100-200	50-100	25ml, 10ml, 5ml
200-400	100-200	10ml, 5ml, 2ml
400-800	200-400	10ml, 5ml, 2ml, 1ml
800-1600	400-800	4ml, 2ml, 1ml, 0.5ml
1600-3000	800-1600	2ml, 1ml, 0.5ml, 0.3ml, 0.2
3000-6000	1500-3000	1ml, 0.5ml, 0.3ml, 0.2ml, 0.1ml
6000-12000	3000-6000	1ml, 0.5ml, 0.3ml, 0.2ml, 0.1ml, 0.05ml
12000-24000	6000-12000	0.4ml, 0.2ml, 0.1ml, 0.05ml, 0.03ml, 0.02ml
24000-48000	12000-24000	0.2ml,0.1ml,0.05ml,0.03ml,0.02ml,0.01ml
48000-96000	24000-48000	0.1ml,0.05ml,0.03ml,0.02ml,0.01ml,0.005ml

This table is designed so that, for higher BOD values, at least one dilution will be too concentrated, at least two dilutions will be in the valid concentration range and at least two values will be more dilute than needed to cover the range.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 1 of 8
Approved By LM:		Revision: 8-14-95

Detection Limit: 1.0 mg/L on 500ml Samples. See Section 6.2

Sampling	: Composite
Container	: 500ml Plastic/Glass
Preservation	: Cool 4°C
Holding Time	: 7 Days

1.0 GENERAL DISCUSSION

This method is based on EPA Method 160.2 and is applicable to total suspended solids in drinking, surface, and saline waters, domestic and industrial wastes. The procedure involves taking a well-mixed sample and filtering it through a dried, pre-weighed, standard glass fiber filter and the residue retained on the filter is dried to a constant weight. The increase in weight of the filter represents the total suspended solids (TSS). Samples must be collected in clean plastic or glass bottles. They must be analyzed as soon as possible after collection, but can be stored up to seven days when cooled to 4°C.

2.0 INTERFERENCES

The filtration apparatus, filter material, pre-washing, post-washing and drying temperature are specified because these variables have been shown to affect the results.

Samples high in Filterable Residue (dissolved solids), such as saline waters, brines and some wastes, may be subject to positive interference. For samples high in dissolved solids, thoroughly wash the filter to ensure removal of the dissolved material.

Excessive residue on the filter may form a water entrapping crust, so limit the sample size to that yielding no more than 200mg of residue.

Non-representative particulates such as leaves, sticks, fish and rocks may be removed before analysis.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 2 of 8
Approved By LM:		Revision: 8-14-95

3.0 APPARATUS

- Aluminum weighing boats
- Tweezers
- 47 mm Glass fiber filter disc (Whatman 934-AH)
- Graduated cylinder, 100ml
- Volumetric flask, 1000ml
- Analytical balance
- Desiccator
- Filter holder, 47mm
- Drying oven
- Suction flask, or filtering apparatus

4.0 REAGENTS

4.1 Deionized Water Obtain DI water from our in-house system which is checked daily to insure the water quality.

4.2 Standard Weigh out between 200-400mg of cellulose (Sigmacell) on the analytical balance and add it to 900ml of DI water in a 1 Liter volumetric flask. Stir with a magnetic stirrer for about one-half hour or until no clumps of cellulose are present, then dilute to 1000ml.

5.0 PROCEDURE

5.1 Preparation Of Filter Disc

5.1.1 Place a 47 mm filter disc in a filter holder with the wrinkled surface of the filter upward.

5.1.2 Place the filter holder assembly in a filtering flask and apply vacuum.

5.1.3 Wash the disc with three successive 20ml volumes of deionized water.

5.1.4 Remove all traces of water by continuing to apply vacuum after the water has passed through.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 3 of 8
Approved By LM:		Revision: 8-14-95

5.1.5 Remove the disc from the filter holder with tweezers and transfer it to a numbered aluminum weighing boat.

5.1.6 Place the boats in a drying oven at 103°C for one hour.

5.1.7 Remove the boats from the oven and place in a desiccator until cooled to room temperature.

5.2 Sample Volume

5.2.1 On clear samples, a minimum of 100ml of sample should be filtered. If this yields less than 1mg of residue, a larger sample must be used. Up to 500ml may be filtered for clear or easily filtered samples. Excessive residue on the filter may form a water entrapping crust, so limit the sample size to that yielding no more than 200mg of residue.

5.2.2 If during filtration of this initial volume, the filtration stops, or if the filtration time exceeds five minutes, a smaller sample size is required. Start with a fresh filter paper and another (smaller) aliquot of sample.

5.3 Sample Filtration

NOTE: ALL SAMPLES MUST BE AT ROOM TEMPERATURE BEFORE ANALYSIS.

5.3.2 At the time of analysis, take the appropriate number of prepared filters out of the desiccator. Using a pair of tweezers, weigh each glass fiber filter with an analytical balance to the nearest 0.0001g. Record the weight of the filter and the number of the aluminum boat in the TSS data book. Return the filter to its respective boat.

5.3.3 Utilizing a pair of tweezers, place the previously weighed glass fiber filter disc into the filter holder flask assembly.

5.3.4 Wet filter disc with deionized water to ensure adhesion to the holder.

5.3.5 Shake the sample <u>vigorously</u> and immediately quantitatively transfer a volume of sample as determined in Section 5.2 to the filter using a graduated cylinder and apply vacuum.

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 4 of 8
Approved By LM:		Revision: 8-14-95

5.3.6 Remove traces of water by continuing to apply vacuum after the sample has passed through the filter.

5.3.7 With vacuum applied, rinse the graduated cylinder, filter, non-filterable residue, and filter holder wall with three separate portions of distilled water allowing complete drainage between washings.

5.3.8 Slowly release the vacuum from filtering system by removing the hose connection and carefully remove the filter disc from the holder.

5.3.9 Place the disc in its respective pre-numbered aluminum weighing boat.

5.3.11 Pre-heat the oven to103°C-105°C prior to drying the prepared samples.

5.3.10 Place the boat with filter in a drying oven for at least one hour at this temperature or until filters are dried to a constant weight.

5.3.12 Remove the samples from the oven and place in a desiccator until cooled to room temperature.

5.3.13 Remove the disc with a pair of tweezers and weigh to nearest 0.1 mg on the analytical balance. Record final weight in the TSS data book.

CAUTION: If the filters have not been dried to a constant weight or they have not equilibrated to room temperature, the analytical balance read out will fluctuate abnormally.

6.0 CALCULATIONS

6.1 Sample Calculation

$$\text{TSS in mg/L} = \frac{(B - A)\ \cancel{(g)}}{\text{Vol sample filtered}\ \cancel{(ml)}} \times \frac{1000mg}{1g} \times \frac{1000\cancel{ml}}{1L}$$

or $$\text{TSS in mg/L} = \frac{(B - A)}{\text{Vol sample filtered}} \times 1{,}000{,}000$$

A = weight of filter disc (in grams)
B = weight of residue plus filter disc after drying (in grams)

Example: The initial weight of the filter was 0.1076g and the final weight of the filter plus residue was 0.1307g. A sample volume of 100ml was used.

$$\text{TSS in mg/L} = \frac{(0.1307 - 0.1076)}{100} \times 1{,}000{,}000 = 231\text{mg/L}$$

6.2 Detection Limits The detection limit is limited by the requirement that the filters be dried to a constant weight which differs by no more than 0.5mg from the previous weight. The detection limit is calculated by the following formula:

$$DL = \frac{0.5\text{mg}}{\text{Sample Vol (L)}}$$

Sample Vol (ml)	Det.Limit
25	20
50	10
100	5
200	2.5
500	1

7.0 SOIL AND SLUDGE MODIFICATIONS

This parameter is not performed on soil or sludge samples.

8.0 QUALITY CONTROL

For each set of ten (10) samples, a blank, a duplicate sample, and a standard are to be analyzed.

8.1 Definitions

8.1.1 Batch A batch of samples is made up of one (1) to ten (10) samples of like matrix plus at least one duplicate sample and one standard sample.

8.1.2 Reagent Blank Deionized water is added in the same volumes or proportions as used in the sample preparation. It must be carried through the complete analytical procedures. The Reagent Blank is used to document the concentration of TSS that is inherent in the analytical process. It is mandatory that a Reagent Blank be run with each batch of samples.

8.1.3 Standard A solution of known TSS concentration is taken through the same steps as the samples. This sample is used to evaluate the percent recovery.

8.1.3 Duplicate Sample The analysis of an additional aliquot of at least one (1) random sample in the batch. This sample is treated the same as the other samples and undergoes the same procedures. Duplicate samples are used to document the precision of the method. The Standard Deviation and Coefficient of Variation are calculated from the duplicate data.

8.2 Quality Control Limits Before any data is submitted, it must meet the following QC Criteria. A Non-Conformance form must be completed for any batches not passing one or more of the QC Criteria, the problem(s) resolved, and the batch reanalyzed to achieve quality results. If insufficient sample exists for reanalysis, the client needs to be contacted and either more sample obtained or approval given to report results outside ERMI QC Limits. Any results with QC outside ERMI QC Limits must be documented on the final report.

8.2.1 The absolute value of the Reagent Blank must less than 0.5mg

8.2.2 The CV must be less than or equal to 10% for the batch to pass this ERMI QC requirement.

8.2.3 The percent recovery of the standard must be within the limits of 100±10% for the batch to pass this ERMI QC requirement.

8.3 Quality Control Calculations

The following calculations illustrate the QC Calculations. A summary of typical data is given below:

Sample	125mg/L
Sample Dup	119mg/L

8.3.1 **Mean ($\overline{x}$)** is the arithmetic sum of all the duplicate values in a batch divided by the total number of duplicate samples.

$$\overline{x} = (x_1 + x_2) / 2$$

$$\overline{x} = (125 + 119) / 2$$

$$\overline{x} = 122\text{mg/L}$$

8.3.2 **Standard Deviation (SD)** represents the dispersion of the samples around the mean. It is estimated by making a number of replicate measurements of a given sample. This value may be calculated using a calculator and following the manufacturer's instructions, or by using the simplified formula below if only two data points are collected.

8.3.3 **Standard Deviation for two data points:**

$$SD = | x_2 - x_1 | / 1.4142$$

$$= | 125 - 119 | / 1.4142$$

$$= 4.2426$$

8.3.4 **Coefficient of Variation (CV)**

$$CV = \frac{\text{Standard Deviation (SD)}}{\text{Mean } (\overline{x})} \times 100$$

$$= \frac{4.2426}{122} \times 100$$

$$= 3.478\%$$

8.3.6 **Percent Spike Recovery (% Recovery)**

$$\%\text{Rec.} = \frac{\text{Standard Conc.}}{\text{Known Std Concentration}} \times 100$$

$$\%\text{Rec.} = \frac{255\text{mg/L}}{265\text{mg/L}} \times 100 = 96$$

Effective Date: January 1, 1994	Subject	Method: EPA 160.2
Approved By QAM:	TOTAL SUSPENDED SOLIDS or Non-Filterable Residue	Page 8 of 8
Approved By LM:		Revision: 8-14-95

9.0 SAFETY AND HYGIENE

9.1 Use safety glasses, gloves, and a lab coat.

9.2 Read the MSDS sheet for more safety information on the reagent used in this procedure.

9.3 Filter and dry any smelly samples in the hood room.

10.0 WASTE DISPOSAL

10.1 Neutralize and dispose of filtrate in sanitary sewer if no other hazardous components are found.

10.2 Dispose of the filter and TSS in the trash if no other hazardous components are found.

11.0 CLEAN UP AND MAINTENANCE

Glassware is washed with laboratory grade detergent then rinsed three times with tap water, followed by three rinses with DI water.

Effective Date: August 5, 1993	Subject	Method: EPA 410.4
Approved By QAM: GH	COD COLORIMETRIC ANALYSIS using BLOCK DIGESTION	Page 1 of 10
Approved By LM: [illegible]		Revision 8-11-95

Detection Limit: High Range 20mg/L
Low Range ~~5~~mg/L 4.0

Sampling : Composite/Grab
Container : Plastic/Glass
Preservative : Cool @ 4°C / H_2SO_4 to pH <2
Holding Time : 28 days

1.0 GENERAL DISCUSSION

This method measures the quantity of Oxygen required to oxidize the organic matter in surface water, and domestic or industrial wastes under specific oxidizing conditions, at a set temperature and time. Samples are collected in glass or plastic containers and preserved with 1:1 sulfuric acid to a pH<2. Samples are kept at 4°C until analysis.

Samples, blanks and standards are placed in sealed tubes with a strong oxidizing agent and heated at 150°C for 2 hours. After this time, they are allowed to cool and the absorbance is read using the Spectronic 20, set at 600nm.

2.0 INTERFERENCES

Chlorides are quantitatively oxidized by dichromate and represent a positive interference. Mercuric sulfate is added to the digestion tube to complex the chloride and reduce this interference.

3.0 APPARATUS

- Hach COD reactor set at 150°C
- Glass culture tubes with Teflon screw caps (do not mix brands)
- Spectronic 20D set at 600nm
- Volumetric pipets, 1ml, 2ml, and 10ml
- Volumetric pipettor, 100µl
- Automatic pipettor, 5ml adjustable
- Volumetric flask, 100ml, 1000ml
- Analytical balance

Effective Date: August 5, 1993	Subject	Method: EPA 410.4
Approved By QAM:	COD COLORIMETRIC ANALYSIS using BLOCK DIGESTION	Page 2 of 10
Approved By LM:		Revision 8-11-95

4.0 REAGENTS All reagents must be labeled with Contents, Concentration, Preparer, Preparation Date, and Expiration Date. The preparation data must be recorded in the Standard Preparation Log or the Reagent Preparation Log.

4.1 Digestion Solution Add 167ml conc. H_2SO_4 to 500ml distilled water. While the solution is still hot, dissolve 33.3g Mercuric Sulfate ($HgSO_4$) and 10.2g Potassium Dichromate ($K_2Cr_2O_7$) in this solution. Cool and dilute to 1 liter in a volumetric flask.

4.2 Catalyst Solution Add 22g of Silver Sulfate (Ag_2SO_4) to a 4.09Kg (2.5 liters) bottle of conc. H_2SO_4. Stir until dissolved.

4.3 COD Standard, 800mg/L Dissolve 0.680g of primary grade potassium acid phthalate in 800ml of DI water and dilute to 1000ml in a volumetric flask. This standard is stable for 6 months.

4.4 Laboratory Control Sample Stock, 1000mg/L Dissolve 0.850g of primary grade potassium acid phthalate in 800ml of DI water and dilute to 1000ml in a volumetric flask. This standard is stable for 6 months. A different source of potassium acid phthalate must be used in this preparation than in the standard.

5.0 PROCEDURE

5.1 Preparation of COD Tubes When preparing COD tubes, prepare as many as possible at the same time. Verify and document the accuracy of the pipettor at the beginning and end of the dispensing process.

5.1.1 Wash all culture tubes with hot soapy water and rinse ***extremely thoroughly*** with distilled water. Allow to air dry or dry in oven.

5.1.2 Using an automatic pipettor, set at 2.8mls, add catalyst solution to each COD tube.

5.1.3 Using a second pipettor, set at 1.2mls, add digestion solution to each tube.

CAUTION: TUBES WILL BECOME HOT. THESE SOLUTIONS ARE EXTREMELY CORROSIVE!!! WEAR SAFETY GLASSES, GLOVES AND A LAB COAT WHEN HANDLING THESE CHEMICALS.

5.1.4 Before running samples with the new batch of tubes, run a standard. Document the date & the standards recovery

Effective Date: August 5, 1993	Subject	Method: EPA 410.4
Approved By QAM:	COD COLORIMETRIC ANALYSIS using BLOCK DIGESTION	Page 3 of 10
Approved By LM:		Revision 8-11-95

5.2 Preparation of Standards

Vol COD Std (ml)	Vol D.I. Water (ml)	Conc. of Std (mg/L)
0.00	2.00	0
0.10	1.90	40
1.00	1.00	400
2.00	0.00	800

CAUTION: ALL TUBES MUST BE SHAKEN PRIOR TO GOING INTO COD REACTOR TO PREVENT THEM FROM EXPLODING. PLACE IN BLOCK DIGESTOR GENTLY TO AVOID BREAKING TUBES.

5.3 Preparation of Samples Place enough COD tubes in a test tube rack to prepare a complete batch including all QC specified in Section 8.0 plus a few extras to use if dilutions are needed.

5.3.1 Be sure that the sample is mixed completely. If it contains solids which will not suspend easily, mix with a blender before sampling. The sample should be able to easily pass through a pipet tip without clogging.

5.3.2 Add 2ml of sample to a COD tube using a volumetric pipet.

5.3.3 For each spike add 1ml COD standard and 1ml sample to a COD tube using volumetric pipets or calibrated pipettors. Cap and shake well.

5.3.4 Prepare an LCS by pipeting 1ml of LCS stock and 1ml of DI water into a COD tube.

5.3.5 Some samples will have a high COD content and the tube will turn green or aqua immediately upon adding sample. If this happens, a dilution will need to be made.

5.3.5.1 Try a 1:1 dilution first. If a 1:1 dilution turns tube green, then try a 1 to 10 dilution. Use a volumetric pipet to add 10ml of sample into a 100ml graduated cylinder, then dilute to 100ml using deionized water.

5.3.5.2 If a 1:10 dilution turns green, then run a 1:100 dilution by using a volumetric pipet to add 1ml of the original sample into a 100ml graduated cylinder and diluting to volume with deionized water.

NOTE: All dilutions must be made before the digestion. Recheck the tubes after 15 minutes to see if any have turned green and need further dilution.

5.3.6 When all of the samples and dilutions have been prepared, place the tubes in the preheated COD block digester. Remember to shake tubes well before heating. Allow the tubes to digest for 2 hours.

5.3.7 After 2 hours, take the tubes out of block digester and allow them to cool.

5.4 Low Level Modifications The following modifications to this SOP are needed for samples requiring analysis at levels below 20ppm.

5.4.1 Special low level COD tubes from HACH are required.

5.4.2 Dilute the 800ppm standard 1:10 to get a 80ppm standard. Prepare the standard COD tubes as follows:

Vol 80ppm Std (ml)	Vol D.I. Water (ml)	Conc. of Std (mg/L)
0.00	2.00	0
0.25	1.75	10
0.50	1.50	20
1.00	1.00	40
2.00	0.00	80

5.4.3 To prepare an LCS, use only 0.100ml of the 1000ppm LCS concentrate plus 1.900ml of DI water.

5.4.4 Use the Spec 20 rather than the Spec 20D and set the wavelength to 420nm. After a 15min. warm-up, adjust the needle to 0% transmittance.

5.4.5 For this colorimetric low level analysis, you will be measuring the decrease in yellow color rather than the increase in green color. Insert the blank and adjust the needle to 0.5 absorbance units. Each increase in concentration will yield a smaller absorbance value.

5.5 Photometric Analysis

5.5.1 Turn on the Spec 20D. Allow a 15 minute warm-up.

5.5.2 Use the visible photocell and the red filter.

5.5.3 Set the wavelength with the dial on top of the Spec 20D to 600nm.

5.5.4 Using the knob on the left, zero the machine to the zero on the left side of the scale.

5.5.5 Insert the calibration blank (Section 8.1.2) and set full scale absorbance at zero. Repeat the above procedure to be sure the Spec 20D is correctly zeroed and stabilized.

5.5.6 Wipe each tube clean before inserting it into the Spec 20D. Insert the standard and sample tubes and read the absorbance on the lower (Absorbance) scale. Record this value in the data book.

6.0 CALCULATIONS

6.1 Standard Curve Calculations (mg/L)

Prepare a standard curve by plotting the absorbance values of the standards versus COD concentration of that standard. Obtain the concentration value of the samples directly from the standard curve. The curve is prepared and concentrations may be calculated using a calculator, computer, or by hand plotting and graphing the analytical results.

6.2 Dilution Factor Calculation

Dilution Factor (DF) = (C + B) /C
Sample Concentration (mg/L) = A [(C + B) /C] = A x DF

Where: A = mg/L of COD in diluted aliquot from standard curve
B = ml of deionized water used for dilution
C = ml of sample aliquot

DF = (10ml + 90ml) /10ml = 10
Sample Concentration = 108.33 mg/L x 10 = 1083.3mg/L

6.3 Detection Limit Calculation A new detection limit must to be calculated any time there is a dilution. This is done by multiplying the normal detection limit times the dilution factor.

Det Limit = 20ppm X 10 = 200ppm

7.0 SOILS AND SLUDGE MODIFICATIONS

This method is not suitable for soils or sludges.

8.0 QUALITY CONTROL

Each BATCH, of no more than 10 samples of like matrix must meet certain ERMI QC Criteria before the batch data can be released and the final report prepared.

8.1 Definitions

8.1.1 Batch A batch of samples is made up of one (1) to ten (10) samples of like matrix plus a Matrix Spike Sample, a Matrix Spike Duplicate Sample, and a Laboratory Control Sample.

8.1.2 Calibration Blank A volume of deionized water treated in the same manner and containing the same reagents as the samples used in the spectrophotometric analysis (Section 5.0).

8.1.3 Calibration Standards A series of known standard solutions used by the analyst to prepare a standard curve. This series consists of a volume of deionized water and standard solution treated in the same manner and containing the same reagents as the samples. The calibration blank and the calibration standards are analyzed at the beginning of the run. If there are continual batches for the same parameter being run at the same time, one set of calibration standards will suffice for all batches run.

8.1.4 Matrix Spike Sample A known concentration of standard is added to a separate aliquot of sample prior to adding the reagents. Spike concentration levels should be selected by considering sensitivity and detection limits. The Matrix Spike Sample is used to document the accuracy of the method.

8.1.5 Matrix Spike Duplicate Sample This sample is a duplicate analysis of the Matrix Spike Sample, spiked at the same concentration. Matrix Spike Duplicate Samples are used to document the precision of the method. The standard deviation and coefficient of variation are calculated using the spike and the spike duplicate data.

8.1.6 Laboratory Control Sample This sample is a standard from a different source than the calibration standards which must be taken through the complete analytical procedure. It is used to check the accuracy of the standardization.

8.2 Quality Control Limits Before any data is submitted, it must meet the following QC Criteria. A Non-Conformance form must be completed for any batches not passing one or more of the QC Criteria, the problem(s) must be resolved, and the batch reanalyzed to achieve quality results. If insufficient sample exists for reanalysis, the customer needs to be contacted and either more sample obtained or approval given to report results outside ERMI QC Limits. Any results with QC outside ERMI QC Limits must be documented on the final report.

8.2.1 Recovery The reported recovery is the average recovery of the Matrix Spike and Matrix Spike Duplicate analyses. This value must not exceed 100±10% to pass ERMI QC requirements. The entire batch must be reanalysed if this value is exceeded.

8.2.2 Coefficient of Variation The coefficient of variation is calculated using the Matrix Spike and Matrix Spike Duplicate analyses. This value must not exceed 10% for the batch to pass ERMI QC requirements.

8.2.3 Laboratory Control Sample The recovery of this QC sample must not exceed 100±10% for the batch to pass ERMI QC requirements.

8.2.3 Absorbance Verification The absorbance of the 400ppm standard must be within 10% of the average of the last four 400ppm standards for it to pass this ERMI QC requirement.

8.3 Quality Control Calculations

Example Data:

Spike	345.8
Spike Dup	355.8

8.3.1 Mean ($\overline{x}$) is the arithmetic sum of all the duplicate values in a batch divided by the total number of duplicate samples.

$$\overline{x} = (x_1 + x_2)/2$$

$$\overline{x} = (345.8 + 355.8)/2$$

$$\overline{x} = 350.8 \text{mg/L}$$

8.3.2 Standard Deviation (SD) represents the dispersion of the samples around the mean. It is estimated by making a number of replicate measurements of a given sample. This value may be calculated using a calculator and following the manufacturer's instructions, or by using the simplified formula below if only two data points are collected.

8.3.3 Standard Deviation for two data points

$$SD = |x_2 - x_1| / 1.4142$$

$$SD = |345.8 - 355.8| / 1.4142$$

$$SD = 7.071$$

8.3.4 Coefficient of Variation (CV)

$$CV = \frac{\text{Standard Deviation (SD)}}{\text{Mean } (\overline{x})} \times 100$$

$$CV = \frac{7.071}{350.8} \times 100$$

$$CV = 2.02\%$$

8.3.5 Percent Spike Recovery (% Recovery) For example, the concentration of a sample is 701.6mg/L and the spiked sample is 760.5mg/L. This sample was spiked with 1ml of 800mg/L standard.

$$\text{Spike Conc. (mg/L)} = \frac{\text{Vol of Spike (ml)} \times \text{Conc. of Spike (mg/L)}}{\text{Vol of Sample (ml)}}$$

$$= \frac{1\text{ml} \times 800\text{mg/L}}{2\text{ml}}$$

$$= 400 \text{ mg/L}$$

$$\text{\%Recovery} = \frac{\text{Spiked Sample Conc.} - \tfrac{1}{2}\text{Original Sample Conc.}}{\text{Known Spike Concentration}} \times 100$$

$$= \frac{760.5 - 350.8}{400 \text{ mg/L}} \times 100 = 102.4$$

9.0 SAFETY AND HYGIENE

9.1 Wear safety glasses, gloves, and a lab coat.

9.2 Read the MSDS sheets for additional safety and hygiene information on the chemicals used in this procedure.

9.3 Be aware that the tubes become very hot and build up pressure while the digestion is proceeding.

9.4 Use the safety shield on the block digestor.

10.0 WASTE DISPOSAL

10.1 All digested samples and standards must be treated as hazardous wastes. They are composited and turned in to the Hazardous Waste Coordinator for disposal according to our Hazardous Waste Disposal Plan.

10.2 Unused sample which has no toxic properties should be neutralized and poured down the sanitary sewer.

11.0 CLEAN UP AND MAINTENANCE

Wash glassware with a laboratory grade detergent then rinse three times with tap water. Allow to soak in DI water for several hours, then rinse three times with DI water. ***Be sure to rinse all glassware extremely well. Any residue of soap will be measured by this test.***

Town of Addison
Wastewater Flows

Name	Title	Phone
Alan Greer	Principle, Dallas Mgr.	214-920-2500
Jim Pierce	Asst. Public Wks Director	972-450-2879
Donna Renner	RJN Group, Inc	972 437-4300
Leonard Ripley	Freese & Nichols	817-735-7347
Keith Thompson	Utilities Foreman Addison	(972) 450-2873
Jim Henry	MONITORING SUPV. WWC	214 670 0292
Tonia R. Lichtenberg	DWU	214/670 5886
Chris Kaakaty	DWU/Pretreatment & Lab Services Mgr.	214-670-6940
Larry Patterson	AD-WW ops - DWU	(214) 670-3145
Randy Stalnaker	DWU	214-670-5887
MIKE MURPHY	TOWN OF ADDISON	972-450-2878
Chris Terry	"	"
Gary L Morgan	DWU	214 670-8771
Lee Davis	DWU	214 670 4947
MAURICE AKECH	DWU	214 670 4581
Rick Galceran	DWU	214-948-4242

FREESE • NICHOLS

1701 N. Market Street, Suite 500 LB 51
Dallas, Texas 75202-2001
Phone: (214) 920-2500
Fax: (214) 920-2565
www.freese.com

Project Number: ADD00356

TO: Michael Murphy
FROM: Jim Baddaker
DATE: January 31, 2001
RE: ADDISON SEWER STUDY Weekly Report (Jan 22-26)
CC: ADG

Project Updates:

- No work.
-

Tasks and deliverables for the next two weeks:

- Meet with DWU

Date:	Deliverable:
February 8, 01	Meet with DWU

Additional Issues:

- Waiting on DWU to review report and set up meeting
- .
-

FREESE-NICHOLS

Simon W. Freese, P.E. 1900-1990
Marvin C. Nichols, P.E. 1896-1969

Fax Transmittal

TO: Michael Murphy
fax: 972-450-2837

FROM: J.R. Baddaker

DATE: 1/31/01

SUBJECT: Sewer Study Weekly Update

Total number of pages including transmittal sheet: 2

If there is a problem receiving any of the pages, please call Leah at 214-920-2500.

COMMENTS:

- END -

cc: ADD00356- 1.4

FREESE • NICHOLS

Simon W. Freese, P.E. 1900-1990
Marvin C. Nichols, P.E. 1896-1969

Fax Transmittal

TO: Michael Murphy
fax: 972-450-2837

FROM: J.R. Baddaker

DATE: 7/11/00

SUBJECT: Sewer Study Weekly Update

Total number of pages including transmittal sheet: 2

If there is a problem receiving any of the pages, please call Leah at 214-920-2500.

COMMENTS:

- END -

cc: ADD00356- 1.4

FREESE•NICHOLS
1701 N. Market Street, Suite 500 LB 51
Dallas, Texas 75202-2001
Phone: (214) 920-2500
Fax: (214) 920-2565
www.freese.com

Project Number: ADD00356

TO: Michael Murphy
FROM: Jim Baddaker
DATE: July 11, 2000
RE: ADDISON SEWER STUDY Weekly Report (July 3-7)
CC: ADG

Project Updates:

- Met with DWU on site to review protocols and monitoring sites
- RJN installed meters and samplers on the 7th
-

Tasks and deliverables for the next two weeks:

- Flow monitoring and sampling daily
- Leonard Ripley scheduled to review sampling and metering setups on Wednesday July 12.

Date: **Deliverable:**

Additional Issues:

-
-
-

April 13, 1999

Freese and Nichols, Inc.
1341 Mockingbird Lane - Suite 230E
Dallas, TX. 75247

ATTN: Alan Greer, PE

Re: Sanitary Sewer System Environmental Investigation.

Dear Alan,

The Town of Addison appreciates your interest in responding to our Request for Qualifications for the referenced project. Freese and Nichols was the first selection of the Review Committee, Carter Burgess was second and Garcia was third.

Again thank you for your participation and I look forward to working with you and your staff. Therefore, please schedule Tuesday April 13, 1999 at 10:30AM to meet with me and my staff to discuss "SCOPE" of the project.

Please feel free to contact me if you have any questions or need additional information.

Sincerely,

Michael E. Murphy, PE
Asst. Director / Town of Addison – Public Works

REQUEST FOR QUALIFICATIONS
FOR
ENVIRONMENTAL INVESTIGATION

The Town of Addison is presently accepting Statements of Qualifications from engineering consulting firms for an Environmental Investigation of the "entire" sanitary sewer system of the Town of Addison. The purpose of this project is to determine why BOD and TSS levels have been consistently increasing. Also as part of this project the successful engineering firm will be required to provide solutions and methods of implementation to lower the BOD and TSS limits below the 250 mg/l surcharge cap we are currently operating under.

The most qualified firm will be asked to submit a proposal and a fee will be negotiated to perform the work.

Addison will accept written Statement of Qualifications (SOQ) from consultants through ***???DATE??.*** Two (2) copies of the SOQ shall be submitted. The SOQ should contain a maximum number of thirty-five (35) single sided pages on 8 ½ " X 11" paper. The firm should provide enough information to demonstrate their adequate experience in analysis of wastewater quality data, measurement of wastewater flows, industrial waste discharges, infiltration and inflow and affects of construction activity and their ability to perform the work. The SOQ shall designate the individuals who will be assigned to this project (Principal-in charge, Project Manager, Project engineer, etc.) and resumes for each individual. A list of similar projects that the firm has completed in the last five (5) years shall be provided. For each project a description shall be provided along with completion date, names of project members involved in the project, name of the client, contact person, and phone number for contact person.

All written Statements of Qualifications submitted will be evaluated by the Selection Committee, which will be made up of Mike Murphy (Assistant Director of Public Works), Jim Pierce (City Engineer), Keith Thompson (Utilities Foreman). The review of the SOQ's will be based on the selection criteria shown on the attached page. The SOQ should specifically address each criterion for evaluation. If it is deemed necessary, the top three (3) firms will be asked to meet with the Town and make oral presentations.

The Town reserves the right to end this relationship if the Town is not satisfied with the performance of the firm and/or if it is in the best interest of the Town. The Town and the Engineer are not under any obligation to continue with subsequent projects.

Interested consultants should direct questions and submit Statements of Qualifications to:

Mailing: *Michael E. Murphy, P.E.*
Asst. Director of Public Works
P.O. Box 144
Addison, Texas 75001

FAX: *(972) 450-2837*
OFF: *(972) 450-2878*

TOWN OF ADDISON
PUBLIC WORKS DEPARTMENT
(972) 450-2871
Post Office Box 9010 Addison, Texas 75001-9010
16801 Westgrove

April 8, 1999

Garcia & Associates Engineering, Inc.
6850 Manhattan Blvd. - Suite 300
Fort Worth, TX. 76120

ATTN: Don M. Treude, PE

Re: Sanitary Sewer System Environmental Investigation.

Dear Don,

The Town of Addison appreciates your interest in responding to our Request for Qualifications for the referenced project. However, Freese and Nichols was the first selection of the Review Committee, Carter Burgess was second and Garcia was third.

Again thank you for your participation and I look forward to working with you and your staff on future projects.

Please feel free to contact me if you have any questions or need additional information.

Sincerely,

Michael E. Murphy, PE
Asst. Director / Town of Addison – Public Works

TOWN OF
ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

April 8, 1999

Carter – Burgess, Inc.
7950 Elmbrook – Suite 250
Dallas, TX.

ATTN: Albert C. Petrasek, Jr., Ph.D., PE

Re: Sanitary Sewer System Environmental Investigation.

Dear Al,

The Town of Addison appreciates your interest in responding to our Request for Qualifications for the referenced project. However, Freese and Nichols was the first selection of the Review Committee, Carter Burgess was second and Garcia was third.

Again thank you for your participation and I look forward to working with you and your staff on future projects.

Please feel free to contact me if you have any questions or need additional information.

Sincerely,

Mike E. Murphy

Michael E. Murphy, PE
Asst. Director / Town of Addison – Public Works

PARSON
~~FREESE~~
~~GARCIA~~
~~CARTER BURGESS~~
~~MALCOMB~~

MEMORANDUM

To: Chris Terry / Asst. City Manager

From: Michael E. Murphy, PE / Acting Director of Public Works

Re: Proposal from Freese & Nichols for Phase I Engineering Services related to the Sanitary Sewer System Environmental Investigation.

Date: April 4, 2000

Attached is a proposal from Freese & Nichols for Engineering Services related to the Sanitary Sewer System Environmental Investigation.

We are planning a three-phase approach to investigate the Town of Addison's Sanitary Sewer System in an attempt to determine what is causing increasingly high **BOD** (Biochemical Oxygen Demand) and **TSS** (Total Suspended Solids) readings. These are readings that indicate the pollutant strength of the Towns Sanitary Sewer Effluent. These indicators are then used to determine if any surcharge fines are to be assessed to the Town of Addison by the City of Dallas. For the last several months we have seen an increase in surcharge fines from the City of Dallas go from \$2000 - \$3000 per month up to a high of \$22,000, which over the last 12 months is averaging approximately \$10,000 per month.

Phase I would collect flow and sampling data from the City of Dallas for review purposes, install flow meter and sampling equipment immediately upstream of the Trinity Christian, Dallas Parkway, and Arapaho road metering facilities. The flow monitoring and sampling would coincide with the City of Dallas sampling of the Town's discharge. The results would then be compared with City of Dallas sampling results. Phase 2 would be initiated if the Phase 1 results did not identify the sources of the problem. Phase 2 would establish a sampling and flow monitoring plan for upstream of the meter stations in an attempt to isolate the sources of the high BOD and TSS readings. A review of existing land use, industrial permit users and sources, along with manhole inspections would be included. Once the sources of the high readings are determined, and then a specific plan for mitigation will be developed as Phase 3 of the process.

The proposed cost for Phase I Engineering Services is \$46,863 and will be accounted for in the Utilities Fund Account for Engineering Services 61-711-56570. Funds for Phase 2 were approved in the 1999-2000 Budget in the amount of \$131,000 and funds for Phase 3, if necessary, will be requested in 2000-2001 Budget.

Staff recommends that the Council authorize the City manager to enter into a contract with Freese & Nichols for Phase I Engineering Services estimated at \$46,863.

Utilities Division
Report for the month of March 2000
February 11, 2000 through March 9, 2000

	This Month	Last Month	Year to Date	Year Ago to Date
otal Gallons from ROF's	141,402,000	133,840,000	1,000,871,000	906,188,000
otal Gallons Billed	120,491,210	118,172,600	894,481,821	835,730,273
ccounted for Water - Leaks & City - sconnections, Final Reads, Loan Meters	589,150	606,670	4,337,460	3,211,014
otal Billed and Accounted for Water	121,080,360	118,779,270	898,819,281	838,941,287
otal Unaccounted for Water	20,321,640	15,060,730	102,051,719	67,246,713
otal Percent of Unaccounted for Water	14.37%	11.25%	10.20%	7.42%
inimum Daily Pumpage	4,180,000	3,836,000	2,729,000	2,163,000
aximum Daily Pumpage	5,814,000	5,644,000	9,100,000	8,766,000
verage Daily Use	5,050,071	4,615,172	5,686,767	4,584,379
onthly Sewer to Dallas	37,788,300	26,409,000	167,349,900	137,994,900
onthly Sewer to TRA	68,409,000	62,580,000	386,325,000	343,929,000
wood Sewer Contract (Farmers Branch)	766,016	814,424	5,336,856	5,803,112
allas Franchise, Winter Average	6,500,000	6,500,000	39,000,000	39,000,000
otal Sewer Usage	113,463,316	96,303,424	598,011,756	526,727,012
ewer Return Compared to Water Usage	80.24%	71.95%	59.75%	58.13%
otal Number of Accounts	3,122	3,122	3,136	3,186
otal Number of Water Samples	25	25	149	65
ositive Samples	0	0	1	0
egative Samples	25	25	148	65
umber of Service Orders	130	156	1083	1,238
eet of Sewer Line Cleaned	0	1,621	30,610	23,308
ewer Stoppages	0	2	6	3
or Larger Water Main Breaks	1	1	4	1
mount of Rainfall	0.95	0.22	7.31	20.59
umber of Billing Days - Addison	28	29	176	183

TOWN OF ADDISON
PUBLIC WORKS DEPARTMENT (972) 450-2871
Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

March 29, 1999

Malcolm Pirnie, Inc.
12221 Merit Drive
Suite 1170
Dallas, TX. 75251
ATTN: Robert McCollum, PE / Associate

Re: Environmental Investigation of Sanitary Sewer System

Dear Mr. McCollum,

The Town of Addison appreciates your interest in responding to our Request for Qualifications for the referenced project. Unfortunately, Malcolm Pirnie Engineering was not chosen as a finalist and is no longer being considered for this project.

Thank you for your participation.

Sincerely,

Mike E. Murphy

Michael E. Murphy, PE
Asst. Director of Public Works / Addison

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

March 29, 1999

Parsons Engineering Science, Inc.
5485 Beltline Road
Suite 199
Dallas, TX. 75240-7655
ATTN: Jack Thibodeau, PE / Manager, Dallas Office

Re: Environmental Investigation of Sanitary Sewer System

Dear Mr. Thibodeau,

The Town of Addison appreciates your interest in responding to our Request for Qualifications for the referenced project. Unfortunately, Parsons Engineering was not chosen as a finalist and is no longer being considered for this project.

Thank you for your participation.

Sincerely,

Michael E. Murphy, PE
Asst. Director of Public Works / Addison

TOWN OF ADDISON ®

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

March 23, 1999

Garcia & Associates Engineering, Inc.
6850 Manhattan Blvd. - Suite 300
Fort Worth, TX. 76120

ATTN: Don M. Treude, PE

Re: Sanitary Sewer System Environmental Investigation.

Dear Don,

Thank you for your interest in working with the Town of Addison. As a result of your firms qualifications I would like to inform you that Garcia & Associates has been selected as a finalist for the Sanitary Sewer Environmental Investigation Project. Therefore, you are scheduled for 2:30 pm on Thursday April 1, 1999 to make a brief presentation to the Project Review Committee.

You will be allowed forty-five minutes to make your presentation and answer questions from the Review Committee. For your information I am including copies of our last four Dallas Wastewater Sample Results.

Location for presentations: 16801 Westgrove Drive in the Town of Addison's Service Center down stairs conference room.

Please feel free to contact me if you have any questions or need additional information

Sincerely,

Michael E. Murphy, PE
Asst. Director / Town of Addison – Public Works

The City of Dallas Wastewater Sampling Survey results for Addison are not available for October 1998, November 1998, and January 1999.

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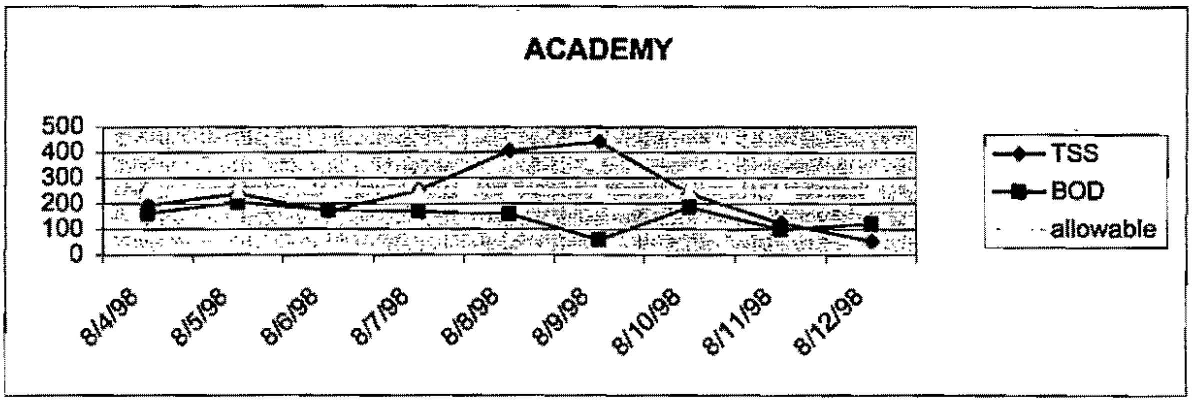

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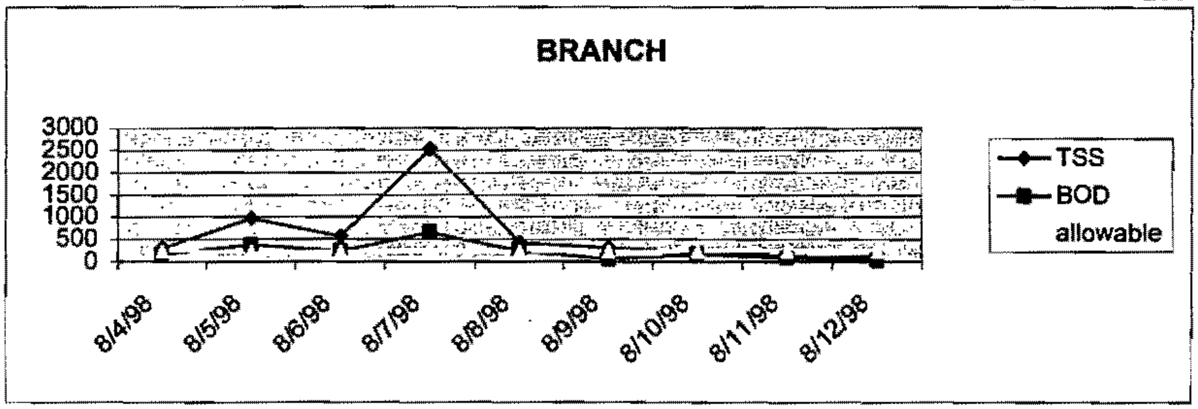

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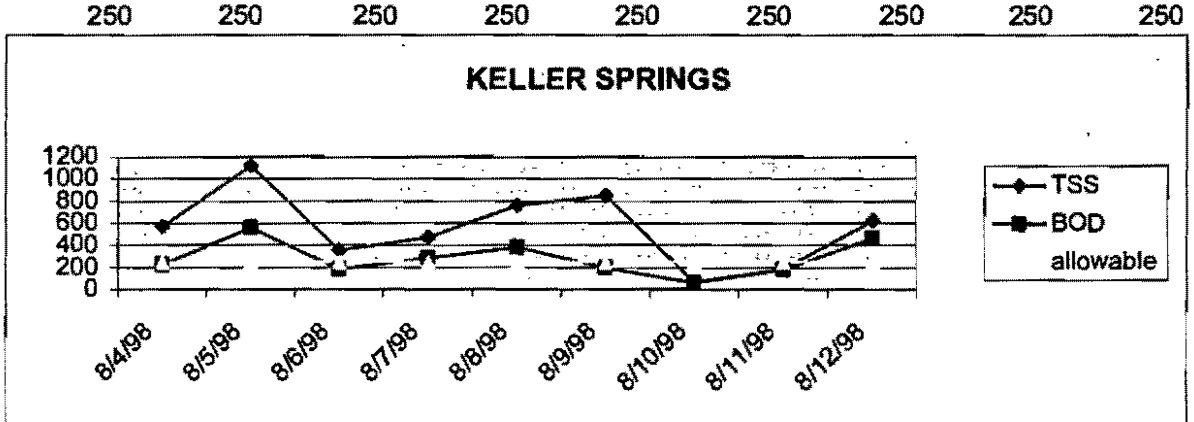

	9/9/98	9/10/98	9/11/98	9/12/98	9/13/98	9/14/98	9/15/98	9/16/98	9/17/98
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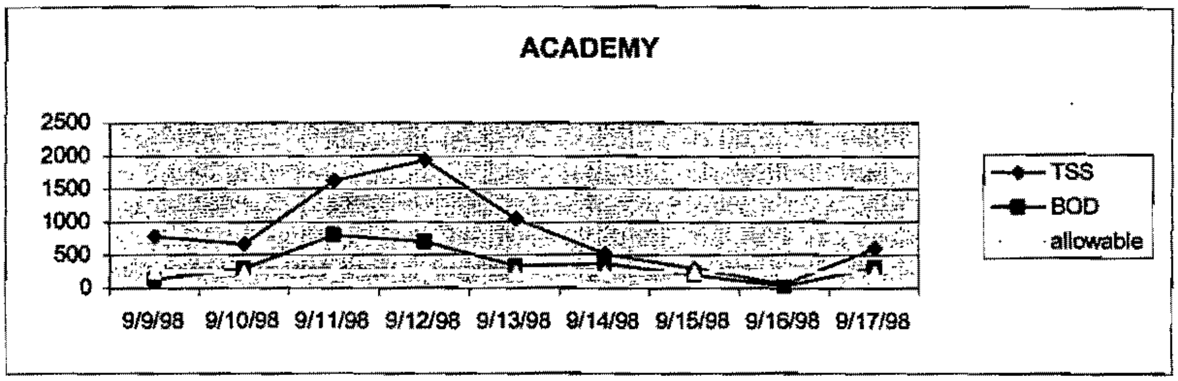

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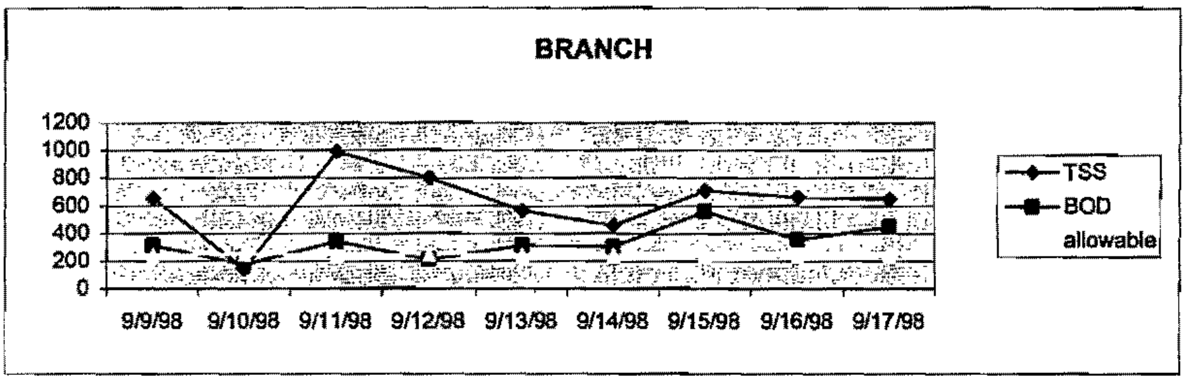

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TSS	934	428	512	1992	518	246	3000	1720	630
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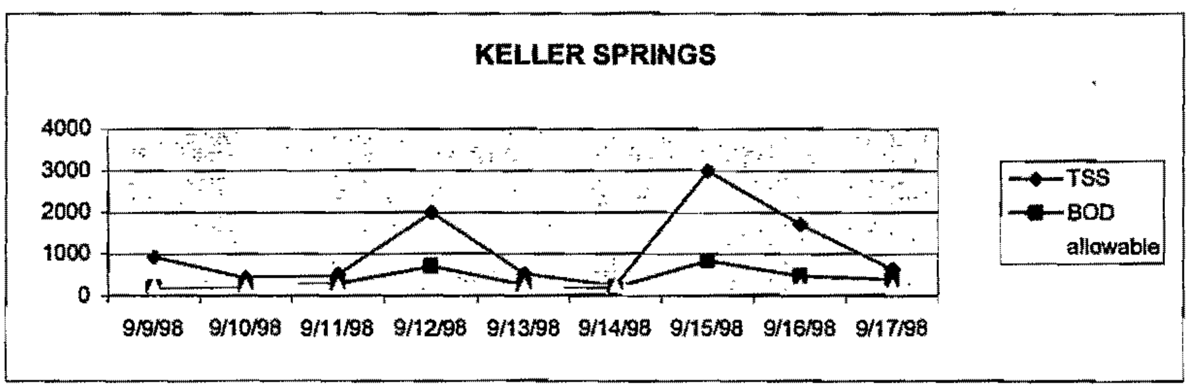

	12/2/98	12/3/98	12/4/98	12/5/98	12/6/98	12/7/98	12/8/98	12/9/98	12/10/98
TSS	751	179	493	148	88	364	404	274	50
BOD	460	151	207	118	64	182	188	180	45
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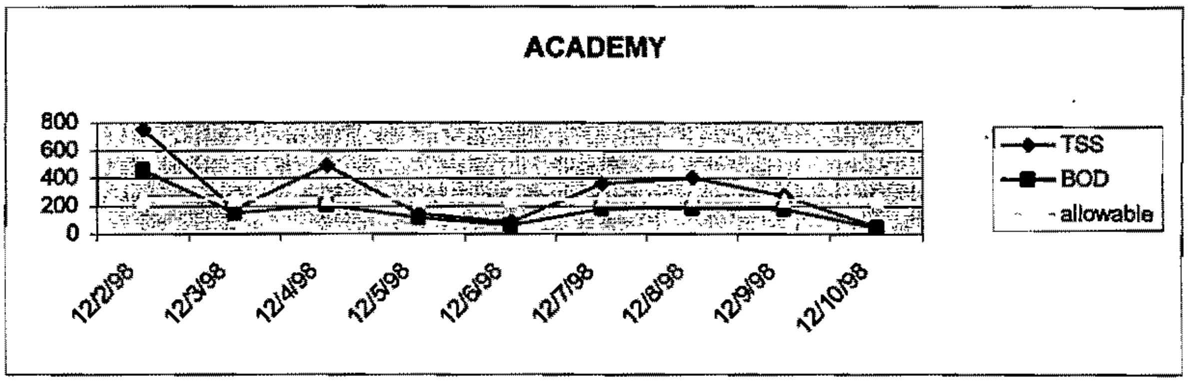

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TSS	35	174	434	170	144	523	1038	3465	28
BOD	32	120	182	142	248	218	252	645	25
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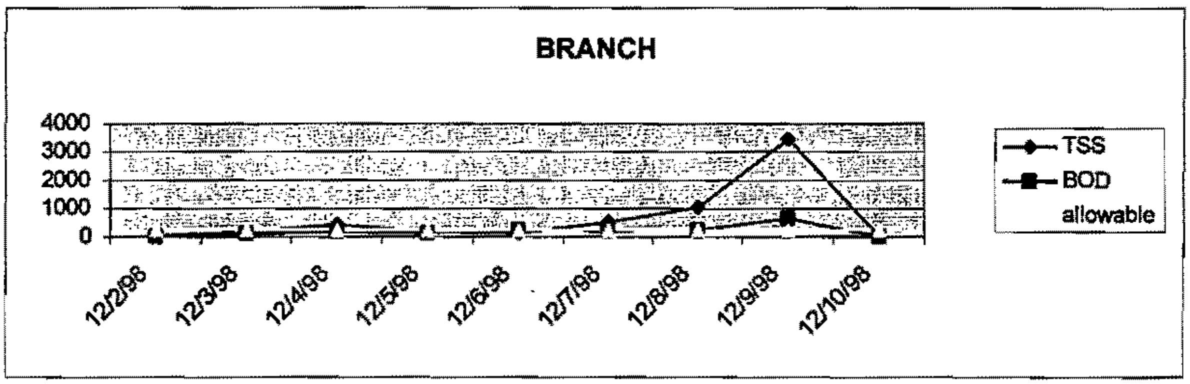

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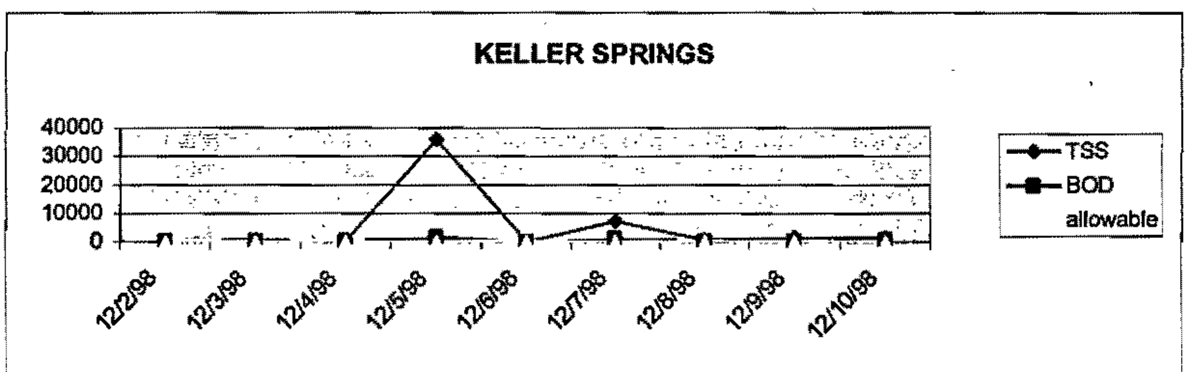
TSS	330	648	194	36000	98	7265	593	1282	1346
BOD	225	315	140	1500	92	1075	300	308	655
allowable	250	250	250	250	250	250	250	250	250



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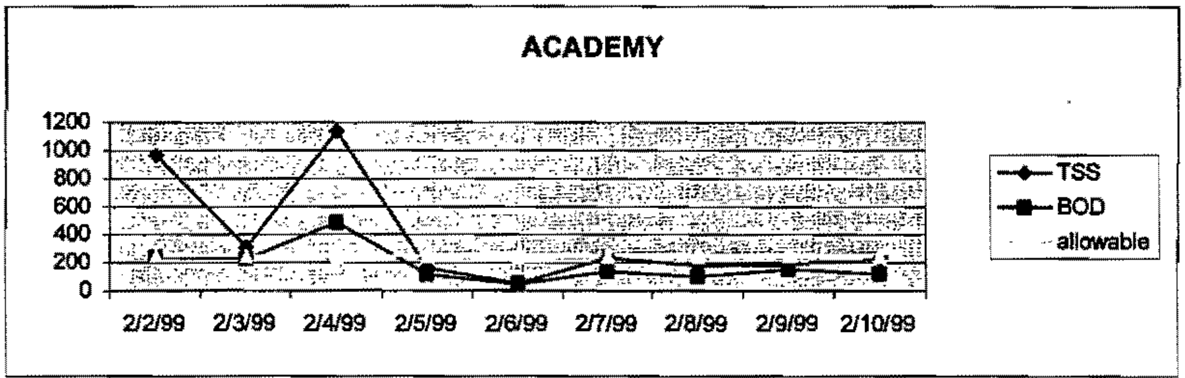

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TSS	190	194	122	4203	962	323	462	122	199
BOD	210	223	200	1340	408	334	280	171	247
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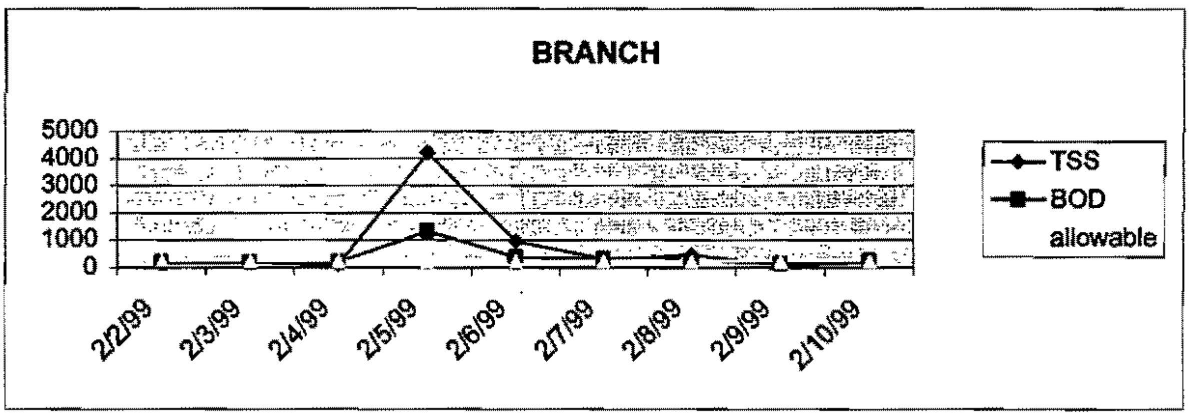

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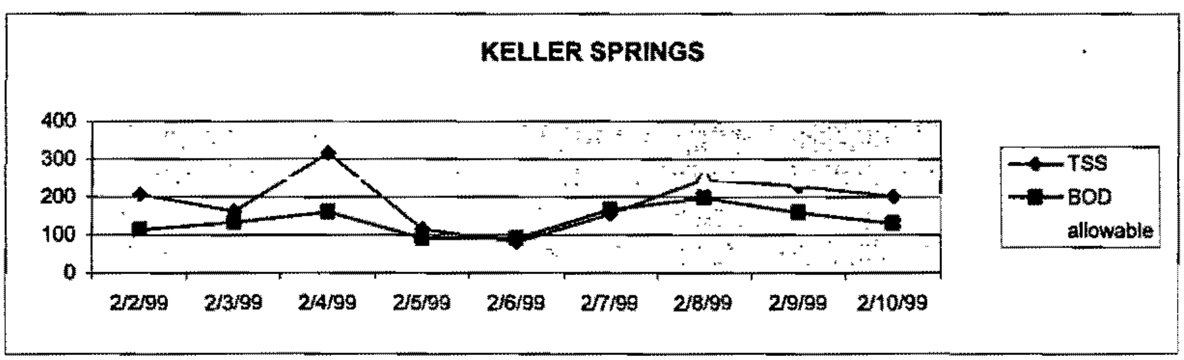

TOWN OF ADDISON

PUBLIC WORKS DEPARTMENT (972) 450-2871

Post Office Box 9010 Addison, Texas 75001-9010 16801 Westgrove

March 23, 1999

Carter – Burgess, Inc.
7950 Elmbrook – Suite 250
Dallas, TX.

ATTN: Albert C. Petrasek, Jr., Ph.D., PE

Re: Sanitary Sewer System Environmental Investigation.

Dear Al,

Thank you for your interest in working with the Town of Addison. As a result of your firms qualifications I would like to inform you that Cater Burgess has been selected as a finalist for the Sanitary Sewer Environmental Investigation Project. Therefore, you are scheduled for 1:30 pm on Thursday April 1, 1999 to make a brief presentation to the Project Review Committee.

You will be allowed forty-five minutes to make your presentation and answer questions from the Review Committee. For your information I am including copies of our last four Dallas Wastewater Sample Results.

Location for presentations: 16801 Westgrove Drive in the Town of Addison's Service Center down stairs conference room.

Please feel free to contact me if you have any questions or need additional information

Sincerely,

Mike E. Murphy

Michael E. Murphy, PE
Asst. Director / Town of Addison – Public Works

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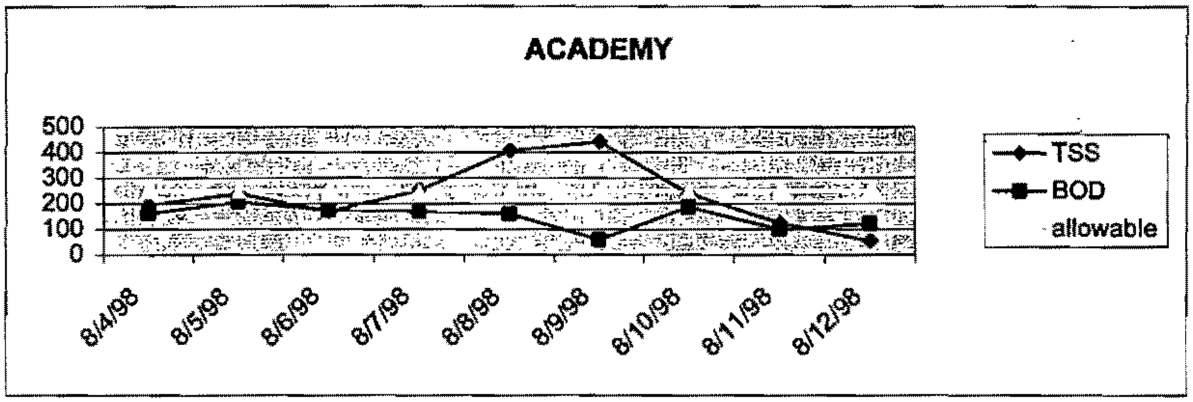

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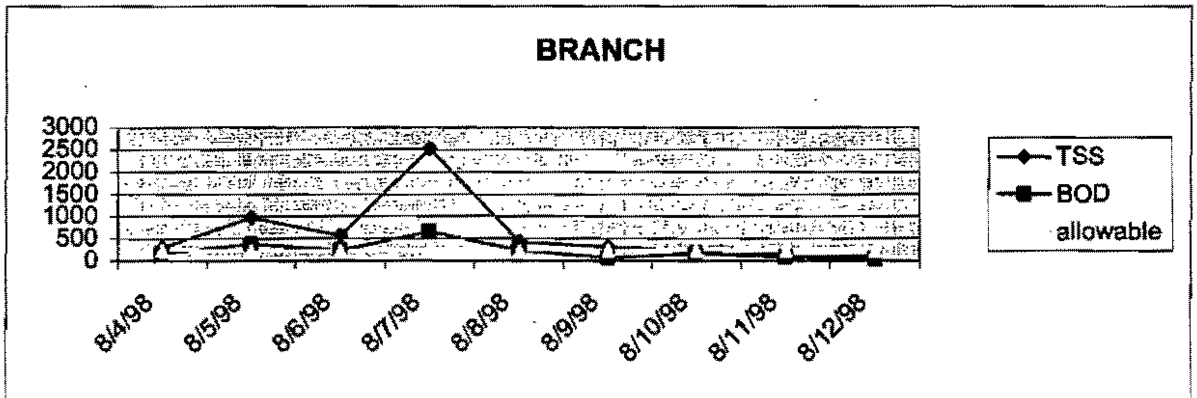

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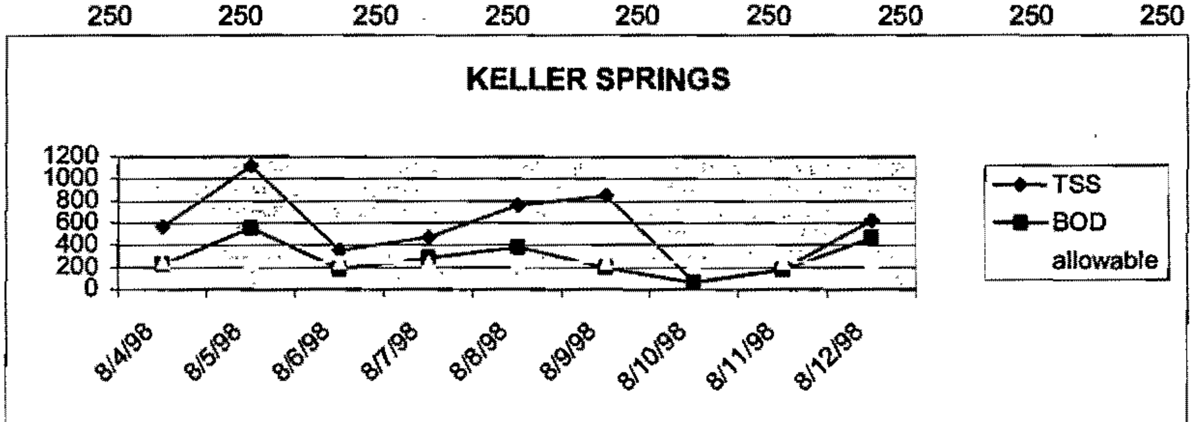

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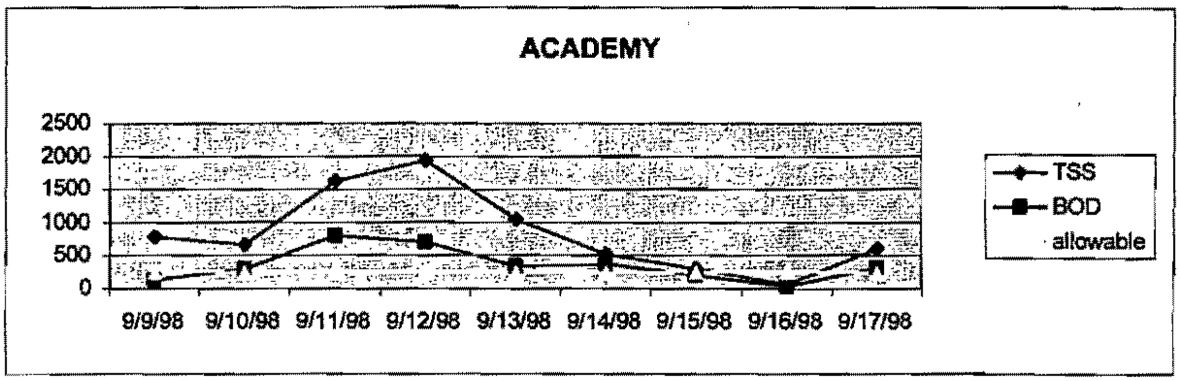

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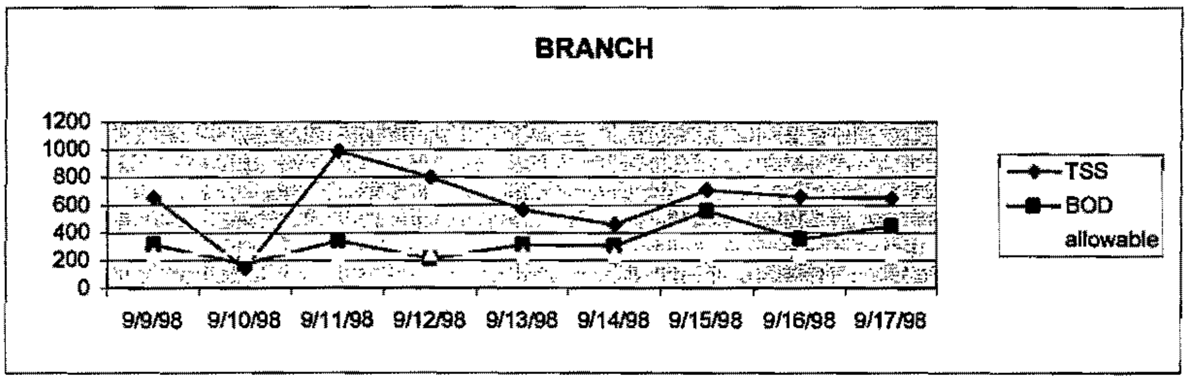

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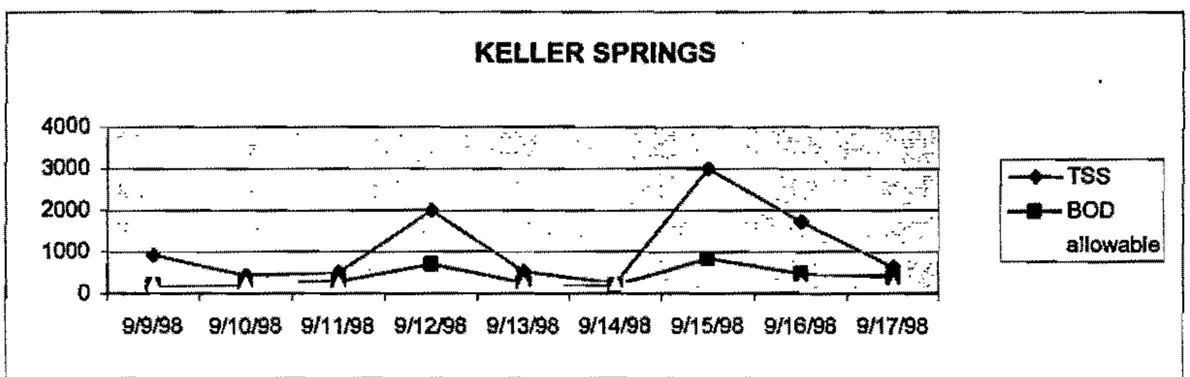

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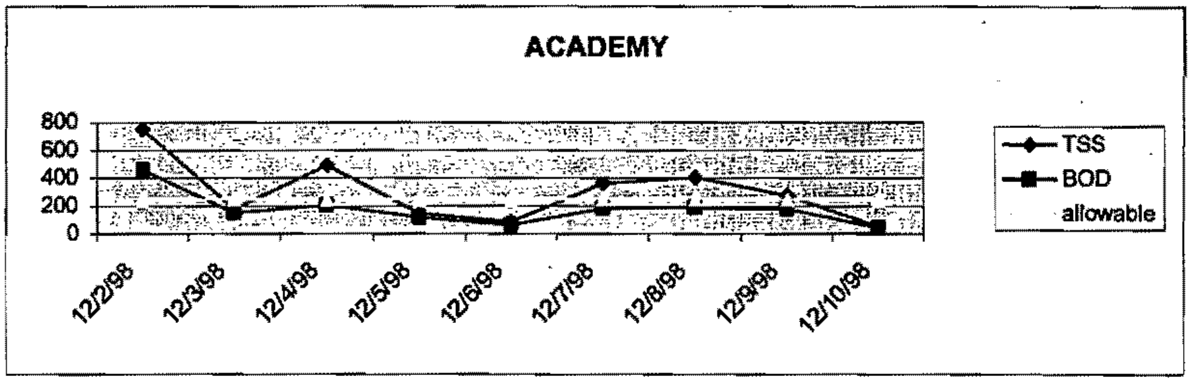

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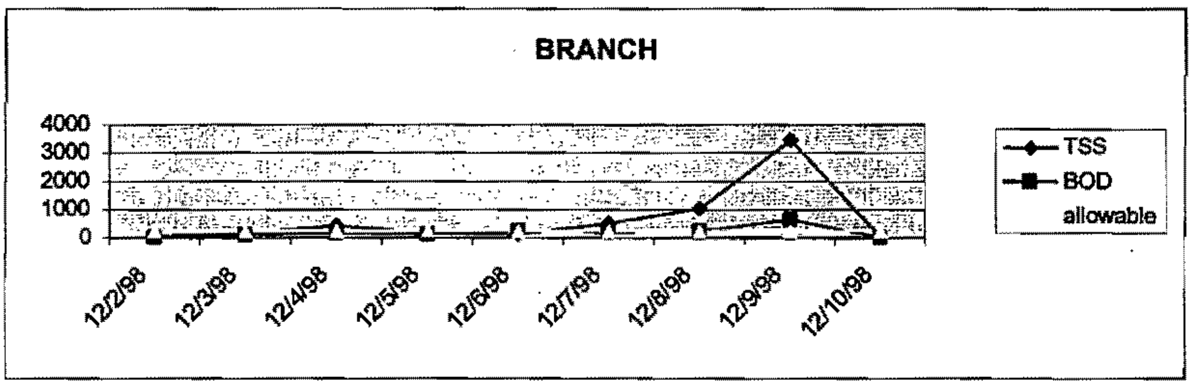

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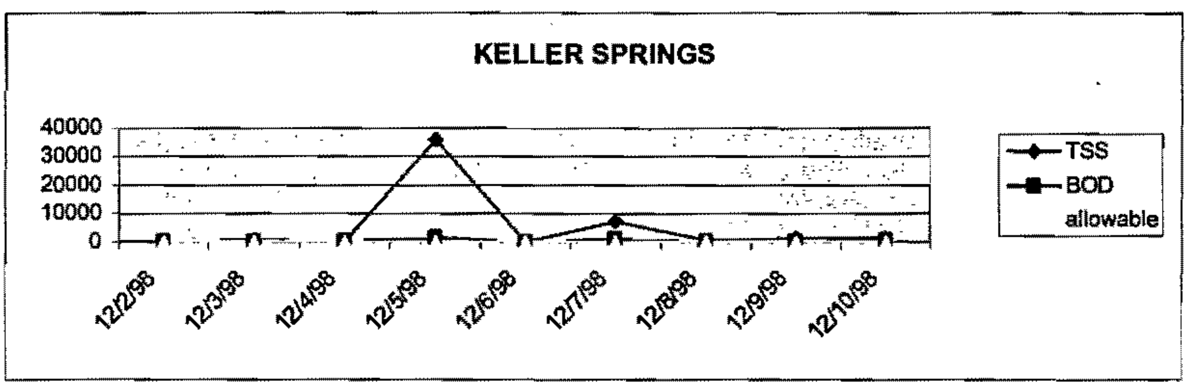

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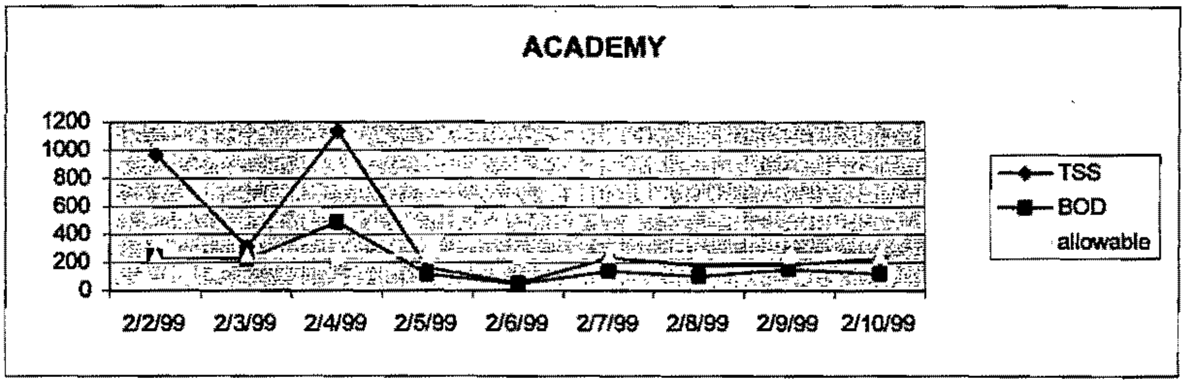

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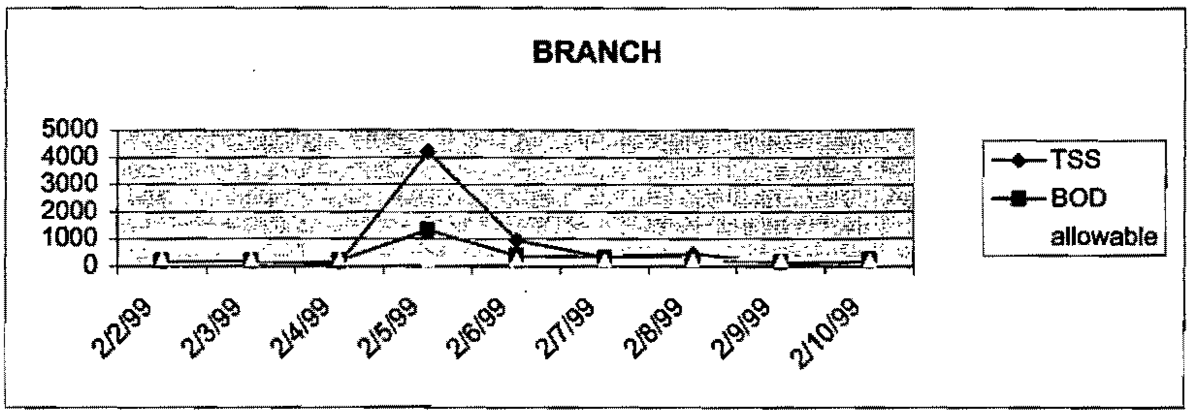

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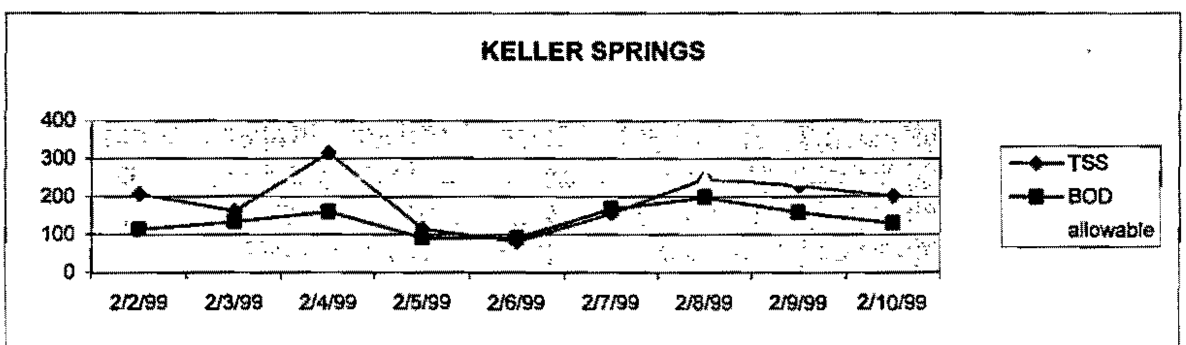

FREESE • NICHOLS

Simon W. Freese, P.E. 1900-1990
Marvin C. Nichols, P.E. 1896-1969

Fax Transmittal

TO: Michael Murphy, P.E.
fax: 972-450-2837

FROM: J.R. Baddaker P.E. Jim Baddaker

DATE: March 4, 2000

SUBJECT: Sewer Investigation Study Contract

Total number of pages including transmittal sheet: 12

If there is a problem receiving any of the pages, please call Kathryn at 214-920-2500.

COMMENTS:

Thought you might want to look at this before Tuesday meeting. The laboratory and RJN costs to us have gone up approximately $2,100. We hope that doesn't create a problem.

See you Tuesday.

- END -

cc:

FREESE AND NICHOLS, INC. • 1701 N. MARKET STREET, SUITE 500 LB 51 • DALLAS, TEXAS 75202-2001
TELEPHONE: 214-920-2500 • FAX: 214-920-2565

FREESE•NICHOLS

March 3, 2000

Mr Mike Murphy, P.E.
Town of Addison
16801 Westgrove Drive
Addison, Tx.
75001-9010

Dear Mr. Murphy

We are pleased to present our proposal to you for services related to the Sanitary Sewer System Environmental Investigation. Our team members for the investigation includes Freese and Nichols, RJN for flow monitoring and sampling, and tentively ERMI for the laboratory work. As you are aware from our meeting last week , we are planning on a three phase approach to the investigation. Phase 1 would collect flow and sampling data from the City of Dallas for review purposes, install flow meters and sampling equipment immediately upstream of the Trinity Christian, Dallas Parkway, and Arapahoe Road metering facilities. The flow monitoring and sampling would coincide with City of Dallas sampling of the Town's discharge. The results would be compared with City of Dallas sampling results. Phase 2 would be initiated if the Phase 1 results did not identify the sources of the problem. Phase 2 would establish a sampling and flow monitoring plan for upstream of the meter stations in an attempt to isolate the sources of the high BOD and TSS readings. A review of existing land use, industrial permit users and sources, along with manhole inspections would be included. Once the sources of the high readings are determined, then a specific plan for mitigation will be developed as Phase 3 of the process. A detailed description of the scope of work is as follows:

SCOPE OF SERVICES:

Freese and Nichols will render the following professional services in connection with the development of the Project:

Phase 1-

This phase sets up the baseline parameters for further analysis during other phases of the investigation. The results of this phase should identify problem areas in sampling and data collection protocols, and determine if further study is necessary by individual metering basin.

1. Collect sampling and flow data from Dallas Water Utilities (DWU). Attend one (1) meeting with DWU to review sampling protocols used by the City and ascertain the type and format of data available.

2. Inspect DWU sampling point manholes. Inspect manholes immediately upstream of the DWU meters to determine suitability for installation of flowmeters and automatic sampling equipment. This task will be performed by RJN.

3. Install flow meters and automatic samplers at suitable manholes immediately upstream of upstream of the Trinity Christian, Dallas Parkway, and Arapahoe Road metering stations. Three flow meters and six samplers are anticipated. This task will be performed by RJN.

4. Collect hourly samples at the temporary flow monitoring stations for a period of 10 days. Twenty four hourly samples will be collected for each day and transported to the laboratory. The flow monitoring and sampling period should correspond to the same time period when DWU is collecting samples. Initially this is planned on a one time basis. Sampling results will dictate whether a second 10-day sampling period is necessary. This task will be performed by RJN.

5. Provide for laboratory services to analyze the hourly samples for TSS and COD, develop a flow weighted composite sample for each day of the monitoring period and analyze for BOD, TSS, and COD. Analyze the samples provided by DWU (7-24hour composite samples) for BOD and TSS. The laboratory analysis will be contracted through RJN. At this point in time, the preferred laboratory is ERMI. It is our understanding the DWU is performing their own laboratory analysis. The Laboratory performing the work is subject to change depending on the DWU reaction to ERMI. The intent is to use a laboratory that is acceptable to all parties.

6. Review the results of the laboratory testing to ascertain trends and compare these with DWU sampling results.

7. Issue a single letter report of the findings with recommendations for Phase 2 procedures for each of the three basins. Two draft copies will be submitted for review by the Town. Four final copies will be furnished to the Town. One final copy will be provided to DWU.

8. Attend a maximum of two meetings with DWU and the Town to discuss results.

Phase 2

The actual Phase 2 items which are to be accomplished will be defined in the Phase 1 letter report. Written authorization from the Town of Addison to proceed will be necessary to initiate Phase 2. If no additional work is necessary in a metered area as a result of Phase 1 then no work will be done on that metered basin in Phase 2. Phase 2 work will be completed by basin and will include the following:

1. Manhole inspections of all manholes in a particular meter basin to document unusual conditions such as build up of grease and sediment. This will proceed from the downstream end of the meter basin upstream. Manhole inspections will document the following items: general condition of all incoming and outgoing lines, general condition of the manhole, depth

of flow and sediment in all incoming and outgoing lines, and a description of the sediment.The Trinity Christian, Dallas Parkway, and Arapahoe Road metering areas have 6, 38, and 44 manholes, respectively shown in the "Report on 1996 Wastewater Collection System" on 8-inch and larger lines. The number to be inspected has been increased by 50% for budgetary purposes to account for smaller city owned lateral lines connecting into the identified line segments. The manhole inspections are budgeted at 9, 57, and 66 for the Trinity Christian, Dallas Parkway, and Arapahoe Road metering areas. It is hoped that this will help isolate specific areas for potential high TSS discharges.

2. Map of all industrial discharge permit locations within the meter basin along with the construction activities. Locate all restaurants within the metering area. Review the current landuse map to identify potential sources of high BOD and TSS flows.

3. Utilize the HYDROWORKS software program to model the flow and settlement of contaminants. The model will be calibrated to the metering data collected during Phase I and initially will have a uniform distribution of contaminants to the number of manholes shown in the "Report on 1996 Wastewater Collecrion System". The collection system layout and piping data will be as shown in this report for the basins identified in Phase I for modeling during Phase 2. The model results will be used in conjunction with the manhole inspections to select the metering and sampling locations within the basins.

4. Install flow monitors and samplers in the meter area. The number of meters and locations will be determined based on the manhole inspections in this Phase and the HYDROWORKS modeling results. For budgetary purposes the metering locations are arbitrarily set at three per basin. A maximum of 9 flow meters and 18 samplers are anticipated. The flow monitoring and sampling will be the same as items 4 and 5 in Phase 1. The results will be included in the HYDROWORKS model to recalibrate based on the newly acquired flow and meter data.

5. Analyze all data collected and make recommendations for Phase 3 work. A letter report will be issued with the results of the analysis, identification of areas that need additional study and data collection, and recommendations for corrections that can be identified from the analysis. This should isolate problem areas within the meter basin being considered and provide the direction necessary to isolate the high BOD, TSS flow areas to specific locations (users) in Phase 3. Two draft copies will be submitted for review by the Town. Four final copies will be furnished to the Town. One final copy will be provided to DWU

6. Attend a maximum of three (3) meetings with DWU and the Town to discuss the results.

Phase 3

Phase three items will include all recommended items from the Phase 2 letter report. Written authorization from the Town of Addison to proceed will be necessary to initiate Phase 3.

1. Televise all line segments in the subareas identified in the Phase 2 report to identify grease and sediment build up along the line segment and further isolate the location of high BOD and TSS flow input into the Town system. For budgetary purposes, the line lengths are set at 1/3 of the line segment lengths included in the "Report On 1996 Wastewater Collection System" by basin. The budgetary line lengths are 667 feet for the Trinity Christian Basin, 4,311 feet for the Dallas Parkway Basin, and 4,500 feet for the Arapahoe Basin.

2. Field visit all wastewater billing customers in the identified problem subareas with Town of Addison personnel to identify processes and procedures used to generate discharges into the Town sanitary sewer system. Review water billing records for said customers. Determine the last time grease traps were cleaned based on customer interviews.

3. Install flow meters and samplers immediately downstream of areas identified in items one and two of this task. For budgetary purposes this is established at 3 per metering basin. A maximum of 9 flow meters and 18 samplers is anticipated.

4. Collect hourly samples at the temporary flow monitoring stations for a period of 10 days. Twenty four hourly samples will be collected for each day and transported to the laboratory.

5. Provide for laboratory services to analyze the hourly samples for TSS and COD, develop a flow weighted composite sample for each day of the monitoring period and analyze for BOD, TSS, and COD. The laboratory analysis will be contracted through RJN.

6. Review the results of the laboratory testing to ascertain trends and specific customers with discharges that exceed the DWU maximums.

7. Issue a letter report with recommendations for corrections. The following alternatives will be evaluated in the letter report:
   a). Pay the surcharges for exceeding the DWU quality limitations
   b). Work with the noncompliant customer(s) to achieve compliance
   c.) Install Town of Addison pretreatment facilities in order to achieve compliance based on the flow monitoring data and protocols identified in this and other Phases of the investigation.

   Two draft copies will be submitted for review by the Town. Four final copies will be furnished to the Town. One final copy will be provided to DWU.

8. Attend a maximum of three meetings with DWU to discuss results and recommendations.

TIME OF COMPLETION

FNI is authorized to commence work on the Project upon execution of this AGREEMENT and agrees to complete the services in accordance with the following schedule:

Phase 1 - within 60 days of notice to proceed.

Phase 2- within 90 days of authorization to proceed to this phase.
Phase 3- within 120 days of authorization to proceed to this phase.

FNI reserves the right to extend the completion schedule due to OWNER's delays. Additional compensation may be requested by FNI if project is unduly prolonged due to delays beyond the control of FNI.

RESPONSIBILITIES OF TOWN OF ADDISON

The Town of Addison shall perform the following in a timely manner so as not to delay the services of Freese and Nichols:

A. Designate in writing a person to act as Town of Addison's representative with respect to the services to be rendered under this Agreement. Such person shall have contract authority to transmit instructions, receive information, interpret and define Town of Addison's policies and decisions with respect to Freese and Nichols's services for the Project.

B. Assist Freese and Nichols by placing at Freese and Nichols's disposal all available information pertinent to the Project including previous reports and any other data relative to the Investigation. Provide photographs of the Trinity Christian, Dallas Parkway, and Arapahoe Road metering stations and DWU sampling locations associated with the each metering location. Assist by meeting with DWU to ascertain sampling and meter data availability and making appropriate requests for information and data to DWU. Furnish an aerial photo map, zoning map, map of recent construction activities during the non-compliance flows to DWU, one copy of the current agreement between the Town and DWU for the discharge of sanitary sewer flows, list of industrial pretreatment permits with locations within the identified three DWU noncompliance areas, and any available information on grease trap inspections within the three DWU noncompliance areas.

D. Arrange for access to and make all provisions for Freese and Nichols to enter upon public and private property as required for Freese and Nichols to perform services under this Agreement. Attend meetings with customers during the Phase 3 interviews, assist in grease trap and other inspections required to complete the Phase 3 tasks.

E. Examine all studies, reports, sketches, drawings, specifications, proposals and other documents presented by Freese and Nichols, obtain advice of an attorney, insurance counselor and other consultants as the TOWN OF ADDISON deems appropriate for such examination and render in writing decisions pertaining thereto within a reasonable time so as not to delay the services of Freese and Nichols.

COMPENSATION

COST BASED ON HOURLY RATES WITH A MAXIMUM FEE LIMIT

A.**Not to Exceed:** The total fee for Basic Services shall be computed on the basis of the Attachment SC-1, Schedule of Charges but shall not exceed $46,863 for Phase 1, $133,528 for Phase 2, and $148,239 for Phase 3 . If FNI sees the Scope of Services changing so that Additional Services are needed , FNI will notify the Town of Addison for approval before proceeding. Additional services shall be computed based on the attachment SC-1 Schedule of Charges. Attachment SC-2 reflect the schedule of charges to Freese and Nichols for the subconsultants, flow monitoring, sampling, manhole inspections and laboratory fees. Attachment A gives an overall budget breakdown by phase.

TERMS AND CONDITIONS OF AGREEMENT

We propose to furnish our services as described herein in accordance with Attachment TC, " Terms and Conditions of Agreement."

We appreciate this opportunity to submit this proposal If additional information or clarification is desired, please do not hesitate to contact us. If you are in agreement with the services described above and wish for us to proceed with this assignment, please sign below and return one copy of the agreement for our files.

Yours very truly,

FREESE AND NICHOLS, INC.

Jim Baddaker

J.R. Baddaker, P.E.
Project Manager

Alan Greer

Alan Greer, P.E.
Dallas Office Manager, Principal

TOWN OF ADDISON

By:______________________

Title:______________________

Date:______________________

ATTACHMENT TC
8-20-96

TERMS AND CONDITIONS OF AGREEMENT

1. **DEFINITIONS:** The term Owner as used herein refers to Town of Addison. The term FNI as used herein refers to Freese and Nichols, Inc., its employees and agents; also its subcontractors and their employees and agents. As used herein, Services refers to the professional services performed by Freese and Nichols pursuant to the AGREEMENT.

2. **CHANGES:** Owner, without invalidating the AGREEMENT, may order changes within the general scope of the WORK required by the AGREEMENT by altering, adding to and/or deducting from the WORK to be performed. If any change under this clause causes an increase or decrease in FNI's cost of, or the time required for, the performance of any part of the Services under the AGREEMENT, an equitable adjustment will be made by mutual agreement and the AGREEMENT modified in writing accordingly.

3. **TERMINATION:** The obligation to provide services under this AGREEMENT may be terminated by either party upon ten days' written notice. In the event of termination, FNI will be paid for all services rendered and reimbursable expenses incurred to the date of termination and, in addition, all reimbursable expenses directly attributable to termination.

4. **CONSEQUENTIAL DAMAGES:** In no event shall FNI or its subcontractors be liable in contract, tort, strict liability, warranty, or otherwise for any special, indirect, incidental or consequential damages, such as loss of product, loss of use of the equipment or system, loss of anticipated profits or revenue, non-operation or increased expense of operation or other equipment or systems.

5. **INFORMATION FURNISHED BY OWNER:** Owner will assist FNI by placing at FNI's disposal all available information pertinent to the Project including previous reports and any other data relative to design or construction of the Project. FNI shall have no liability for defects or negligence in the Services attributable to FNI's reliance upon or use of data, design criteria, drawings, specifications or other information furnished by Owner and Owner agrees to indemnify and hold FNI harmless from any and all claims and judgments, and all losses, costs and expenses arising therefrom. FNI shall disclose to Owner, prior to use thereof, defects or omissions in the data, design criteria, drawings, specifications or other information furnished by Owner to FNI that FNI may reasonably discover in its review and inspection thereof.

6. **INSURANCE:** FNI shall provide to Owner certificates of insurance which shall contain the following minimum coverage (All limits in thousands):

Commercial General Liability		**Workers' Compensation**	
General Aggregate	$2,000	Each Accident	$500
Automobile Liability (Any Auto)		**Professional Liability**	
CSL	$1,000	$3,000	Annual Aggregate

7. **SUBCONTRACTS:** If, for any reason, at any time during the progress of providing Services, Owner determines that any subcontractor for FNI is incompetent or undesirable, Owner will notify FNI accordingly and FNI shall take immediate steps for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same regulations. Nothing contained in the AGREEMENT shall create any contractual relation between any subcontractor and Owner.

8. **OWNERSHIP OF DOCUMENTS:** All drawings, reports data and other project information developed in the execution of the Services provided under this AGREEMENT shall be the property of the Owner upon payment of FNI's fees for services. FNI may retain copies for record purposes. Owner agrees such documents are not intended or represented to be suitable for reuse by Owner or others. Any reuse by Owner or by those who obtained said documents from Owner without written verification or adaptation by FNI will be at Owner's sole risk and without liability or legal exposure to FNI, or to FNI's independent associates or consultants, and Owner shall indemnify and hold harmless FNI and FNI's independent associates and consultants from all claims, damages, losses and expenses including attorneys' fees arising out of or resulting therefrom. Any such verification or adaptation will entitle FNI to further reasonable compensation. FNI may reuse all drawings, report data and other project information in the execution of the Services provided under this AGREEMENT in FNI's other activities. Any reuse by FNI will be at FNI's sole risk and without liability or legal exposure to Owner, and FNI shall indemnify and hold harmless Owner from all claims, damages, losses and expenses including attorneys' fees arising out of or resulting therefrom.

FNI________
OWNER________

9. **POLLUTANTS AND HAZARDOUS WASTES:** It is understood and agreed that FNI has neither created nor contributed to the creation or existence of any hazardous, radioactive, toxic, irritant, pollutant, or otherwise dangerous substance or condition at the site, if any, and its compensation hereunder is in no way commensurate with the potential risk of injury or loss that may be caused by exposures to such substances or conditions. The parties agree that in performing the Services required by this AGREEMENT, FNI does not take possession or control of the subject site, but acts as an invitee in performing the services, and is not therefore responsible for the existence of any pollutant present on or migrating from the site. Further, FNI shall have no responsibility for any pollutant during clean-up, transportation, storage or disposal activities.

10. **OPINION OF PROBABLE COSTS:** FNI will furnish an opinion of probable project development cost based on present day cost, but does not guarantee the accuracy of such estimates. Opinions of probable cost, financial evaluations, feasibility studies, economic analyses of alternate solutions and utilitarian considerations of operations and maintenance costs prepared by FNI hereunder will be made on the basis of FNI's experience and qualifications and represent FNI's judgement as an experienced and qualified design professional. It is recognized, however, that FNI does not have control over the cost of labor, material, equipment or services furnished by others or over market conditions or contractors' methods of determining their prices.

11. **CONSTRUCTION REPRESENTATION:** If required by the AGREEMENT, FNI will furnish Construction Representation according to the defined scope for these services. FNI will observe the progress and the quality of work to determine in general if the work is proceeding in accordance with the Contract Documents. In performing these services, FNI will endeavor to protect Owner against defects and deficiencies in the work of Contractors; FNI will report any observed deficiencies to Owner, however, it is understood that FNI does not guarantee the Contractor's performance, nor is FNI responsible for the supervision of the Contractor's operation and employees. FNI shall not be responsible for the means, methods, techniques, sequences or procedures of construction selected by the Contractor, or the safety precautions and programs incident to the work of the Contractor. FNI shall not be responsible for the acts or omissions of any person (except his own employees or agent) at the Project site or otherwise performing any of the work of the Project. If Owner designates a person to serve in the capacity of Resident Project Representative who is not a FNI's employee or FNI's agent, the duties, responsibilities and limitations of authority of such Resident Project Representative(s) will be set forth in writing and made a part of this AGREEMENT before the Construction Phase of the Project begins.

12. **PAYMENT:** Progress payments may be requested by FNI based on the amount of services completed. Payment for the services of FNI shall be due and payable upon submission of a statement for services to OWNER. Statements for services shall not be submitted more frequently than monthly. Any applicable new taxes imposed upon services, expenses, and charges by any governmental body after the execution of this AGREEMENT will be added to FNI's compensation.

    If OWNER fails to make any payment due FNI for services and expenses within thirty (30) days after receipt of FNI's statement for services therefore, the amounts due FNI will be increased at the rate of one percent (1%) per month from said thirtieth (30th) day, and, in addition, FNI may, after giving seven (7) days' written notice to OWNER, suspend services under this AGREEMENT until FNI has been paid in full, all amounts due for services, expenses and charges.

13. **ARBITRATION:** No arbitration arising out of, or relating to, this AGREEMENT involving one party to this AGREEMENT may include the other party to this AGREEMENT without their approval.

14. **SUCCESSORS AND ASSIGNMENTS:** OWNER and FNI each are hereby bound and the partners, successors, executors, administrators and legal representatives of OWNER and FNI are hereby bound to the other party to this AGREEMENT and to the partners, successors, executors, administrators and legal representatives (and said assigns) of such other party, in respect of all covenants, agreements and obligations of this AGREEMENT.

    Neither OWNER nor FNI shall assign, sublet or transfer any rights under or interest in (including, but without limitation, moneys that may become due or moneys that are due) this AGREEMENT without the written consent of the other, except to the extent that any assignment, subletting or transfer is mandated by law or the effect of this limitation may be restricted by law. Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under this AGREEMENT. Nothing contained in this paragraph shall prevent FNI from employing such independent associates and consultants as FNI may deem appropriate to assist in the performance of services hereunder.

15. **PURCHASE ORDERS:** If a Purchase Order is used to authorize FNI's Services, only the terms, conditions/instructions typed on the face of the Purchase Order shall apply to this AGREEMENT. Should there be any conflict between the Purchase Order and the terms of this AGREEMENT, then this AGREEMENT shall prevail and shall be determinative of the conflict.

Attachment SC-1

SCHEDULE OF CHARGES

FREESE • NICHOLS

POSITION	MIN	MAX
PRINCIPAL	115	165
GROUP MANAGER	83	150
SENIOR ENGINEER	90	115
ENGINEER (PE)	65	100
ENGINEER (EIT)	40	85
ELECTRICAL ENGINEER	65	110
MECHANICAL ENGINEER	65	95
ENVIRONMENTAL SCIENTIST	50	98
ARCHITECT	65	114
DESIGNER	44	90
TECHNICIAN	40	62
OPERATIONS ANALYST	56	75
WORD PROCESSING/SECRETARIAL	35	55
CONTRACT ADMINISTRATOR	35	44
CO-OP	18	35

The ranges and individual salaries will be adjusted annually.

EXPENSES

Plotting	
Bond	$ 4.00 per plot
Color	$10.00 per plot
Vellum	$11.50 per plot
Mylar	$15.00 per plot

Printing	
Bluelines/Blacklines	$0.55 per square foot
Offset and Xerox Copies	$0.15 per side copy
Binding	$2.50 per book
Tape Binding	$1.00 per book

Travel
$0.31 per mile

OTHER DIRECT EXPENSES

Other direct expenses are reimbursed at actual cost times multiplier of 1.10. They include outside printing and reproduction expense, communication expense, travel, transportation and subsistence away from Dallas and other miscellaneous expenses directly related to the work, including costs of laboratory analysis, tests, and other work required to be done by independent persons other than staff members.

Attachment SC-2

Sanitary Sewer System Environmental Investigation
City of Addison, Texas

Cost Summary

Description	Unit	Unit Cost ($)	Total ($)
Phase 1			
Administration	1 LS	880.00	880.00
Inspect Sampling Points	1 LS	440.00	440.00
Flow Monitoring[1/]	30 M-D	95.00	2,850.00
Sampling (6 samplers)[1/]	60 S-D	91.67	5,500.00
Split Sampling w/DWU (3 sites/10 days)	30 EA	36.00	1,080.00
Laboratory Services			
BOD Sampling	30 EA	31.00	930.00
TSS/COD Sampling	750 EA	27.10	20,325.00
Split Sampling (BOD/TSS)	30 EA	40.52	1,215.60
Subtotal, Phase 1			**33,220.60**
Phase 2			
Administration	1 LS	1,240.00	1,240.00
Manhole Inspections[2/]	132 MH	37.95	5,009.40
Sampling (18 samplers)	180 S-D	91.67	16,500.60
Flow Monitoring	90 M-D	95.00	8,550.00
Testing			
BOD Sampling	90 EA	31.00	2,790.00
TSS/COD Sampling	2,250 EA	27.10	60,975.00
Split Sampling (BOD/TSS)	90 EA	40.52	3,646.80
Subtotal, Phase 2			**98,711.80**
Phase 3			
Administration	1 LS	1,426.00	1,426.00
Television Inspection	9,478 LF	1.50	14,217.00
Sampling (18 samplers)	180 S-D	91.67	16,500.00
Flow Monitoring (9 meters)	90 M-D	95.00	8,550.00
Testing			
BOD Sampling	90 EA	31	2,790.00
TSS/COD Sampling	2,250 EA	27.10	60,975.00
Split Sampling (BOD/TSS)	90 EA	40.52	3,646.80
Subtotal, Phase 3			**108,104.80**
Total			**240,037.20**

1/ Site will be the same as DWU for the Arapaho Metering Station sampling.
2/ Manholes uncovered by the City.

Attachment A

ANTICIPATED BUDGET

Town Of Addison

Environmental Investigation

July 14, 1999

DESCRIPTION	PRINCIPAL Alan Greer $120		PROJECT MANAGER J.R. Baddaker, P.E. $110		SENIOR ENGINEER Dr. Leonard Ripley P.E. $110		ENGINEER $65		TECHNICIAN $50		WORD PROCESSING $35		TOTAL	
	HOURS	TOTAL	HOURS	TOTAL	HOURS	TOTAL	HOURS	TOTAL	HOURS	TOTAL	HOURS	TOTAL	HOURS	COST
Phase 1	6	$720	40	$4,400	40	$4,400		$0		$0	4	$140	90	9660
Phase 2	8	$960	40	$4,400	80	$8,800	120	$7,800	20	$1,000	4	$140	272	23190
Phase 3	8	$960	40	$4,400	80	$8,800	200	$13,000	20	$1,000	4	$140	352	28300
SUBTOTAL SALARY	22	$2,640	120	$13,200	200	$22,000	320	$20,800	40	$2,000	12	$420	714	$55,060

EXPENSES	Phase 1	Phase 2	Phase 3		
TRAVEL	$50	100	$100		
PRINTING	$50	50	$50		
GENERAL	500	777	785		
HYDROWORKS LEASE		750			
SUBTOTAL EXPENSES	$600	$1,677	$935		$5,207
				10% markup of expenses	$521
SUBCONSULTANT (INCLUDING EXPENSES)+10%	$26,343	$128,583	$118,916		$204,042
TOTAL	$46,563	$132,528	$148,239		**$328,630**

Michael Murphy

From: Carmen Moran
Sent: Tuesday, February 16, 1999 9:27 AM
To: Michael Murphy
Subject: platting for Addison Circle, phase III

David Meyers asked about platting our right-of-way for the Morris extension. I told him to just plat what they owned, and we would take care of platting the Morris street extension when we built the street. Will we plat it? We didn't plat our property at Arapaho and Quorum when we took that street through. Maybe we should have. If we want Huitt-Zollars to plat that property now, we need to let them know. In addition, the right-of-way will clip a corner of the Conference and Theatre property, which is platted, so that would involve a replat of that as well.

Carmen

TALK TO J.B.

only plat that property that will be affected

Mike M. | ENVIRONMENTAL INVESTIGATION | 1/21/99

To: J.B, KEITH, Jim.

FROM: Mike

SUBJ: SANITARY SEWER INVESTIGATION

As you all are aware we've been experiencing extremely high BOD & TSS readings as tested/sampled by DWU.

I'm proposing to get a consultant on board to help us get to the bottom of this problem.

Attached is a rough DRAFT of Request for Qualifications (RQQ). Please review and get comments back to me.

Thanks,

Mike

Mike
comments
attached.
Jim

TOPS 35500

as measured metering

Insert (1) —

REQUEST

ENVIRONM

The firm should be experienced in analysis of wastewater quality data, measurement of wastewater flows, industrial waste discharges, infiltration and inflow and affects of construction activity

The Town of Addison is prese
engineering consulting firms for an
sewer system of the Town of Addis
BOD and TSS levels have been co
successful engineering firm will
implementation to lower the BOD a
are currently operating under.

Only qualified firms are enc
~~The most~~ qualified firm will be aske
perform the work.

Addison will accept written Stateme
???DATE??. Two (2) copies of the
maximum number of thirty-five (35)
should provide enough information t
The SOQ shall designate the ind
(Principal-in charge, Project Mana
individual. A list of similar projects
shall be provided. For each project a
date, names of ~~proposed~~ project me
contact person, and phone number fo

All written Statements of Qualifica
Committee, which will be made up c
based on the selection criteria shown
address each criterion for evaluation
will be asked to meet with the Town

The Town reserves the right to end this relationship if the Town is not satisfied with the performance of the firm and/or if it is in the best interest of the Town. The Town and the Engineer are not under any obligation to continue with subsequent projects.

don't why need this

Interested consultants should direct questions and submit Statements of Qualifications to:

?????ADDRESS???.

More scope? Ability to measure flows
Wastewater analyses
Survey System wrt business, const activity
Review past data

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	4
	sanitary sewer system		
2.	Professional background of key personnel and experience in engineering, surveying and project administration~~, and resident project representation~~. The firm's current staff, both size and related experience, is qualified to provide the desired service. Strength of firms to which work will be subcontracted and history of working with proposed subcontractors.	0 - 10	4
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	1
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	1
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	1
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10	2
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4

3/3/2000	$ 6,586	
2/3/2000	$ 7,594	
1/7/2000	2,637	
12/6/1999	13,088	
9/28/99	5,227	
7/28/99	6,138	
7/18/99	11,185	10 K
~~6/18/99~~	~~22,471~~	
9/4/98	16,612.65	
7/24/98	2,084	
7/22/98	14,305	
6/29/98	8,540	
6/17/98	19,142	
5/16/98	9,542	
5/07/98	7,046	8,100
3/16/98	2,170.	
1/29/98	3,842	
12/19/97	4,805	
~~1/10/2000~~	$ 162,501	/ 8125 MO.
2/2/2000	7594	
3/6/2000	6600	
3/30/	8188	
1/10/2000	2637	
12/5/99	13,088	

	MIKE	KEITH	JIM	AVG.
CARTER BURGESS	97	90	97	94.6
GARCIA	95.5	86	72	84.5
~~FREESE~~ NICH.	87.5	75	91	84.5
Parsons	86.5	76	76	79.5
MalcomB	86	84	61	77

INVITE

Thurs. April 1st - in AFTERNOON

1^{30} 2^{30} 3^{30}

KCM

GOOD for KEITH

3/18/99

[illegible]

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	4
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	4
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	1
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	1
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	1
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10	2
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4

Mike M. | ENVIRONMENTAL INVESTIGATION | 1/21/99

To: J.B, Keith, Jim.

From: Mike

Subj: Sanitary Sewer Investigation

As you all are aware we've been experiencing extremely high BOD & TSS readings as tested/sampled by DWU.

I'm proposing to get a consultant on board to help us get to the bottom of this problem.

Attached is a rough <u>draft</u> of Request for Qualifications (RoQ). Please review and get comments back to me.

Thanks,

Mike

REQUEST FOR QUALIFICATIONS
FOR
ENVIRONMENTAL INVESTIGATION

The Town of Addison is presently accepting Statements of Qualifications from engineering consulting firms for an Environmental Investigation of the "entire" sanitary sewer system of the Town of Addison. This purpose of this project is to determine why BOD and TSS levels have been consistently increasing. Also as part of this project the successful engineering firm will be required to provide solutions and methods of implementation to lower the BOD and TSS limits below the 250 mg/l surcharge cap we are currently operating under.

The most qualified firm will be asked to submit a proposal and a fee will be negotiated to perform the work.

Addison will accept written Statement of Qualifications (SOQ) from consultants through ***???DATE??.*** Two (2) copies of the SOQ shall be submitted. The SOQ should contain a maximum number of thirty-five (35) single sided pages on 8 ½ " X 11" paper. The firm should provide enough information to demonstrate the firm's ability to perform the work. The SOQ shall designate the individuals who will be assigned to these projects (Principal-in charge, Project Manager, Project engineer, etc.) and resumes for each individual. A list of similar projects that the firm has completed in the last five (5) years shall be provided. For each project a description shall be provided along with completion date, names of proposed project members involved in the project, names of the client, contact person, and phone number for contact person.

All written Statements of Qualifications submitted will be evaluated by the Selection Committee, which will be made up of ***???NAMES??.*** The review of the SOQ's will be based on the selection criteria shown on the attached page. The SOQ should specifically address each criterion for evaluation. If it is deemed necessary, the top three (3) firms will be asked to meet with the Town and make oral presentations.

The Town reserves the right to end this relationship if the Town is not satisfied with the performance of the firm and/or if it is tin the best interest of the Town. The Town and the Engineer are not under any obligation to continue with subsequent projects.

Interest consultants should direct questions and submit Statements of Qualifications to:

?????ADDRESS???.

GO BY

REQUEST FOR QUALIFICATIONS
FOR
DESIGN AND CONSTRUCTION ADMINISTRATION
TOWN OF ADDISON

The Town of Addison is presently accepting Statements of Qualifications from engineering consulting firms for design and construction administration of the improvements at Celestial Pump Station. These improvements include the addition of 2 smaller pumps, an emergency generator and motor control center. Also included as part of the project is the design of a SCADA system (Supervisory Control and Data Acquisition). The SCADA system will monitor and operate the Celestial Pump Station, elevated storage tank, ground storage and the wastewater lift station.

The most qualified firm will be asked to submit a proposal and a fee will be negotiated to perform the work.

Addison will accept written Statements of Qualifications (SOQ) from consultants through June 27, 1997. Two (2) copies of the SOQ shall be submitted. The SOQ should contain a maximum number of thirty five (35) single sided pages on 8½" X 11" paper. The firm should provide enough information to demonstrate the firm's ability to perform the work. The SOQ shall designate the individuals who will be assigned to these projects (Principal-in-charge, Project Manager, Project Engineer, etc.) and resumes for each individual. A list of similar projects that the firm has completed in the last five (5) years shall be provided. For each project a description shall be provided along with completion date, names of proposed project members involved in the project, name of the client, contact person, and phone number for contact person.

All written Statements of Qualifications submitted will be evaluated by the Selection Committee, which will be made up of John Baumgartner, Director of Public Works, and Jeff Markiewicz, Project Manager. The review of the SOQ's will be based on the selection criteria shown on the attached page. The SOQ should specifically address each criteria for evaluation. If it is deemed necessary, the top three (3) firms will be asked to meet with the Town and make oral presentations.

The Town reserves the right to end this relationship if the Town is not satisfied with the performance of the firm and/or if it is in the best interest of the Town. The Town and the Engineer are not under any obligation to continue with subsequent projects.

Interested consultants should direct questions and submit Statements of Qualifications to:

Mailing:	John Baumgartner Director of Public Works P.O. Box 144 Addison, Texas 75001	Street:	16801 Westgrove Addison, Texas 75248
Phone:	(972) 450-2871	Fax:	(972) 450-2837

How to Register

Space is limited... reserve your seat today.

CALL

800-678-6565 EXT. 132
OR 319-556-8392 EXT. 132
INCLUDE: Name, Address, Phone & Fax numbers, E-mail address, Number of attendees and Location you're interested in attending

FAX

319-556-5321 ATTN. CIVIL SEMINAR REGISTRATION
INCLUDE: Name, Address, Phone & Fax numbers, E-mail address, Number of attendees and Location you're interested in attending

MAIL

EAGLE POINT SOFTWARE
4131 WESTMARK DRIVE
DUBUQUE, IA 52002-2627
ATTN. CIVIL SEMINAR REGISTRATION
INCLUDE: Name, Address, Phone & Fax numbers, E-mail address, Number of attendees and Location you're interested in attending

E-MAIL

jen.bushaw@eaglepoint.com
INCLUDE: Name, Address, Phone & Fax numbers, E-mail address, Number of attendees and Location you're interested in attending

SEMINAR REGISTRATION

Name: ____________________

Company: ____________________

Address: ____________________

City: ____________________ State: __________ Zip __________

Phone: (____) __________ FAX: (____) __________ E-mail: __________

Number of Atendees: _____

Location you wish to attend: ____________________

EAGLE POINT
4131 Westmark Drive • Dubuque, IA 52002
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Eagle Point Civil Engineering & Surveying Software

AUTOMATION
a Vision of the Future

Eagle Point will be hosting a series of seminars to introduce the power and flexibility of Eagle Point 98. We invite you to attend one of these free seminars nearest you.

Austin, TX
Monday, February 22nd
Holiday Inn Airport/Highland Mall
6911 IH-35N
Austin, TX 78752
(512) 459-4251

Norman, OK
Thursday, February 25th
Holiday Inn of Norman
1000 North Interstate Drive
Norman, Ok 73072
(405)364-2882

Houston, TX
Tuesday, February 23rd
Holiday Inn Northwest Freeway
14996 Northwest Freeway
Houston, TX 77040
(713) 939-9955

Arlington, TX
Friday, February 26th
Holiday Inn - Arlington
1507 North Watson Road
Arlington, TX 76006
(817) 640-7712

Shreveport, LA
Wednesday, February 24th
Holiday Inn
5555 Financial Plaza
Shreveport, LA 71129
(318) 688-3000

All seminars will start promptly at 9:00 a.m. and will conclude by 1:00 p.m.

FREE Seminars

Who should attend

PRINCIPALS
PROJECT MANAGERS
DEPARTMENT MANAGERS
NETWORK ADMINISTRATORS
CIVIL ENGINEERS
SURVEYORS
CAD TECHNICIANS
DRAFTERS

and anyone else interested in learning how data can flow through your process to create the deliverables for:

- *Subdivisions*
- *Site Designs*
- *Urban Streets*
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- *State Highways*
- *Topographic Surveys*
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- *Cross-sections*
- *Landfills*
- *Construction Staking*
- *Industrial Sites*
- *Dams*
- *Intersections*
- *Interchanges*
- *Storm Sewers*
- *Sanitary Sewers*

For More Information Call: (319) 556-8392, ext. 132

Carter Burgess

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10 9	4	32
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10 10	4	40
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10 10	1	10
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10 8	1	8
5.	Technical approach to projects. (Include computer capacity.)	0 - 10 8	1	8
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10 ~~6~~	2	~~6~~ ~~[illegible]~~ 90
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4	

Garcia

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10 9	4	36
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10 10	4	40
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10 10	1	10
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10 10	1	10
5.	Technical approach to projects. (Include computer capacity.)	0 - 10 10	1	10
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10 6	2	[illegible]
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4	

86

Malcom Pirnie

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10 8	4	32
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10 6	4	24
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10 10	1	10
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10 8	1	8
5.	Technical approach to projects. (Include compnter capacity.)	0 - 10 10	1	10
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10 6	2	12
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4	
				84

Parsons

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10 8	4	32
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10 5	4	20
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10 10	1	10
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10 5	1	5
5.	Technical approach to projects. (Include computer capacity.)	0 - 10 9	1	9
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10 10	2	20 ~~96~~
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4	76

Freese + Nichols

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10 8	4	32
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10 7	4	28
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10 10	1	10
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10 5	1	5
5.	Technical approach to projects. (Include computer capacity.)	0 - 10 5	1	5
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10 6	2	~~86~~
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4	
				75

CARTER BURGESS

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	8.5	4	34
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	9	4	36
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	9	1	9
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	9	1	9
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	9	1	9
					97
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

3/18/99

GARCIA & ASSOCIATES

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	8.5	4	34
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	9	4	36
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	9	1	9
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	8.5	1	8.5
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	8	1	8
					95.5
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10	8	2	
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

[signature]
3/18/99

FREESE & NICHOLS

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	7	4	28
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	8.5	4	34
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	8	1	8
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	9	1	9
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	8.5	1	8.5
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	87.5
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

[signature]
3/10/99

PARSONS

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	7.5	4	30
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	8	4	32
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	9	1	9
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	7.5	1	7.5
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	8	1	8
					86.5
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

Mike [illegible]
3/18/99

MALCOLM PIRNIE

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	7	4	28
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	8	4	32
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	10	1	10
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	8	1	8
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	8	1	8
					86
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

3/18/99

Garcia & Associates J. Pucci

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	6	4	24
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	6	4	24
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	8	1	8
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	8	1	8
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	8	1	8
					72
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

John Hart looks good
No mention of a lab

8:30 - 11:30

Tues 30th morning
Thurs 1st
1:30 thru 4:30

Freese & Nichols [illegible]

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	8.5	4	34
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	8	4	32
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	9	1	9
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	8	1	8
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	8	1	8
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	91
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

Dont need 2 people on QA/QC
Schuelein experience NA
HOSSAIN Looks good
No laboratory association
Proj manager has little relevant experience

Parsons E.S. Jo Pierre

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	7	4	28
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	7	4	28
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	8	1	8
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	6	1	6
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	6	1	6
					76
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

Thibodeau looks good
Other team members in Dallas?

No Mention of a lab

VALUATION CRITERIA FOR ENGINE__ING

		POINTS	MULTIPLIER
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	4
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	4
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	1
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	1
5.	Technical approach to projects. (Include compnter capacity.)	0 - 10	1
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10	2
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4

Carter & Burgess

EVALUATION CRITERIA FOR ENGINEERING

		POINTS		MULTIPLIER	
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	9	4	36
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	9	4	36
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	8	1	8
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	8	1	8
5.	Technical approach to projects. (Include compnter capacity.)	0 - 10	9	1	9
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10		2	97
7.	Oral presentation (short listed firms only if necessary).	0 - 10		4	

Which lab did sampling @ Granbury?
Ditto Ft. Worth Project
Have worked with Boyd Forbes & Carter before? Yes

CARTER

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	4
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	4
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	1
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	1
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	1
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10	2
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4

SURCHARGE (waste water impacts on businesses)

15

#

M 2

K 2

J 2

GARCIA

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	4
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	4
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	1
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	1
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	1
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10	2
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4

DID THE TGG - SURCHARGE FINES GO away because of your recs.

M = #3

K = #3

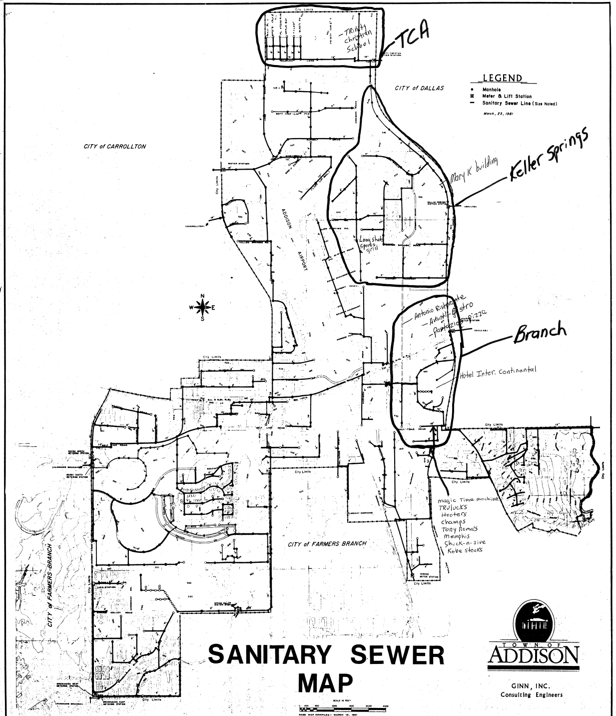
J = #3

FREESE

EVALUATION CRITERIA FOR ENGINEERING

		POINTS	MULTIPLIER
1.	The firm's experience in successfully performing similar assignments, scope, and size for others within the last five (5) years, by personnel still on the firm's staff.	0 - 10	4
2.	Professional background of key personnel and experience in engineering, surveying and project administration, and resident project representation. The firm's current staff, both size and related experience, is qualified to provide the desired service.	0 - 10	4
3.	Location of main office and/or branch office that will provide services and experience in the local area.	0 - 10	1
4.	Management approach to projects. (Include schedule and budget programs.)	0 - 10	1
5.	Technical approach to projects. (Include computer capacity.)	0 - 10	1
6.	Previous clients, for similar projects express satisfaction with the firm's work (Short listed firms only, if necessary).	0 - 10	2
7.	Oral presentation (short listed firms only if necessary).	0 - 10	4

M = #1
K = #1
J = #1



Trinity christian School
TCA
LEGEND
Manhole
Meter & Lift Station
Sanitary Sewer Line (Size Noted)
March, 25, 1981
CITY of DALLAS
CITY of CARROLLTON
Mary K building
Keller Springs
ADDISON AIRPORT
Long shots Sports grill
Antonio Ristorante
Avanti Bistro
Pastazio's pizza
Branch
Hotel Inter. Continental
magic Time machine
TRulucks
Hooters
champs
Tony Roma's
memphis
Shuck-n-Jive
Kobe steaks
CITY of FARMERS BRANCH
SANITARY SEWER MAP
TOWN OF ADDISON
GINN, INC.
Consulting Engineers