H Referenced Reports

I WDW-277 Permit and Discussion

J Plume Modeling Output Data and Interpretation Key

EXECUTIVE SUMMARY

This report is a request for a Petition Exemption Reissuance to the approved Hoechst Celanese Bay City Plant Injection Well Petition. Specifically, the Bay City Plant requests an expansion of the current specific gravity range of injected fluids at the facility. The document, Underground Injection Control Program Guidance # 74 - Modification of Class I Hazardous Waste Injection Well "No-Migration" Exemptions, issued by Michael B. Cook, Director, Office of Drinking Water, was used as a reference in analyzing potential requirements to amend the Bay City Plant Petition.

The Bay City Plant currently operates four Class I waste injection wells. All four wells were re-permitted by the Texas Water Commission effective January 13, 1987. The permits for the four wells were revised May 8, 1991, and the plant is currently operating under these permits. Two waste streams are injected by the Bay City Plant, an "acid" and a "neutral" waste. Each stream is injected into a separate well system. Waste Disposal Well WDW-110 injects into the Lower Miocene Injection Interval. WDW-14, WDW-32, and WDW-49 inject into the Upper Miocene Injection Interval. A permit application has been approved by the Texas Water Commission (July, 1991) for an additional injection well WDW-277, that will serve as a back-up to WDW-110, and be subject to the same, or more restrictive, permit conditions.

The Bay City Plant wishes to expand the specific gravity range currently specified in the approved Petition by submittal of an exemption reissuance at the request of EPA Region VI. The approved Petition specifies that the specific gravity of injected fluids lie within the range of 1.0032 to 1.0054 at 68°F (a density range of 1.0012 to 1.0034 g/cm^3). The requested specific gravity range is 1.00 to 1.10 at 68°F. This change is requested based on a demonstration of hydraulic similarity between the initial Petition injectate and the modified injectate (expanded specific gravity range) as reflected by the behavior and characteristics of the formation fluids.

As part of the Petition Reissuance, the Bay City Plant also wishes to add the newly permitted WDW-277 well to the Petition Exemption. Thus the newly issued permit has been added with a discussion.

Additional plume modeling using the high and low values of the proposed waste specific gravity range show that movement of the injected waste plume will not extend significantly beyond the limits defined by modeling in the original Petition demonstration, and thus does not significantly affect the "no-migration" demonstration in the approved Petition.

Because the characteristics of the expanded specific gravity range injectate are sufficiently within, or more dense than, the range of specific gravities modeled in the initial Petition, exemption reissuance of the Petition is justified. This is illustrated graphically in Figure 1.

The following points summarize the technical review and approach undertaken to prepare our request for Petition exemption reissuance:

- A review of the Underground Injection Control Program Guidance # 74 - Modification of Class I Hazardous Waste Injection Well "No-Migration" Exemptions document was made to determine that the requested Petition specific gravity modification is appropriate as an exemption reissuance.

- The 10,000 year plume model was rerun to determine the worst-case location of the plumes using the expanded specific gravity range.

- The revised specific gravity plumes were plotted on the approved Petition maps to show any new area covered by these plumes that was not covered by the plumes in the initial approved Petition.

- A review of the revised plume areas was conducted to determine if any additional artificial penetrations are impacted by the revised plume area.

Based on the above actions, a determination was made that the requested specific gravity range expansion of injected fluids will not affect the demonstration of no-migration in the approved Bay City Petition.

1.0 INTRODUCTION

The Hoechst Celanese Chemical Group, Inc., Bay City Plant, submitted a Petition to exempt hazardous waste injection from the land disposal restrictions. This Petition was submitted to the EPA in September 1988 and was approved May 4, 1990.

The Bay City Plant now wishes to modify the Petition via a Petition reissuance. This Petition exemption reissuance relates directly to the injection operations, in that the modification involves an expansion of an injectate parameter range which will slightly affect the hydraulic characteristics of the injected waste.

It is the interpretation of the Bay City Plant that only a Petition modification is required for this specific gravity modification based on EPA Guidance Document #74. However, due to discussions with representatives of EPA Region VI, the Bay City Plant is submitting this request as an exemption reissuance.

2.0 REGULATORY FRAMEWORK

The United States Environmental Protection Agency (EPA) has promulgated regulations that outline the procedures for altering exemptions to Class I injection well Petitions where the changes an operator seeks to make are more than clerical and may affect the demonstration. 40 CFR Sec. 148.20 (e) and (f) provide a framework for assessing changes that a well operator may wish to make, and for determining whether the changes are supported by data that was submitted with the Petition for exemption or whether the review of additional data is appropriate.

40 CFR Sec. 148.20 (e) states "any person who has been granted an exemption pursuant to this section may submit a Petition for reissuance of the exemption to include an additional restricted waste or wastes or to modify any conditions placed on the exemption by the Director. The Director shall reissue the Petition if the petitioner complies with the requirements of paragraphs (a), (b), and (c) of this section."

40 CFR Sec. 148.20 (f) states "any person who has been granted an exemption pursuant to this section may submit a Petition to modify an exemption to include an additional (hazardous) waste or wastes. The Director may grant the modification if he determines, to a reasonable degree of certainty, that the additional waste or wastes will behave hydraulically and chemically in a manner similar to previously included wastes and that it will not interfere with the containment capability of the injection zone."

Within this framework, the Bay City Plant requests a Petition exemption reissuance based on demonstrating that the new waste stream will behave hydraulically and chemically in a manner similar to wastes for which a demonstration has already been made. It will also be shown that the modification to the waste stream will not interfere with the containment capability of the injection zone.

3.0 WASTE STREAM MODIFICATION

The proposed change in waste stream character involves the incorporation of a wider specific gravity range into the modified Petition. The initial Petition stipulated that the specific gravity of injected fluids will remain within a range of 1.0032 to 1.0054 (a density range of 1.0012 to 1.0034 g/cm^3) at 68°F. The Bay City Plant proposes to amend this specific gravity range to the new specific gravity range of 1.0000 to 1.1000 at 68°F. Waste specific gravities measured at the plant are shown in Table 1. Measured waste stream specific gravity and modeled specific gravity ranges are reported in Table 2. The density/specific gravity nomograph used for conversion is included as Figure 2.

This change allows injection of a waste stream that will sometimes be of a slightly lower specific gravity, and sometimes be of a slightly higher specific gravity, than the waste stream modeled in the initial Petition.

Because this minor alteration of waste stream character will, to some degree, affect the hydraulic behavior of the new injectate, modeling was performed to show the new injectate movement. The results of this modeling show no significant movement beyond the limits established by modeling in the approved Petition demonstration. It is due to this confirmation modeling that application for Exemption Reissuance (40 CFR Sec. 148.20 (e)) is being made.

4.0 BUOYANCY

It is the Hoechst Celanese position that the buoyancy issue is not a problem at the site because for buoyancy to occur, this assumes that a waste fluid would previously enter a borehole, displace the drilling mud, and thus create a situation where a lighter fluid column is present in the wellbore with the propensity to buoyantly rise. It is the Hoechst Celanese position that this scenario cannot happen and that buoyancy driven flow does not occur due to the following:

1) Low permeability, drilling mud derived filter cake will be present along a mud filled open borehole providing a mechanical barrier to fluids entering or exiting the borehole;

2) Drilling muds are specifically designed so that the clay platlets and other components in the mud will not exit an open borehole into a formation and thus there is no process by which the mud would leave the borehole and be replaced by waste fluid;

3) Even if some mud that was in proximity to the waste plume were to leave the borehole by some process, the overbalanced mud column would immediately force new mud downward to replace it;

4) Most of the wells in the Hoechst Celanese 10,000 plume path are either cased, or have cement plugs and mud in them (or both) creating a closed system, and fluid entry into the wellbore would be prevented by the mechanical barrier of the well casing or by the inability of the entering fluid to "levitate" a cement plug in order to create space for waste fluid to enter the borehole;

5) Borehole closure and sloughing will seal off any open boreholes to fluid flow;

6) The gel strength and static fluid column pressure of the mud in an open mud-filled borehole will resist any influx of fluids from outside the borehole;

7) Hoechst Celanese shows in the Area of Review demonstration that in open boreholes, in cases where the pressure is highest due to elevated injection pressures, waste will not enter the borehole and the downward force of the mud column will exceed the upward driving forces caused by injection pressure increases in the injection zone;

8) Buoyancy is a vertical force, with a minimal horizontal component due to the gently dipping beds at Hoechst Celanese and unless the lighter fluid could be emplaced into the borehole, there will be no significant vertical buoyant driving force exerted on the borehole mud column;

9) The only fluid movement that could take place into the borehole, would be on a molecular level, with molecules of formation fluid or waste being substituted for molecules of borehole fluid, without a significant change in the resultant borehole fluid density.

The net effect of the above factors is that a significant waste fluid induced density contrast could not occur in a mud-filled borehole, and thus the creation of a buoyant fluid column pressure in a wellbore will not occur.

A more detailed discussion of this last item (i.e., number nine) follows:

A mud-filled borehole (using conventional mud systems) contains a colloidal suspension of microscopic clay, barite and other particles in water that has set up to form a gel. The clay particles in this structure are immobilized mechanically by electrostatic forces. Specifically, the positively charged edges of the clay platelets align with the negatively charged flat surfaces of adjacent platelets (Gray, Darley, and Rodgers, 1980). It is the electrostatic attraction of the clay particles which gives mud its gel strength and also prevents the clay and other particles from settling out of the mud. The ability of drilling mud to carry particles in suspension, even when static, is a key property of mud. Without sufficient gel strength, mud would not be able to remove excess solids and solids would drop to the bottom of the borehole. Since the density of the mud is primarily a function of suspended particles, immobilization of these particles by electrostatic forces prevents any potential loss in density resulting from interaction between the waste and the mud.

Water is a component of both drilling mud and waste fluid. Since water is a polar molecule, it will interact electrostatically with clay particles in the mud by hydrogen bonding. This will tend to immobilize the water molecules within the gel structure of the mud and prevent them from leaving. However, even if the water molecules could diffuse out of the mud, each molecule that left would be replaced by a readily available counterdiffusing water molecule from the waste fluid. Because the vast majority of injected waste is composed of water, the overall result would be no net diffusion of water molecules into or out of the borehole mud. Therefore, diffusional interaction of water molecules between the waste fluid and the drilling mud would, at worst, result in no net density change for the mud and buoyancy contrasts sufficient to create driving forces in the borehole will not occur.

Additionally, waste molecules are typically heavier than water molecules and if contaminant molecules in the waste diffused into the drilling mud, this would produce an increase in mud density, rather than a decrease. The amount of the density increase would typically be insignificant because the concentration of contaminant species in the waste is normally in the ppm range.

In conclusion, the gel structure of drilling mud prevents clay and weighting agents from migrating out of the mud. It is primarily the clay that is responsible for the higher density of the mud. Since, clay cannot leave due to the electrostatic bonds, the lower portion of the mud column that is in contact with the waste plume cannot become more buoyant. Water within the mud can interchange with water in the waste fluid; this will only occur on a one-for-one molecule level and will result in no net density change. Trace concentrations of contaminant species within the waste can diffuse into the mud, thus producing a slight density increase whose effect will usually be insignificant.

The above discussion demonstrates that waste fluid cannot enter a mud-filled borehole and this is the Hoechst Celanese position. Still, in the interest of absolute conservatism, and for the purposes of the following calculation, Hoechst Celanese makes the assumption that waste fluid could enter a borehole and replace the drilling mud from the injection interval to the top of the injection zone.

Using the following equations, and making these very conservative assumptions, it can still be shown that the artificial penetrations within the waste plume are safe because the buoyancy induced by the waste fluid arrival at a mud filled borehole is still substantially less than the conservatively calculated mud gel strength. A discussion of this follows.

The density contrast between a mud-filled borehole and a low density waste in the injection reservoir may produce a small upward driving force, assuming the waste was able to get into the borehole. This force is caused by the buoyancy of the less dense waste relative to the borehole fluid. However, in a mud-filled borehole, the buoyant force is opposed by the gel strength of the mud, and mudcake which will prevent the waste from infiltrating into the mud column at the wellbore face. Furthermore, during the 10,000 year time period the injected plume will disperse, and the density contrast and resulting buoyant force will decrease over time.

Miller, et al. (1986) have quantified the buoyant effect, and have shown that the resulting pressure increase (psi) is equal to the distance times the density difference (gm/cc) between the waste and the borehole fluid. The buoyancy pressure contributed by the waste plume, conservatively assuming no dispersion, for the injected waste stream at the Bay City Plant can be calculated by:

$$P = (\rho_f - \rho_w)gL \qquad \text{Equation (1)}$$

Where:

P = buoyancy pressure (psi)
ρ_f = formation fluid density (gm/cc)
ρ_w = waste density (gm/cc)
g = acceleration of gravity (0.433)
L = distance from injection zone to upper injection interval (feet)

As an example, solving Equation 1 above using a 0.056 gm/cm^3 density difference (formation fluid density of 1.056 gm/cm^3 minus the lightest density waste 1.0 gm/cm^3), a distance from the uppermost injection interval to the top of the injection zone and making the appropriate unit conversions (i.e., 485 feet), the maximum buoyancy pressure at the Bay City Plant equals 11.8 psi. The attached table shows the data for each individual well within the plume and the buoyancy effect due to waste and the gel strength of each borehole.

A conservative assumption is made that the buoyant force is opposed only by the gel strength of the mud. To calculate the gel strength of the static mud column, Equation 2 was employed from a recent Texas Water Commission study (Johnson and Knape, 1986).

$$P_g = (0.00333) \times G \times \frac{h}{d} \qquad \text{Equation (2)}$$

Where:

P_g = pressure due to gel strength (psi)

G = gel strength (20 lbs/100 sq ft)

h = depth to uppermost injection interval (feet)

d = bit diameter through uppermost injection interval (inches) and 0.00333 is the conversion factor, such that P_g is in psi.

As an example, solving the above equation for artificial penetration #250, and using 9-7/8 inches as a borehole diameter, 20 lbs/100 square feet for the gel strength (Davis, 1986) and 3422 feet as the worst-case minimum depth to the uppermost injection interval, a very conservative gel strength estimate of 23.1 is obtained. Parameters for each individual well and the resulting gel strengths within the plume are shown in the attached Table. However, Pierce (1989) and Collins (1989) have shown that the gel strength of the mud is most likely an order of magnitude larger, yielding a considerable margin of safety. The gel strength of clay-based muds comes from the tendency of the plate-like clay particles to align so that the positively charged edges are adjacent to the negatively charged flat surfaces. If the mud sits at rest, then gel strength increases with time as the additional clay particles come into alignment. Thus, in the case of a borehole abandoned for some time, it is likely that the mud originally used during drilling has set to form a gel with a substantial gel strength. All boreholes intercepted by the 10,000 year plume have been investigated and assured plugged by appropriate weight of mud, at least 9.0 lbs/gal. Since the gel strength of a static mud column is larger than the buoyancy pressure, fluid movement of the waste, not only into but also vertically, in a mud-filled borehole could not occur; therefore, only molecular diffusion need be considered in the no-migration demonstration. For a discussion of molecular diffusion, see Appendix 2-11 in the original Petition document submitted to the EPA. Following is a summary table of the gel strength and buoyancy calculations for each well in the 10,000 year plume path. In each case, the opposing gel strength is greater than the waste induced buoyancy, and thus, the wells are safe.

The requested information is being supplied in the following table.

Map ID#	Top II Subsea Depth (feet)	Elevation (feet)	Top II Depth Below GL (feet)	Top IZ Subsea Depth (feet)	Distance II to IZ (feet)	Mud Weight* (lb/gal)	Bit Diameter (inches)	Gel Strength (psi)	Buoyant Force (psi)
4	-3356	30 est	+3386	-2898	458	11.5	9 7/8	22.8	11.1
6	-3355	30 est	+3385	-2875	480	12.5	12 1/4	18.4	11.6
9	-3300	31	+3331	-2833	467	10.1	12 1/4	18.1	11.3
10	-3318 est	34	+3352	-2855 est	463	11.1	9 7/8	22.6	11.2
11	-3312	30 est	+3342	-2850	462	9.8	12 1/4	18.2	11.2
30	-3407	30 est	+3437	-2928	479	11.9	9 7/8	23.2	11.6
242	-3407	32	+3439	-2932	475	12.1	9 7/8	23.2	11.5
250	-3400	22	+3422	-2925	475	13.9	9 7/8	23.1	11.5
251	-3406	18	+3424	-2921	485	13.2	9 7/8	23.1	11.8
252	-3405 est	19	+3424	-2920 est	485	11.7	9 7/8	23.1	11.8
255	-3397	20	+3417	-2918	479	11.4	12 1/4	18.6	11.6
256	-3409	20	+3429	-2924	485	13.2	9 7/8	23.1	11.8
257	-3362	20	+3382	-2935	427	12.5 est	9 7/8	22.8	10.4
Petrus	-3365	27	+3392	-2950	415	12.2	9 7/8	22.9	10.1

DATA SOURCES:

1) **SUBSEA DEPTH** - taken from Appendix 3-7, Structure Map Top of Upper Miocene Injection Interval.

2) **ELEV.** - taken from electric logs in Appendix 4-15, Well Logs.

3) **TOP IZ** - taken from Appendix 3-8, Structure Map Top of Permitted Injection Zone.

4) **DISTANCE IZ TO II** - the top of the Upper Miocene Injection Interval is taken from 1) above and the top of the injection zone is taken from 3) above.

5) **MUD WEIGHT** - taken from electric logs, mud weight in injection interval.

6) **BIT DIAMETER** - taken from electric logs in Appendix 4-15, Well Logs; diameter of bit at injection interval.

7) **GEL STRENGTH** - calculated using the equation $P_g = 0.00333*G*h/d$ where G = 20 lb/100 sq. ft.

8) **BUOYANT FORCE** - Calculated using equation $P_B=(\rho_F - \rho_W)gL$, where $G=0.433$, $\rho_F = 1.056$ g/cm^3, $\rho_W = 1.000$ g/cm^3, and L is taken from the table (Distance) (i.e., from top of injection zone to top of upper injection interval.) also, ρ_i = upper miocene injection interval formation fluid density, and ρ_w = lightest requested waste density for injection.

REFERENCE

Gray, G. R., Darley, H.C.H., and Rodgers, W.F., 1980, Composition and Properties of Oil Well Drilling Fluids, Fourth Edition, Gulf Publishing Co.; Houston ,Texas, 630 p.

5.0 COMPATIBILITY

Because this proposed Petition modification deals solely with an expansion of injectate fluid specific gravity range, the new waste stream will be identical to the injectate in the approved Petition in every respect except specific gravity. Therefore, there will be no change in molecular diffusion rates of individual constituents in the waste stream.

The non-endangerment standard demonstrated in the initial petition will still be valid for vertical waste movement using the revised specific gravity range because no significant vertical pressure component is added to the driving force modeled in the original Petition. Also, a change solely in waste specific gravity will not affect the compatibility of the waste with the formation fluid or formation rock.

6.0 MODELING

The 10,000 Year plume modeling runs were performed on both the Upper and Miocene Injection Intervals using the highest and lowest, specific gravity values. All parameters used in the initial petition demonstration have been held constant with the exception of the injectate waste stream specific gravity and the dip rate. A conservative dip rate of 50 feet per 1000 feet was used in the original petition, but a dip rate of 50 feet per mile is more representative of the actual regional gradient and therefore was used during remodeling in the reissuance. The resultant plumes are shown on the approved petition structure maps and are enclosed in Appendix D. The plume plots and modeling inputs are enclosed in Appendix C. The job and the output files are contained in Appendix G.

Four specific cases are presented in Appendix C: the Upper Miocene with a low density waste of 0.998 g/cc, the Upper Miocene with a high density of 1.086 g/cc, the Lower Miocene with a low density of 0.984 g/cc, and the Lower Miocene with a high density of 1.080 g/cc. The Upper and Lower Miocene low density cases have been reviewed on 5 to 10 year time increments ("snapshots") during the first 50 years of post-closure, since this is when the plume will move the maximum distance updip due to buoyancy.

Results of the Upper Miocene, 10,000 Year Plume Model show that low density plume (with an initial radius of 3500 feet) will move updip a maximum distance of 5,080 feet within 5 to 10 years after injection has ended. Snapshots of the plume are included in Appendix C for time periods of 5, 10, 15, 25, 50, 250, 500, 750, 1,000, 1,500, 2,000, 3,000, and 10,000 years after injection has ended. The maximum down dip distance of the Upper Miocene, low density plume after 10,000 years is approximately 34,000 feet. The Upper Miocene, high density, waste plume has a maximum down dip extent of approximately 44,000 feet in 10,000 years.

Results of the Lower Miocene, 10,000 Year Plume Model indicate that the low density plume (with an initial radius of 1950 feet) will move updip a maximum distance of 3,140 feet (during the first 10 years of post-closure). Snapshots of the plume are included in Appendix C for time periods of 10, 20, 30, 62.5, 125, 187.5, 250, 500, 1000, 1500, 2000, and 2500 years after injection has ended. The low density plume for 10,000 years has been hand calculated because of the Cray memory limitations. The model indicates that the plume moves 11,000 feet in 2500 years. The product of the natural groundwater flow velocity (3.18 ft/yr) and 7,500 years, yields a movement of 23,850 feet. The sum of the 2,500 year plume and the additional 7,500 year movement is 34,850 feet, which is the maximum distance traveled by the 10,000 year plume. A quick validation of this method is obtained by multiplying the natural gradient (3.18 ft/yr) by 2,500 years. This gives a value of 7,950 feet. Add this to the initial plume size (1,950 feet) and the hand calculation renders a downdip movement of 9,900 feet. This value is very similar to the more conservative 11,000 feet calculated by the model for the 2,500 time period. The high density, Lower Miocene, waste plume is modeled at approximately 38,000 feet downdip.

7.0 PLUME AREA REVIEW

Because the higher specific gravity 10,000 year plume extends about one half mile farther downdip than the plume modeled in the initial Petition, a search was conducted to ensure that no new or existing wells were now in the revised plume area. Agency Information Consultants, Inc., (AIC) was contacted to make a search of the Texas Railroad Commission records. A letter and map from AIC are included in Appendix B which states the results of the conducted plume area search. Also included in Appendix B is a detailed explanation of the protocol used by AIC for the plume area review search as well as the actual steps undertaken.

This review determined that no wells exist in the newly modeled plume path that were not previously recognized. However, one newly drilled well was found in this new search that is in the plume of both the plume modeled in the initial Petition, and this most recent plume modeling.

This well, the Petrus No. 2 Butter Estate was drilled to a total depth of 13,400 feet on January 24, 1990. It was a dry hole that was plugged and abandoned February 13, 1990. According to the state plugging form, the well was filled with mud-laden fluid but, due to plug placement, is considered an improperly plugged well for petition purposes. Further investigation indicates that the well does pass the no-migration standard through the application of the molecular diffusion calculation. All well records and a completion schematic are included in Appendix F.

8.0 CONCLUSION

In requesting an expansion of the specific gravity range stated in the initial Petition demonstration, the Bay City Plant feels that this procedure is appropriate because:

- the hydraulic similarity of injectates is maintained,
- the change in the updip and downdip movement of the injected plume, caused by the specific gravity modification is insignificant, and,
- the injectate, including the new or altered waste, is, in greatest part, within or of a greater specific gravity than the range of injectate fluid specific gravities on which the initial Petition modeling was based.

9.0 SUMMARY OF PETITION REISSUANCE REQUEST

The current injectate specific gravity range specified in the approved Hoechst Celanese Chemical Group, Inc., Bay City Plant Petition is 1.0032 to 1.0054 at 68°F (a density range of 1.0012 to 1.0034 g/cm^3). The requested modified injectate specific gravity range is 1.00 to 1.10 at standard conditions (68°F).

Based on the previous discussion, the Hoechst Celanese Bay City Plant formally requests the EPA to issue a Petition Exemption Reissuance under 40 CFR Sec. 148.20 (e) to approve the modified range of injectate specific gravity at the Bay City Plant.

Also, Hoechst Celanese is adding a copy of the state permit for a newly permitted well at the plant (WDW-277) to this reissuance document, in order to complete the administrative record for the new well as part of the petition exemption from the land bans.

10.0 STATEMENT OF CERTIFICATION

I, C. R. Pennington, Plant Manager,

certify under penalty of law that I have personally examined and am familiar with the information submitted in this petition and all attached documents, and that, based on my inquiry of those individuals responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature: C.R.P.

Title: Plant Manager

Date: August, 1991

SUBSCRIBED AND SWORN to before me by the said C. R. Pennington on this 9th day of Aug. My commission expires on 1-17-94.

Vanessa Flory
Notary Public in and for
Matagorda County, Texas

TABLES

TABLE 1

Bay City Plant Liquid Waste Discharge
Analytical Monitoring Program
Acid & Neutral Well Analysis 1988 to 1990

DATE Sample	Acid Well Specific Gravity	Acid Well Total Solids ppm	Acid Well Total Solids ppm	Neutral Well Specific Gravity	Neutral Well Total Solids ppm	Neutral Well Total Solids ppm
Jan 08 1988	1.0056	586	604	1.0012	584	625
Feb 05 1988	1.0061	452	514	1.0013	1077	975
March 15 1988	1.0056	624	615	1.0013	1504	1472
April 19 1988	1.0061	498	524	1.0021	963	933
May 10 1988	1.0067	619	669	1.0021	706	689
June 13 1988	1.0037	423	396	1.0014	1385	1409
July 18 1988	1.0015	439	403	1.0013	1402	1436
Aug 02 1988	1.0049	514	495	1.0014	1116	1139
Sept 06 1988	1.005	399	376	1.0019	693	690
Oct 05 1988	1.0059	597	582	1.002	1230	1173
Nov 10 1988	1.006	621	602	1.002	1194	1177
Dec 13 1988	1.0056	432	387	1.0017	1142	1137
Jan 05 1989	1.0053	415	379	1.002	1055	1078
Feb 13 1989	1.0059	420	402	1.002	1005	1071
March 09 1989	1.0056	595	548	1.002	703	766
April 12 1989	1.0056	610	638	1.0021	870	856
May 15 1989	1.0044	394	463	1.0018	1059	1185
June 07 1989	1.0047	359	343	1.0015	1083	1076
July 14 1989	1.0093	706	603	1.0017	651	742
Aug 07 1989	1.0009	467	551	1.0019	532	558
Sept 06 1989	1.0036	463	446	1.0032	1305	1338
Oct 09 1989	1.0038	456	414	1.0034	1769	1766
Nov 02 1989	1.0028	550	556	1.002	663	681
Dec 05 1989	1.0028	422	473	1.0025	1319	1096
Jan 11 1990	1.0028	542	484	1.0023	1154	1189
Feb 07 1990	1.003	456	434	1.0026	1358	1336
MAR 07 1990	1.0029	301	349	1.0016	629	581
APRIL 17 1990	1.0047	489	499	1.0019	439	441
MAY 08 1990	1.0025	281	294	1.0011	424	415
JUNE 05 1990	1.002	395	405	1.0015	415	405
JULY 12 1990	1.0018	359	385	1.0018	450	475
AUG 19 1990	1.002	385	365	1.0019	470	479
MEAN =	1.004043	475.7187	474.9575	1.001871	947.8125	949.5937
STD DEV =	0.001761	101.2977	98.26851	0.000620	361.4068	355.8232

NOTE: Measured at 68 degrees F

TABLE 2
SPECIFIC GRAVITY CONVERSIONS

MEASURED SPECIFIC GRAVITY RANGE (68°F)

Upper Miocene Neutral Waste	1.0011 - 1.0034
Lower Miocene Acid Waste	1.0015 - 1.0067

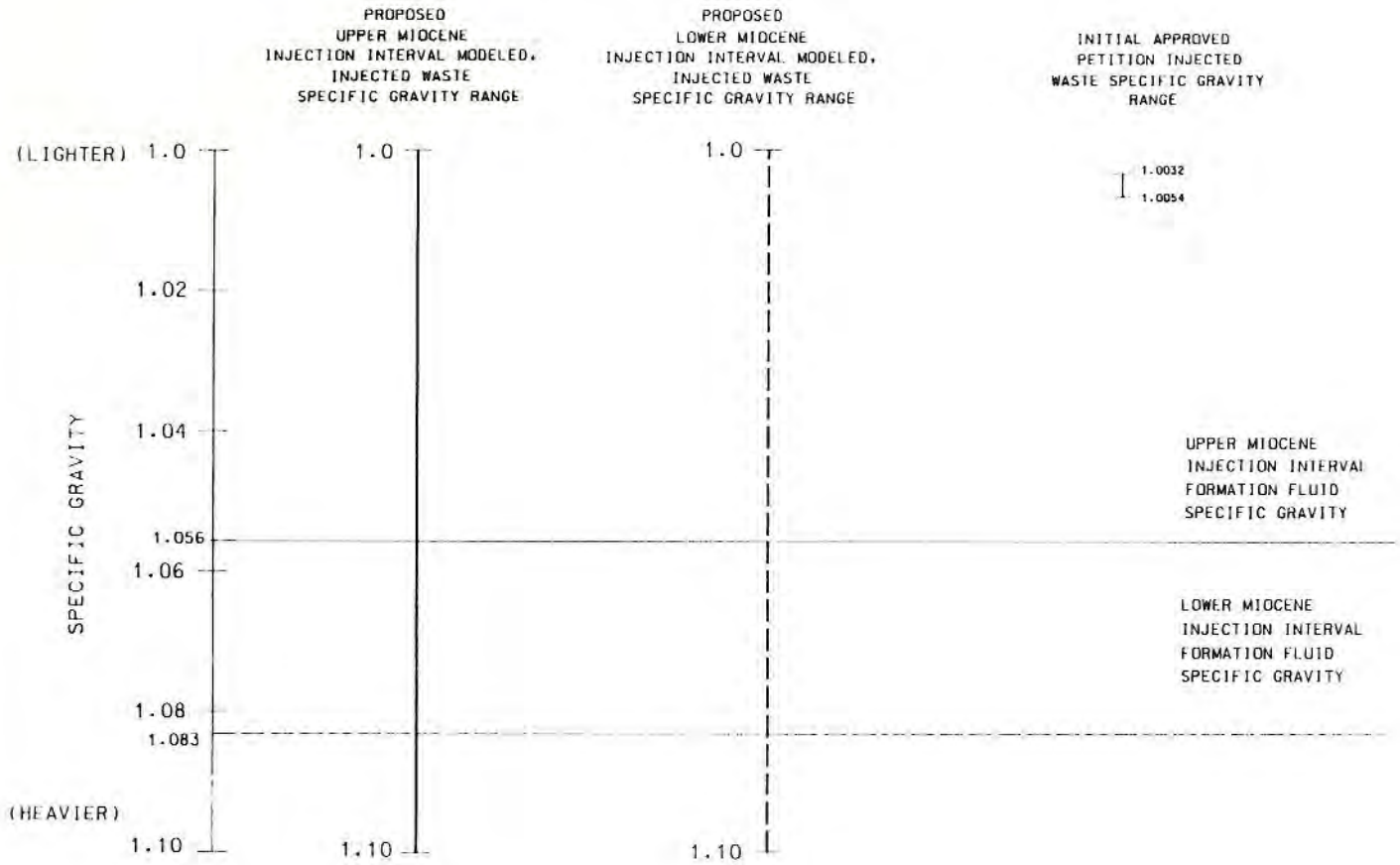
MODELED DENSITY RANGE

	Low Density Waste (gm/cm^3)	High Density Waste (gm/cm^3)	Formation Fluid Density (gm/cm^3)
Upper Miocene Injection Interval (at 113°F)	0.998	1.086	1.045
Lower Miocene Injection Interval (at 137°F)	0.984	1.080	1.072

MODELED SPECIFIC GRAVITY RANGE (68°F)

	Low Specific Gravity Waste	High Specific Gravity Waste	Formation Fluid Specific Gravity
Upper Miocene Injection Interval	1.0	1.1	1.056
Lower Miocene Injection Interval	1.0	1.1	1.083

FIGURES



NOTES:

ALL VALUES AT 68° F

DU PONT
ENVIRONMENTAL
REMEDIATION
SERVICES
HOUSTON, TEXAS

REVISIONS

NO.	DESCRIPTION	DATE

FIGURE 1

WASTE/FORMATION
FLUID
SPECIFIC GRAVITY
COMPARISON

PROJECT NO.
873745D

DRAWING NO. SHEET NO.
OF

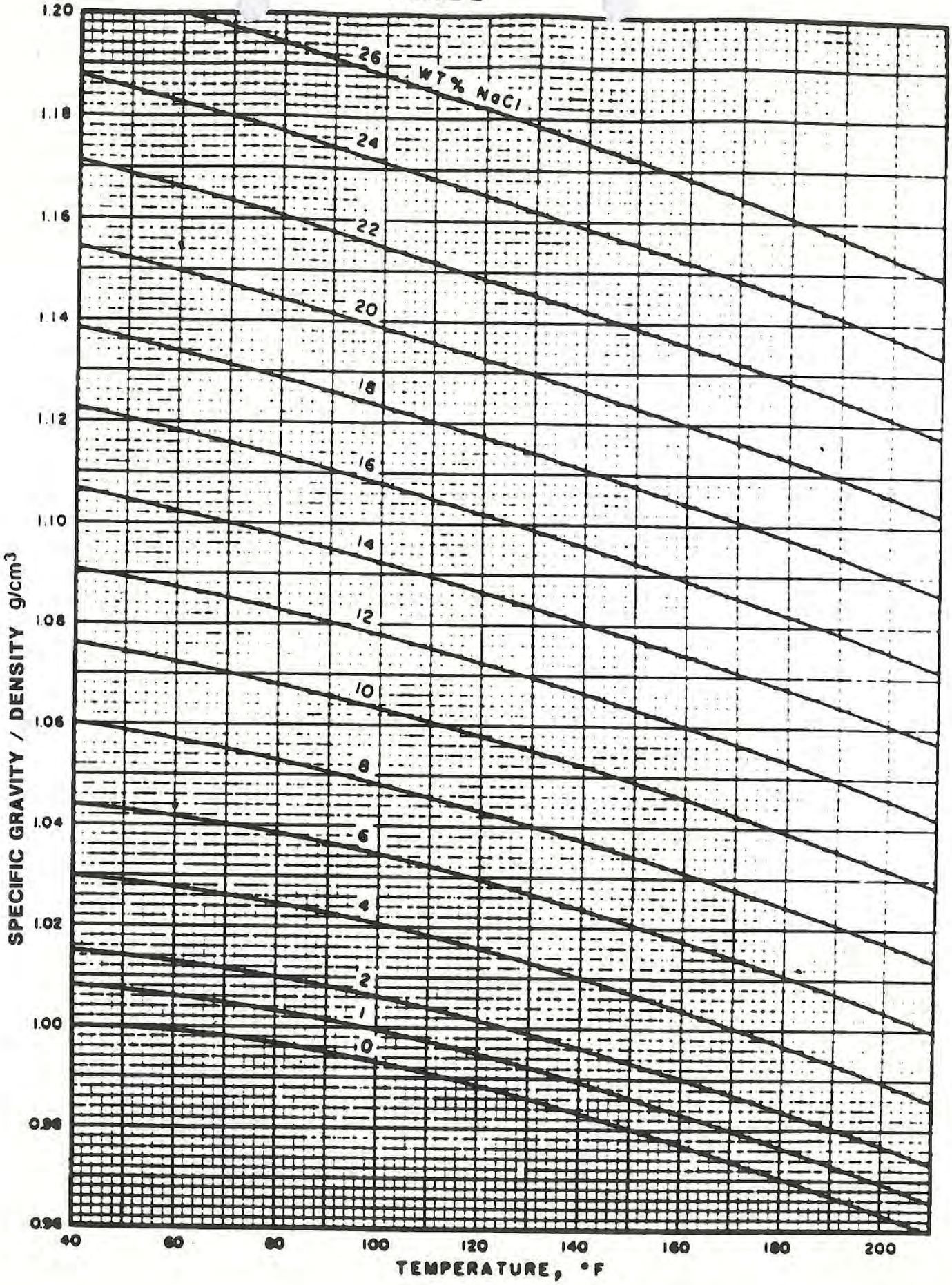
DRAWN BY LL
CHECKED BY J.F.G.

APPROVED BY J.F.G.
DATE 12-12-90

SCALE
AS SHOWN

DUPONT

FIGURE 2


26
WT % NaCl
24
22
20
18
16
14
12
10
8
6
4
2
1
0
1.20
1.18
1.16
1.14
1.12
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.96
SPECIFIC GRAVITY / DENSITY g/cm3
40
60
80
100
120
140
160
180
200
TEMPERATURE, °F

APPENDICES

APPENDIX A
UNDERGROUND INJECTION CONTROL PROGRAM
GUIDANCE # 74 - MODIFICATION OF CLASS I
HAZARDOUS WASTE INJECTION WELL
"NO-MIGRATION" EXEMPTIONS

APPENDIX B
AGENCY INFORMATION CONSULTANTS INC., PLUME AREA WELL SEARCH

APPENDIX C
REVISED WASTE SPECIFIC GRAVITY MODELING PLOTS AND INPUT DATA

* * * Hoechst Celanese, Bay City, TX -- Upper Miocene Inj. Sand -- Low dens. Waste * * *

I N P U T P A R A M E T E R S

Plume Parameters:

Nominal Radius (ft)	=	3500.	Waste Density (g/cc)	=	0.998

Formation Parameters:

* Natural Velocity (ft/yr)	=	2.83	Formation Fluid Density (g/cc)	=	1.045
Lateral Dispersivity (ft)	=	50.0	Transverse Dispersivity (ft)	=	5.0
Dip Angle (ft/mi)	=	-50.0	Porosity	=	0.330
Viscosity (cp)	=	0.710	Permeability (Darcy)	=	1.350

Model Parameters:

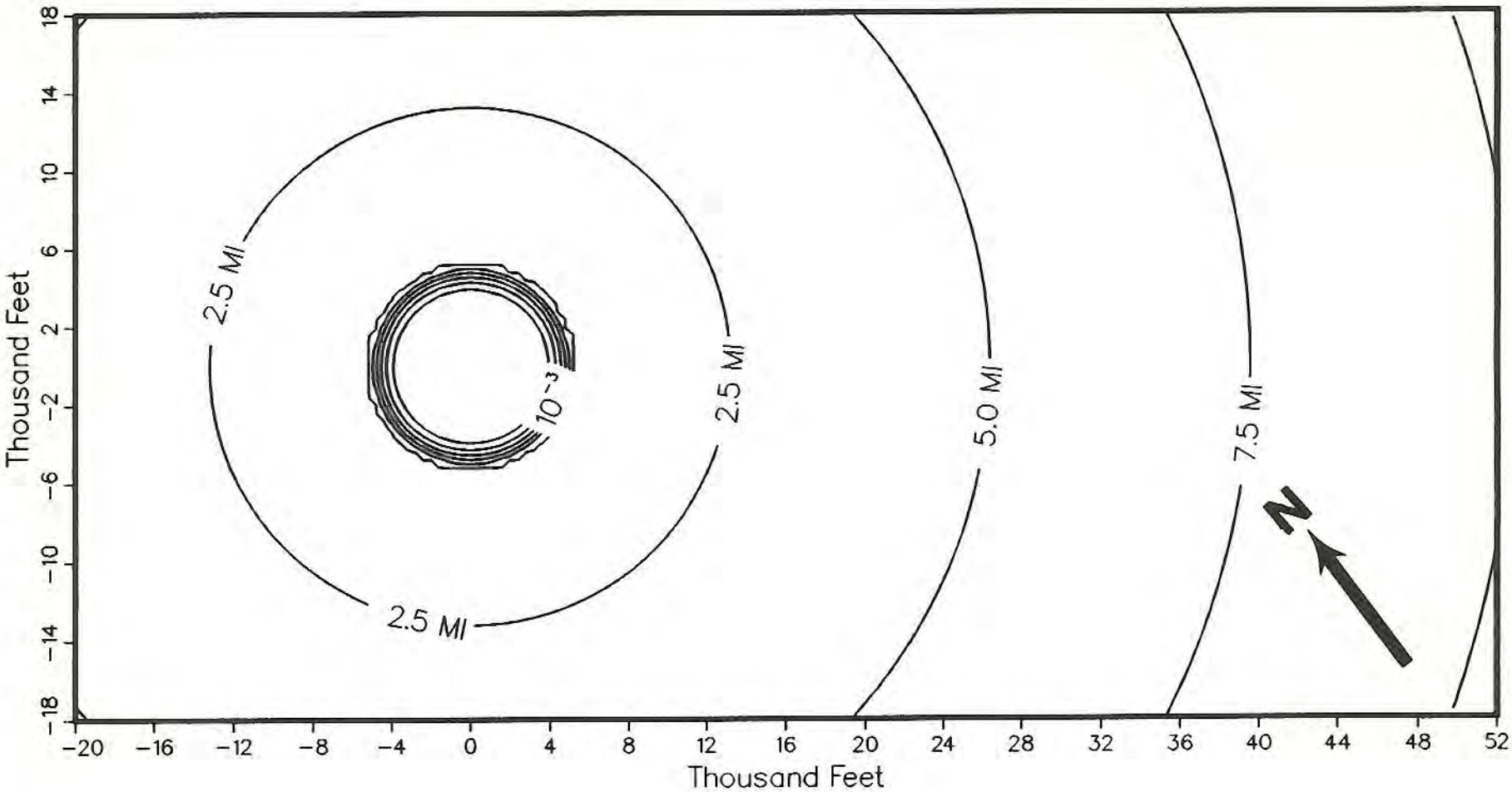
Problem Time (yr)	=	10000.	Number of Output Intervals	=	1.0
Prob. Space Limit (Norm. Y Coord.)	=	3.750	Prob. Space Limit (Norm. -X Coord.)	=	-3.750
Number of Coordinate Moves	=	0.0	Nat. Vel. Dispersion Factor	=	0.00

D E R I V E D P A R A M E T E R S

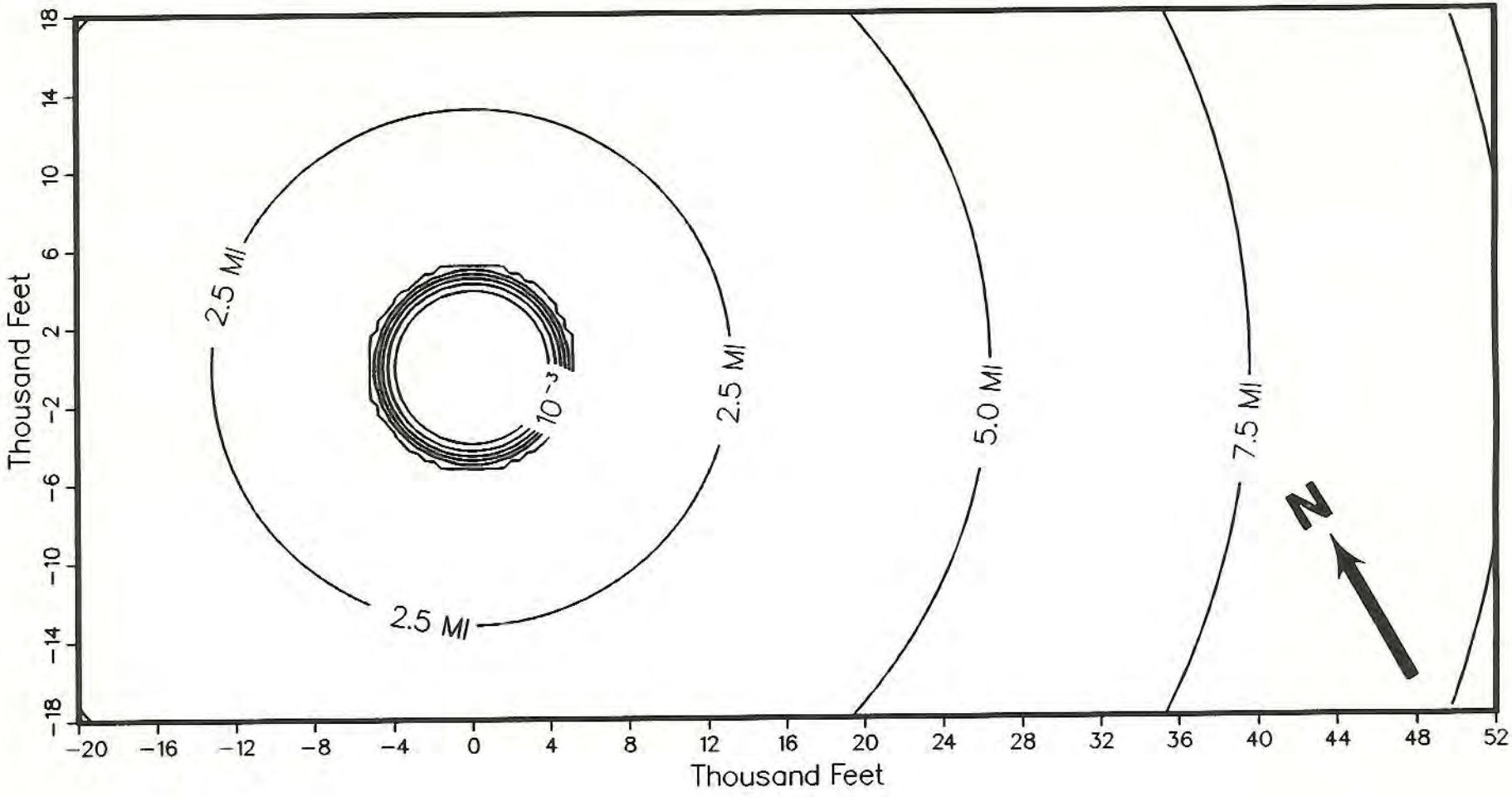
* Max. Density Driven Vel. (ft/yr)	=	-1.28	Dimensionless Time	=	10.89
Beta	=	0.8182	L	=	0.0079
Cos(Xi)	=	-0.6702	Sin(Xi)	=	0.7422
delX = delY	=	0.0300	Prob. Space Limit (Norm. +X Coord.)	=	11.250

* Negative implies updip velocity

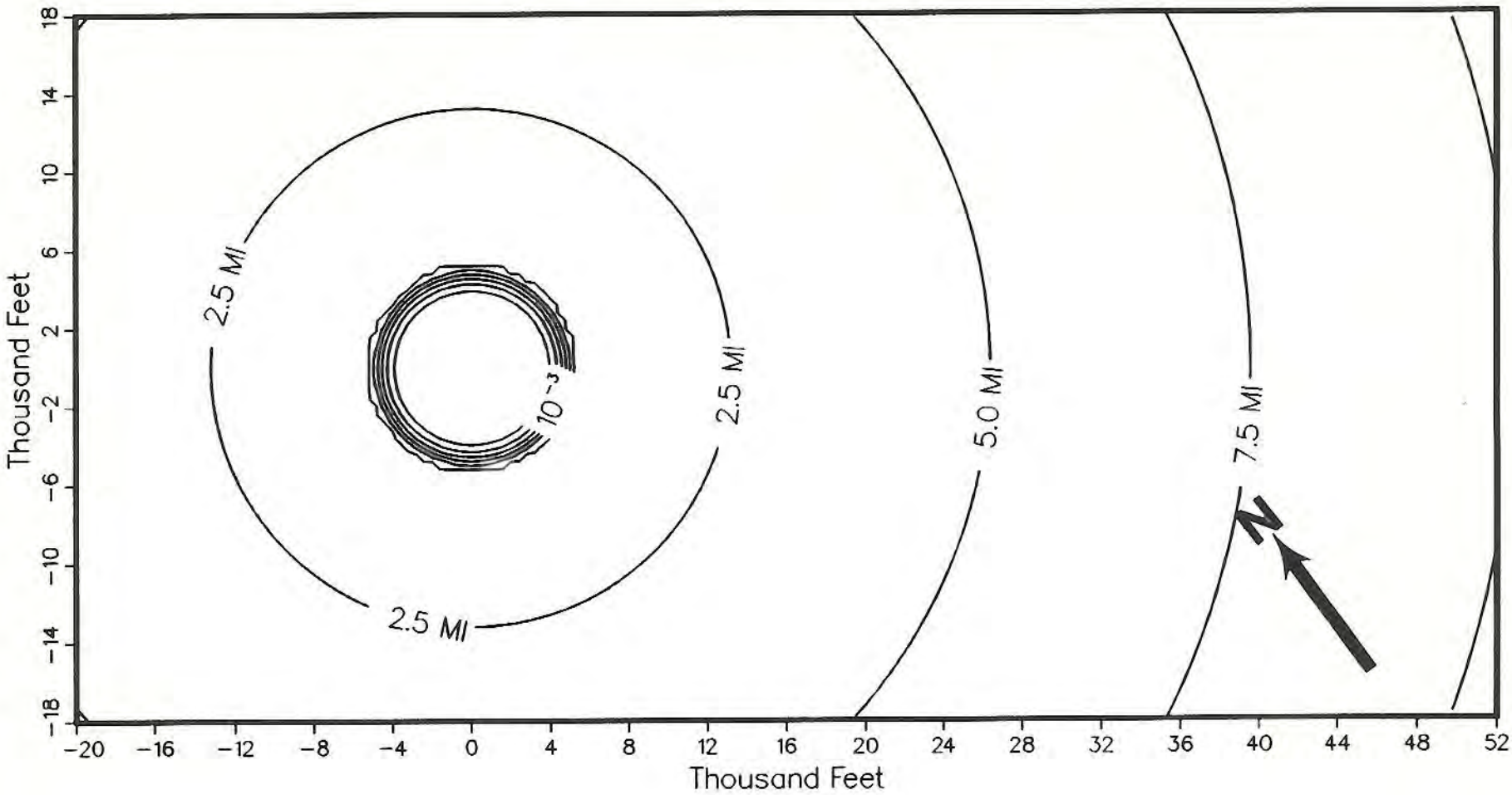
CELANESE – U. MIOCENE – LOW DENSITY – 5 YEARS



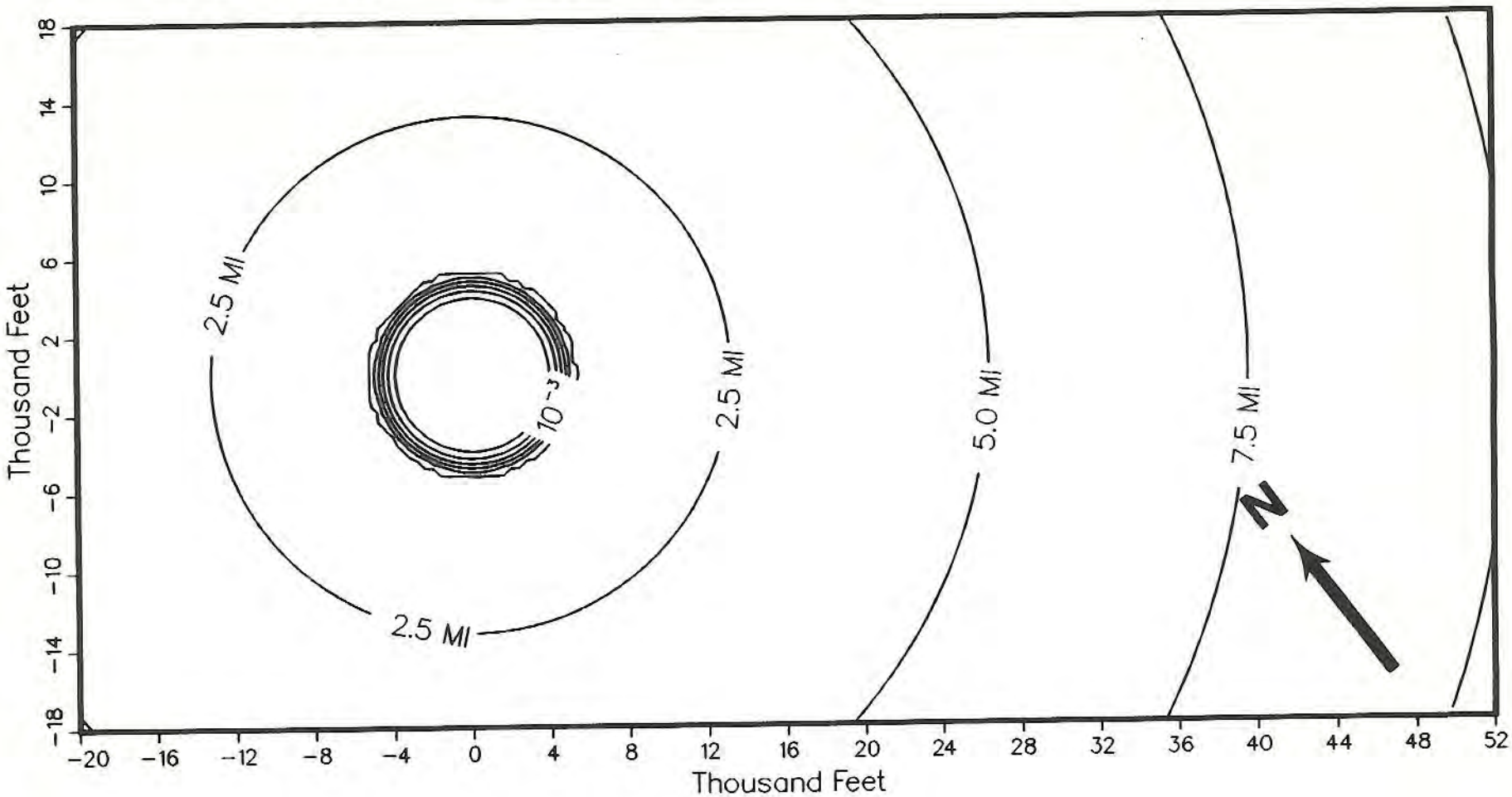
CELANESE – U. MIOCENE – LD WASTE – 10 YEARS



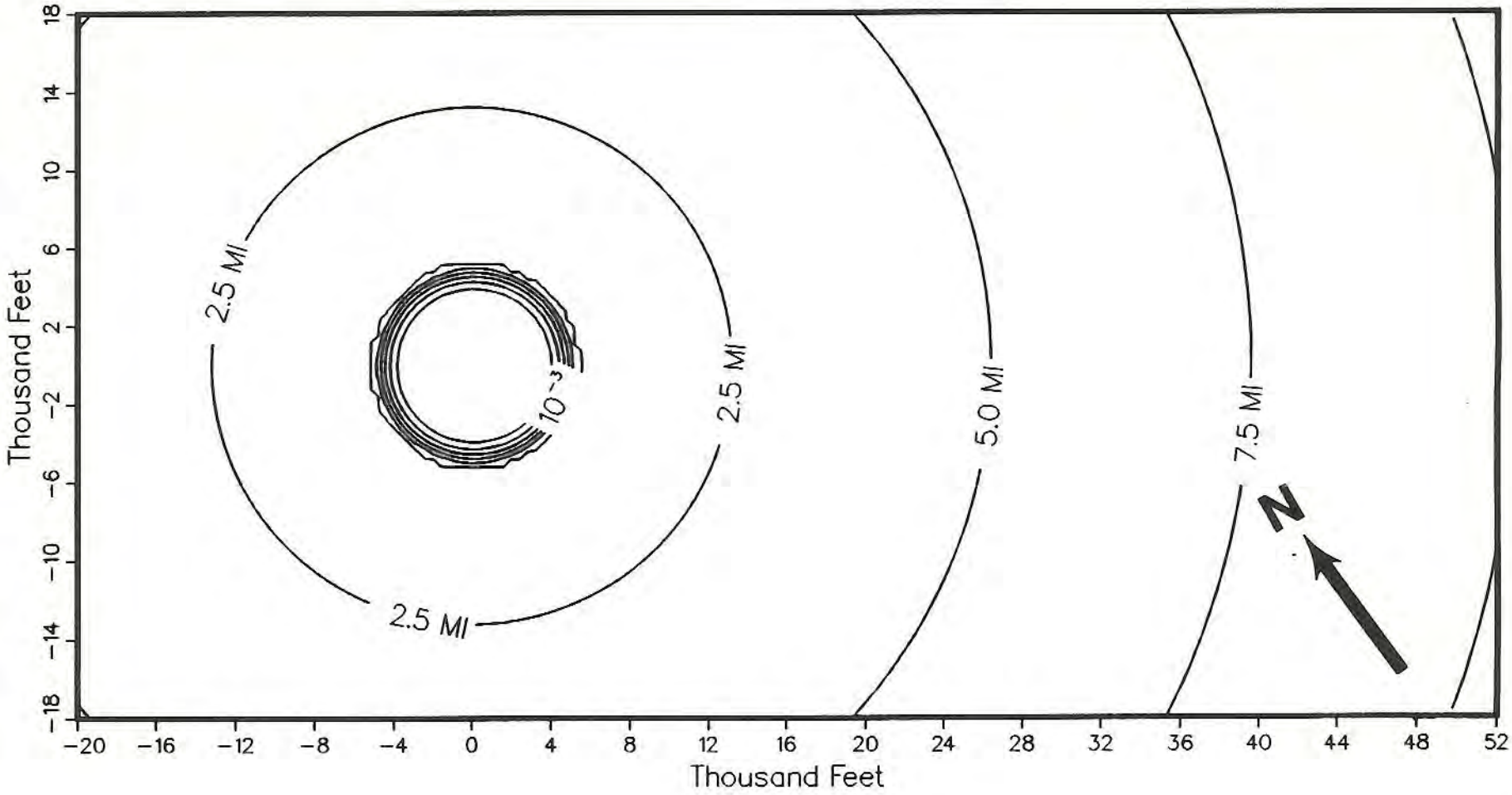
CELANESE – U. MIOCENEC – LD WASTE – 15 YEARS



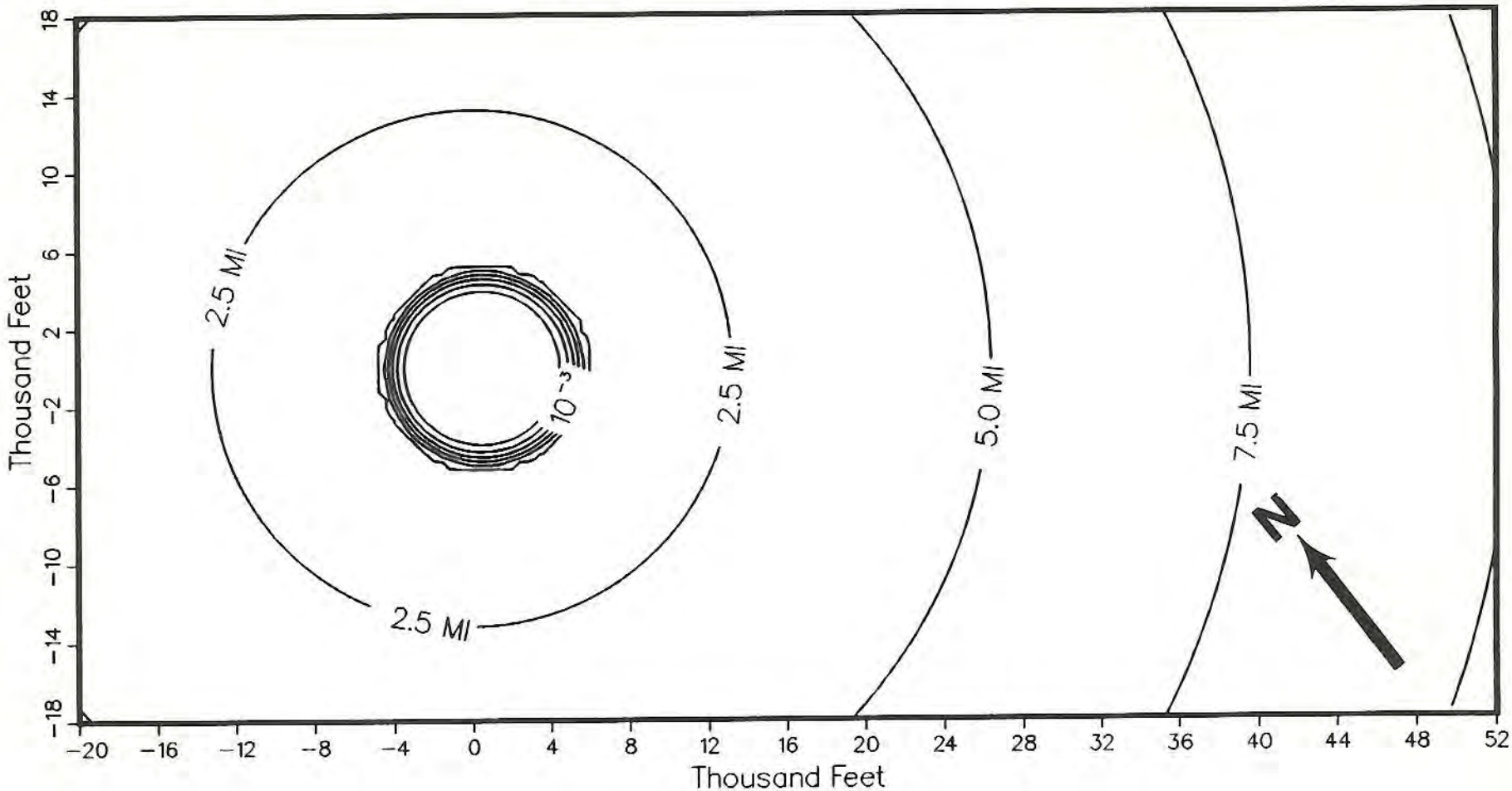
CELANESE – U. MIOCENE – LD WASTE – 25 YEARS



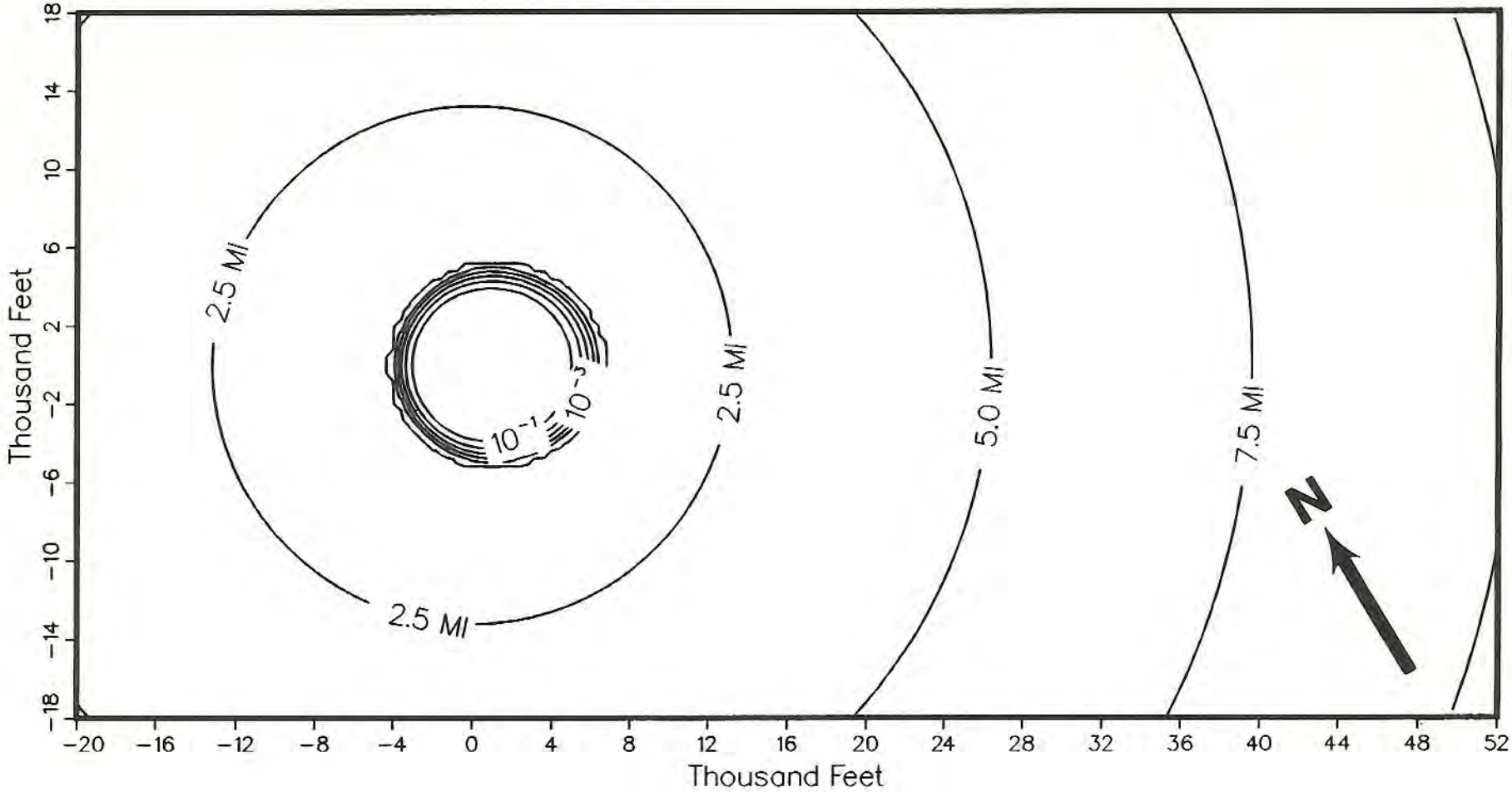
CELANES – U. MIOCENE – LD WASTE – 50 YEARS



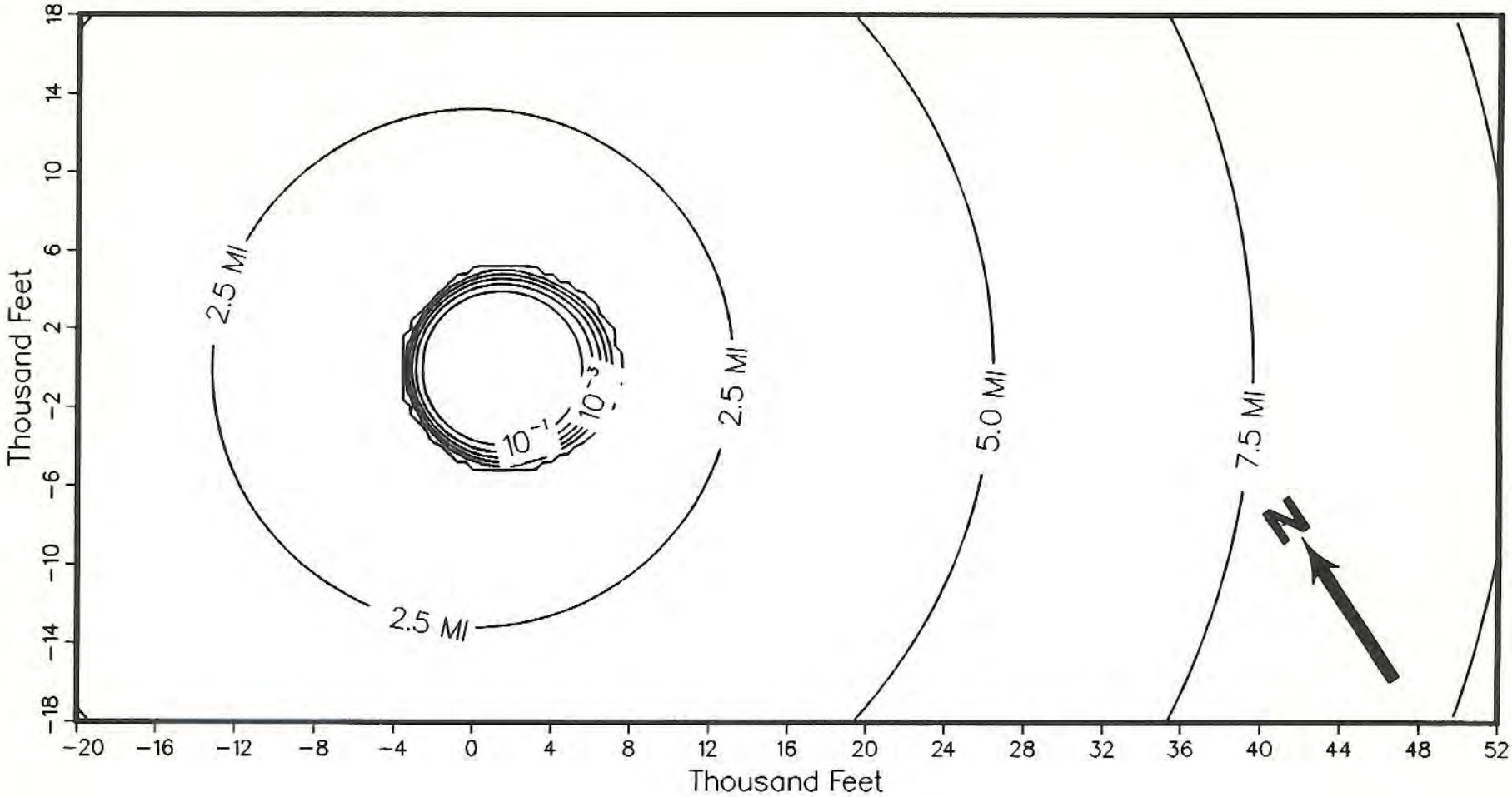
CELANESE – UPPER MIOCENE – LOW DENSITY – 250 YEARS



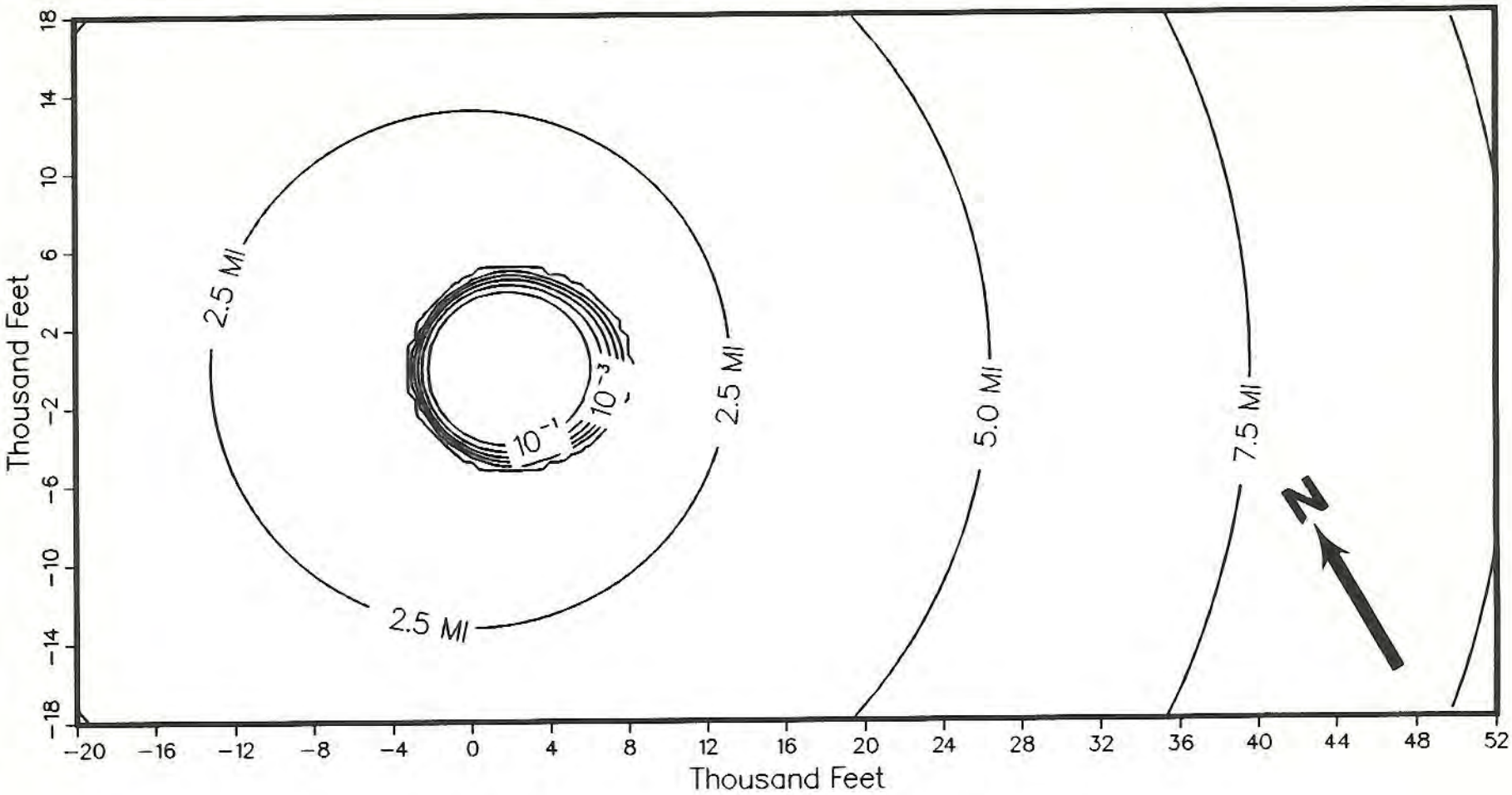
CELANESE – UPPER MIOCENE – LOW DENSITY – 500 YEARS



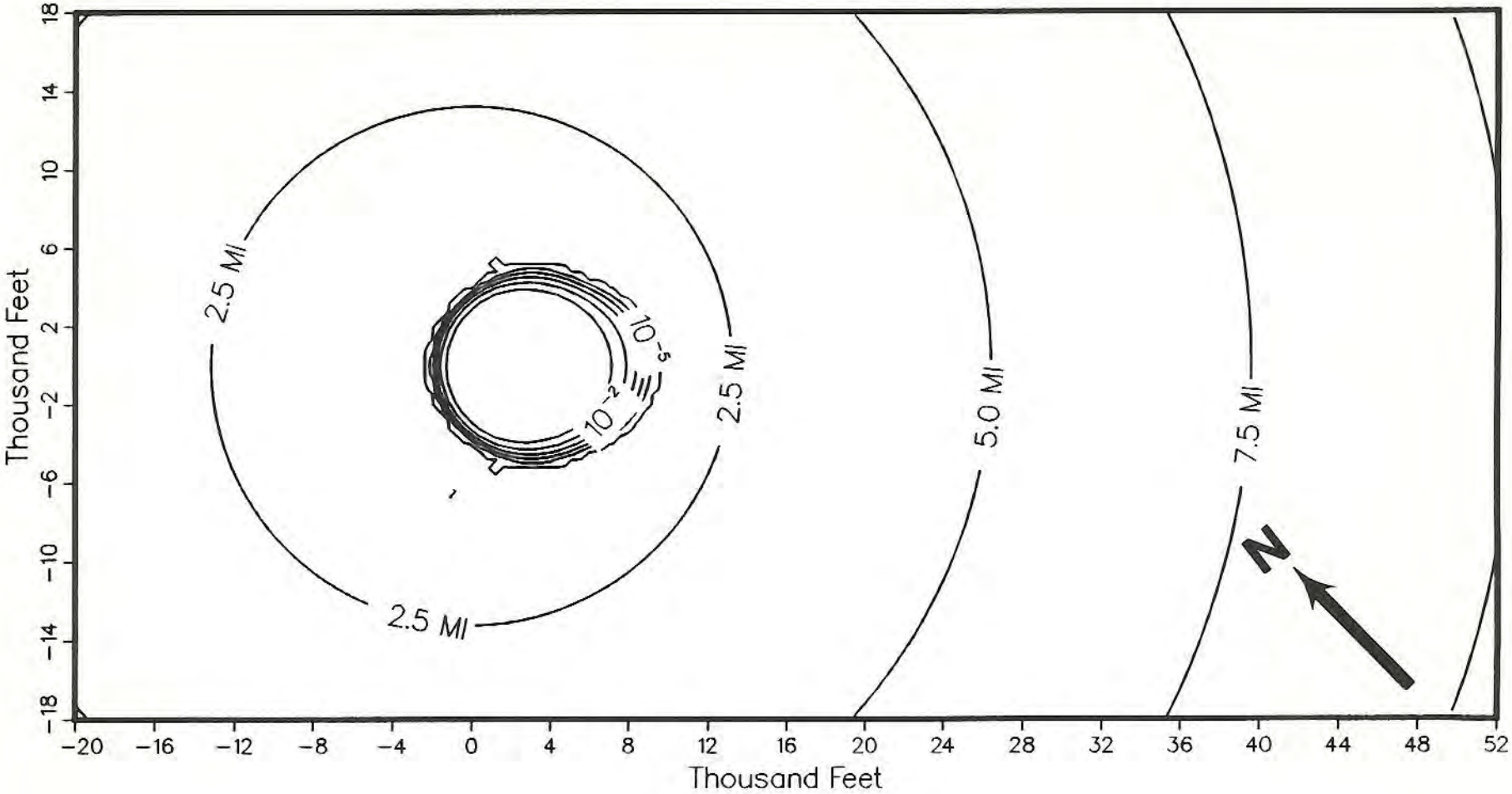
CELANESE – UPPER MIOCENE – LOW DENSITY – 750 YEARS



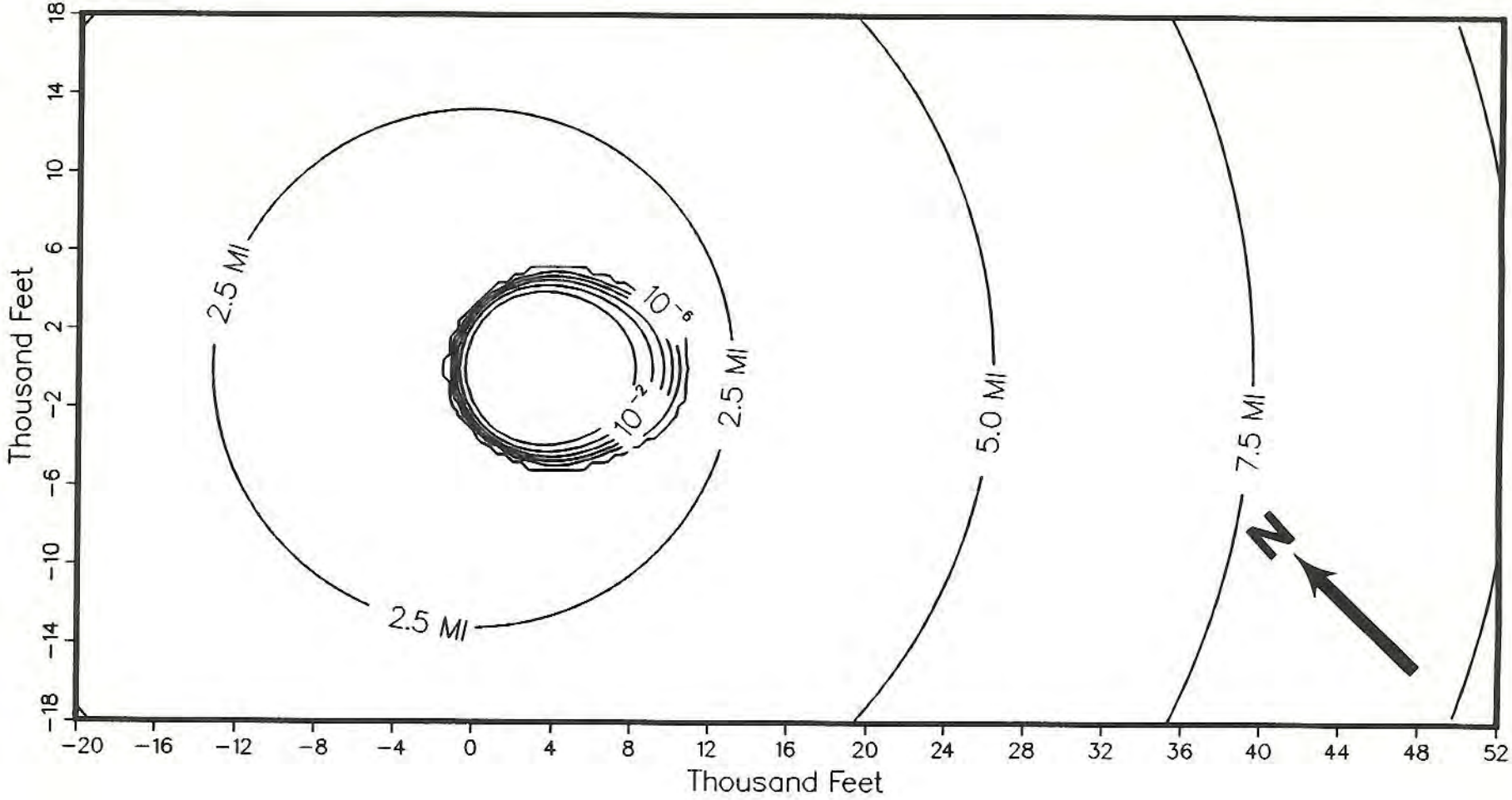
CELANESE – UPPER MIOCENE – LOW DENSITY – 1,000 YEARS



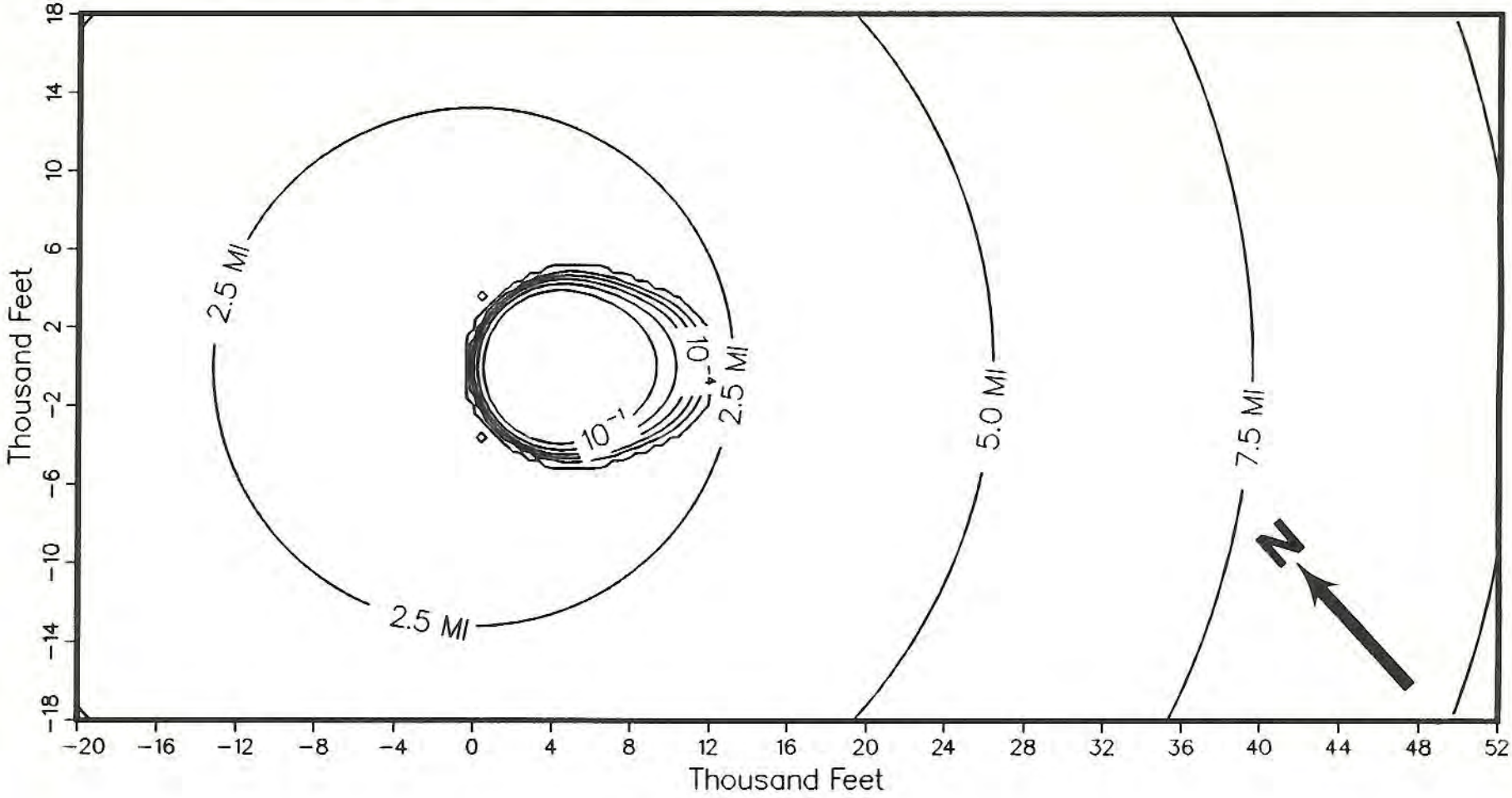
CELANESE – UPPER MIOCENE – LOW DENSITY– 1500 YEARS



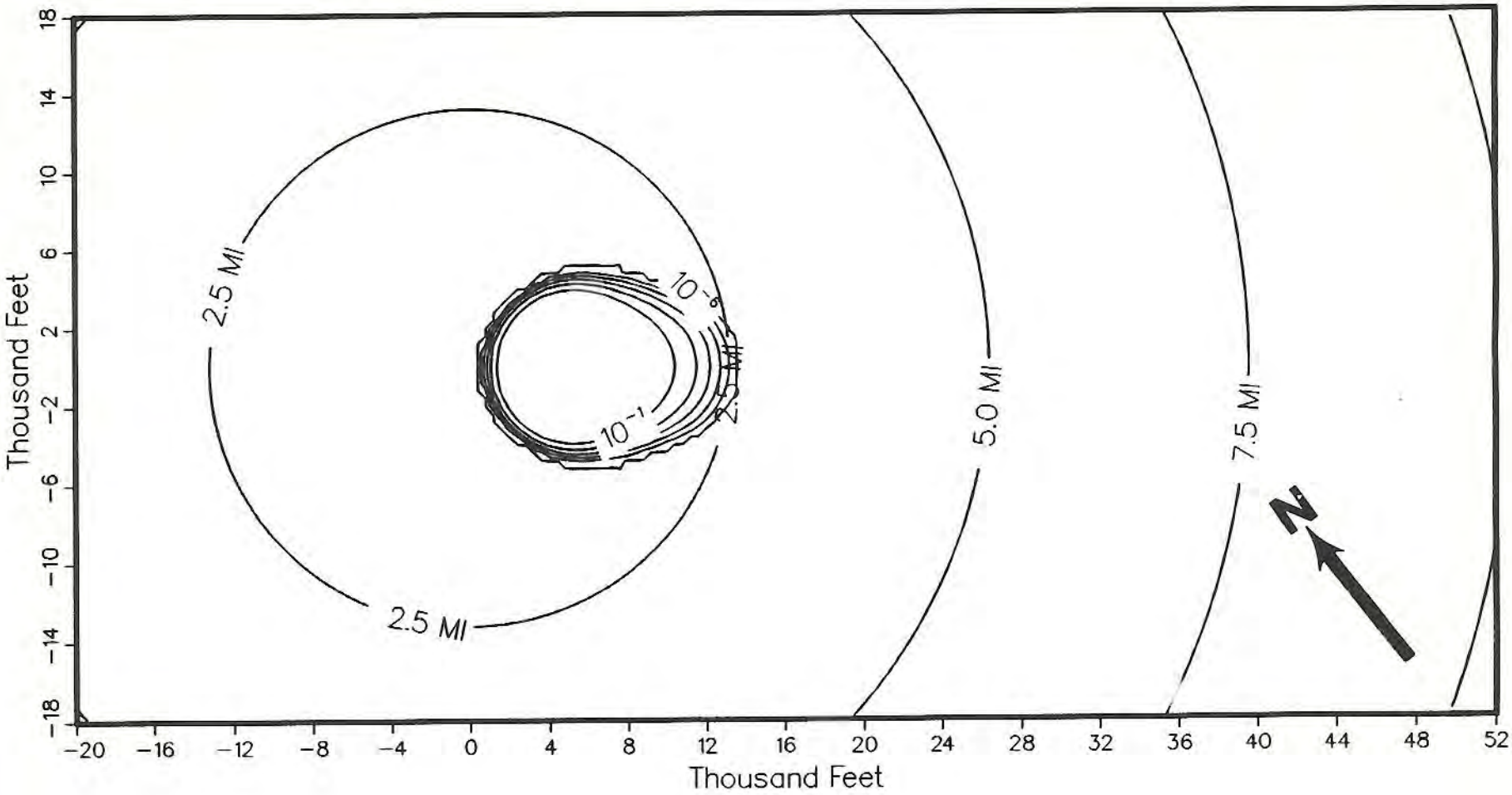
CELANESE – UPPER MIOCENE – LOW DENSITY – 2000 YEARS



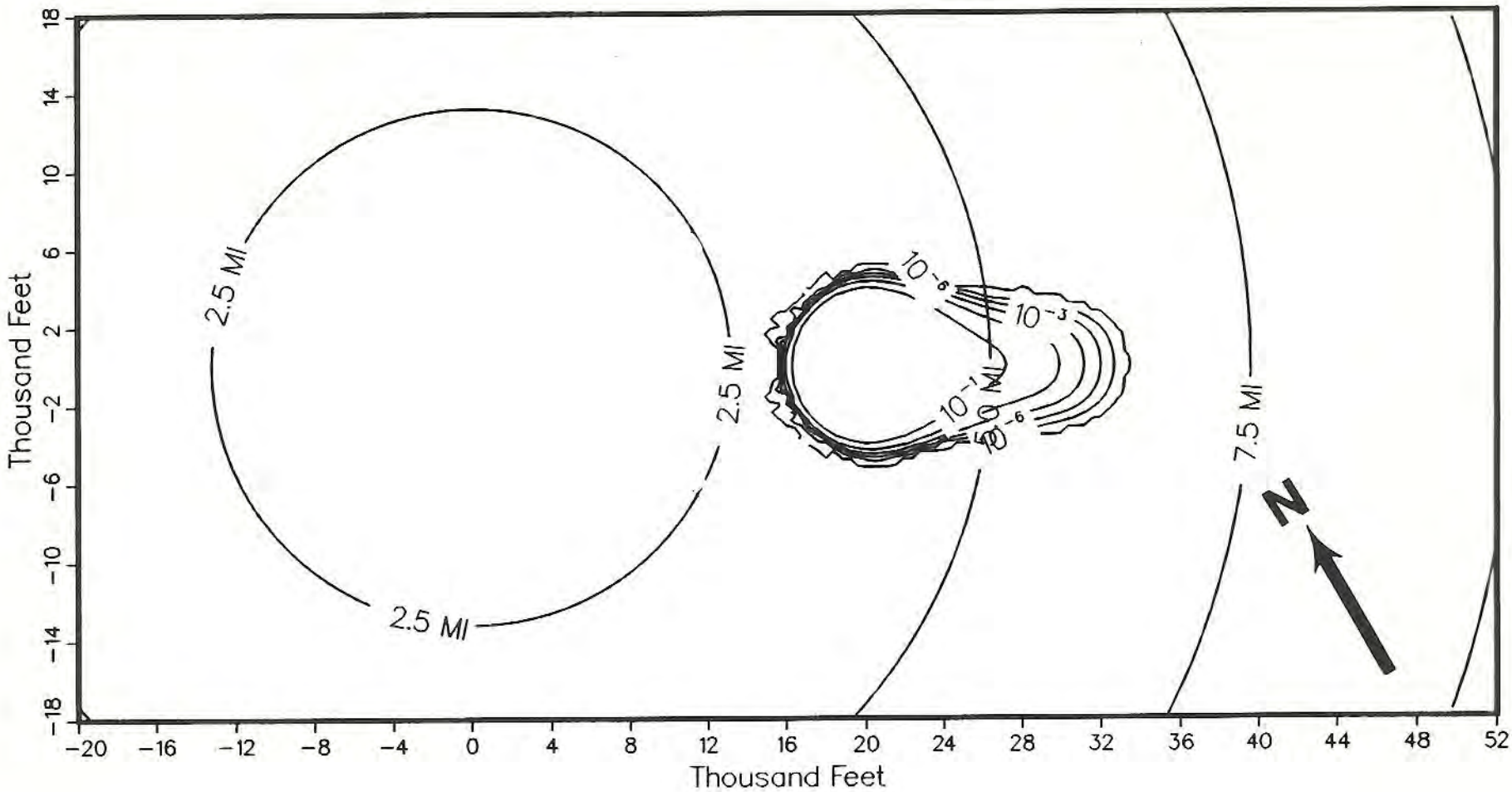
CELANESE – UPPER MIOCENE – LOW DENSITY – 2500 YEARS



CELANESE – UPPER MIOCENE – LOW DENSITY – 3000 YEARS



CELANESE – UPPER MIOCENE – LOW DENSITY – 10,000



* * * Hoechst Celanese, Bay City, TX -- Upper Miocene Inj. Sand -- High dens. Waste * * *

INPUT PARAMETERS

Plume Parameters:

Nominal Radius (ft)	=	3500.	Waste Density (g/cc)	=	1.086

Formation Parameters:

* Natural Velocity (ft/yr)	=	2.83	Formation Fluid Density (g/cc)	=	1.045
Lateral Dispersivity (ft)	=	50.0	Transverse Dispersivity (ft)	=	5.0
Dip Angle (ft/mi)	=	-50.0	Porosity	=	0.330
Viscosity (cp)	=	0.710	Permeability (Darcy)	=	1.350

Model Parameters:

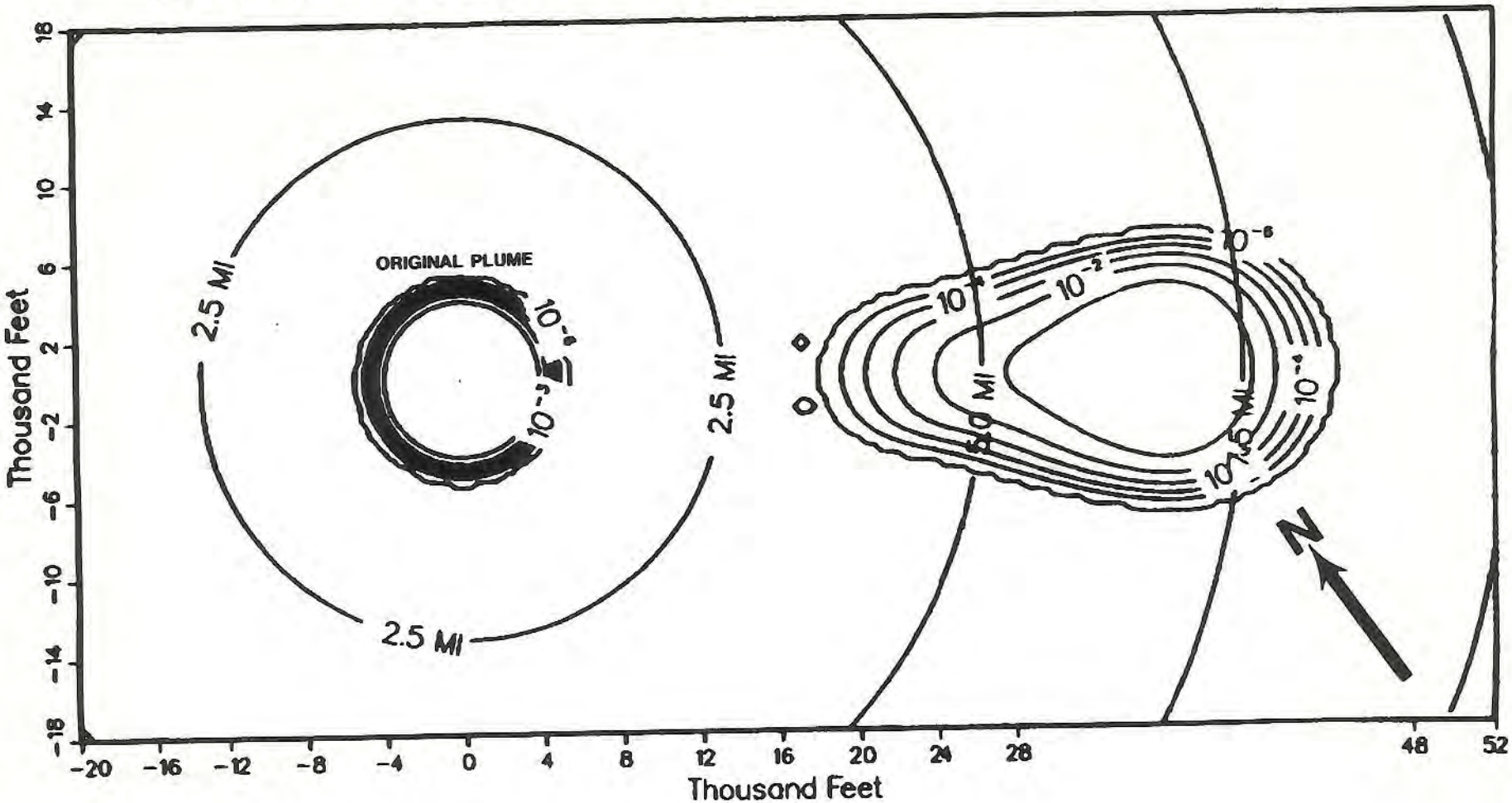
Problem Time (yr)	=	10000.	Number of Output Intervals	=	2.0
Prob. Space Limit (Norm. Y Coord.)	=	4.000	Prob. Space Limit (Norm. -X Coord.)	=	-4.000

DERIVED PARAMETERS

* Max. Density Driven Vel. (ft/yr)	=	1.11	Dimensionless Time	=	10.29
Beta	=	0.8182	L	=	0.0079
Cos(Xi)	=	0.6188	Sin(Xi)	=	0.7856
delX = delY	=	0.0320	Prob. Space Limit (Norm. +X Coord.)	=	12.000

* Negative implies updip velocity

Hoechst Celanese – U. Miocene – High Dens. Waste



* * * Hoechst Celanese, Bay City, TX -- Lower Miocene Inj. Sand -- Low dens. Waste * * *

INPUT PARAMETERS

Plume Parameters:

Nominal Radius (ft)	=	1950.	Waste Density (g/cc)	=	0.984

Formation Parameters:

* Natural Velocity (ft/yr)	=	3.18	Formation Fluid Density (g/cc)	=	1.072
Lateral Dispersivity (ft)	=	50.0	Transverse Dispersivity (ft)	=	5.0
Dip Angle (ft/mi)	=	-75.0	Porosity	=	0.320
Viscosity (cp)	=	0.640	Permeability (Darcy)	=	1.300

Model Parameters:

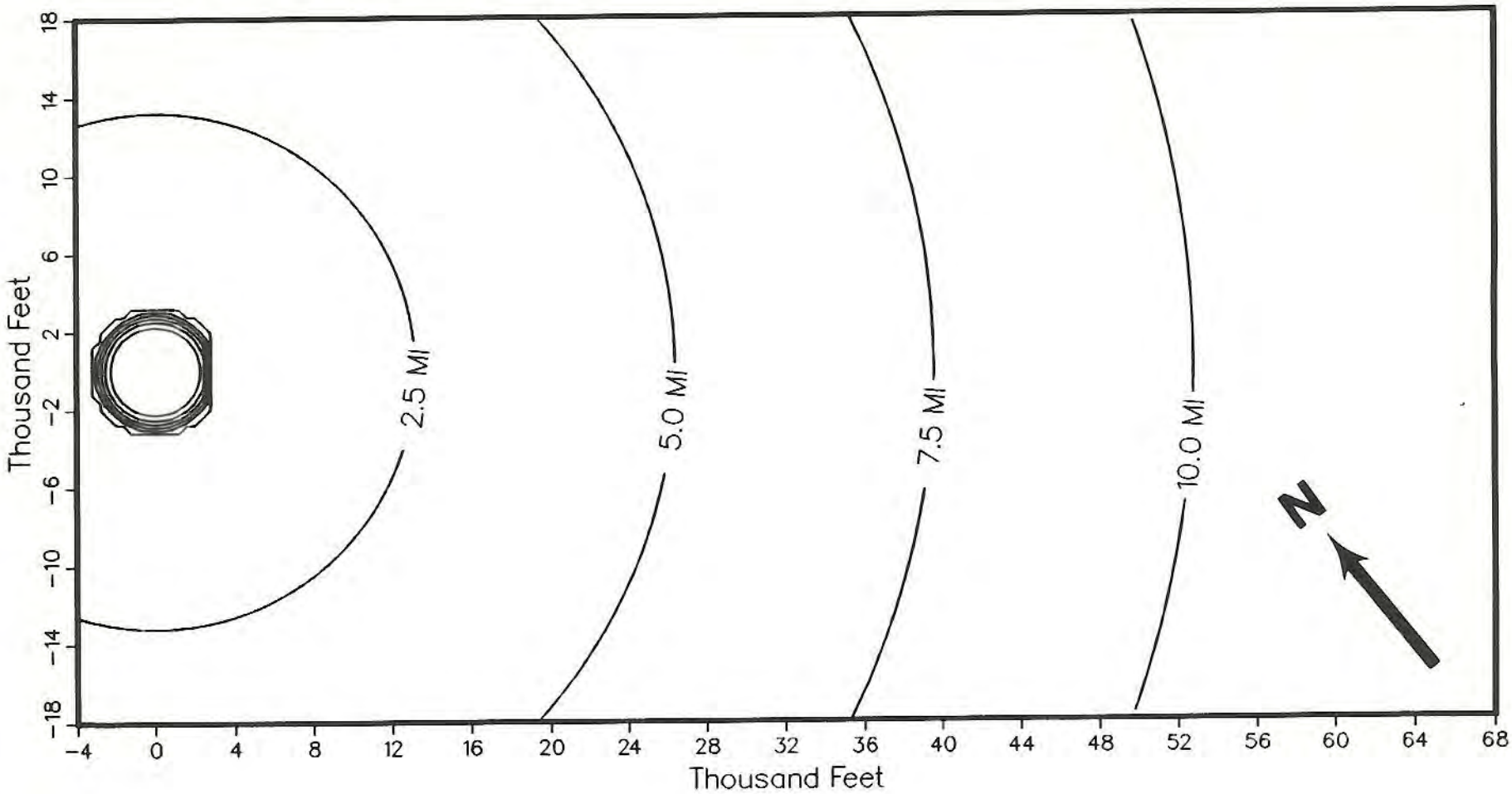
Problem Time (yr)	=	2500.	Number of Output Intervals	=	3.0
Prob. Space Limit (Norm. Y Coord.)	=	2.700	Prob. Space Limit (Norm. -X Coord.)	=	-0.750
Number of Coordinate Moves	=	0.0	Nat. Vel. Dispersion Factor	=	0.00

DERIVED PARAMETERS

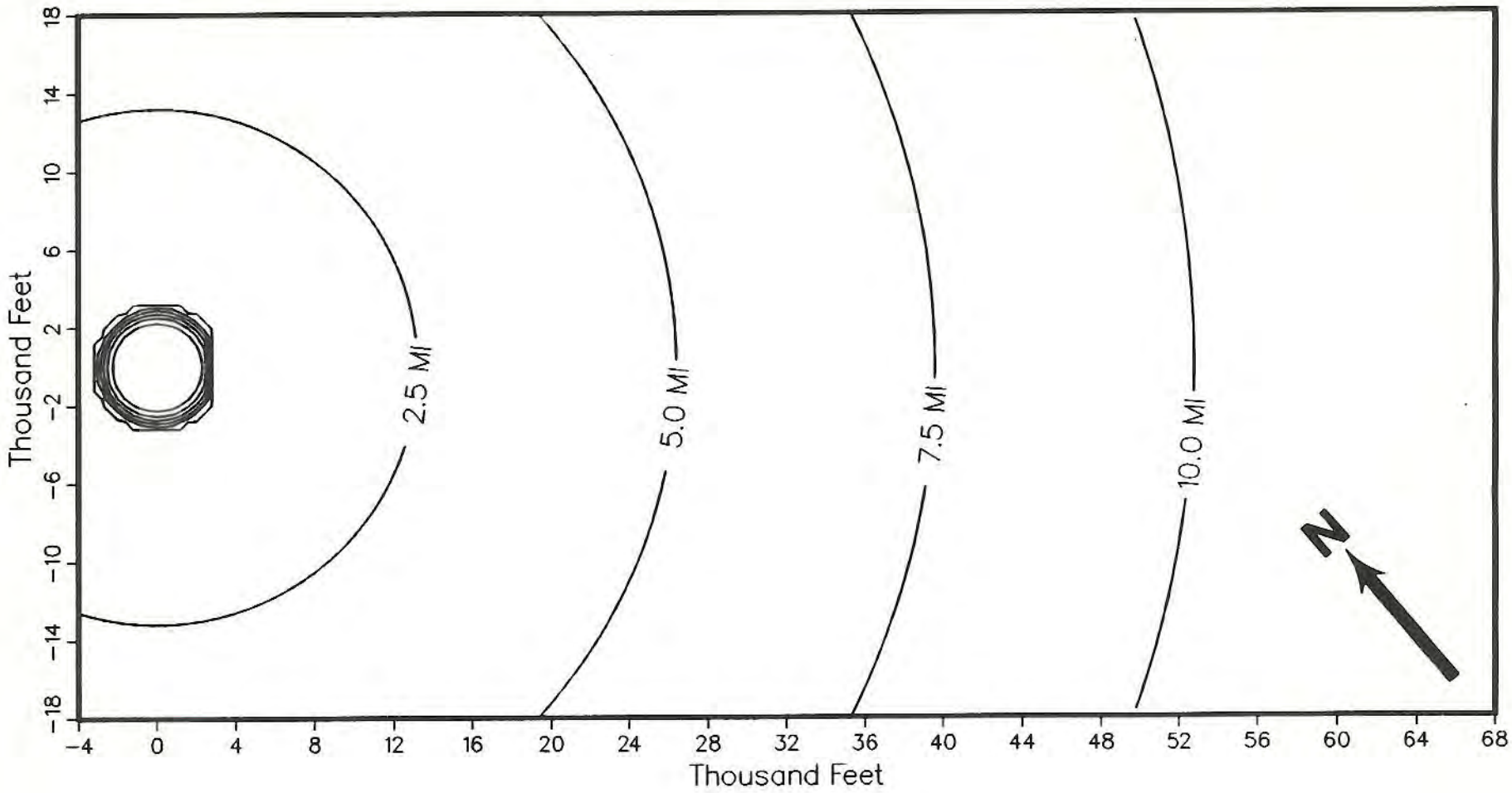
* Max. Density Driven Vel. (ft/yr)	=	-3.95	Dimensionless Time	=	10.93
Beta	=	0.8182	L	=	0.0141
Cos(Xi)	=	-0.9278	Sin(Xi)	=	0.3732
delX = delY	=	0.0150	Prob. Space Limit (Norm. +X Coord.)	=	7.350

* Negative implies updip velocity

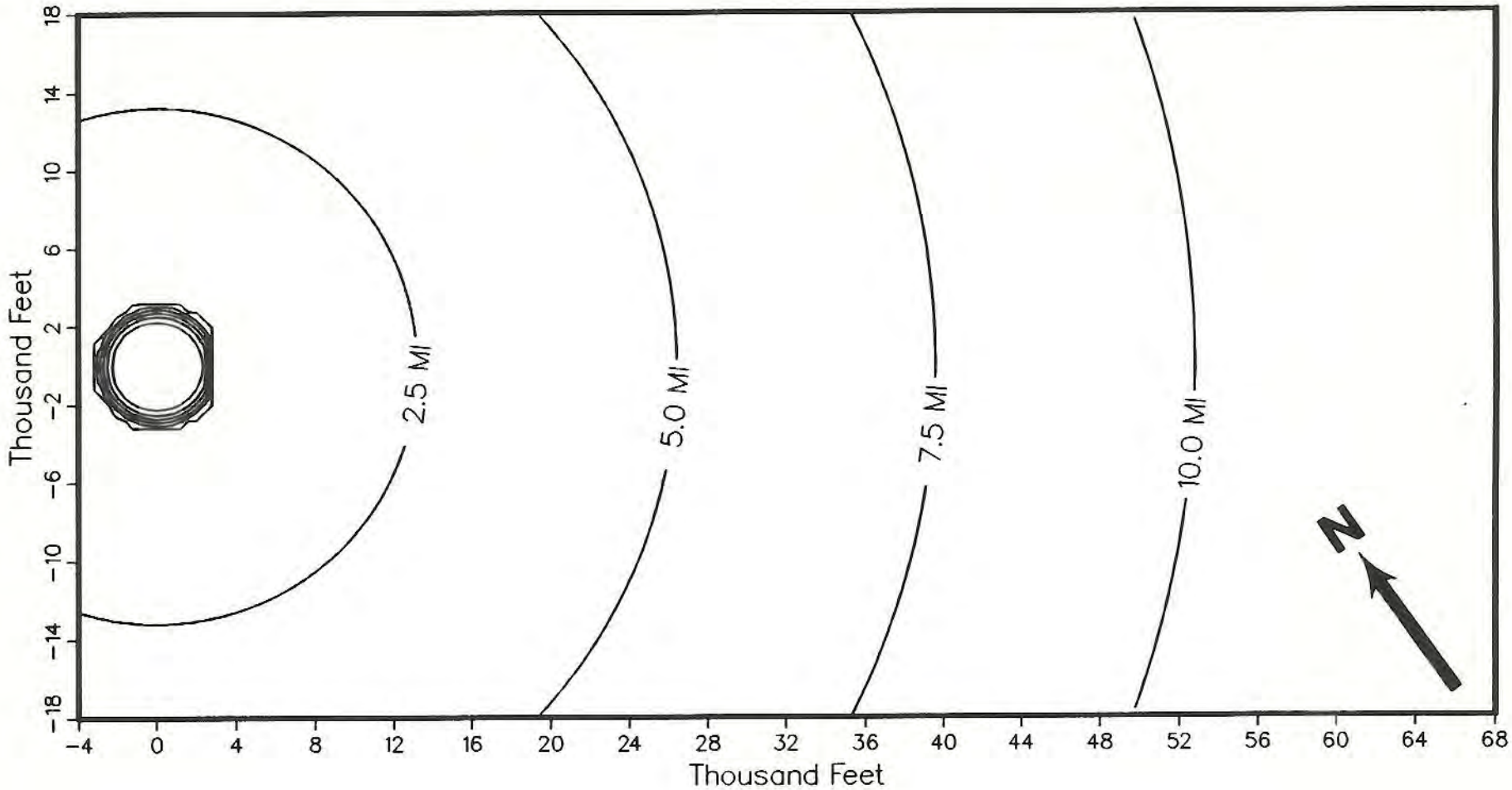
CELANESE – L. MIOCENE – LD WASTE – 10 YEARS



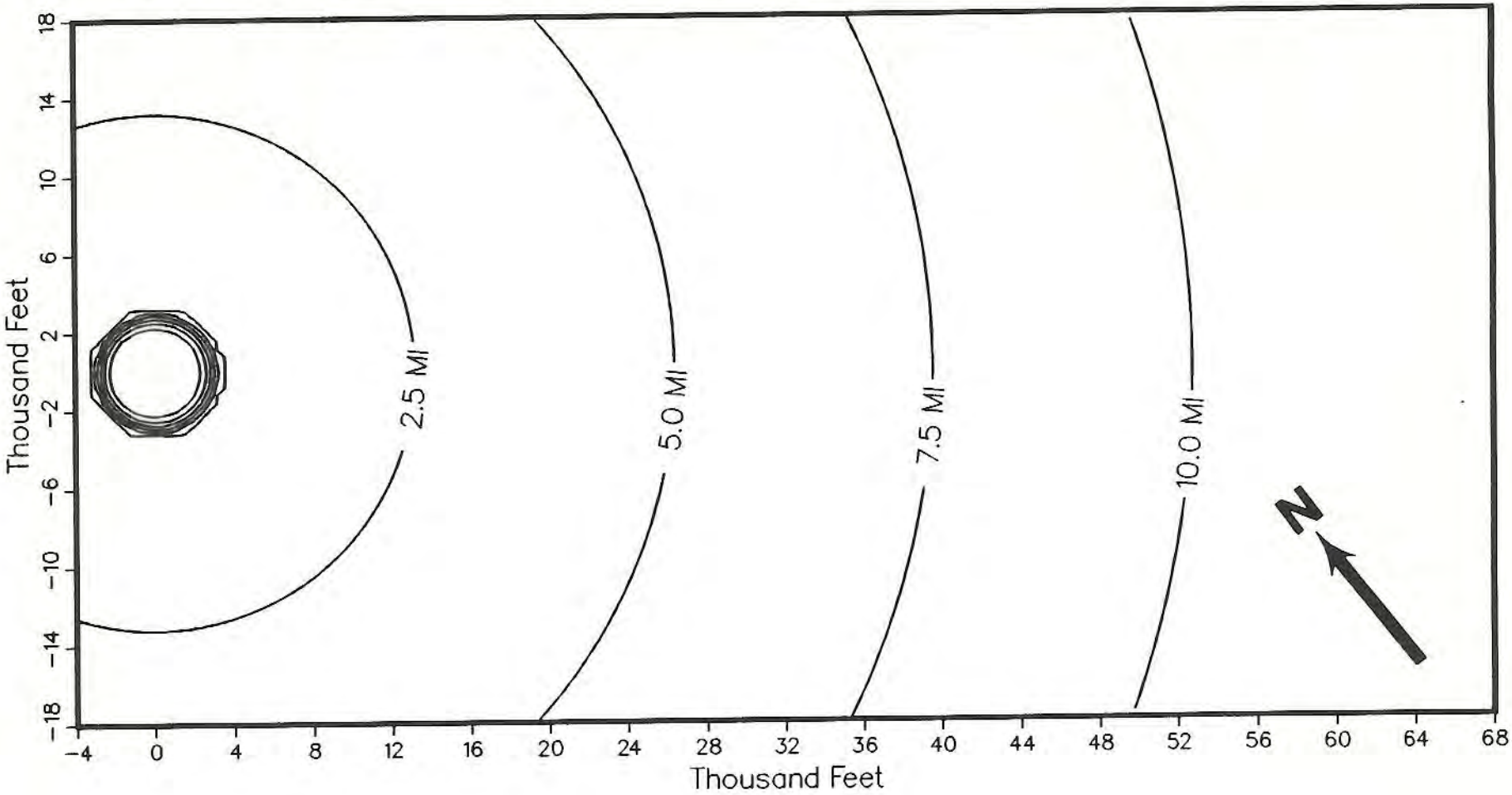
CELANESE – L. MIOCENE – LD WASTE – 20 YEARS



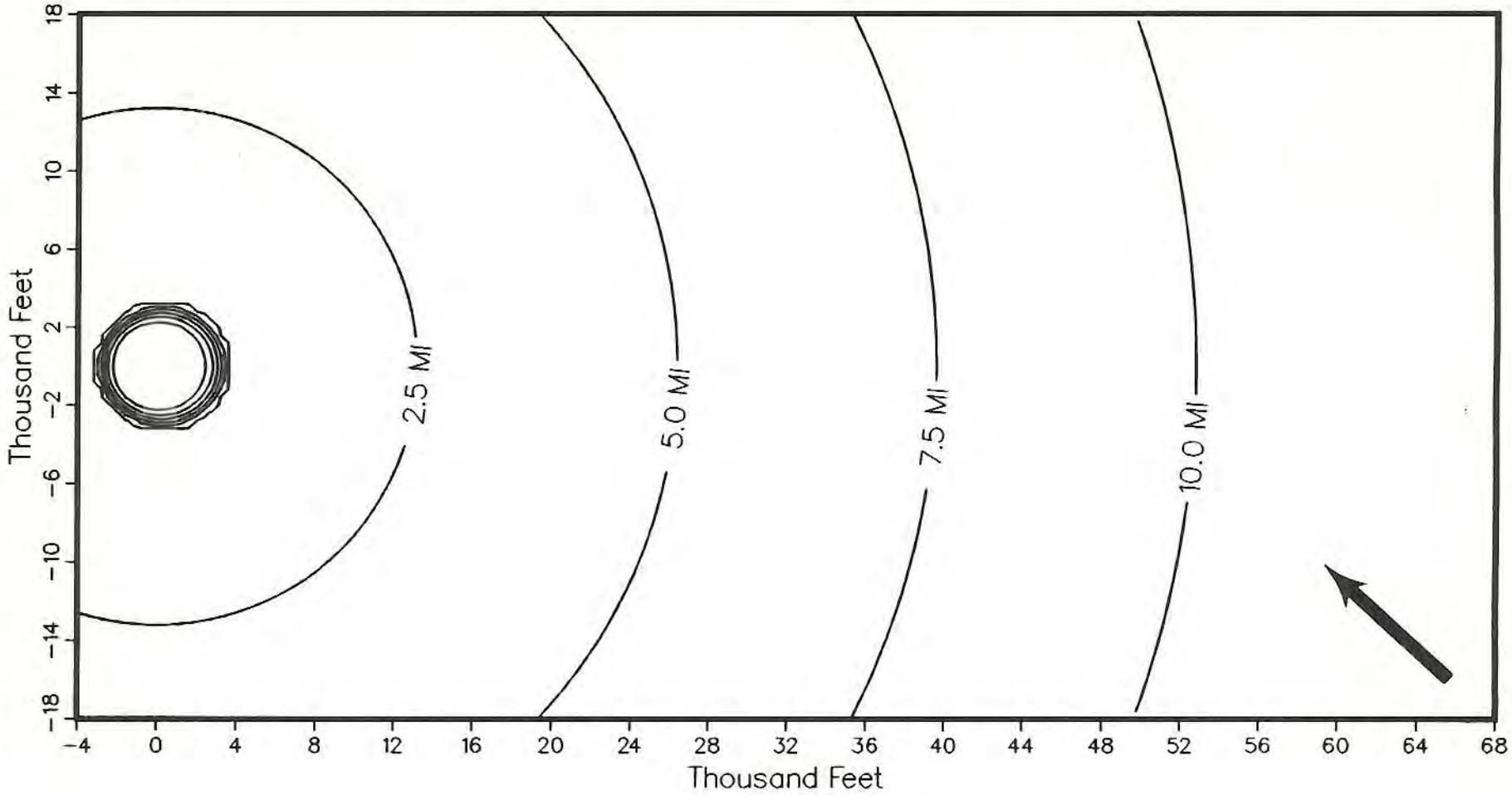
CELANESE – L. MIOCENE – LD WASTE – 30 YEARS



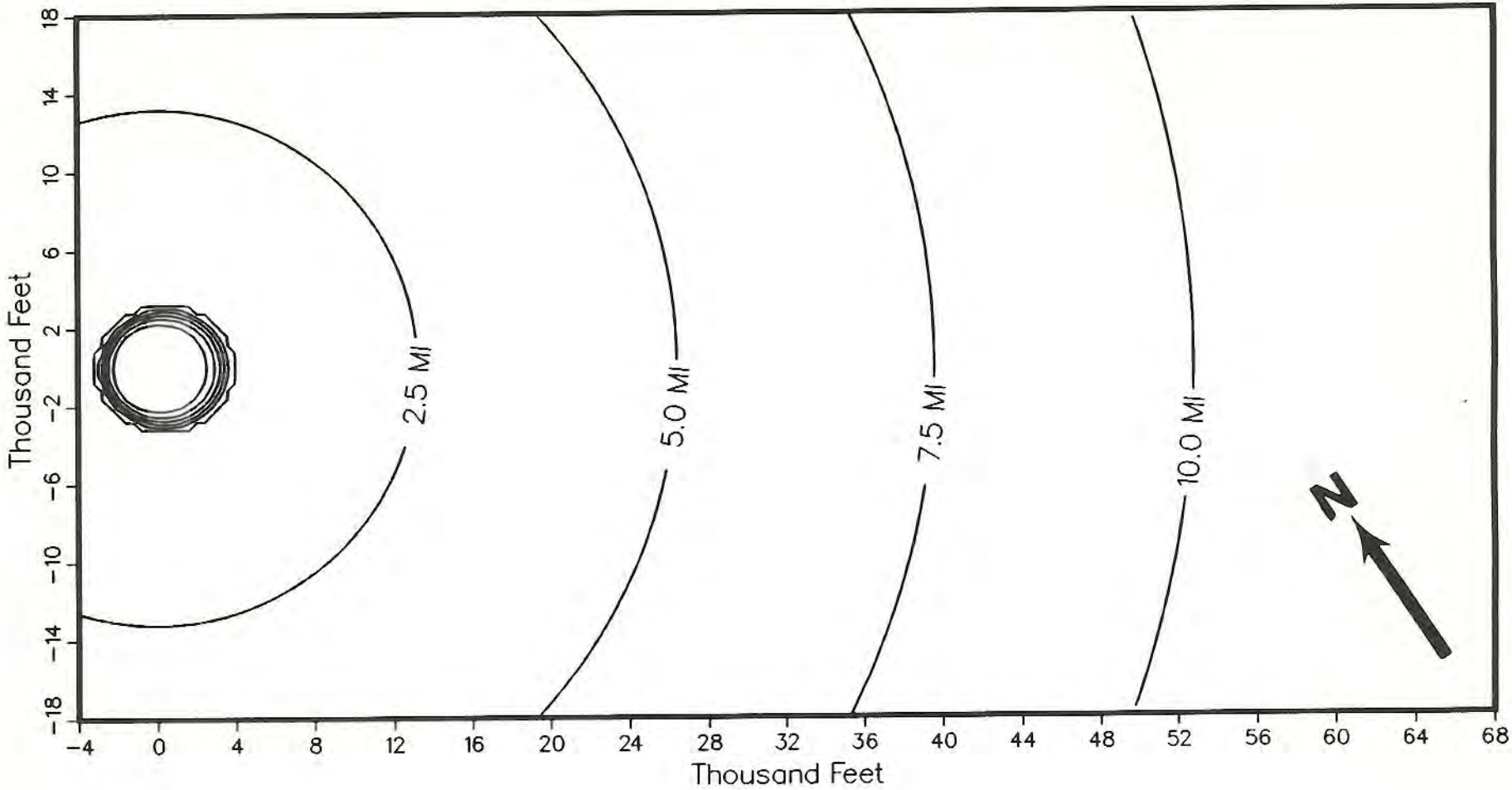
CELANESE – L. MIOCENE – LD WASTE – 62.5 YEARS



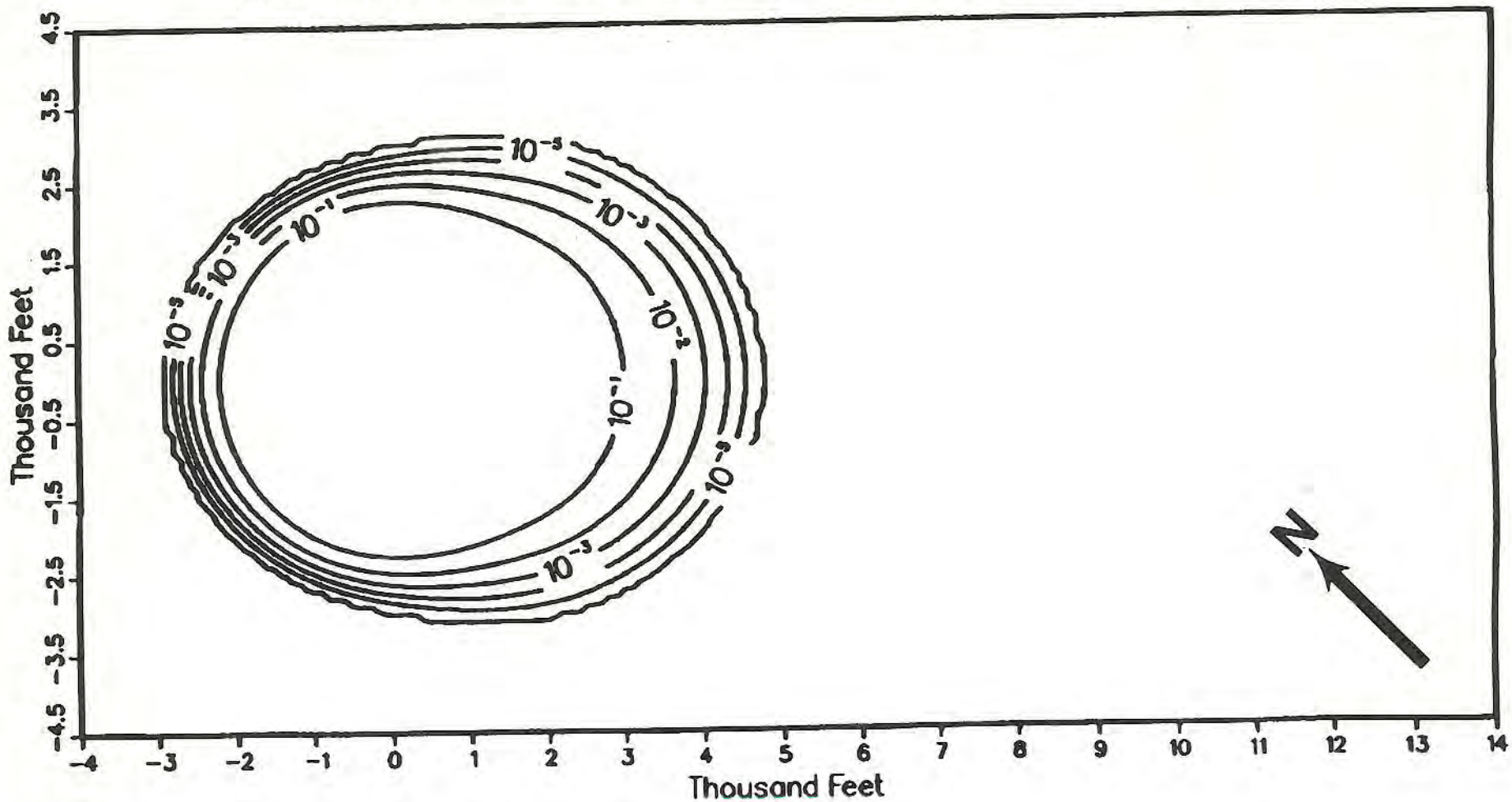
CELANESE – L. MIOCENE – LD WASTE – 125 YEARS



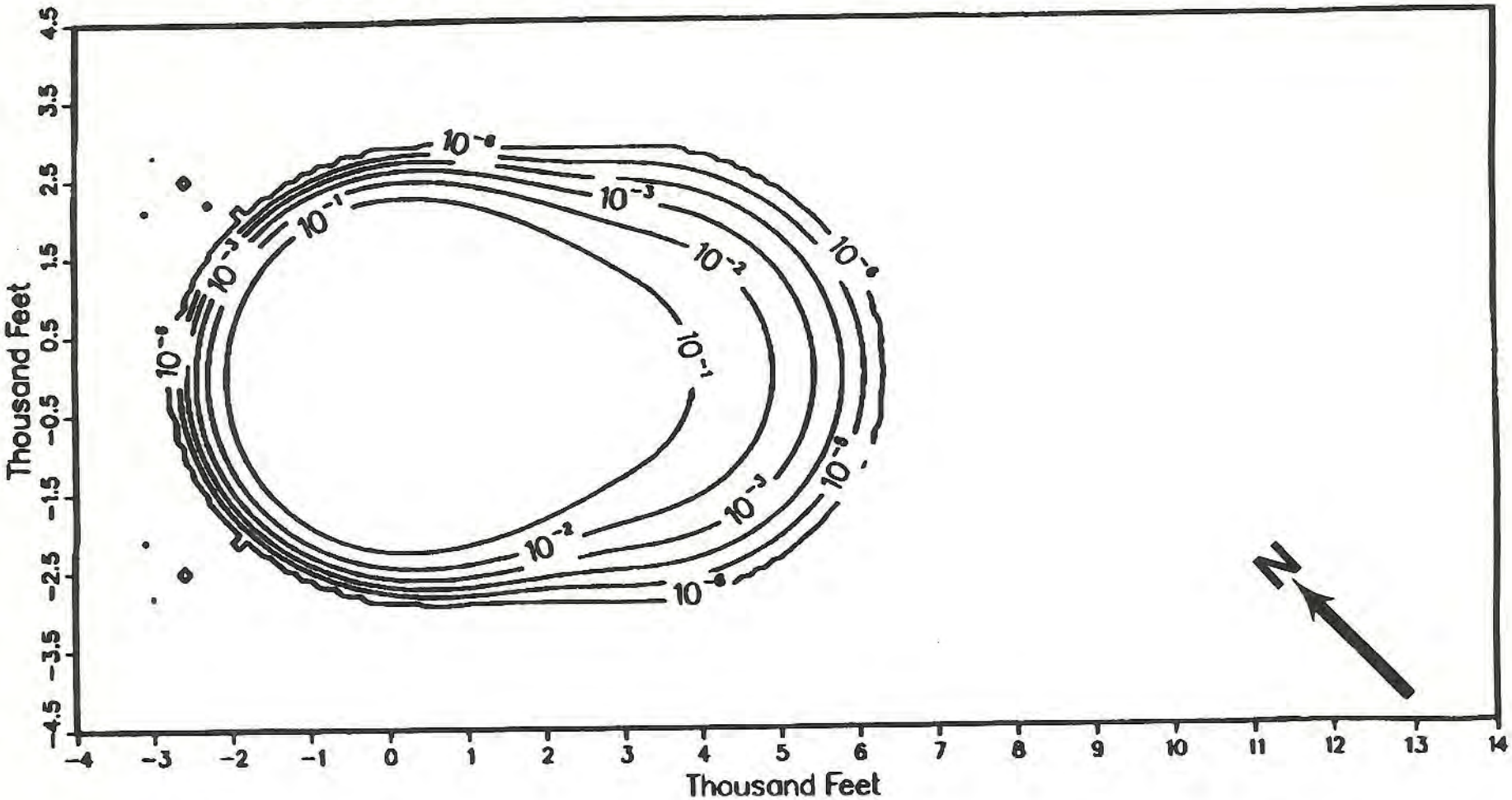
CELANESE – L. MIOCENE – LD WASTE – 187.5 YEARS



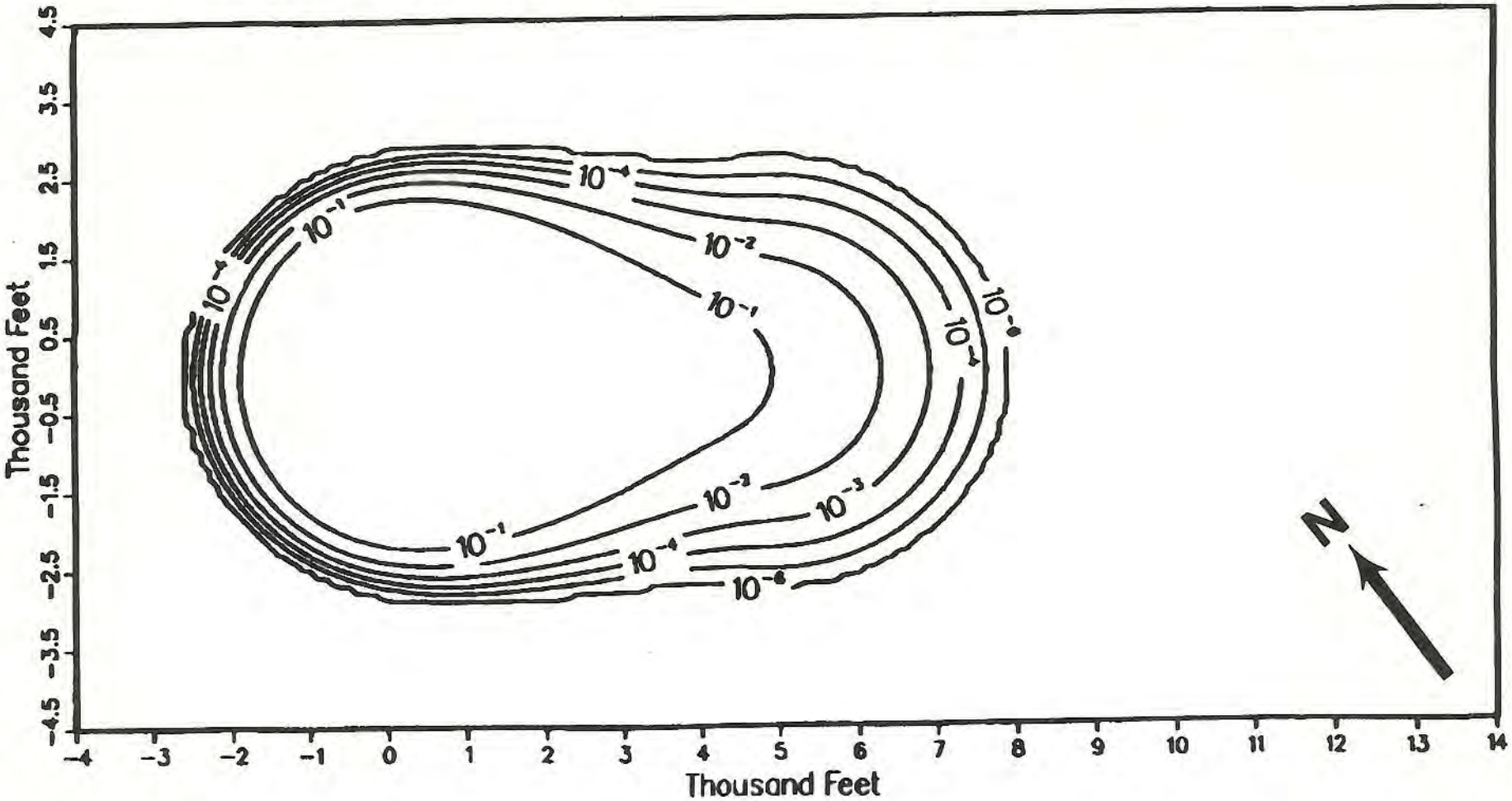
Celanese – L. Miocene – LD Waste – 500 yr



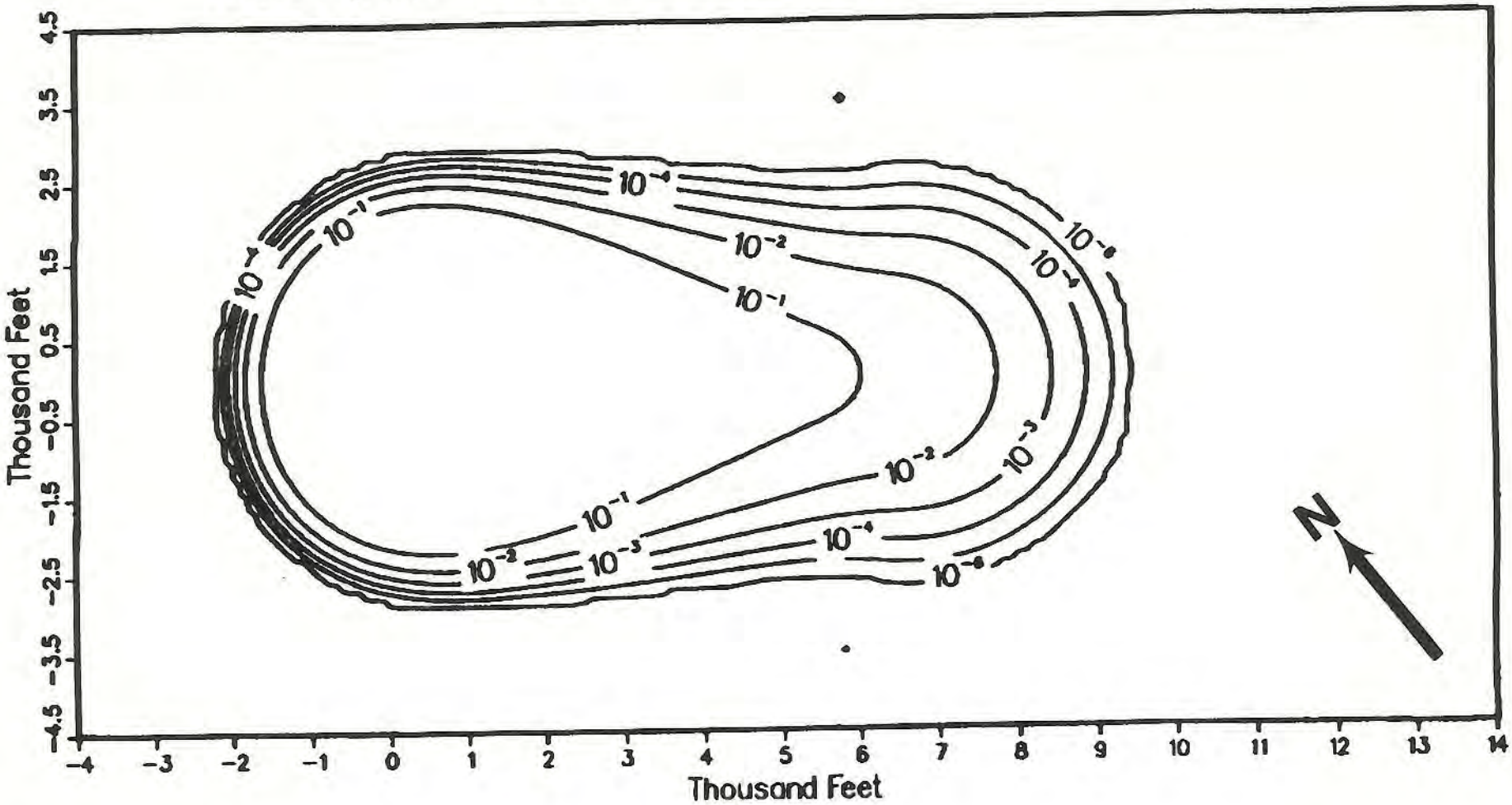
Celanese – L. Miocene – LD Waste – 1000 yr



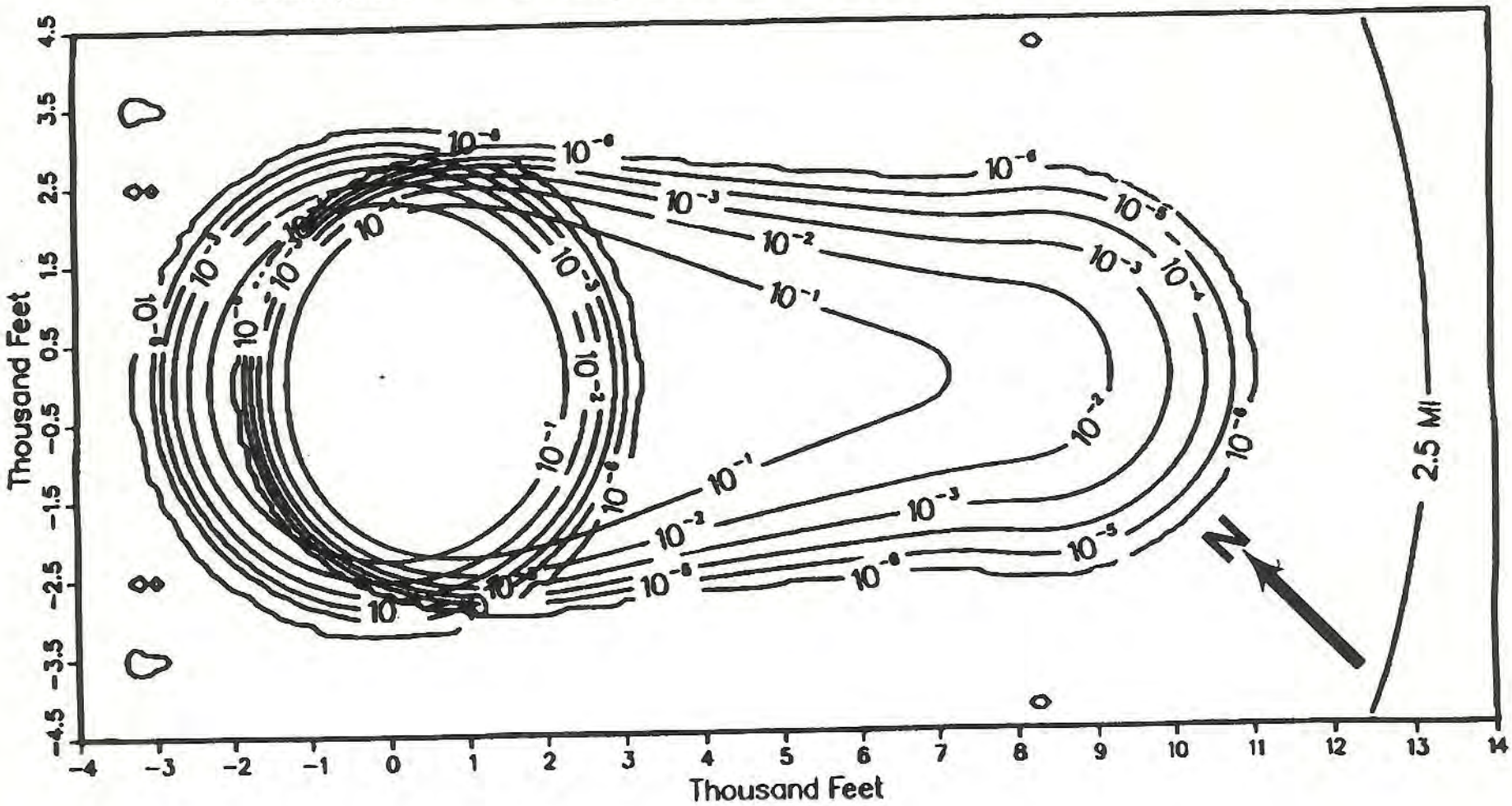
Celanese – L. Miocene – LD Waste – 1500 yr



Celanese – L. Miocene – LD Waste – 2000 yr



Celanese – L. Miocene – LD Waste – 2500 yr



* * * Hoechst Celanese, Bay City, TX -- Lower Miocene Inj. Sand -- High dens. Waste * * *

I N P U T P A R A M E T E R S

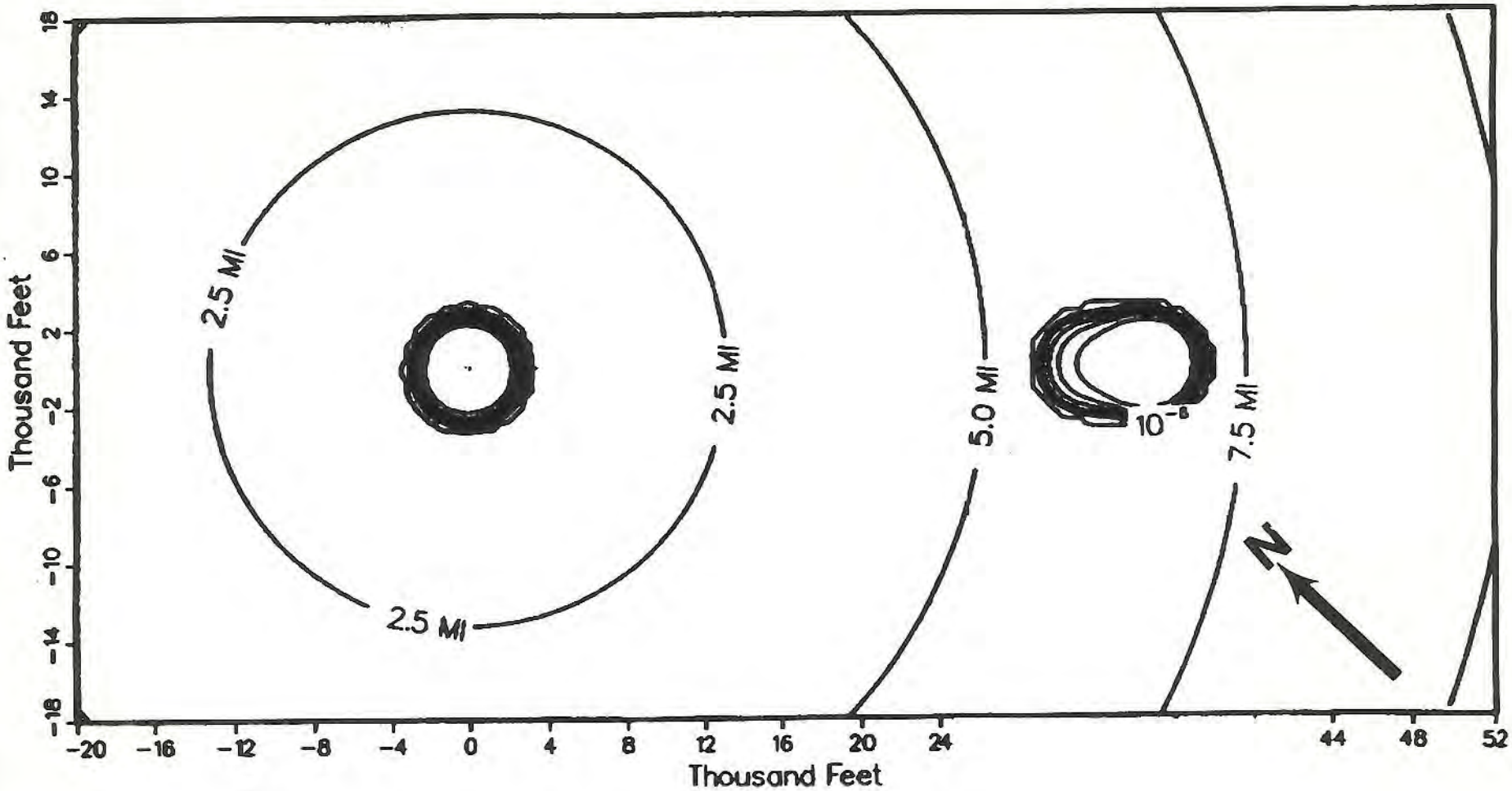
Plume Parameters:					
Nominal Radius (ft)	=	1950.	Waste Density (g/cc)	=	1.080
Formation Parameters:					
* Natural Velocity (ft/yr)	=	3.18	Formation Fluid Density (g/cc)	=	1.072
Lateral Dispersivity (ft)	=	50.0	Transverse Dispersivity (ft)	=	5.0
Dip Angle (ft/mi)	=	-75.0	Porosity	=	0.320
Viscosity (cp)	=	0.640	Permeability (Darcy)	=	1.300
Model Parameters:					
Problem Time (yr)	=	10000.	Number of Output Intervals	=	4.0
Prob. Space Limit (Norm. Y Coord.)	=	4.000	Prob. Space Limit (Norm. -X Coord.)	=	-4.000
Number of Coordinate Moves	=	0.0	Nat. Vel. Dispersion Factor	=	0.00

D E R I V E D P A R A M E T E R S

* Max. Density Driven Vel. (ft/yr)	=	0.36	Dimensionless Time	=	16.72
Beta	=	0.8182	L	=	0.0141
Cos(Xi)	=	0.2205	Sin(Xi)	=	0.9754
delX = delY	=	0.0320	Prob. Space Limit (Norm. +X Coord.)	=	12.000

* Negative implies updip velocity

Hoechst Celanese – L. Miocene – High Dens. Waste



APPENDIX D
STRUCTURE MAPS: TOP OF UPPER MIOCENE AND TOP OF LOWER MIOCENE INJECTION INTERVALS SHOWING REVISED PLUMES

APPENDIX E
WELL RECORDS

APPENDIX F
REFERENCES

REFERENCES

[1] Johnston, O. C., and Knape, 1986, Pressure effects of the static mud column in abandoned wells: Texas Water Commission LP86-06, 106 p.

[2] Davis, K. E., 1986, Factors affecting the area of review for hazardous waste disposal wells: Proceedings of the International Symposium on Subsurface Injection of Liquid Wastes, New Orleans, National Water Well Assoc., Dublin, Ohio, p. 148-194.

[3] Miller, C., Fischer, T. A. II, Clark, J. E., Porter, W., Hales, C. H., Tilton, J. R., 1986, Flow and Containment of Injected Waste: Proceedings of the International Symposium on Subsurface Injection of Liquid Wastes, New Orleans, National Water Well Assoc., Dublin, Ohio, p.520-599.

[4] Pierce, M. S., 1989, Long-term properties of clay in water-based drilling fluids: Proceedings of the International Symposium on Class I and II Injection Well Technology, Dallas, Texas, Underground Injection Practices Council Research Foundation, p. 115-132.

[5] Collins, R. E. and Kortum, D., 1989, Drilling mud as a hydraulic seal in abandoned wellbores: Underground Injection Practices Council, 1989 Winter Meeting, San Antonio, Texas.

[6] Hoechst Celanese Chemical Group, Inc., Bay City Plant, Class I Injection Well Petition.

APPENDIX G
CELANESE PETITION EXEMPTION REISSUANCE
NOTICE OF DEFICIENCIES
DATED JULY 10, 1991
QUESTIONS AND ANSWERS

APPENDIX H
REFERENCED REPORTS

APPENDIX I
WDW-277 PERMIT

APPENDIX I
WDW-277 PERMIT

Hoechst Celanese wishes to add its newly permitted WDW-277 injection well to the administrative record for the petition, and complete its inclusion in the petition exemption. The permit application for WDW-277 has been before the Texas Water Commission (TWC) for several years. After a rigorous investigation, the TWC has approved it and a TWC permit was issued in July, 1991.

This new well may never be drilled, but since it may become necessary for plant operations if WDW-110 becomes non-operational, WDW-277 was modeled and discussed in the original petition demonstration. As a result, this newly permitted well is completely covered by the approved Hoechst Celanese Bay City Plant Deepwell Petition. The well will be located close to WDW-110 (approximately 500 feet away), and together, they act essentially as a point source for modeling purposes, due to their proximity. These wells both inject into the Lower Miocene injection sand (at 5,700 feet to 5,950 feet) and this is modeled in the approved petition. The modeling in the petition also resulted in an approved rate of injection of 600 gpm for either WDW-277 or WDW-110, injecting singly or in combination. Because WDW-277 was recently permitted to inject at a maximum injection rate of only 400 gpm (either by itself or when combined with the WDW-110 injection rate), the modeling in the petition completely covers the new well. Finally, the petition modeling assumed that WDW-277 would be drilled by 1989, and operate until the year 2000. Currently, WDW-277 has not yet been drilled, and the TWC permit is only five years, so this is also conservative.

In summary, all aspects of the new well modeling and operation are already covered in the original approved petition, so the final addition of WDW-277 to the petition exemption is requested at this time because the final approved TWC permit is now available.

John Hall, Chairman
B. J. Wynne, III, Commissioner
John E. Birdwell, Commissioner

TEXAS WATER COMMISSION

PROTECTING TEXANS' HEALTH AND SAFETY BY PREVENTING AND REDUCING POLLUTION

August 2, 1991

Hoechst - Celanese Chemical Group, Inc.
Farm Road 3057
P. O. Box 509
Bay City, TX 77414

RE: HOECHST CELANESE CHEMICAL GROUP, INC.
NEW; Permit WDW-277

Enclosed is a copy of:

( ) a Permit for a wastewater treatment facility issued pursuant to Chapter 26 of the Texas Water Code. In order that you may comply with monitoring requirements for your waste discharge permit, self-reporting forms and instructions will be forwarded to you from the Water Quality Division at an early date. If you have these forms on hand, please continue using them until new forms are sent. (NOTE: If your permit is for disposal only, self-reporting forms are not applicable.) If your facility is not yet operating, please use the attached "Report of Progress of Construction of Wastewater Treatment Facilities" form. This form will advise this agency and our district office of the completion or placement in operation of proposed facilities in accordance with the special provision incorporated into the permit.

( ) a Permit for a hazardous or solid waste facility issued pursuant to Art. 4477-7, Texas Revised Civil Statutes. Your attention is directed to Commission Rule 335.5 which may be applicable to your facility.

(✓) a Permit for a waste disposal well or an injection well issued pursuant to Chapter 27 of the Texas Water Code. In accordance with the Texas Water Code, you must file a copy of the permit with the city and county health authorities.

If there are any questions concerning this permit, please let us know.

Sincerely,

Gloria A. Vasquez

Gloria A. Vasquez, Chief Clerk

GAV:ra

Enclosure

cc w/enclosure:
TWC District Office 7
All Parties

Permit No. WDW-277

TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

PERMIT to conduct Class I underground injection under provisions of Chapter 26 & 27, Texas Water Code

I. Name of Permittee:

A. Name Hoechst - Celanese Chemical Group, Inc.

B. Address Farm Road 3057
P. O. Box 509
Bay City, Texas 77414

II. Type of Permit: Regular ___X___ Amended _____
Commercial _____ Non-commercial __X__
Hazardous ___X___ Non-hazardous _____

III. Nature of Business: Petrochemical Plant

IV. General Description and Location of Injection Activity:

The disposal well is to be used to dispose of industrial waste from the Bay City Plant. The well is to be located approximately 18,130 feet from the east line and 2,320 feet from the north line of the James Moore League, A-62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; longitude 96°01'12" West, latitude 28°51'50" North. The injection zone will be the lower Miocene Formation in the approximate subsurface depths of 2,900 to

CONTINUED on Pages 2 through 5.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit is valid for a period of five (5) years or until amended or revoked by the Commission.

APPROVED, ISSUED, AND EFFECTIVE this 30th day of July, 1991.

ATTEST: Gloria A. Vasquez

For the Commission

5,950 feet below ground level. The authorized injection interval will be at the approximate subsurface depths of 5,700 to 5,950 feet, within the injection zone.

V. Drilling and Completion Requirements

A. The permittee shall set and cement surface casing to a minimum subsurface depth of 1400 feet and long string casing to or through the injection zone to properly protect each USDW or freshwater aquifer.

B. Mechanical integrity shall be demonstrated prior to authorization by the executive director to conduct injection operations.

VI. Character of the Waste Streams

A. Industrial waste authorized to be injected by this permit shall consist solely of the following waste streams:

1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.

2. Wastes generated from the manufacture of acetaldehyde, acetic acid, n-butyl alcohol, n-propyl alcohol, isobutyl alcohol and vinyl acetate. The waste contains the following E.P.A. hazardous waste numbers: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002 and Hexavalent Chromimum.

3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams and reservoir.

B. The specific gravity of injected fluids shall remain within a range of from 1.00 to 1.10, inclusive (measured at approximately 68° F).

C. No discharge of wastes is authorized by this permit from this facility into water in the State other than those waste streams authorized above in Paragraph VI.A. injected into the lower Miocene Formation within the injection interval between 5,700 to 5,950 feet.

D. Waste prohibited from injection in 40 CFR Part 148, Subpart B, are specifically prohibited from injection by this permit, unless an exemption from prohibition has been granted pursuant to 40 CFR Part 148, Subpart C.

E. Industrial wastes which can be practicably treated and disposed of by alternative methods are not authorized for injection.

F. Wastes regulated by the Texas Department of Health are not authorized for injection by this permit.

VII. Operating Parameters

A. The operating surface injection pressure shall not exceed 900 psig.

B. The maximum average rate of injection shall not exceed 400 gallons per minute. The maximum instantaneous rate of injection shall not exceed 600 gallons per minute.

C. The volume of wastewater injected shall not exceed 17,856,000 gallons per month (based on a 30 day month at 400 gallons per minute), or 210,240,000 gallons per year (based on a 365 day year at 400 gallons per minute).

D. If both WDW-277 and WDW-110 are in service at the same time then the cumulative maximum average rate of injection shall not exceed 400 gallons per minute. The maximum instantaneous rate of injection for each well shall not exceed 600 gallons per minute. The combined maximum volume of wastewater injected shall not exceed 17,856,000 gallons per month (based on a 30 day month at 400 gallons per minute), or 210,240,000 gallons per year (based on a 365 day year at 400 gallons per minute).

E. A positive pressure differential of at least 100 psig over tubing injection pressures shall be maintained in the tubing-casing annulus for the purpose of leak detection. Temporary deviations from this requirement which are a part of normal well operations are authorized but may not exceed 15 minutes in duration.

F. The specific gravity of the injected wastes shall be monitored on a batch basis, or by grab samples taken once every shift.

G. In accordance with 31 TAC § 305.153 the permittee shall secure and maintain in full force financial security in the amount of $123,000.00. The amount of the financial security may, at the discretion of the Executive Director, be altered at a future date to provide for adequate closure subject to the then prevailing economic conditions. The injection of fluids is not authorized until the permittee has received approval of the above financial security from the Executive Director.

VIII. Record Keeping Requirements

In addition to the record keeping requirements of 31 TAC § 331.67, the permittee shall also keep complete and accurate records of:

1. Injection fluid specific gravity.

IX. Prior to the well being placed in service Hoechst Celanese (HC) shall certify in writing that:

A. HC has a program to reduce the volume or quantity and toxicity of waste to the degree determined by HC to be economically practicable; and

B. Injection of waste is that practicable method of disposal currently available to HC which minimizes the present and future threat to human health and the environment.

X. A. The following rules effective this date are incorporated as terms and conditions of this permit by reference:

1. Amendments, Renewals, Transfers, Corrections, Revocation, and Suspension of Permits, 31 TAC Chapter 305, Subchapter D

2. Actions, Notice, and Hearing 31 TAC Chapter 305, Subchapter E

3. Permit Characteristics and Conditions, 31 TAC Chapter 305, Subchapter F

4. Additional Conditions for Injection Well Permits, 31 TAC Chapter 305, Subchapter H

5. General Provisions, 31 TAC Chapter 331, Subchapter A

6. General Standards and Methods, 31 TAC Chapter 331, Subchapter C

7. Standards for Class I Wells, 31 TAC Chapter 331, Subchapter D

8. Hazardous Waste Injection Restrictions, 40 CFR Part 148

9. Identification and Listing of Waste Codes, 40 CFR Part 261

B. The express incorporation of the above rules as terms and conditions of this permit does not relieve the permittee of an obligation to comply with all other laws or regulations which are applicable to the permittee or to the activities authorized herein.

APPENDIX J
PLUME MODELING OUTPUT DATA AND INTERPRETATION KEY

APPENDIX J
PLUME MODELING OUTPUT DATA AND INTERPRETATION KEY

In order to check the accuracy of the output files and the plume plots, the starting position of the plots (i.e., the physical location of the X_0 and Y_0) must be known. The Du Pont 10,000 year Plume Model is designed such that the grid has a floating starting point. Therefore, the modeler does not need to know the lateral extent of the plume before running the model. The formula to determine the starting position of the grid is as follows:

[(dimensionless time)(switching velocity) + Xninf] x (plume radius)

Using the above equation, the starting positions for the 10,000 year grids are:

Upper Miocene, high density plume is 14,356.19 feet
Upper Miocene, low density plume is 2,450.86 feet
Lower Miocene, high density plume is 24,031.80 feet
Lower Miocene, low density plume is -6,221.97 feet

(2)

JUL 12 1991

CERTIFIED MAIL: # P 176 161 644
RETURN RECEIPT REQUESTED

REPLY TO: 6W-SU

I.O. Coleman
Hoechst Celanese Chemical Group, Inc.
Bay City Plant
Farm Road 3057, P.O. Box 509
Bay City, TX 77414

Dear Mr. Coleman:

The review of the Hoechst Celanese request for a Petition Exemption Reissuance has been completed. Enclosed is a list of deficiencies on this request. These deficiencies were discovered through EPA's review of the Celanese Reissuance request for an expansion of the current specific gravity range of injected fluids at the facility. These deficiencies were also transmitted to you by facsimile on July 10, 1991.

If you have any questions or comments, please call Phil Dellinger or Ronnie Crossland at (214) 655-7160.

Sincerely yours,

Oscar Cabra, Jr. P.E.
Chief
Municipal Facilities Branch (6W-M)

Enclosure

cc: Tom Roth, Texas Water Commission

PD 7/11/91

6W-SU:7/10/91:DELLINGER:CE:C:®WP50®CELANESE®CEL.LTR
FILE CODE: WAT 18-6-5-9
6W-SU
CROSSLAND
RDC
7/11/91

CELANESE July 10, 1991
PETITION EXEMPTION REISSUANCE

NOTICE OF DEFICIENCIES

GENERAL

1. Celanese calculated an 18.3 psi gel strength pressure on page 6 and an 18.2 psi buoyancy pressure on page 7 of the Petition Exemption Reissuance for the Bay City Petition. Celanese should provide the bit diameter through the injection interval, depth to the top of the injection interval, and the injection interval formation height for the wells located within the 10,000 year plume under any scenario. These parameters have a direct impact in their respective equations. Therefore, Celanese should list the parameters and provide the identifying reference source. Example, Depth to the top of the injection interval: 3300' for well A, Reference source: structure map.

2. Celanese should supply the Johnson and Knape, 1986, reference for determining the gel strength pressure of the mud column.

3. On page 7 of the Petition Exemption Reissuance, Celanese presents equation 2, quantifying the effects of buoyancy on artificial penetrations. Celanese calculated a maximum buoyancy pressure of 18.2 psi. An examination of the Miller, et al., 1986 reference paper indicated that the equation employed by Celanese to quantify the effects of buoyancy in artificial penetrations, $P=(P_m - P_w)gh/2$, was presented by Miller, et al. to quantify the effects of density differences on the upward permeation driving force. The equation cited by the authors as quantifying the effects of density differences on the upward migration through defects in the confining layer (boreholes) is, $P=(P_m - P_w)gh$. Therefore, Celanese should recalculate the buoyancy pressure utilizing the correct formula. In addition, although this paper presents both of these equations, neither was derived. Therefore, Celanese should re-examine the applicability of the cited equation and either derive, or present a scientific paper which derives it.

MODELING

1. On page 10 of the Petition Exemption Reissuance, Celanese states that for the Lower Miocene, low density plume model, "... within 2,500 years, the plume tail will have separated from the main injected mass of the plume due to loss of specific gravity contrast.". It appears in the figure in Appendix C that both plumes retain their same concentration

within their respective interiors and should remain equally buoyant. Celanese should justify the separation of the plume for the Lower Miocene, low density waste at 2500 years in Appendix C.

2. Regarding the Lower Miocene injection interval low specific gravity waste plume on page 10 of the Petition Exemption Reissuance, Celanese states that "Because updip movement of the plume has ceased within 2,500 years, the plume tail will move downdip at the formation fluid velocity.". This implies that the buoyant plume will migrate updip after injection has ceased for the next 2500 years. The figures included in Appendix C for the Lower Miocene, low density waste show no further plume movement updip from the operational plume which has a radius of approximately 3500'. These figures are therefore inconsistent with the text. Celanese should justify the movement of the buoyant plume. Additional figures should be included to illustrate the total area of plume movement.

3. Celanese used a 5000 year time interval for the Upper Miocene, low density waste model input in Appendix C of the Petition Exemption Reissuance. Celanese should model for a 10,000 year time interval. Additional figures should be included to illustrate the maximum plume movement updip and to depict the plume swept area through 10,000 years.

4. Celanese provided the 10,000 year plume model output. However, Celanese should also supply the basic plume input and output files and the input file for the 10,000 year plume model runs. Celanese should supply any necessary interpretive text or annotate the input and output files.

5. Celanese should justify the plume radius parameters input in the 10,000 year plume models.

6. Celanese states that the Upper Miocene, low density, 10,000 year waste plume is not as long as initially modeled (page 9 of the Petition Exemption Reissuance). Celanese should justify why there is a discrepancy if the model input parameters were not altered.

Wat 18-6-5-9

HOECHST CELANESE
PETITION EXEMPTION REISSUANCE

NOTICE OF DEFICIENCIES
July 10, 1991

DRAFT

GENERAL

EPA Comment:

1. Celanese calculated an 18.3 psi gel strength pressure on Page 6 and an 18.2 psi buoyancy pressure on Page 7 of the Petition Exemption Reissuance for the Bay City Petition. Celanese should provide the bit diameter through the injection interval, depth to the top of the injection interval, and the injection interval formation height for the wells located within the 10,000 year plume under any scenario. These parameters have a direct impact in their respective equations. Therefore, Celanese should list the parameters and provide the identifying reference source. Example, Depth to the top of the injection interval: 3300' for Well A, Reference source: structure map.

Hoechst Celanese Response:

Because the response to the EPA General Comments #1 and #3 are so closely related, the combined response to these questions is contained in the response to General Comment #3.

EPA Comment:

2. Celanese should supply the Johnson and Knape, 1986, reference for determining the gel strength pressure of the mud column.

Hoechst Celanese Response:

As requested, the Johnson and Knape paper for determining gel strength pressure of the mud column is being supplied. The discussion on gel strength occurs on pages 8-11. The exact reference is:

Johnson, Orville, C., and Ben K. Knape, 1986, Pressure Effects of the Static Mud Column in Abandoned Wells, Texas Water Commission LP 86-06, 99 pages.

EPA Comment:

3. On Page 7 of the Petition Exemption Reissuance, Celanese presents equation 2, quantifying the effects of buoyancy on artificial penetrations. Celanese calculated a maximum buoyancy pressure of 18.2 psi. An examination of the Miller, et. al., 1986 reference paper indicated that the equation employed by Celanese to quantify the effects of buoyancy in artificial penetrations, $P = (P_m - P_w)\ gh/2$, was presented by Miller, et. al., to quantify the effects of density differences on the upward permeation driving force. The equation cited by the authors as quantifying the effects of density differences on the upward migration through defects in the confining layer (boreholes) is, $P = (P_m - P_w)\ gh$. Therefore, Celanese should recalculate the buoyancy pressure utilizing the correct formula. In addition, although this paper presents both of these equations, neither was derived. Therefore, Celanese should re-examine the applicability of the cited equation and either derive, or present a scientific paper which derives it.

Hoechst Celanese Response:

The basic equations are derived in:

Baker, Stephen E., 1981, Determining the Area of Review for Industrial Waste Disposal Wells, M. S. Thesis, University of Texas at Austin, 146 pages. See Appendix D, pages 88-113, Determination of Gel Strength, and page 2 for derivation of the formula.

Davis, Ken E., 1986, Factors Affecting the Area of Review for Hazardous Waste Disposal Wells, Proceedings of the International Symposium on Subsurface Injection of Liquid Wastes, National Water Well Association, Dublin, Ohio, pages 148-194. See page 172 through 192 for a discussion of gel strength.

Collins, Eugene R., 1986, Technical Basis for Area of Review, An Engineering Study Prepared for Chemical Manufactures Association, Washington, D.C., CMA Reference Number: 80-160-000-4.

The EPA correctly points out that when referring to the reference cited, the equation <u>without</u> the subscript 2 does appear to be the formula that may be most appropriately used for buoyancy calculations through defects.

The formula with the factor of two in the denominator was derived specifically for determining the increase in vertical permeation from the waste plume in the injection zone, and represents the increased pressure on the overlying aquitard layer as a result of a density difference between the waste and the formation fluid. This increased pressure exists only in the region of the waste plume. This formula was incorrectly applied to the case of buoyancy in an artificial penetration.

A more rigorous investigation, and personal communication with Dr. Miller, Ph. D., indicates that the second formula, without the factor of 2 in the denominator, only applies in cases of a brine filled open borehole, or a mud-filled artificial penetration once fluid flow has been initiated by injection induced elevated injection zone pressures. Therefore, this second equation does not strictly apply in the Hoechst Celanese case because it assumes waste fluid would previously enter a borehole, displace the drilling mud, and thus create a situation where a lighter fluid column is present in the wellbore with the propensity to buoyantly rise. It is the Hoechst Celanese position that this scenario cannot happen and that buoyancy driven flow does not occur due to the following:

1) Low permeability, drilling mud derived filter cake will be present along a mud filled open borehole providing a mechanical barrier to fluids entering or exiting the borehole;

2) Drilling muds are specifically designed so that the clay platlets and other components in the mud will not exit an open borehole into a formation and thus there is no process by which the mud would leave the borehole and be replaced by waste fluid;

3) Even if some mud that was in proximity to the waste plume were to leave the borehole by some process, the overbalanced mud column would immediately force new mud downward to replace it;

4) Most of the wells in the Hoechst Celanese 10,000 plume path are either cased, or have cement plugs and mud in them (or both) creating a closed system, and fluid entry into the wellbore would be prevented by the mechanical barrier of the well casing or by the inability of the entering fluid to "levitate" a cement plug in order to create space for waste fluid to enter the borehole;

5) Borehole closure and sloughing will seal off any open boreholes to fluid flow;

6) The gel strength and static fluid column pressure of the mud in an open mud-filled borehole will resist any influx of fluids from outside the borehole;

7) Hoechst Celanese shows in the Area of Review demonstration that in open boreholes, in cases where the pressure is highest due to elevated injection pressures, waste will not enter the borehole and the downward force of the mud column will exceed the upward driving forces caused by injection pressure increases in the injection zone;

8) Buoyancy is a vertical force, with a minimal horizontal component due to the gently dipping beds at Hoechst Celanese and unless the lighter fluid could be emplaced into the borehole, there will be no significant vertical buoyant driving force exerted on the borehole mud column;

9) The only fluid movement that could take place into the borehole, would be on a molecular level, with molecules of formation fluid or waste being substituted for molecules of borehole fluid, without a significant change in the resultant borehole fluid density.

The net effect of the above factors is that a significant waste fluid induced density contrast could not occur in a mud-filled borehole, and thus the creation of a buoyant fluid column pressure in a wellbore will not occur.

A more detailed discussion of this last item (i.e., number nine) follows:

A mud-filled borehole (using conventional mud systems) contains a colloidal suspension of microscopic clay, barite and other particles in water that has set up to form a gel. The clay particles in this structure are immobilized mechanically by electrostatic forces. Specifically, the positively charged edges of the clay platelets align with the negatively charged flat surfaces of adjacent platelets (Gray, Darley, and Rodgers, 1980). It is the electrostatic attraction of the clay particles which gives mud its gel strength and also prevents the clay and other particles from settling out of the mud. The ability of drilling mud to carry particles in suspension, even when static, is a key property of mud. Without sufficient gel strength, mud would not be able to remove excess solids and solids would drop to the bottom of the borehole. Since the density of the mud is primarily a function of suspended particles, immobilization of these particles by electrostatic forces prevents any potential loss in density resulting from interaction between the waste and the mud.

Water is a component of both drilling mud and waste fluid. Since water is a polar molecule, it will interact electrostatically with clay particles in the mud by hydrogen bonding. This will tend to immobilize the water molecules within the gel structure of the mud and prevent them from leaving. However, even if the water molecules could diffuse out of the mud, each molecule that left would be replaced by a readily available counterdiffusing water molecule from the waste fluid. Because the vast majority of injected waste is composed of water, the overall result would be no net diffusion of water molecules into or out of the borehole mud. Therefore, diffusional interaction of water molecules between the waste fluid and the drilling mud would, at worst, result in no net density change for the mud and buoyancy contrasts sufficient to create driving forces in the borehole will not occur.

Additionally, waste molecules are typically heavier than water molecules and if contaminant molecules in the waste diffused into the drilling mud, this would produce an increase in mud density, rather than a decrease. The amount of the density increase would typically be insignificant because the concentration of contaminant species in the waste is normally in the ppm range.

In conclusion, the gel structure of drilling mud prevents clay and weighting agents from migrating out of the mud. It is primarily the clay that is responsible for the higher density of the mud. Since, clay cannot leave due to the electrostatic bonds, the lower portion of the mud column that is in contact with the waste plume cannot become more buoyant. Water within the mud can interchange with water in the waste fluid; this will only occur on a one-for-one molecule level and will result in no net density change. Trace concentrations of contaminant species within the waste can diffuse into the mud, thus producing a slight density increase whose effect will usually be insignificant.

The above discussion demonstrates that waste fluid cannot enter a mud-filled borehole and this is the Hoechst Celanese position. Still, in the interest of absolute conservatism, and for the purposes of the following calculation, Hoechst Celanese makes the assumption that waste fluid could enter a borehole and replace the drilling mud from the injection interval to the top of the injection zone.

In this case, the second equation, without the factor of 2 in the denominator, applies. Using this equation, and making these very conservative assumptions, it can still be shown that the artificial penetrations within the waste plume are safe because the buoyancy induced by the waste fluid arrival at a mud filled borehole is still substantially less than the conservatively calculated mud gel strength. A discussion of this follows.

The density contrast between a mud-filled borehole and a low density waste in the injection reservoir may produce a small upward driving force, assuming the waste was able to get into the borehole. This force is caused by the buoyancy of the less dense waste relative to the borehole fluid. However, in a mud-filled borehole, the buoyant force is opposed by the gel strength of the mud, and mudcake which will prevent the waste from infiltrating into the mud column at the wellbore face. Furthermore, during the 10,000 year time period the injected plume will disperse, and the density contrast and resulting buoyant force will decrease over time.

Miller, et al. (1986) have quantified the buoyant effect, and have shown that the resulting pressure increase (psi) is equal to the distance times the density difference (gm/cc) between the waste and the borehole fluid. The buoyancy pressure contributed by the waste plume, conservatively assuming no dispersion, for the injected waste stream at the Bay City Plant can be calculated by:

$$P = (\rho_f - \rho_w)gL \qquad \text{Equation (1)}$$

Where:

P = buoyancy pressure (psi)
ρ_f = formation fluid density (gm/cc)
ρ_w = waste density (gm/cc)
g = acceleration of gravity (0.433)
L = distance from injection zone to upper injection interval (feet)

As an example, solving Equation 1 above using a 0.056 gm/cm^3 density difference (formation fluid density of 1.056 gm/cm^3 minus the lightest density waste 1.0 gm/cm^3), a distance from the uppermost injection interval to the top of the injection zone and making the appropriate unit conversions (i.e., 485 feet), the maximum buoyancy pressure at the Bay City Plant equals 11.8 psi. The attached table shows the data for each individual well within the plume and the buoyancy effect due to waste and the gel strength of each borehole.

A conservative assumption is made that the buoyant force is opposed only by the gel strength of the mud. To calculate the gel strength of the static mud column, Equation 2 was employed from a recent Texas Water Commission study (Johnson and Knape, 1986).

$$P_g = (0.00333) \times G \times \frac{h}{d} \qquad \text{Equation (2)}$$

Where:

P_g = pressure due to gel strength (psi)

G = gel strength (20 lbs/100 sq ft)

h = depth to uppermost injection interval (feet)

d = bit diameter through uppermost injection interval (inches) and 0.00333 is the conversion factor, such that P_g is in psi.

As an example, solving the above equation for artificial penetration #250, and using 9-7/8 inches as a borehole diameter, 20 lbs/100 square feet for the gel strength (Davis, 1986) and 3422 feet as the worst-case minimum depth to the uppermost injection interval, a very conservative gel strength estimate of 23.1 is obtained. Parameters for each individual well and the resulting gel strengths within the plume are shown in the attached Table. However, Pierce (1989) and Collins (1989) have shown that the gel strength of the mud is most likely an order of magnitude larger, yielding a considerable margin of safety. The gel strength of clay-based muds comes from the tendency of the plate-like clay particles to align so that the positively charged edges are adjacent to the negatively charged flat surfaces. If the mud sits at rest, then gel strength increases with time as the additional clay particles come into alignment. Thus, in the case of a borehole abandoned for some time, it is likely that the mud originally used during drilling has set to form a gel with a substantial gel strength. All boreholes intercepted by the 10,000 year plume have been investigated and assured plugged by appropriate weight of mud, at least 9.0 lbs/gal. Since the gel strength of a static mud column is larger than the buoyancy pressure, fluid movement of the waste, not only into but also vertically, in a mud-filled borehole could not occur; therefore, only molecular diffusion need be considered in the no-migration demonstration. For a discussion of molecular diffusion, see Appendix 2-11 in the original Petition document submitted to the EPA. Following is a summary table of the gel strength and buoyancy calculations for each well in the 10,000 year plume path. In each case, the opposing gel strength is greater than the waste induced buoyancy, and thus, the wells are safe.

The requested information is being supplied in the following table.

Map ID#	Top II Subsea Depth (feet)	Elevation (feet)	Top II Depth Below GL (feet)	Top IZ Subsea Depth (feet)	Distance II to IZ (feet)	Mud Weight* (lb/gal)	Bit Diameter (inches)	Gel Strength (psi)	Buoyant Force (psi)
4	-3356	30 est	+3386	-2898	458	11.5	9 7/8	22.8	11.1
6	-3355	30 est	+3385	-2875	480	12.5	12 1/4	18.4	11.6
9	-3300	31	+3331	-2833	467	10.1	12 1/4	18.1	11.3
10	-3318 est	34	+3352	-2855 est	463	11.1	9 7/8	22.6	11.2
11	-3312	30 est	+3342	-2850	462	9.8	12 1/4	18.2	11.2
30	-3407	30 est	+3437	-2928	479	11.9	9 7/8	23.2	11.6
242	-3407	32	+3439	-2932	475	12.1	9 7/8	23.2	11.5
250	-3400	22	+3422	-2925	475	13.9	9 7/8	23.1	11.5
251	-3406	18	+3424	-2921	485	13.2	9 7/8	23.1	11.8
252	-3405 est	19	+3424	-2920 est	485	11.7	9 7/8	23.1	11.8
255	-3397	20	+3417	-2918	479	11.4	12 1/4	18.6	11.6
256	-3409	20	+3429	-2924	485	13.2	9 7/8	23.1	11.8
257	-3362	20	+3382	-2935	427	12.5 est	9 7/8	22.8	10.4
Petrus	-3365	27	+3392	-2950	415	12.2	9 7/8	22.9	10.1

DATA SOURCES:

1) **SUBSEA DEPTH** - taken from Appendix 3-7, Structure Map Top of Upper Miocene Injection Interval.

2) **ELEV.** - taken from electric logs in Appendix 4-15, Well Logs.

3) **TOP IZ** - taken from Appendix 3-8, Structure Map Top of Permitted Injection Zone.

4) **DISTANCE IZ TO II** - the top of the Upper Miocene Injection Interval is taken from 1) above and the top of the injection zone is taken from 3) above.

5) **MUD WEIGHT** - taken from electric logs, mud weight in injection interval.

6) **BIT DIAMETER** - taken from electric logs in Appendix 4-15, Well Logs; diameter of bit at injection interval.

7) **GEL STRENGTH** - calculated using the equation $P_g = 0.00333*G*h/d$ where G = 20 lb/100 sq. ft.

8) **BUOYANT FORCE** - Calculated using equation $P_B=(\rho_F - \rho_W)gL$, where $G=0.433$, $\rho_F = 1.056$ g/cm^3, $\rho_W = 1.000$ g/cm^3, and L is taken from the table (Distance) (i.e., from top of injection zone to top of upper injection interval.) also, ρ_F = upper miocene injection interval formation fluid density, and ρ_w = lightest requested waste density for injection.

REFERENCE

Gray, G. R., Darley, H.C.H., and Rodgers, W.F., 1980, Composition and Properties of Oil Well Drilling Fluids, Fourth Edition, Gulf Publishing Co.; Houston ,Texas, 630 p.

MODELING

EPA Comment:

1. On Page 10 of the Petition Exemption Reissuance, Celanese states that for the Lower Miocene, low density plume model, "... within 2,500 years, the plume tail will have separated from the main injected mass of the plume due to loss of specific gravity contrast.". It appears in the figure in Appendix C that both plumes retain their same concentration within their respective interiors and should remain equally buoyant. Celanese should justify the separation of the plume for the Lower Miocene, low density waste at 2,500 years in Appendix C.

Hoechst Celanese Response:

The low density plume within the lower Miocene does not split into two sections. The plume during the early time periods attenuates, that is, the head of the plume moves updip due to density differences while the tail is moving downdip due to with the natural flow gradient. After a period of time (approximately 10 years) the plume has dispersed causing the density contrast between it and the formation fluid to be minor enough that the natural gradient is the primary driving force while buoyancy effects play a secondary role in control of the plume direction. This sentence will be changed in the new submittal of the reissuance.

EPA Comment:

2. Regarding the Lower Miocene injection interval low specific gravity waste plume on Page 10 of the Petition Exemption Reissuance, Celanese states that "Because undip movement of the plume has ceased within 2,500 years, the plume tail will move downdip at the formation fluid velocity." This implies that the buoyant plume will migrate updip after injection has ceased for the next 2,500 years. The figures included in Appendix C for the Lower Miocene, low density waste show no further plume movement updip from the operational plume which has a radius of approximately 3500'. These figures are therefore inconsistent with the text. Celanese should justify the movement of the buoyant plume. Additional figures should be included to illustrate the total area of plume movement.

Hoechst Celanese Response:

There was never any intention to imply that the buoyant plume will migrate updip after injection has ceased. As explained in the response to Question 1, the plume will move downdip after 5 to 10 years due to the natural hydraulic gradient. At no time, except within the first 10 years, will the plume move updip. The entire paragraph on page 10 will be rewritten.

EPA Comment:

3. Celanese used a 5,000 year time interval for the Upper Miocene, low density waste model input in Appendix C of the Petition Exemption Reissuance. Celanese should model for a 10,000 year time interval. Additional figures should be included to illustrate the maximum plume movement updip and to depict the plume swept area through 10,000 years.

Hoechst Celanese Response:

The summary sheet in which the time period of 5,000 years is listed does not correspond to the 10,000 year plot which is shown in Appendix C. This summary sheet comes from an early computer run and will be changed in the reissuance. The 10,000 year plume plot is correct. Additional 'snap shots' of the upper Miocene, low density plume will also be included in Appendix C in order to depict the maximum distance the plume will travel updip before the density contrast is reduced and the plume movement is primarily controlled by the natural hydraulic gradient.

EPA Comment:

4. Celanese provided the 10,000 year plume model output. However, Celanese should also supply the basic plume input and output files and the input file for the 10,000 year plume model runs. Celanese should supply any necessary interpretative text or annotate the input and output files.

EPA Comment:

5. Celanese should justify the plume radius parameters input in the 10,000 year plume models.

Hoechst Celanese Response:

As explained in the response to Question 4, the plume radius parameters used in the 10,000 year plume are the same as calculated by the Basic Plume Model in the original petition submittal. The basic plume model is simply a volumetric calculation of the extent of the plume. It does incorporate the use of a multiplying factor which accounts for the possibility of higher permeable layer within the injection interval. This is explained in detail in the original petition, Section 2, page 2-21.

EPA Comment:

6. Celanese states that the Upper Miocene, low density, 10,000 year waste plume is not as long as initially modeled (Page 9 of the Petition Exemption Reissuance). Celanese should justify why there is a discrepancy if the model input parameters were not altered.

Hoechst Celanese Response:

Careful examination of the original upper Miocene, low density, 10,000 year plume input and output files and source codes reveal that an extremely conservative dip angle of 50 feet per 1000 feet was inadvertently used in the original model calculations. The correct dip rate is 50 feet per mile and this value was used in the current 10,000 year plume calculations. Thus, the input parameters are not the same as previously used. This explains the discrepancy in the plumes' dimensions. Additional snapshots of the plume will be added to Appendix C for the early time periods when buoyancy is the primary driving force.

91 APR 17 AM 10: 34

6W-S

Chemical Group
Hoechst Celanese Corporation
1250 West Mockingbird Lane
PO Box 569320
Dallas, TX 75356-9320
214 689 4000

April 16, 1991
CJS-054-91

Mr. Ronald D. Crossland
U.S. Environmental Protection Agency
Region VI (6W-SU)
1445 Ross Avenue
Dallas, Texas 75202-2733

Wat 18-6-5-9

SUBJECT: Minor Modification Request to Approved No-Migration Petition Hoechst Celanese Chemical Group, Inc. Bay City Plant; Bay City, Texas. (Referenced Letter, I.O. Coleman's IOC-60-91 of March 27, 1991 to you.)

Dear Mr. Crossland,

In my CJS-050-91 of April 15, 1991 to you, there was an inadvertent error in the last sentence of the letter. Please replace their letter and attachment with the enclosed corrected copy.

I have enclosed corrected copies for Messrs. Myron O. Knudson, Oscar Cabra, Jr., and Brian Graves of your EPA Region VI office.

I.O. Coleman advised me of the teleconference he had with you on April 15. The meeting time in your Region VI Dallas office on April 23 has been changed from 9am to 1pm.

Thank You,

C.J. Schaefer /RAM

C.J. Schaefer
Manager Environmental &
Product Safety

/kh

cc: Myron O. Knudson - EPA Region VI, Dallas
Oscar Cabra, Jr. - EPA Region VI, Dallas
Brian Graves - EPA Region VI, Dallas

Chemical Group
Hoechst Celanese Corporation
1250 West Mockingbird Lane
PO Box 569320
Dallas, TX 75356-9320
214 689 4000

April 15, 1991
CJS-050-91

Mr. Ronald D. Crossland
U.S. Environmental Protection Agency
Region VI (6W-SU)
1445 Ross Avenue
Dallas, Texas 75202-2733

SUBJECT: Minor Modification Request to Approved No-Migration Petition
Hoechst Celanese Chemical Group, Inc. Bay City Plant;
Bay City, Texas. (Referenced Letter, I.O. Coleman's IOC-60-91
of March 27, 1991 to you.)

Dear Mr. Crossland,

This will confirm the telephone discussion which I.O. Coleman, Bob Maurer and I had with you April 11 pertaining to the captioned minor modification to the Bay City no-migration petition. Messrs. I.O. Coleman (Bay City), Don Squyres (Dupont Consultant) and Bob Maurer (Hoechst Celanese Consultant) plan to meet with you at 9AM in your Dallas office on Tuesday, April 23. We want to again go over the petition minor modification document (a copy of which is attached) which requests a broader specific gravity range of the injected wastewater. We feel that the modeling results at the broader specific gravity range conclusively show that the "no-migration" petition requirement is still attained.

In our March 24 Minor Modification Request, Mr. Coleman reiterates that there is an imminent land ban date (June 8, 1991, i.e. expiration of a two (2) year capacity variance) for the waste injected into WDW-110, Bay City acid well. In our April 10 teleconference you pointed out, again, that top priority is being given by EPA to petition applications which have not been approved and to approved petitions where litigation is involved.

We feel, however, that companies with land ban capacity variances which will expire in the near future, like our June 8 expiration, and who have requested a minor modification to address correction of "no-migration petiton" provisions that cause operation difficulties, should also be given top priority. This is particularly true since, as you pointed out, if EPA makes the decision to approve the modification EPA must still publish the planned approval in a newspaper for a 45 day public comment period and evaluate any comments that are received by the agency.

We look forward to the April 23 meeting with you, and will certainly appreciate any priority you can give to expediting the review of our modification request.

Sincerely,

C. J. Schaefer
Manager Environmental &
Product Safety

/kh

cc's attached

Chemical Group
Hoechst Celanese Corporation
1250 West Mockingbird Lane
PO Box 569320
Dallas, TX 75356-9320
214 689 4000

April 15, 1991
CJS-050-91

RECEIVED
1991
6 W-SU

Mr. Ronald D. Crossland
U.S. Environmental Protection Agency
Region VI (6W-SU)
1445 Ross Avenue
Dallas, Texas 75202-2733

SUBJECT: Minor Modification Request to Approved No-Migration Petition
Hoechst Celanese Chemical Group, Inc. Bay City Plant;
Bay City, Texas. (Referenced Letter, I.O. Coleman's IOC-60-91
of March 27, 1991 to you.)

Dear Mr. Crossland,

This will confirm the telephone discussion which I.O. Coleman, Bob Maurer and I had with you April 11 pertaining to the captioned minor modification to the Bay City no-migration petition. Messrs. I.O. Coleman (Bay City), Don Squyres (Dupont Consultant) and Bob Maurer (Hoechst Celanese Consultant) plan to meet with you at 9AM in your Dallas office on Tuesday, April 23. We want to again go over the petition minor modification document (a copy of which is attached) which requests a broader specific gravity range of the injected wastewater. We feel that the modeling results at the broader specific gravity range conclusively show that the "no-migration" petition requirement is still attained.

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We feel, however, that companies with land ban capacity variances which will expire in the near future, like our June 8 expiration, and who have requested a minor modification to address correction of "no-migration petiton" provisions that cause operation difficulties, should also be given top priority. This is particularly true since, as you pointed out, if EPA makes the decision to approve the modification EPA must still publish the planned approval in a newspaper for a 45 day public comment period and evaluate any comments that are received by the agency.

LT 18-6-5-9

We look forward to the April 23 meeting with you, and will certainly appreciate any priority you can give to our expediting the review of modification request.

Sincerely,

C. J. Schaefer
Manager Environmental &
Product Safety

/kh

cc's attached

1700 North Congress Ave.
Austin, Texas 78711-3087

Mr. Richard E. Merritt - w/o Attach.
Geologist
Underground Injection Control Section
Hazardous and Solid Waste Division
Texas Water Commission
P.O. Box 13087, Capitol Station
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Mr. Minor Brooks Hibbs, Chief - w/o Attach.
Permit Section
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Mr. Myron O. Knudson - w/o Attach.
Deputy Director
Water Management Division
United States Environmental Protection Agency
Region I, (6W-S)
1445 Ross Ave.
Dallas, Texas 75202-2733

Mr. Oscar Cabra, Jr., Chief - w/o Attach.
United States Environmental Protection Agency
Region I, (6W-S)
1445 Ross Ave.
Dallas, Texas 75202-2733

Mr. Brian Graves - w/o Attach.
United States Environmental Protection Agency
Region VI
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Dallas, Texas 75202-2733

Mr. M.B. Gray
Plant Manager
Monsanto Company
P.O. Box 711
Alvin, TX 77512-9888

R. Kinnan Golemon
Brown Maroney & Oaks Hartline
1400 Franklin Plaza
111 Congress Avenue

6W-S

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509, FM 3057
Bay City, TX 77404-0509
409 245 4871

March 27, 1991
IOC-60-91

Mr. Ronald D. Crossland
U. S. Environmental Protection Agency
Region VI (6W-SU)
1445 Ross Avenue
Dallas, Texas 75202-2733

Subject: Minor Modification Request To Approved No-Migration Petition
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
(Reference Letters, IOC-24-91, IOC-25-91 and IOC-26-91
Dated February 6 and February 8, 1991 Respectively)

Dear Mr. Crossland:

Per your request during our telephone conversation on Thursday, March 24, 1991,this letter transmits to EPA the Hoechst Celanese Chemical Group, Inc., Bay City Plant's re-submission of its Class I Injection Well Petition exemption modification (for specific gravity) document. This petition exemption modification request is made under "Section II, Exemption Modification, D., Change in Density of Fluids", of the recently issued February EPA guidance document applicable to this issue (UIC Program Guidance #74).

With this submission, the Bay City Plant again requests the EPA to increase the range of specific gravities of the injected fluids, approved in the Bay City Plant Class I Petition exemption.

The exemption modification was submitted to EPA February 6, 1991, and was based on the proposed guidance document on petition modifications. The final EPA guidance document, " #74" has now been issued, and a review of the final guidance document indicates that there were no significant changes to the requirements for specific gravity exemption modifications. Thus, in the interest of expediting the exemption approval, no revisions have been made to the exemption modification request document submitted February 6, 1991.

It should be noted that the Bay City Plant is requesting the revised range for injected wastes be given in specific gravities and not in densities. This is because specific gravities are what is customarily measured at the facility. The necessary conversions

There is an imminent land ban date (June 8, 1991, i.e., expiration of 2 year capacity variance) for the waste injected into WDW-110 (Well 1-A). Thus, the plant requests the EPA to expedite this petition exemption modification request, and approve the injecting of the revised range of specific gravities, on or before this June 8, 1991 ban date.

Please don't hesitate to contact by telephone Mr. Ralph D. Riley at (409) 245-4871 or me at extension 4197 if you have any comments or questions concerning this matter.

Very truly yours,

I. O. Coleman, Jr.
Environmental Affairs, Industrial Hygiene
and Health Section Leader

IOC/la
Attachments

cc: Mr. Thomas Roth, Chief - w/o Attach.
Underground Injection Control Section
Hazardous and Solid Waste Division
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
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Mr. Myron O. Knudson - w/o Attach.
Deputy Director
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1445 Ross Avenue
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Mr. Oscar Cabra, Jr., Chief w/o Attach.
United Stated Environmental Protection Agency
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Mr. Richard E. Merritt - w/o Attach.
Geologist
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Mr. Brian Graves - w/o Attach.
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Dallas, Texas 75202-273

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509, FM 3057
Bay City, TX 77404-0509
409 245 4871

February 6, 1991
IOC-24-91

Mr. Ronald D. Crossland
U. S. Environmental Protection Agency
Region VI (6W - SU)
1445 Ross Avenue
Dallas, Texas 75202-2733

Subject: No-Migration Minor Petition Modification
Hoechst Celanese Chemical Group, Inc.,
Bay City Plant, Bay City, Texas

Dear Mr. Crossland:

As followup to our meeting in your office on Monday, December 17, 1990, I have enclosed herewith a document entitled "Minor Petition Modification", Hoechst Celanese Chemical Group, Inc.,Bay City Plant, for your review and consideration. This document was prepared by Du Pont Environmental Remediation Services and supports our request for a minor modification of our approved No-Migration Petition.

Specifically, the Bay City Plant requests a minor modification to expand the specific gravity range of the injected fluids. The Proposed Guidance on Modification of Exemption to Hazardous Waste Disposal Injection Restrictions draft, dated October 31, 1990, developed for and by the Underground Injection Practices Council, was used as reference for analyzing potential requirements to amend our petition.

We currently operate four Class I injection wells. These wells were re-permitted by the Texas Water Commission effective January 13, 1987 through January 13, 1992. Two waste streams are injected: an "acid" waste (hazardous stream) and a "neutral" waste (non hazardous stream). Each stream is injected into a separate well system. WDW-110 injects into the Lower Miocene In-jection Sand Interval. WDW-14, WDW-32 and WDW-49 inject into the Upper Miocene Injection Sand Interval. (Also, we have submitted a permit application to TWC for an additional well, WDW-277, which is intended to serve as backup to the existing WDW-110).

We wish to expand the specific gravity range currently specified in our Petition by submittal of an exemption modification. Our Petition specifies that the specific gravity of injected fluids be within the range of 1.0012 and 1.0034 g/cm^3 at 68°F. The requested specific gravity is 1.00 to 1.10 g/cm^3 at 68°F. This change is requested based on a demonstration of hydraulic similarity between the initial Petition injectate and the modified injectate (expanded specific gravity range) as reflected by the behavior and characteristics of the formation fluids.

Additional plume modeling, using the high and low values of the proposed density, was performed. The modeling showed that movement of the injected waste plume will not extend significantly beyond the limits defined by modeling in the original petition demonstration. Consequently, there is no significant affect on the no-migration demonstration in our approved Petition.

Since the characteristics of the expanded specific gravity range injectate are sufficiently within (or less dense than) the range of specific gravities modeled in the initial Petition, modification of the exemption to our Petition is justified. (See Figure 1 of the enclosed document.)

In summary, the technical review and approach undertaken to prepare the " Minor Petition Modification " document involved the following:

* A review of the Proposed Guidance Document on Modification of Exemptions to Hazardous Waste Disposal Injection Restrictions was made to determine that the requested Petition specific gravity modification is a minor modification.

* The 10,000-year plume model was rerun, using the expanded specific gravity range, to determine locations of plumes.

* Revised specific gravity plumes were plotted on our approved Petition maps to show any new area covered by these plumes that was not covered by the plumes in the approved Petition.

* Review of the revised plume areas was conducted to assure that no additional artificial penetrations were impacted by the revised plume areas.

Based on the above, we feel the requested specific gravity range expansion of injected fluids will not affect the demonstration of no-migration in our approved Petition. Also, since this proposed modification deals solely with an expansion of specific gravity range, the new waste stream will be identical to the injectate in the Petition in every respect expect specific gravity. Consequently, there will be no change in molecular diffusion rates

Additionally: (1) the non-endangerment standard demonstrated in our approved Petition will remain valid for vertical waste movement using the revised specific gravity range because no significant pressure component is added to the driving force modeled in the Petition; (2) no additional well penetrations are impacted and (3) a change in specific gravity will not affect the compatibility of the waste with the formation fluid or formation rock.

In requesting the expansion of the specific gravity range of the injected fluid stated in our Petition, we submit that the exemption modification procedure is appropriate because:

- the hydraulic similarity of injectates is maintained,
- the change in the updip and downdip movement of the injected plume, caused by the specific gravity modification, is insignificant, and,
- the injectate, is, for the most part, within the specific gravity range on which the initial modeling was based.

Your timely review and consideration of our request for a minor Petition Modification are appreciated.

If you have any comments or questions pertaining to this matter, please don't hesitate to contact Mr. R. D. Riley at (409) 245-4871, Ext. 4033 or me at Ext. 4197.

Sincerely,

I. O. Coleman, Jr.

I. O. Coleman, Jr.
Environmental Affairs, Industrial Hygiene
and Health Section Leader

IOC/la

Attachments

cc: Mr. Thomas Roth, Chief
Underground Injection Control Section
Hazardous and Solid Waste Division
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
Austin, Texas 78711-3087

Deputy Director
Water Management Division
United States Environmental Protection Agency
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1445 Ross Avenue
Dallas, Texas 75202-2733

Mr. Oscar Cabra, Jr., Chief w/o Attach.
United States Environmental Protection Agency
Region IV, (6W-S)
1445 Ross Avenue
Dallas, Texas 75202-2733

Mr. Richard E. Merritt - w/o Attach.
Geologist
Underground Injection Control Section
Hazardous and Solid Waste Division
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Mr. Minor Brooks Hibbs, Chief - w/o Attach.
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Mr. Brian Graves - w/o Attach.
United States Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-273

10/30

Chemical Group
Bay City Plant
Hoechst Celanese Corporation
PO Box 509, FM 3057
Bay City, TX 77404-0509
409 245 4871

October 22, 1990
IOC-327-90

Mr. Ronald Crossland
EPA Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Subject: No-Migration Petition Amendment Request
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas

Dear Mr. Crossland:

As follow-up to our telephone conversation on Monday, October 22, 1990, this letter documents Hoechst Celanese Chemical Group, Inc., Bay City Plant's intent to submit a request to your Agency to amend our No-Migration Petition. Specifically, we are requesting an increase in the density range (and/or specific gravity range) associated with the injection fluids covered in the Petition.

It is my understanding that a guidance document on Petition modifications will be available from the Environmental Protection Agency, Washington, D.C. Office in early November, 1990. Please transmit a copy of this document (in draft or final form) to me as soon as possible, so that I can develop the required documentation (in proper format) requesting the increase in density ranges.

Very truly yours,

I. O. Coleman, Jr. /RDR

I. O. Coleman, Jr.
Environmental Affairs, Industrial Hygiene
and Health Section Leader

IOC/la

cc: Mr. Thomas Roth, Chief
Underground Injection Control Section
Hazardous And Solid Waste Division
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
Austin, Texas 78711-3087

RECEIVED
OCT 30 1990
EPA 6W-S
REGION VI

Mr. Richard E. Merritt
Geologist
Underground Injection Control Section
Hazardous And Solid Waste Division
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
Austin, Texas 78711-3087

Ms. Brenda W. Foster, Chief Clerk
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
Austin, Texas 78711-3087

Mr. Minor Brooks Hibbs, Chief
Permits Section
Hazardous And Solid Waste Division
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
Austin, Texas 78711-3087

Mr. Brian Graves
United States Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

RECEIVED
OCT 30 1995
EPA OH-S

TEXAS WATER COMMISSION

B. J. Wynne, III, Chairman
John E. Birdwell, Commissioner
Cliff Johnson, Commissioner

John J. Vay, General Counsel
Michael E. Field, Chief Hearings Examiner
Brenda W. Foster, Chief Clerk

Allen Beinke, Executive Director

October 15, 1990

Crossland
10/17

Mr. Ronnie Crossland
United States Environmental Protection Agency
Region VI (6WSU)
1445 Ross Ave.
Dallas, Texas 75202

Re: Draft Minor Amendments to T.W.C. Permit Nos. WDW-14, WDW-32, WDW-49 and WDW-110, Hoechst Celanese Chemical Group, Inc., Bay City Plant; Matagorda County, Texas

Dear Mr. Crossland:

Enclosed are the draft minor amendments to the above referenced T.W.C. waste disposal well permits. These amendments are sought to conform the existing waste disposal well permits to the approved No-Migration Petition, pursuant to 40 CFR § 148.20, and are submitted for your information and review. Please respond within 10 days of receipt of this letter if you have any comments in this regard. If we do not receive comments within the 10 day period we will assume the U.S.E.P.A. approves of the draft permits as written.

If you have any questions, please contact Mr. Richard E. Merritt at 512/463-8139.

Sincerely,

Ray Henry Austin, P.E. for
Minor Brooks Hibbs, Chief
Permits Section
Hazardous and Solid Division

REM/

Attachments

RECEIVED
OCT 17 1990
EPA 6W-S
REGION VI

Applications for minor amendments to UIC permits to conduct underground injection under provisions of Chapters 26 and 27 of the Texas Water Code for Hoechst Celanese Chemical Group, Incorporated; TWC Permit Nos. WDW-14, WDW-32, WDW-49 and WDW-110.

TECHNICAL SUMMARY

On September 17, 1990, Hoechst Celanese Chemical Group, Inc. (Bay City Plant) completed filing applications with the Texas Water Commission (TWC) for minor amendments to the Underground Injection Control (UIC) permits for the existing waste disposal wells, WDW-14, WDW-32, WDW-49 and WDW-110. These amendments are sought to conform the existing waste disposal well permits to the No-Migration Petition as required by 40 CFR § 148.20. The minor amendments will increase the amount of financial security required to provide for closure costs, and add language to the permits to include the newly defined terms of injection interval and injection zone. For WDW-14, WDW-32 and WDW-49, the injection volume and injection rates will remain the same as in the preceding permit provisions. For WDW-110, provisions have been added to define maximum volumes and rates for injection into both the Upper and Lower Miocene injection zones. The maximum surface injection pressure will be reduced, from the preceding permit provisions, for the wells injecting into the Upper Miocene (WDW-14, WDW-32, WDW-49 and WDW-110).

The disposal wells are located on company property at the Hoechst Celanese chemical manufacturing plant ten miles southwest of Bay City, Matagorda County, Texas, within the James Moore League, Abstract No. 62. The disposal wells will continue to inject hazardous and non-hazardous wastewaters generated from the production of acetaldehyde, acetic acid, n-butyl alcohol, n-propyl alcohol, isobutyl alcohol and vinyl acetate. The survey locations are as follows:

WDW-14	James Moore League	Abstract 62	5,230 ft. S. of most N. NWC 2,220 ft. W. of most N. NWC
WDW-32	James Moore League	Abstract 62	4,292 ft. S. of most N. NWC 2,029 ft. W. of most N. NWC
WDW-49	James Moore League	Abstract 62	3,489 ft. N of the SWC 2,442 ft. E of the SWC
WDW-110	James Moore League	Abstract 62	18,050 ft. from the E. line 2,200 ft. from the N. line

Fresh ground water in the project area is obtained from wells drilled into the Chicot and Evangeline aquifers. Useable-quality ground water occurs to a maximum depth of 1300 feet. The injection zone will be contained within the Miocene age sands at the approximate subsurface depth of 2,900 and 5,950 feet below ground level. The

authorized injection intervals will be the Miocene Age sands at the approximate subsurface depths of 3,350 to 3,600 feet and 5,700 to 5,950 feet below ground level. The injection interval is synonymous with the subsurface interval used in the preceding permit provisions. The sands are known to be areally extensive and have sufficient porosity and permeability to accept the proposed waste volumes. Massive impermeable shales of Miocene Age overlie each injection sand. These impermeable shales will prevent the upward migration of fluids, effectively preventing contamination of useable-quality water resources.

Records have been reviewed of all known artificial penetrations of the injection zone occurring within the 2 and 1/2 mile area of review for each well. Calculated formation pressure increases predict that injection activities will not significantly affect the Upper and Lower Miocene Formation as an contained reservoir. For WDW-14, WLW-32, WDW-49 and and WDW-110, mechanical integrity was last demonstrated on October 31, 1989, and will next be due no later than October 31, 1990; and shall thereafter be demonstrated annually for the life of the wells.

Hoechst Celanese is required to secure and maintain in full force and effect at all times a performance bond, or other form of financial security acceptable to the Executive Director, to provide for proper plugging and abandonment for the waste disposal wells. The bond or other form of financial security must be in the amount of $115,000.00 for WDW-14, $113,000.00 for WDW-32, $112,000.00 for WDW-49 and $122,000.00 for WDW-110. The amount of financial security may, at the discretion of the Texas Water Commission, be altered at a future date to provide for adequate plugging subject to the then prevailing general economic conditions. These permits will not authorize underground injection of fluid unless the permittee has in effect a performance bond or other form of financial security acceptable to the Executive Director in the above amounts.

The injection volume and injection rates will remain the same as in the preceding permit provisions. For injection into the Upper Miocene injection interval, the maximum injection rate for WDW-14, WDW-32, WDW-49 and the proposed well, WDW-277 will be 750 gpm, cumulative. If any portion of the Upper Miocene interval is used for injection by WDW-110 the maximum rate of injection will be 750 gpm, cumulative. The maximum monthly injection volume limit will be 32,400,000 gallons, cumulative. The maximum annual volume will be 394,200,000 gallons, cumulative.

For injection into the lower Miocene injection interval the maximum injection rate for WDW-110 will be 600 gpm, cumulative with the proposed well, WDW-277. The maximum monthly injection volume limit will be 25,920,000 gallons, cumulative with WDW-277. The maximum annual volume will be 315,360,000 gallons, cumulative with WDW-277.

The maximum surface injection pressure will be reduced, from the preceding permit provisions, to 775 psig; for the wells injecting into the Upper Miocene (WDW-14, WDW-32 and WDW-49). If any portion of the Upper Miocene interval is used for injection by WDW-110, the maximum surface injection pressure will be 775 psig. The maximum surface injection injection pressure for WDW-110, injecting in the Lower Miocene, will remain unchanged at 900 psig. The density of the injected fluids shall remain within a range of from 1.0012 to 1.0043, inclusive.

Surface and long string casings will be properly set and cemented to protect ground water resources. The long string - injection tubing annulus is to be continuously monitored for detection of leaks.

With proper safeguards as specified in the proposed permit, both surface and useable quality ground water resources can be adequately protected from contamination by the injected waste streams.

The proposed permits will expire at midnight, January 13, 1997.

Prepared by:

Richard E. Merritt

Approved by:

Thomas P. Roth

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202-2733

May 4, 1990

CERTIFIED MAIL P-105 324 949
RETURN RECEIPT REQUESTED

REPLY TO: 6W-SU

Mr. I. O. Coleman
Environmental Affairs
Hoechst Celanese Chemical
Group, Incorporated
P.O. Box 509
Bay City, Texas 77414

Re: Final Hoechst Celanese Chemical Group, Incorporated - Bay City, Texas, Petition Decision

Dear Mr. Coleman:

Effective the date of this letter, the Environmental Protection Agency (EPA) approves the Hoechst Celanese - Bay City petition for an exemption to the land disposal restrictions imposed by the Hazardous and Solid Waste Amendments of 1984 to the Resource Conservation and Recovery Act. This approval is contingent upon the conditions listed below.

The land disposal restrictions prohibit the injection of hazardous waste unless a petitioner can demonstrate to the EPA, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the injection zone for as long as the wastes remain hazardous. The land disposal restrictions for injection wells which are codified in 40 CFR Part 148, provide the standards and procedures by which petitions to dispose of an otherwise prohibited waste by injection will be reviewed and by which exemptions pursuant to these petitions will be granted or denied.

A letter dated March 6, 1990, informed Hoechst Celanese that the Environmental Protection Agency (EPA) would propose to approve the Bay City petition for an exemption to the land disposal restrictions. The public comment period associated with this proposed decision began on March 7, 1990, and closed on April 20, 1990. In addition to this comment period, a public hearing was held in Bay City, Texas, on April 12, 1990, to allow the local public the opportunity to present comments concerning the EPA's proposed decision. Enclosed is EPA's response to the issues raised during the public comment period.

Based on a detailed technical review of the submitted petition and support documents, the information presented during the public comment period, and consultations with the Texas Water Commission, the EPA has determined that the Hoechst Celanese - Bay City, petition meets the requirements of 40 CFR Part 148 by demonstrating no migration of hazardous constituents from the injection zone for 10,000 years.

Petition Approval Conditions

The final approval to allow injection of restricted hazardous wastes is subject to the following conditions. Noncompliance with any of these conditions is grounds for termination of the exemption in accordance with 40 CFR 148.24(a)(1).

1. This exemption is only for the four injection Wells WDW-14, WDW-32, WDW-49, and WDW-110 which were permitted by the Texas Water Commission.

2. Injection of restricted waste shall be limited to the injection intervals for the following wells:

Well No. WDW-14	3350 to 3600 feet. (log depth)
Well No. WDW-32	3350 to 3600 feet. (log depth)
Well No. WDW-49	3350 to 3600 feet. (log depth)
Well No. WDW-110	5700 to 5950 feet. (log depth)

These injection intervals occur in an injection zone occurring at a depth of 2900 feet to 6200 feet (log depth).

3. The cumulative monthly volume injected in WDW-14, WDW-32, and WDW-49 shall not exceed 33,480,000 gallons. The monthly volume injected in WDW-110 shall not exceed 26,784,000 gallons.

4. The facility shall cease injection of restricted hazardous waste by December 31, 2000.

5. The characteristics of the injected waste stream shall at all times conform to those of Section 2.1 in the petition. The density of the waste stream shall remain within a range of from 1.0012 to 1.0034, inclusive.

6. The final approval for injection is limited to the following hazardous wastes: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002, Hexavalent Chromium.

7. Hoechst Celanese must petition for approval to inject additional hazardous wastes which are not included in Condition No. 5, above. Hoechst Celanese must also petition for approval to increase the concentration of any waste which would necessitate the recalculation of the limiting concentration reduction factor and the extent of the waste plume. Petition modifications and reissuance should be made pursuant to 40 CFR 148.20 (e) or (f).

8. Hoechst Celanese shall annually submit to EPA the results of a bottom hole pressure survey for WDW-14, WDW-32, WDW-49, and WDW-110. This survey shall have been performed after shutting in each well for a period of time sufficient to allow the pressure in the injection interval to reach equilibrium, in accordance with 40 CFR 146.68(e)(1).

9. Upon the expiration, cancellation, reissuance, or modification of the Texas Water Commission's Underground Injection Control permit for Well No(s). WDW-14, WDW-32, WDW-49 and WDW-110, this exemption is subject to review. A new demonstration may be required if information shows that the basis of granting the exemption is no longer valid.

In addition to the above conditions, this final petition approval is contingent upon the validity of the information submitted in the Hoechst Celanese - Bay City petition for an exemption to the land disposal restrictions. This approval is subject to termination where new information shows that the basis for approval of the petition is no longer valid, which is in accordance with Section 148.24(a)(3).

If you have any questions or comments, please call Oscar Cabra, Jr., at (214) 655-7150.

Sincerely yours,

Myron O. Knudson

Myron O. Knudson, P.E.
Director
Water Management Division (6W)

Enclosures

cc: Michael Cook (WH-550A)
Francoise Brasier (WH-550E)
Texas Water Commission

DRAFT
SUBJECT TO REVISION

OCT 1 1 1990

Permit No. WDW-110

This permit supersedes and replaces TWC Permit No. WDW-110 issued January 13, 1987

TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

PERMIT to conduct Class I underground injection under provisions of Chapter 26 & 27, Texas Water Code

I. Name of Permittee:

A. Name Hoechst - Celanese Chemical Group, Inc.

B. Address P. O. Box 509
Bay City, Texas 77404-0509

II. Type of Permit: Regular_____ Amended____X_____
Commercial_____ Non-commercial__X__
Hazardous___X___ Non-hazardous_____

III. Nature of Business: Petrochemical Plant

IV. General Description and Location of Injection Activity:

The disposal well is used to dispose of industrial waste from the Bay City Plant. The well is located approximately 18,050 feet from the east line and 2,200 feet from the north line of the James Moore League, Abstract No. 62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; 28°51'48" north latitude, 96°01'15" west longitude. The injection zone will be the Upper and Lower Miocene Formations in the approximate subsurface depth of 2,900 and 5,950 feet below ground level. The

does this mean between 2900 + 5950.

CONTINUED on Pages 2 through 5.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit expires at midnight, January 13, 1997, unless renewed or revoked by the Commission.

APPROVED, ISSUED, AND EFFECTIVE this _____ day of _____.

ATTEST: _____ _____.
For the Commission

authorized injection intervals will be at the approximate subsurface depths of 3,350 to 3,600 feet for the Upper Miocene and 5,700 to 5,950 feet for the Lower Miocene.

V. Construction History

A. Permit No. WDW-110 for the drilling and operation of this disposal well was issued on March 27, 1973. The permittee set and cemented surface casing to a depth of 1,369 feet, and long string casing from the surface into the injection zone to 5,656 feet to properly protect each USDW or freshwater aquifer. Cement was circulated outside both casings back to the surface. Any changes to the plans and specifications in the original application were certified in writing by the executive director that said changes provided equivalent or greater protection than the original design criteria and standards.

VI. Character of the Waste Streams

A. Industrial waste authorized to be injected by this permit shall consist solely of the following waste streams:

1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.

2. Wastes generated from the manufacture of acetaldehyde, acetic acid, n-butyl alcohol, n-propyl alcohol, isobutyl alcohol and vinyl acetate. Injection of hazardous wastes shall be limited to the following E.P.A. waste codes: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002 and Hexavalent Chromimum. A chemical analysis of the wastes is included in Attachment A.

3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams and reservoir.

B. The density of injected fluids shall remain within a range of from 1.0012 to 1.0034, inclusive.

C. No discharge of wastes is authorized by this permit from this facility into water in the State other than those waste streams authorized above in Paragraph VI.A. injected into the Upper and Lower Miocene Formations within the injection intervals between 3,350 to 3,600 feet for the Upper Miocene and 5,700 to 5,950 feet for the Lower Miocene.

D. Waste prohibited from injection in 40 CFR Part 148, Subpart B, are specifically prohibited from injection by this permit, unless an exemption from prohibition has been granted pursuant to 40 CFR Part 148, Subpart C.

E. Wastes regulated by the Texas Department of Health are not authorized for injection by this permit.

VII. Operating Parameters

A. The operating surface injection pressure shall not exceed 1475 psig for injection into the Lower Miocene injection interval. If any portion of the Upper Miocene interval between 3,350 and 3,600 is used for injection, the operating surface injection pressure shall not exceed 775 psig.

WDW-277 is not included in the petition

B. The maximum average rate of injection shall not exceed 600 gallons per minute (cumulative with WDW-277) for injection into the Lower Miocene injection interval. The maximum instantaneous rate of injection shall not exceed 800 gallons per minute (cumulative with WDW-277) for injection into the Lower Miocene injection interval.

C. If any portion of the Upper Miocene interval between 3,350 and 3,600 feet is used for injection, the maximum rate of injection shall not exceed 750 gallons per minute, cumulative with WDW-14, WDW-32 and WDW-49.

D. The volume of wastewater injected shall not exceed 26,784,000 gallons per month (based on a 31 day month, calculated by multiplying 600 gallons per minute x 1440 minutes per day x the number of days in a given month), or 315,360,000 gallons per year (based on a 365 day year at 600 gallons per minute) for injection into the Lower Miocene injection interval; cumulative with WDW-277.

not necessary

E. If any portion of the Upper Miocene interval between 3,350 and 3,600 feet, is used for injection the volume of waste water injected shall not exceed 33,480,000 gallons per month (based on a 31 day month, calculated by multiplying 750 gallons per minute x 1440 minutes per day x the number of days in a given month); cumulative with WDW-14, WDW-32, WDW-49 and WDW-277.

F. A positive pressure differential of at least 100 psig over tubing injection pressures shall be maintained in the tubing-casing annulus for the purpose of leak detection. Temporary deviations from this requirement which are a part of normal well operations are authorized but may not exceed 15 minutes in duration.

G. The density of the injected wastes shall be monitored on a batch basis, or by grab samples taken once every shift.

F. In accordance with 31 TAC § 305.153 the permittee shall secure and maintain in full force financial security in the amount of $122,000.00. The amount of the financial security may, at the discretion of the Executive Director, be altered at a future date to provide for adequate closure subject to the then prevailing economic conditions. The injection of fluids is not authorized until the permittee has received approval of the above financial security from the Executive Director.

VIII. Record Keeping Requirements

In addition to the record keeping requirements of 31 TAC § 331.67, the permittee shall also keep complete and accurate records of:

1. Injection fluid density

2. Quarterly reports of corrosion monitoring

IX. A. The following rules effective this date are incorporated as terms and conditions of this permit by reference:

1. Amendments, Renewals, Transfers, Corrections, Revocation, and Suspension of Permits, 31 TAC Chapter 305, Subchapter D

2. Actions, Notice, and Hearing 31 TAC Chapter 305, Subchapter E

3. Permit Characteristics and Conditions, 31 TAC Chapter 305, Subchapter F

4. Additional Conditions for Injection Well Permits, 31 TAC Chapter 305, Subchapter H

5. General Provisions, 31 TAC Chapter 331, Subchapter A

6. General Standards and Methods, 31 TAC Chapter 331, Subchapter C

7. Standards for Class I Wells, 31 TAC Chapter 331, Subchapter D

8. Consideration Prior to Permit Issuance 31 TAC Chapter 331, Subchapter G

9. Hazardous Waste Injection Restrictions, 40 CFR Part 148

10. Identification and Listing of Waste Codes, 40 CFR Part 261

B. The express incorporation of the above rules as terms and conditions of this permit does not relieve the permittee of an obligation to comply with all other laws or regulations which are applicable to the permittee or to the activities authorized herein.

ATTACHMENT A

HOECHST CELANESE CHEMICAL GROUP, INC. - BAY CITY PLANT
RECENT TYPICAL ANALYSIS OF ACID WASTE STREAM
(Analysis Done 9/22/87)

Specific Conductance (μmhos)	1,250
Chlorinated Organics (ppm)	1,772
Alkalinity (ppm)	< 1
Hardness (ppm)	< 1
Phosphorus - Ortho (ppm)	< 1
Phosphorus - Total (ppm)	< 1
Oil and Grease (ppm)	< 5
Ash (%)	0.0147
Water (%)	99.29
Nitrate (ppm)	< 0.1
Total Organic Carbon (ppm)	4826
Total Suspended Solids	5
Total Dissolved Solids (ppm)	504
pH	2.07
Chemical Oxygen Demand (ppm)	16,854
Specific Gravity	1.0044
Total Cyanides (mg/l)	< 0.005
Total Phenols (mg/l)	0.030
Antimony (mg/l)	< 0.005
Arsenic (mg/l)	< 0.005
Barium (mg/l)	< 0.050
Cadimum (mg/l)	< 0.005
Calcium (mg/l)	45

Chromium (mg/l)	< 0.01
Copper (mg/l)	0.31
Lead (mg/l)	< 0.005
Manganese (mg/l)	0.02
Mercury (mg/l)	< 0.002
Nickel (mg/l)	0.022
Sulfate (ppm)	37
Selenium (mg/l)	< 0.005
Silver (mg/l)	< 0.005
Thallium (mg/l)	< 0.005
Vandadium (mg/l)	< 0.005
Zinc (mg/l)	< 0.005
Halogenated Organic Compounds (HOC) (ppm)	1772

Taken from regular bi-annual waste analysis performed at the Bay City Plant.

DRAFT
SUBJECT TO REVISION
OCT 1 1 1999

Permit No. WDW-32

This permit supersedes and replaces TWC Permit No. WDW-32 issued January 13, 1987

TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

PERMIT to conduct Class I underground injection under provisions of Chapter 26 & 27, Texas Water Code

I. Name of Permittee:

A. Name Hoechst - Celanese Chemical Group, Inc.

B. Address P. O. Box 509
Bay City, Texas 77404-0509

II. Type of Permit: Regular_____ Amended____X_____
Commercial_____ Non-commercial__X__
Hazardous___X___ Non-hazardous_____

III. Nature of Business: Petrochemical Plant

IV. General Description and Location of Injection Activity:

The disposal well is used to dispose of industrial waste from the Bay City Plant. The well is located approximately 4,292 feet south and 2,029 feet west of the most northerly northwest corner of the company property, which is located on the James Moore League, Abstract No. 62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; 28°51'59" north latitude, 96°01'13" west longitude. The injection zone will be the Upper Miocene Formation in the approximate subsurface depth of 2,900 and

CONTINUED on Pages 2 through 5.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit expires at midnight, January 13, 1997, unless renewed or revoked by the Commission.

APPROVED, ISSUED, AND EFFECTIVE this _____ day of _____.

ATTEST: _____ _____.
For the Commission

3,700 feet below ground level. The authorized injection interval will be at the approximate subsurface depth of 3,350 to 3,600 feet.

V. Construction History

A. Permit No. WDW-32 for the drilling and operation of this disposal well was issued on July 3, 1967. The permittee set and cemented surface casing to a depth of 1,302 feet, and long string casing from the surface into the injection zone to 3,245 feet to properly protect each USDW or freshwater aquifer. Cement was circulated outside both casings back to the surface. Any changes to the plans and specifications in the original application were certified in writing by the executive director that said changes provided equivalent or greater protection than the original design criteria and standards.

VI. Character of the Waste Streams

A. Industrial waste authorized to be injected by this permit shall consist solely of the following waste streams:

1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.

2. Wastes generated from the manufacture of acetaldehyde, acetic acid, n-butyl alcohol, n-propyl alcohol, isobutyl alcohol and vinyl acetate. Injection of hazardous wastes shall be limited to the following E.P.A. waste codes: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002 and Hexavalent Chromimum. A chemical analysis of the wastes is included in Attachment A.

3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams and reservoir.

B. The density of injected fluids shall remain within a range of from 1.0012 to 1.0034, inclusive.

C. No discharge of wastes is authorized by this permit from this facility into water in the State other than those waste streams authorized above in Paragraph VI.A. injected into the Miocene Formation within the injection intervals between 3,350 to 3,600 feet.

D. Waste prohibited from injection in 40 CFR Part 148, Subpart B, are specifically prohibited from injection by this permit, unless an exemption from prohibition has been granted pursuant to 40 CFR Part 148, Subpart C.

E. Wastes regulated by the Texas Department of Health are not authorized for injection by this permit.

VII. Operating Parameters

A. The operating surface injection pressure shall not exceed 775 psig.

B. The maximum rate of injection shall not exceed 750 gallons per minute (cumulative with WDW-14, WDW-49 and WDW-277) for injection into the Upper Miocene injection interval. WDW-07

C. The volume of wastewater injected shall not exceed 33,480,000 gallons per month (based on a 31 day month, calculated by multiplying 750 gallons per minute x 1440 minutes per day x the number of days in a given month), <u>or</u> 394,200,000 gallons per year (based on a 365 day year at 750 gallons per minute). Above volume totals are cumulative with WDW-14, WDW-49 and WDW-277 for injection into the Upper Miocene injection interval. WDW-07

D. A positive pressure differential of at least 100 psig over tubing injection pressures shall be maintained in the tubing-casing annulus for the purpose of leak detection. Temporary deviations from this requirement which are a part of normal well operations are authorized but may not exceed 15 minutes in duration.

E. The density of the injected wastes shall be monitored on a batch basis, or by grab samples taken once every shift.

F. In accordance with 31 TAC § 305.153 the permittee shall secure and maintain in full force financial security in the amount of $113,000.00. The amount of the financial security may, at the discretion of the Executive Director, be altered at a future date to provide for adequate closure subject to the then prevailing economic conditions. The injection of fluids is not authorized until the permittee has received approval of the above financial security from the Executive Director.

VIII. Record Keeping Requirements

In addition to the record keeping requirements of 31 TAC § 331.67, the permittee shall also keep complete and accurate records of:

1. Injection fluid density
2. Quarterly reports of corrosion monitoring

IX. A. The following rules effective this date are incorporated as terms and conditions of this permit by reference:

1. Amendments, Renewals, Transfers, Corrections, Revocation, and Suspension of Permits, 31 TAC Chapter 305, Subchapter D

2. Actions, Notice, and Hearing 31 TAC Chapter 305, Subchapter E

3. Permit Characteristics and Conditions, 31 TAC Chapter 305, Subchapter F

4. Additional Conditions for Injection Well Permits, 31 TAC Chapter 305, Subchapter H

5. General Provisions, 31 TAC Chapter 331, Subchapter A

6. General Standards and Methods, 31 TAC Chapter 331, Subchapter C

7. Standards for Class I Wells, 31 TAC Chapter 331, Subchapter D

8. Consideration Prior to Permit Issuance 31 TAC Chapter 331, Subchapter G

9. Hazardous Waste Injection Restrictions, 40 CFR Part 148

10. Identification and Listing of Waste Codes, 40 CFR Part 261

B. The express incorporation of the above rules as terms and conditions of this permit does not relieve the permittee of an obligation to comply with all other laws or regulations which are applicable to the permittee or to the activities authorized herein.

ATTACHMENT A

HOECHST CELANESE CHEMICAL GROUP, INC. - BAY CITY PLANT
RECENT TYPICAL ANALYSIS OF ACID WASTE STREAM
(Analysis Done 9/22/87)

Specific Conductance (μmhos)	1,250
Chlorinated Organics (ppm)	1,772
Alkalinity (ppm)	< 1
Hardness (ppm)	< 1
Phosphorus - Ortho (ppm)	< 1
Phosphorus - Total (ppm)	< 1
Oil and Grease (ppm)	< 5
Ash (%)	0.0147
Water (%)	99.29
Nitrate (ppm)	< 0.1
Total Organic Carbon (ppm)	4826
Total Suspended Solids	5
Total Dissolved Solids (ppm)	504
pH	2.07
Chemical Oxygen Demand (ppm)	16,854
Specific Gravity	1.0044
Total Cyanides (mg/l)	< 0.005
Total Phenols (mg/l)	0.030
Antimony (mg/l)	< 0.005
Arsenic (mg/l)	< 0.005
Barium (mg/l)	< 0.050
Cadimum (mg/l)	< 0.005
Calcium (mg/l)	45

Chromium (mg/l)	< 0.01
Copper (mg/l)	0.31
Lead (mg/l)	< 0.005
Manganese (mg/l)	0.02
Mercury (mg/l)	< 0.002
Nickel (mg/l)	0.022
Sulfate (ppm)	37
Selenium (mg/l)	< 0.005
Silver (mg/l)	< 0.005
Thallium (mg/l)	< 0.005
Vandadium (mg/l)	< 0.005
Zinc (mg/l)	< 0.005
Halogenated Organic Compounds (HOC) (ppm)	1772

Taken from regular bi-annual waste analysis performed at the Bay City Plant.

DRAFT
SUBJECT TO REVISION

OCT 1 1 1990

Permit No. WDW-49

This permit supersedes and replaces TWC Permit No. WDW-49 issued January 13, 1987

TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

PERMIT to conduct Class I underground injection under provisions of Chapter 26 & 27, Texas Water Code

I. Name of Permittee:

A. Name Hoechst - Celanese Chemical Group, Inc.

B. Address P. O. Box 509
Bay City, Texas 77404-0509

II. Type of Permit: Regular_____ Amended____X_____
Commercial_____ Non-commercial__X__
Hazardous___X___ Non-hazardous_____

III. Nature of Business: Petrochemical Plant

IV. General Description and Location of Injection Activity:

The disposal well is used to dispose of industrial waste from the Bay City Plant. The well is located approximately 3,489 feet north and 2,442 feet east of the southwest corner of the company property, which is located on the James Moore League, Abstract No. 62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; 28°21'24" north latitude, 96°00'59" west longitude. The injection zone will be the Upper Miocene Formation in the approximate subsurface depth of 2900 and 3,700 feet below

CONTINUED on Pages 2 through 5.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit expires at midnight, January 13, 1997, unless renewed or revoked by the Commission.

APPROVED, ISSUED, AND EFFECTIVE this _____ day of _____.

ATTEST: _____ _____
For the Commission

ground level. The authorized injection interval will be at the approximate subsurface depth of 3,350 to 3,600 feet.

V. Construction History

A. Permit No. WDW-49 for the drilling and operation of this disposal well was issued on April 8, 1969. The permittee set and cemented surface casing to a depth of 1,389 feet, and long string casing from the surface into the injection zone to 3,162 feet to properly protect each USDW or freshwater aquifer. Cement was circulated outside both casings back to the surface. Any changes to the plans and specifications in the original application were certified in writing by the executive director that said changes provided equivalent or greater protection than the original design criteria and standards.

VI. Character of the Waste Streams

A. Industrial waste authorized to be injected by this permit shall consist solely of the following waste streams:

1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.

2. Wastes generated from the manufacture of acetaldehyde, acetic acid, n-butyl alcohol, n-propyl alcohol, isobutyl alcohol and vinyl acetate. Injection of hazardous wastes shall be limited to the following E.P.A. waste codes: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002 and Hexavalent Chromimum. A chemical analysis of the wastes is included in Attachment A.

3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams and reservoir.

B. The density of injected fluids shall remain a range of from 1.0012 to 1.0034, inclusive.

C. No discharge of wastes is authorized by this permit from this facility into water in the State other than those waste streams authorized above in Paragraph VI.A. injected into the Miocene Formation within the injection intervals between 3,350 to 3,600 feet.

D. Waste prohibited from injection in 40 CFR Part 148, Subpart B, are specifically prohibited from injection by this permit, unless an exemption from prohibition has been granted pursuant to 40 CFR Part 148, Subpart C.

E. Wastes regulated by the Texas Department of Health are not authorized for injection by this permit.

VII. Operating Parameters

A. The operating surface injection pressure shall not exceed 775 psig.

B. The maximum rate of injection shall not exceed 750 gallons per minute (cumulative with WDW-14, WDW-32 and WDW-277) for injection into the Upper Miocene injection interval.

C. The volume of wastewater injected shall not exceed 33,480,000 gallons per month (based on a 31 day month, calculated by multiplying 750 gallons per minute x 1440 minutes per day x the number of days in a given month), or 394,200,000 gallons per year (based on a 365 day year at 750 gallons per minute). Above volume totals are cumulative with WDW-32, WDW-49 and WDW-277 for injection into the Upper Miocene injection interval.

D. A positive pressure differential of at least 100 psig over tubing injection pressures shall be maintained in the tubing-casing annulus for the purpose of leak detection. Temporary deviations from this requirement which are a part of normal well operations are authorized but may not exceed 15 minutes in duration.

E. The density of the injected wastes shall be monitored on a batch basis, or by grab samples taken once every shift.

F. In accordance with 31 TAC § 305.153 the permittee shall secure and maintain in full force financial security in the amount of $112,000.00. The amount of the financial security may, at the discretion of the Executive Director, be altered at a future date to provide for adequate closure subject to the then prevailing economic conditions. The injection of fluids is not authorized until the permittee has received approval of the above financial security from the Executive Director.

VIII. Record Keeping Requirements

In addition to the record keeping requirements of 31 TAC § 331.67, the permittee shall also keep complete and accurate records of:

1. Injection fluid density
2. Quarterly reports of corrosion monitoring

IX. A. The following rules effective this date are incorporated as terms and conditions of this permit by reference:

1. Amendments, Renewals, Transfers, Corrections, Revocation, and Suspension of Permits, 31 TAC Chapter 305, Subchapter D

2. Actions, Notice, and Hearing 31 TAC Chapter 305, Subchapter E

3. Permit Characteristics and Conditions, 31 TAC Chapter 305, Subchapter F

4. Additional Conditions for Injection Well Permits, 31 TAC Chapter 305, Subchapter H

5. General Provisions, 31 TAC Chapter 331, Subchapter A

6. General Standards and Methods, 31 TAC Chapter 331, Subchapter C

7. Standards for Class I Wells, 31 TAC Chapter 331, Subchapter D

8. Consideration Prior to Permit Issuance 31 TAC Chapter 331, Subchapter G

9. Hazardous Waste Injection Restrictions, 40 CFR Part 148

10. Identification and Listing of Waste Codes, 40 CFR Part 261

B. The express incorporation of the above rules as terms and conditions of this permit does not relieve the permittee of an obligation to comply with all other laws or regulations which are applicable to the permittee or to the activities authorized herein.

ATTACHMENT A

HOECHST CELANESE CHEMICAL GROUP, INC. - BAY CITY PLANT
RECENT TYPICAL ANALYSIS OF ACID WASTE STREAM
(Analysis Done 9/22/87)

Specific Conductance (μmhos)	1,250
Chlorinated Organics (ppm)	1,772
Alkalinity (ppm)	< 1
Hardness (ppm)	< 1
Phosphorus - Ortho (ppm)	< 1
Phosphorus - Total (ppm)	< 1
Oil and Grease (ppm)	< 5
Ash (%)	0.0147
Water (%)	99.29
Nitrate (ppm)	< 0.1
Total Organic Carbon (ppm)	4826
Total Suspended Solids	5
Total Dissolved Solids (ppm)	504
pH	2.07
Chemical Oxygen Demand (ppm)	16,854
Specific Gravity	1.0044
Total Cyanides (mg/l)	< 0.005
Total Phenols (mg/l)	0.030
Antimony (mg/l)	< 0.005
Arsenic (mg/l)	< 0.005
Barium (mg/l)	< 0.050
Cadimum (mg/l)	< 0.005
Calcium (mg/l)	45

Chromium (mg/l)	< 0.01
Copper (mg/l)	0.31
Lead (mg/l)	< 0.005
Manganese (mg/l)	0.02
Mercury (mg/l)	< 0.002
Nickel (mg/l)	0.022
Sulfate (ppm)	37
Selenium (mg/l)	< 0.005
Silver (mg/l)	< 0.005
Thallium (mg/l)	< 0.005
Vandadium (mg/l)	< 0.005
Zinc (mg/l)	< 0.005
Halogenated Organic Compounds (HOC) (ppm)	1772

Taken from regular bi-annual waste analysis performed at the Bay City Plant.

DRAFT
SUBJECT TO REVISION
OCT 1 1 1990

Permit No. WDW-14

This permit supersedes and replaces TWC Permit No. WDW-14 issued January 13, 1987

TEXAS WATER COMMISSION
Stephen F. Austin State Office Building
Austin, Texas

PERMIT to conduct Class I underground injection under provisions of Chapter 26 & 27, Texas Water Code

I. Name of Permittee:

A. Name Hoechst - Celanese Chemical Group, Inc.

B. Address P. O. Box 509
Bay City, Texas 77404-0509

II. Type of Permit: Regular_____ Amended____X____
Commercial_____ Non-commercial__X__
Hazardous___X___ Non-hazardous_____

III. Nature of Business: Petrochemical Plant

IV. General Description and Location of Injection Activity:

The disposal well is used to dispose of industrial waste from the Bay City Plant. The well is located approximately 5,230 feet south and 2,220 feet west of the most northerly northwest corner of the company property, which is located on the James Moore League, Abstract No. 62, Matagorda County, Texas, approximately 10 miles southwest of Bay City, Texas; 28°52'19" north latitude, 96°01'15" west longitude. The injection zone will be the Upper Miocene Formation in the approximate subsurface depth of 2900 and

CONTINUED on Pages 2 through 5.

The permittee is authorized to conduct injection activity in accordance with limitations, requirements, and other conditions set forth herein. This permit is granted subject to the rules and orders of the Commission, and the laws of the State of Texas. This permit expires at midnight, January 13, 1997, unless renewed or revoked by the Commission.

APPROVED, ISSUED, AND EFFECTIVE this _____ day of _____.

ATTEST: _____ _____
For the Commission

3,700 feet below ground level. The authorized injection interval will be at the approximate subsurface depth of 3,350 to 3,600 feet.

V. Construction History

A. Permit No. WDW-14 for the drilling and operation of this disposal well was issued on September 28, 1964. The permittee set and cemented surface casing to a depth of 1,369 feet, and long string casing from the surface into the injection zone to 3,750 feet to properly protect each USDW or freshwater aquifer. Cement was circulated outside both casings back to the surface. Any changes to the plans and specifications in the original application were certified in writing by the executive director that said changes provided equivalent or greater protection than the original design criteria and standards.

VI. Character of the Waste Streams

A. Industrial waste authorized to be injected by this permit shall consist solely of the following waste streams:

1. Wastes generated during closure of the well and associated facilities that are compatible with permitted wastes and the reservoir.

2. Wastes generated from the manufacture of acetaldehyde, acetic acid, n-butyl alcohol, n-propyl alcohol, isobutyl alcohol and vinyl acetate. Injection of hazardous wastes shall be limited to the following E.P.A. waste codes: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002 and Hexavalent Chromimum. A chemical analysis of the wastes is included in Attachment A.

3. Other associated wastes such as ground water and rainfall contaminated by the above authorized wastes, spills of the above authorized wastes, and wash waters and solutions used in cleaning and servicing the waste disposal well system equipment which are compatible with the permitted waste streams and reservoir.

B. The density of injected fluids shall remain a range of from 1.0012 to 1.0034, inclusive.

C. No discharge of wastes is authorized by this permit from this facility into water in the State other than those waste streams authorized above in Paragraph VI.A. injected into the Miocene Formation within the injection intervals between 3,350 to 3,600 feet.

D. Waste prohibited from injection in 40 CFR Part 148, Subpart B, are specifically prohibited from injection by this permit, unless an exemption from prohibition has been granted pursuant to 40 CFR Part 148, Subpart C.

E. Wastes regulated by the Texas Department of Health are not authorized for injection by this permit.

VII. Operating Parameters

A. The operating surface injection pressure shall not exceed 775 psig.

B. The maximum rate of injection shall not exceed 750 gallons per minute (cumulative with WDW-32, WDW-49 and WDW-277) for injection into the Upper Miocene injection interval.

C. The volume of wastewater injected shall not exceed 33,480,000 gallons per month (based on a 31 day month, calculated by multiplying 750 gallons per minute x 1440 minutes per day x the number of days in a given month), <u>or</u> 394,200,000 gallons per year (based on a 365 day year at 750 gallons per minute). Above volume totals are cumulative with WDW-32, WDW-49 and WDW-277 for injection into the Upper Miocene injection interval.

D. A positive pressure differential of at least 100 psig over tubing injection pressures shall be maintained in the tubing-casing annulus for the purpose of leak detection. Temporary deviations from this requirement which are a part of normal well operations are authorized but may not exceed 15 minutes in duration.

E. The density of the injected wastes shall be monitored on a batch basis, or by grab samples taken once every shift.

F. In accordance with 31 TAC § 305.153 the permittee shall secure and maintain in full force financial security in the amount of $115,000.00. The amount of the financial security may, at the discretion of the Executive Director, be altered at a future date to provide for adequate closure subject to the then prevailing economic conditions. The injection of fluids is not authorized until the permittee has received approval of the above financial security from the Executive Director.

VIII. Record Keeping Requirements

In addition to the record keeping requirements of 31 TAC § 331.67, the permittee shall also keep complete and accurate records of:

1. Injection fluid density
2. Quarterly reports of corrosion monitoring

IX. A. The following rules effective this date are incorporated as terms and conditions of this permit by reference:

1. Amendments, Renewals, Transfers, Corrections, Revocation, and Suspension of Permits, 31 TAC Chapter 305, Subchapter D

2. Actions, Notice, and Hearing 31 TAC Chapter 305, Subchapter E

3. Permit Characteristics and Conditions, 31 TAC Chapter 305, Subchapter F

4. Additional Conditions for Injection Well Permits, 31 TAC Chapter 305, Subchapter H

5. General Provisions, 31 TAC Chapter 331, Subchapter A

6. General Standards and Methods, 31 TAC Chapter 331, Subchapter C

7. Standards for Class I Wells, 31 TAC Chapter 331, Subchapter D

8. Consideration Prior to Permit Issuance 31 TAC Chapter 331, Subchapter G

9. Hazardous Waste Injection Restrictions, 40 CFR Part 148

10. Identification and Listing of Waste Codes, 40 CFR Part 261

B. The express incorporation of the above rules as terms and conditions of this permit does not relieve the permittee of an obligation to comply with all other laws or regulations which are applicable to the permittee or to the activities authorized herein.

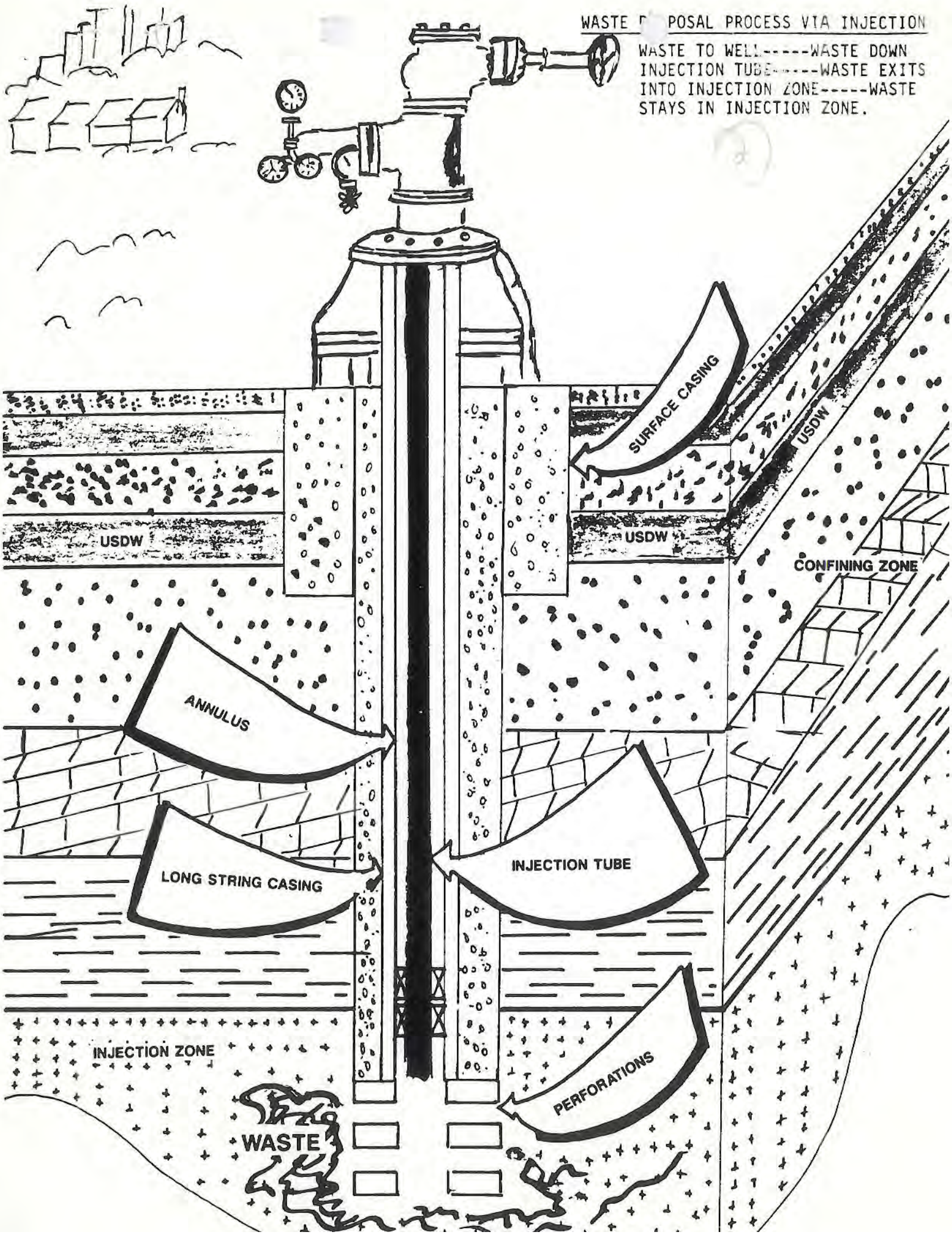
ATTACHMENT A

HOECHST CELANESE CHEMICAL GROUP, INC. - BAY CITY PLANT
RECENT TYPICAL ANALYSIS OF ACID WASTE STREAM
(Analysis Done 9/22/87)

Specific Conductance (μmhos)	1,250
Chlorinated Organics (ppm)	1,772
Alkalinity (ppm)	< 1
Hardness (ppm)	< 1
Phosphorus - Ortho (ppm)	< 1
Phosphorus - Total (ppm)	< 1
Oil and Grease (ppm)	< 5
Ash (%)	0.0147
Water (%)	99.29
Nitrate (ppm)	< 0.1
Total Organic Carbon (ppm)	4826
Total Suspended Solids	5
Total Dissolved Solids (ppm)	504
pH	2.07
Chemical Oxygen Demand (ppm)	16,854
Specific Gravity	1.0044
Total Cyanides (mg/l)	< 0.005
Total Phenols (mg/l)	0.030
Antimony (mg/l)	< 0.005
Arsenic (mg/l)	< 0.005
Barium (mg/l)	< 0.050
Cadimum (mg/l)	< 0.005
Calcium (mg/l)	45

WASTE DISPOSAL PROCESS VIA INJECTION

WASTE TO WELL-----WASTE DOWN INJECTION TUBE-----WASTE EXITS INTO INJECTION ZONE-----WASTE STAYS IN INJECTION ZONE.



March 4, 1990

FACT SHEET

For proposed approval to allow injection of restricted hazardous wastes into the following injection well(s):

Applicant: Hoechst Celanese Chemical Group, Inc.
Bay City Plant
Farm Road 3057
P. O. Box 509
Bay City, Texas 77414

Facility Location: Matagorda County

Permit Number	Well Number
WDW-14	2
WDW-32	3
WDW-49	4
WDW-110	1-A
WDW-277	5

Issuing Office: U.S. Environmental Protection Agency
Region 6
First Interstate Bank Tower
1445 Ross Avenue
Dallas, Texas 75202-2733

1. The Environmental Protection Agency (EPA) proposes to allow the injection of restricted hazardous wastes into the well(s) described above and in the petition demonstration document.

2. This fact sheet or similar statement of basis is required under Title 40 of the Code of Federal Regulations, §§ 124.7 and 124.8 (40 CFR §§ 124.7 and 124.8, as referenced by 40 CFR §§ 148.22 and 124.10).

3. The following is an explanation of the derivation of the proposed decision, which is categorized according to the criteria outlined in 40 CFR Part 148. [53 Fed. Reg., 28118, (1988)]

Summary

The EPA land disposal restrictions promulgated under § 3004 of the Resource Conservation and Recovery Act prohibit the injection of hazardous waste unless a petitioner demonstrates to the EPA that there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. These no migration demonstrations include a description of the well operations, geologic siting, and waste stream characteristics. They also include modeling

strategies which incorporate all the above mentioned information and utilize mathematical equations to predict pressure build up and waste movement.

The Hoechst Celanese - Bay City petition described its well operation through a discussion of the well construction, well stimulations, injection pressures, and injection volumes. The site location and geologic conditions were presented through a discussion of the depositional environment, well logs, cross-sections, well tests, geologic maps, and well records. The characteristics of the injection wastestream were described and evaluated for compatibility with the injection and confining zones. Hoechst Celanese incorporated all this information into a modeling strategy which predicted the pressure build up and waste movement for the Bay City site. The waste plume, under worst conditions, was predicted to move laterally approximately 7.3 miles southeast in the upper interval and 6.6 miles southeast in the lower interval in 10,000 years. Vertical movement is approximately 128 feet. Both of these distances are within the injection zone.

In addition to the reasonably conservative data and assumptions in the no migration demonstration, the following factors augment the demonstration of no migration:

(a) The petition over predicts pressure buildup and waste plume extent by modeling the injection rate at 750 gpm for the upper interval and 600 gpm for the lower interval which is more than the historic rate of 251 gpm for the upper interval and 190 gpm for the lower interval.

(b) The petition over predicts the injected hazardous constituent concentration by assuming the constituent concentration is two orders of magnitude greater than the measured value.

(c) The petition is reasonably conservative by not taking into account the degradation of the contaminant in the injection zone. Examples of degradation which were not considered are adsorption, oxidation, hydrolysis, temperature, and microbiological degradation.

(d) In the evaluation of artificial penetrations, the petition does not take into account the natural occurrence of wellbore closure. This occurs within the Gulf Coast region due to the unconsolidated sediments.

Therefore, after a detailed and thorough review of the Bay City site petition, the EPA proposes that Hoechst Celanese

has demonstrated, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the injection zone for a time period of 10,000 years.

The factors considered in the formulation of this proposed petition decision are described below.

Artificial Penetrations

The area around the Class I hazardous waste well cited in the petition must be evaluated to ensure that the injection activity will not endanger Underground Sources of Drinking Water (USDW) by causing movement of fluids into improperly sealed, completed, or abandoned wells. The petition applicant submitted information on all wells penetrating the injection or confining zones within 2.5 miles of the injection wells.

(a) Artificial penetrations within the 2.5 mile radius are plugged or constructed to prevent the endangerment to an USDW.

(b) There are 32 wells within the area of review (AOR) which meet this standard.

(c) The calculated cone of influence (COI) is less than 1230 feet.

In addition to the nonendangerment standard, some artificial penetrations must also meet the no-migration standard. These artificial penetrations are wells which penetrate the injection zone and are located within the area of the waste plume movement over 10,000 years.

(a) The artificial penetrations which penetrate the injection zone and are located within the area of the waste plume movement over 10,000 years are plugged or constructed to prevent the migration of hazardous waste from the injection zone.

(b) There are 13 wells within the area of the plume which meet the no-migration standard.

(c) All wells met this standard through a demonstration that waste movement due to pressure and molecular diffusion in an artificial penetration will remain within the injection zone.

Mechanical Integrity Testing (MIT) Information

To assure that the wastes will reach the injection zone, a petitioner must submit the results of pressure and radioactive tracer tests according to §148.20 (a)(2)(iv). A well has mechanical integrity when there is no significant leak in the casing, tubing, or packer, and when there is no significant fluid movement into an USDW through vertical channels adjacent to the injection well bore. The petition demonstrates that the active wells have been tested and do satisfy the above criteria.

Well No.	Date of Pressure Test	Date of Radioactive Tracer Survey
WDW-14	10-26-89	10-26-89
WDW-32	10-24-89	10-24-89
WDW-49	10-25-89	10-25-89
WDW-110	10-31-89	10-31-89
WDW-277	Not Drilled	

Injection well WDW-277 must meet the requirements of the Texas Water Commission injection permit. Results of the pressure and radioactive tracer tests must be submitted to the EPA Region 6 for approval prior to injection of restricted hazardous waste in well WDW-277. In addition, information obtained from the drilling and construction of the WDW-277 well shall be submitted to the EPA Region 6 to ensure the basis for the petition decision continues to remain valid. The information should include well logs, geologic core analysis of the confining and injection zones, a hydrogeologic compatibility determination, and formation tests.

Quality Assurance

According to §148.21 (a)(4), the Hoechst Celanese - Bay City petition demonstrates that proper quality assurance and quality control plans were followed in preparing the petition demonstrations.

Specifically, Hoechst Celanese has followed appropriate protocol in identifying and locating records for artificial penetrations within the Area of Review. Information regarding the geology, waste characterization, hydrology, reservoir modeling, and well construction has also been adequately verified or bounded by worst-case scenarios.

Regional and Local Geology

Class I hazardous waste injection wells must be located in areas that are geologically suitable. The injection zone must have sufficient permeability, porosity, thickness, and

areal extent to prevent migration of fluids into USDW's. The confining zone must be laterally continuous and free of transmissive faults or fractures to prevent the movement of fluids into an USDW and must contain at least one formation capable of preventing vertical propagation of fractures. The Hoechst Celanese-Bay City facility is sited in an area meeting the above criteria.

An evaluation of the structural and stratigraphic geology of the local and regional area has determined that the Hoechst Celanese-Bay City facility is located at a geologically suitable site. The injection zone is of sufficient permeability, porosity, thickness, and areal extent to meet requirements stated in 40 CFR Part 148. The confining zone is laterally continuous and free of transecting, transmissive faults or fractures over an area sufficient to prevent the movement of fluids into a USDW.

(1) Depth of Confining Zone: 2350 feet
Depth of Injection Zone: 2900 feet
Depth of Injection Intervals: 3350-3600 feet
5700-5950 feet

(2) The geologic conditions were presented through a discussion of the depositional environment, well logs, cross-sections, well tests, and geologic maps.

(3) The structure and isopach maps provided confidence in the geologic description.

(4) The geologic cross-sections demonstrated that the injection zone is laterally continuous. This justified some of the modeling assumptions.

(5) Pressure falloff tests support the injection zone permeability parameter in the modeling strategy.

Hydrogeology

According to §148.20 (a)(1), a petitioner must submit hydrogeologic information in order to study the effects of the injection well activity. Hoechst Celanese provided hydrogeologic information in the petition which demonstrates that USDW's are properly protected. The base of the lowermost USDW is at 1300 feet.

Characteristics of Injected Fluids

According to §148.22 (a), the characteristics of the injection wastestream must be adequately described in order to determine the wastestream's compatibility with the injection zone. These characteristics are described in the petition and the description is adequate and complete.

areal extent to prevent migration of fluids into USDW's. The confining zone must be laterally continuous and free of transmissive faults or fractures to prevent the movement of fluids into an USDW and must contain at least one formation capable of preventing vertical propagation of fractures. The Hoechst Celanese-Bay City facility is sited in an area meeting the above criteria.

An evaluation of the structural and stratigraphic geology of the local and regional area has determined that the Hoechst Celanese-Bay City facility is located at a geologically suitable site. The injection zone is of sufficient permeability, porosity, thickness, and areal extent to meet requirements stated in 40 CFR Part 148. The confining zone is laterally continuous and free of transecting, transmissive faults or fractures over an area sufficient to prevent the movement of fluids into a USDW.

(1) Depth of Confining Zone: 2350 feet
Depth of Injection Zone: 2900 feet
Depth of Injection Intervals: 3350-3600 feet
5700-5950 feet

(2) The geologic conditions were presented through a discussion of the depositional environment, well logs, cross-sections, well tests, and geologic maps.

(3) The structure and isopach maps provided confidence in the geologic description.

(4) The geologic cross-sections demonstrated that the injection zone is laterally continuous. This justified some of the modeling assumptions.

(5) Pressure falloff tests support the injection zone permeability parameter in the modeling strategy.

Hydrogeology

According to §148.20 (a)(1), a petitioner must submit hydrogeologic information in order to study the effects of the injection well activity. Hoechst Celanese provided hydrogeologic information in the petition which demonstrates that USDW's are properly protected. The base of the lowermost USDW is at 1300 feet.

Characteristics of Injected Fluids

According to §148.22 (a), the characteristics of the injection wastestream must be adequately described in order to determine the wastestream's compatibility with the injection zone. These characteristics are described in the petition and the description is adequate and complete.

The waste contain the following EPA hazardous waste numbers: K009, K010, D001, D002, U001, U002, U031, U112, U123, U140, U154, U197, U226, F001, F002, Hexavalent Chromium

Geochemistry and Injected Waste Compatibility

According to §148.21 (b)(5), a petitioner must describe the geochemical conditions of the well site. The physical and chemical characteristics of the injection zone and the formation fluids in the injection zone were described in the petition. This description included a discussion of the compatibility of the injected waste with the injection zone.

(1) The geochemistry of the injection zone was described through the use of core data.

(2) Hoechst Celanese provided evaluations which demonstrated that the waste stream would not adversely alter the confining capabilities of the injection and confining zones.

Modeling Strategy

According to 40 CFR §148.21(a)(3), in demonstrating no-migration of hazardous constituents from the injection zone, predictive models shall have been verified and validated, shall be appropriate for the specific site and wastestreams, and shall be calibrated for existing sites. The modeling strategy consisted of a combination of analytical models. All the models used were identified as being verified and validated according to the information submitted in the petition. This information consisted of actual model documentation or references of methods or techniques that are widely accepted by the technical community. The petition describes the predictive models used and demonstrates that the above criteria are met.

According to 40 CFR §148.21(a)(5), reasonably conservative values shall be used whenever values taken from the literature or estimated on the basis of known information are used instead of site-specific measurements. Many variables were required to be quantified in order to employ the models used in the petition. All parameters were conservatively assigned to produce worst case conditions for either pressure buildup or waste movement.

According to 40 CFR §148.21 (a)(6), a petitioner must perform a sensitivity analysis in order to determine the effect of uncertainties associated with model parameters. Hoechst Celanese provided this sensitivity analysis in its petition. Through conservative model parameter assignments within this analysis, worst case scenarios for pressure buildup and waste movement were investigated and reported.

February 10, 1990

FACT SHEET

For proposed approval to allow injection of restricted hazardous wastes into the following injection well(s):

Applicant: Monsanto Chemical Company
P.O. Box 711
Alvin, Texas 77512-9888

Facility Location: Chocolate Bayou
Permit Number(s): WDW-002; - 013; -224
Well Number(s): 2, 13, 224

Issuing Office: U.S. Environmental Protection Agency
Region 6
First Interstate Bank Tower
1445 Ross Avenue
Dallas, Texas 75202-2733

1. The Environmental Protection Agency (EPA) proposes to allow the injection of restricted hazardous wastes into the well(s) described above and in the petition demonstration document.

2. This fact sheet or similar statement of basis is required under Title 40 of the Code of Federal Regulations, §§ 124.7 and 124.8 (40 CFR §§ 124.7 and 124.8, as referenced by 40 CFR §§ 148.22 and 124.10).

3. The following is an explanation of the derivation of the proposed decision, which is categorized according to the criteria outlined in 40 CFR Parts 124, 144, 146, and 148. [53 Fed. Reg., 28118, (1988)]

Summary

The EPA land disposal restrictions promulgated under § 3004 of the Resource Conservation and Recovery Act prohibit the injection of hazardous waste unless a petitioner demonstrates to the EPA that there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. These no migration demonstrations include a description of the well operations, geologic siting, and waste stream characteristics. They also include modeling strategies which incorporate all the above mentioned information and utilize mathematical equations to predict pressure build up and waste migration.

The Monsanto Chemical Company (Monsanto) petition described its well operation through a discussion of the well construction, well stimulations, injection pressures, and

construction, well stimulations, injection pressures, and injection volumes. The site location and geologic conditions were presented through a discussion of the depositional environment, well logs, cross-sections, well tests, geologic maps, and well records. The characteristics of the injection wastestream were described and evaluated for compatibility with the injection and confining zones. Monsanto incorporated all this information into a modeling strategy which predicted the pressure build up and waste migration for the Chocolate Bayou site. The waste plume, under worst conditions, was predicted to move laterally approximately 2.6 miles northeast (up-dip) of the site in sand layer 1 (Figure 2.8.7.2.3-1), 5.8 miles southwest (down-dip) of the site in sand layer 8 (Figure 2.8.7.2.3-2), and 4.3 miles northeast (up-dip) of the site in sand layer 11 (Figure 2.8.7.2.3-3) in 10,000 years. Vertical movement is approximately 450 feet above sand layer 1. Both of these distances are within the injection zone. Therefore, after a detailed and thorough review of the Chocolate Bayou site petition, the EPA proposes that Monsanto has demonstrated, to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the injection zone for a time period of 10,000 years.

The factors considered in the formulation of this proposed petition decision are described below.

Artificial Penetrations

The area around the Class I hazardous waste well cited in the petition must be evaluated to ensure that the injection activity will not endanger Underground Sources of Drinking Water (USDW) by causing movement of fluids into improperly sealed, completed, or abandoned wells. The petition applicant submitted information on all wells penetrating the injection or confining zones within 3.4 miles of the injection well(s).

(a) Artificial penetrations within the 3.4 mile radius are plugged or constructed to prevent the endangerment to an USDW.

(b) There are 35 wells within the AOR which met this standard.

(c) The calculated cone of influence (COI) is less than 3.5 miles around well number 2.

In addition to the nonendangerment standard, some artificial penetrations must also meet the no-migration standard. These artificial penetrations are wells which penetrate the

(a) The artificial penetrations which penetrate the injection zone and are located within the area of the waste plume movement over 10,000 years are plugged or constructed to prevent the migration of hazardous waste from the injection zone.

(b) There are 50 wells within the area of the plume which met the no-migration standard.

(c) All wells met this standard through a demonstration that waste movement due to pressure and molecular diffusion in an artificial penetration will remain within the injection zone.

Mechanical Integrity Testing (MIT) Information

To assure that the wastes will reach the injection zone, a petitioner must submit the results of pressure and radioactive tracer tests according to §148.20 (a)(2)(iv). A well has mechanical integrity when there is no significant leak in the casing, tubing, or packer, and when there is no significant fluid movement into an USDW through vertical channels adjacent to the injection well bore. The petition demonstrates that the well(s) (has/have) been tested and (does/do) satisfy the above criteria.

Well No.	Date of Pressure Test	Date of Radioactive Tracer Survey
2	06/17/88	06/17/88
13	06/09/88	06/09/88
224	10/07/88	10/07/88

Quality Assurance

According to §148.21 (a)(4), the Monsanto Chocolate Bayou petition demonstrates that proper quality assurance and quality control plans were followed in preparing the petition demonstrations.

Specifically, Monsanto has followed appropriate protocol in identifying and locating records for artificial penetrations within the Area of Review. Information regarding the geology, waste characterization, hydrology, reservoir modeling, and well construction has also been adequately verified or bounded by worst-case scenarios.

(a) The artificial penetrations which penetrate the injection zone and are located within the area of the waste plume movement over 10,000 years are plugged or constructed to prevent the migration of hazardous waste from the injection zone.

(b) There are 50 wells within the area of the plume which met the no-migration standard.

(c) All wells met this standard through a demonstration that waste movement due to pressure and molecular diffusion in an artificial penetration will remain within the injection zone.

Mechanical Integrity Testing (MIT) Information

To assure that the wastes will reach the injection zone, a petitioner must submit the results of pressure and radioactive tracer tests according to §148.20 (a)(2)(iv). A well has mechanical integrity when there is no significant leak in the casing, tubing, or packer, and when there is no significant fluid movement into an USDW through vertical channels adjacent to the injection well bore. The petition demonstrates that the well(s) (has/have) been tested and (does/do) satisfy the above criteria.

Well No.	Date of Pressure Test	Date of Radioactive Tracer Survey
2	06/17/88	06/17/88
13	06/09/88	06/09/88
224	10/07/88	10/07/88

Quality Assurance

According to §148.21 (a)(4), the Monsanto Chocolate Bayou petition demonstrates that proper quality assurance and quality control plans were followed in preparing the petition demonstrations.

Specifically, Monsanto has followed appropriate protocol in identifying and locating records for artificial penetrations within the Area of Review. Information regarding the geology, waste characterization, hydrology, reservoir modeling, and well construction has also been adequately verified or bounded by worst-case scenarios.

Regional and Local Geology

According to §148, Subpart C, Class I hazardous waste injection wells must be located in areas that are geologically suitable. The injection zone must have sufficient permeability, porosity, thickness, and areal extent to prevent migration of fluids into USDW's. The confining zone must be laterally continuous and free of faults or fractures to prevent the movement of fluids into an USDW and must contain at least one formation capable of preventing vertical propagation of fractures. The Chocolate Bayou facility is sited in an area meeting the above criteria.

An evaluation of the structural and stratigraphic geology of the local and regional area has determined that the Monsanto Chocolate Bayou facility is located at a geologically suitable site. The injection zone is of sufficient permeability, porosity, thickness, and areal extent to meet requirements stated in 40 CFR Part 148.

(1) Depth of Confining Zone: 3560' - 3818'
Depth of Injection Zone: 3818' - 7580'
Depth of Injection Interval(s):

Well #2: 4088' - 4703'
Well #13: 5700' - 6990'
Well #224: 5850' - 7140'

(2) The geologic conditions were presented through a discussion of the depositional environment, well logs, cross-sections, well tests, and geologic maps.

(3) The structure and isopach maps provided confidence in the geologic description.

(4) The geologic cross-sections demonstrated that the injection zone was laterally continuous with a relatively constant thickness. This justified some of the modeling assumptions.

(5) Pressure falloff tests support the injection zone permeability parameter in the modeling strategy.

Hydrogeology

According to §148.20 (a)(1), a petitioner must submit hydrogeologic information in order to study the effects of the injection well activity. Monsanto provided hydrogeologic information in the petition which demonstrates that USDW's are properly protected. The base of the lowermost USDW is at 1090 feet.

Characteristics of Injected Fluids

According to §148.22 (a), the characteristics of the injection wastestream must be adequately described in order to determine the wastestream's compatibility with the injection zone. These characteristics are described in the petition and the description is adequate and complete.

The waste contain the following EPA hazardous waste numbers:

K011; K013; U002; U003; U008; U009; U019; U053; U122; U154; U188; P003; P016; P030; P063; P105; and D002.

Geochemistry and Injected Waste Compatibility

According to §148.21 (b)(5), a petitioner must describe the geochemical conditions of the well site. The physical and chemical characteristics of the injection zone and the formation fluids in the injection zone were described in the petition. This description included a discussion of the compatibility of the injected waste with the injection zone.

(1) The geochemistry of the injection zone was described through the use of core analyses data.

(2) Monsanto provided evaluations which demonstrated that the waste stream would not adversely alter the confining capabilities of the injection and confining zones.

Modeling Strategy

According to 40 CFR §148.21(a)(3), in demonstrating no-migration of hazardous constituents from the injection zone, predictive models shall have been verified and validated, shall be appropriate for the specific site and wastestreams, and shall be calibrated for existing sites. The modeling strategy consisted of a combination of analytical models. All the models used were identified as being verified and validated according to the information submitted in the petition. This information consisted of actual model documentation or references of methods or techniques that are widely accepted by the technical community. The petition describes the predictive models used and demonstrates that the above criteria are met.

According to 40 CFR §148.21(a)(5), reasonably conservative values shall be used whenever values taken from the literature or estimated on the basis of known information are used instead of site-specific measurements. Many variables were required to be quantified in order to employ the models

Maximum Waste Concentration Reduction Factor 10^{-7}

Maximum Lateral Waste Movement:

Sand Layer 1 - 2.6 miles northeast (up-dip) of the site.
Sand Layer 8 - 5.8 miles southwest (down-dip) of the site.
Sand Layer 11 - 4.3 miles northeast (up-dip) of the site.

Maximum Vertical Waste Movement 450 feet (mud) above sand layer 1.

DU PONT

Du Pont Environmental Remediation Services, Inc.

1991 INJECTION ZONE ANNUAL REPORT
CLASS I INJECTION WELLS
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT

Prepared for:

Hoechst Celanese Chemical Group, Inc.
Bay City Plant
Bay City, Texas

Prepared by:

By Du Pont Environmental Remediation Services Inc.
140 Cypress Station Drive
Suite 140
Houston, Texas 77090

DERS Project Number 401244
January, 1991

TABLE OF CONTENTS

LIST OF TABLES iii

LIST OF FIGURES iv

LIST OF APPENDICES v

1.0 INTRODUCTION 1

1.1 Effect of 1991 Injection Operations on the Injection Sands 2

1.2 Artificial Penetration Update 2

1.3 Injected Fluid Analyses 2

2.0 EFFECT OF 1991 INJECTION OPERATIONS ON THE INJECTION SANDS 3

2.1 Waste and Pressure Distribution at the End of 1991 3

2.2 Waste and Pressure Distribution at the End of 2000 4

2.3 Comparison of Measured and Modeled Pressures 4

2.4 Summary 5

3.0 ARTIFICIAL PENETRATION UPDATE 6

3.1 Freshwater Wells 6

3.2 Non-freshwater Wells 6

4.0 1991 INJECTED FLUID ANALYSIS 7

5.0 SUMMARY 8

FEB - 1 1992
G.W.S.U.

LIST OF TABLES

Table 1 Geologic Input Parameters

Table 2 1991 Injection History by Well

Table 3 Shut-in Formation Pressures

Table 4 Representative Chemical Analyses of Acid and Neutral Waste - Analyses Performed July 23, 1991

LIST OF FIGURES

Figure 1 Pressure Contour Plot in Upper Miocene Injection Interval at the End of 1991

Figure 2 Pressure Contour Plot in Lower Miocene Injection Interval at the End of 1991

Figure 3 Composite Waste Plume in Upper Miocene Injection Interval at the End of 1991

Figure 4 Waste Plume in Lower Miocene Injection Interval at the End of 1991

Figure 5 Pressure Contour Plot in Upper Miocene Injection Interval at the End of 2000

Figure 6 Pressure Contour Plot in Lower Miocene Injection Interval at the End of 2000

Figure 7 Waste Plume in Lower Miocene Injection Interval at the End of 2000

Figure 8 Composite Waste Plume in Upper Miocene Injection Interval at the End of 2000

LIST OF APPENDICES

Appendix I — Letter From AIC -Regarding Freshwater and Non-Freshwater Artificial Penetrations

Appendix II — Modeling Results

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1.0 INTRODUCTION

The Hoechst Celanese Chemical Group, Inc., Bay City Plant, operates four Class I injection wells at the Bay City, Texas site. Three of these wells WDW-14 (Well 2), WDW-32 (Well 3), and WDW-49 (Well 4), are known as the "neutral" wells. Although these wells usually inject the non-hazardous "neutral" waste into a subsurface interval known as the upper Miocene injection interval at approximately 3300 feet below ground level, they also are allowed via an approved No-Migration Petition to inject restricted (RCRA Hazardous Waste). The fourth well, WDW-110 (Well 1-A) injects the hazardous "acid" waste into a deeper subsurface interval, at approximately 5700 feet, known as the lower Miocene injection interval.

As required by the Injection Well Permits, issued by the Texas Water Commission, and the Reporting Requirements in Subchapter D of 31 Texas Administrative Code (TAC) 331.65(b)(3), the following Injection Zone Annual Report is being submitted to summarize the injection operations at the Bay City Plant for 1991. Also included in this report are copies of a representative waste analyses of the injected fluids for both the "acid" and the "neutral" wastewater.

During late October and early November, 1991, Annular Pressure tests, Radioactive Tracer Surveys (RTS), Wellhead pressure falloff surveys and other related procedures were performed on the injection wells. The results of the tests indicated that three of the four wells are mechanically sound, are operating in an environmentally safe manner, and are delivering the injected fluids to the injection intervals in the manner prescribed by the Injection Well Permits. Well 1-A was shut in at the first of November due to the fact that a radioactive tracer survey could not be conducted. It was discovered that Well 1-A had become plugged and would not accept any fluid. A workover strategy development of Well 1-A is underway. After completion of workover, mechanical integrity shall be demonstrated/satisfied.

The following report will show that there were no significant changes in the injection operations at the Bay City Plant during 1991 that could adversely affect the injection zone or the injection wells themselves. Also, based on a review of the 1991 injection data and plume and pressure computer modeling for the plant, no unexpected effects due to injection operations were apparent in 1991, or are likely in the future due to well operations at the site.

Following is a summary of the important aspects of each section of the Injection Zone Annual Report.

1.1 Effect of 1991 Injection Operations on the Injection Sands

- It has been demonstrated through the analysis of recent bottom hole pressure measurements and flow modeling, that injection at the Bay City Plant (1964 - 1991) has increased formation pressures in the injection sands slightly. In addition, the modeling indicates continued injection at current rates for the next twenty years (through 2000) will have no significant impact on formation pressures.

1.2 Artificial Penetration Update

- No new or previously undiscovered fresh-water or non-fresh-water wells were found after a search of the Texas Water Commission and Texas Railroad Commission files. This was determined based on research by Agency Information Consultants, and is referenced in letters contained in Appendix I of this report.

1.3 Injected Fluid Analyses

- The composition of the injected fluid has not varied in a manner that could substantially affect the injection zone. Analyses of the injected fluids for 1991 are included in this report and are representative of the 1991 injected fluid characteristics.

2.0 EFFECT OF 1991 INJECTION OPERATIONS ON THE INJECTION SANDS

In order to evaluate the effects of 1991 injection operations, the waste injection system was modeled using the Flow and Containment modeling package utilized in the Bay City Plant Class I Injection Well Petition. This package consists of the Multilayer Pressure, Basic Plume and Vertical Permeation Models. These models predict formation pressure buildup in the injection sands, the lateral extent of the injected waste, and the vertical permeation caused by the injection operations, respectively. Vertical permeation was not evaluated for 1991 and is not required for this Annual Report. For a more detailed description of these models, please refer to the Bay City Plant Class I Injection Well Petition (Petition Section 2).

The geologic inputs to the models (see Table 1), and the model calibrations (see Sections 2.1.4.1 and 2.1.4.2 of the Bay City Plant Petition) remain unchanged from the petition. The only variations from the petition models were the addition of 1991 injection data (see Table 2) and modification of the time frames modeled. Injection operations were modeled for two time frames: 1) historical yearly injection through the end of 1991; and 2) projected yearly injection through the end of 2000 (using the average of 1990 and 1991 injection rates).

2.1 Waste and Pressure Distribution at the End of 1991

The formation pressure distribution at the end of 1991, in the upper Miocene injection interval, is displayed in Figure 1. The maximum formation pressure increase in the upper Miocene injection interval was 34.4 psig at WDW-14, while the pressure increase at the 2.5 mile Area of Review boundary was 11.3 psig or less. Figure 2 shows the formation pressure distribution in the lower Miocene injection interval at the end of 1991. The formation pressure increase in the lower Miocene injection interval at WDW-110 was approximately 21.3 psig, while the increase at the 2.5 mile Area of Review boundary was less than 4.0 psig.

The maximum horizontal extent of the waste in the upper Miocene injection sand, at the end of 1991, is shown in Figure 3. The shape of the composite waste plume is roughly circular, with an approximate diameter of 1.5 miles. At the end of 1991, the waste plume in the lower Miocene injection interval is also roughly circular, with an approximate diameter of 0.91 miles from WDW-110 (see Figure 4).

2.2 Waste and Pressure Distribution at the End of 2000

The modeling results at the end of 2000 are based on the following projected injection rates for the years 1992 through 2000: 1) 98.0 gallons per minute (gpm) in WDW-14, 2) 67.2 gpm in WDW-32, 3) 68.2 gpm in WDW-49, and 4) 156.8 gpm in WDW-110 (see Table 2).

The formation pressure distribution for the upper Miocene injection interval at the end of 2000 is shown in Figure 5. The pressure increase due to injection operations at the Area of Review boundary in the upper Miocene injection interval will be less than 10.6 psi at the end of 2000, while the maximum pressure increase will be approximately 31.1 psi at WDW-14. The maximum formation pressure increase in the lower Miocene injection interval would be approximately 23.0 psig. A pressure increase of less than 4.3 psig would be experienced at the Area of Review boundary in the lower Miocene injection sand (see Figure 6).

The maximum horizontal extent of waste in the lower Miocene injection interval at the end of 2000 is displayed in Figure 7. The waste plume would be centered around WDW-110 with a diameter of approximately 1.25 miles. The composite waste plume in the upper Miocene injection interval would be contained within a diameter of 1.57 miles (see Figure 8).

2.3 Comparison of Measured and Modeled Pressures

A wellhead pressure fall off survey was performed on Plant Well 4 (WDW-49) in late October, 1991, in conjunction with mechanical integrity testing. The results of the survey are displayed in Table 3. The pressure in the upper Miocene injection well (WDW-49) was corrected to the modeled mid-point of the injection sand (3440 feet below ground level). Since the upper Miocene injection interval pressures were recorded in psia, the atmospheric pressure of 14.7 psi was removed from each corrected pressure to obtain a pressure value in psig. The pressure in the lower Miocene injection interval (WDW-110) was not determined due to the fact that the well would not accept any fluids and a proper bottom hole pressure fall off test could not be performed.

During the WDW-49 Mechanical Integrity Tests (MIT's) at the end of October, 1991, the measured shut-in formation pressures in the upper Miocene injection sand had a minimum pressure of 1566.3 psig at 3440 feet. The modeled shut-in formation pressure increase in the upper Miocene injection sand for the same time (October 1991), was approximately 15.7 psig. The estimated original formation pressure for the upper Miocene injection sand was 1555 psig, so the modeled shut-in pressure was 1570.7 psig, a very close pressure match.

The differences between the modeled and measured shut-in pressures for the upper Miocene injection interval are minor (4.4 psig). This pressure difference may be attributed to the following factors: 1) the model is conservative, thus predicting greater pressure buildup, 2) the original formation pressures were slightly overestimated, and 3) errors in pressure measurements and corrections.

2.4 Summary

It has been demonstrated through the analysis of recent bottom hole pressure measurements and flow and containment modeling, that injection at the Bay City Plant (1964 - 1991) has only increased pressures in the injection intervals slightly. In addition, continued injection, at current rates for nineteen years (through 2000), will have no significant impact on formation pressures.

3.0 ARTIFICIAL PENETRATION UPDATE

Agency Information Consultants, Inc. (AIC), Austin, Texas was contracted to conduct an Area of Review update for both newly constructed and/or previously undiscovered fresh-water and non-fresh-water artificial penetrations within a 2.5 mile radius of WDW-14, 32, 49, and 110 during 1991. Records were examined at both the Texas Railroad Commission and the Texas Water Commission.

3.1 Freshwater Wells

No new or previously undiscovered freshwater well artificial penetrations were found during a search of the Texas Water Commission files.

3.2 Non-freshwater Wells

No new or previously undiscovered non-freshwater wells were found during a search of the Texas Railroad Commission files.

4.0 1991 INJECTED FLUID ANALYSIS

The fluid injected during 1991 was very similar to previous years. Table 4 shows representative 1991 bi-annual waste analyses for both the "acid" waste and the "neutral" waste.

5.0 SUMMARY

In summary, an evaluation of the injection operations at the Bay City Plant for 1991 indicates that there have been no substantial variations in operations from recent years that could adversely affect the injection zone or the operation of the injection wells.

No new or previously undiscovered freshwater or non-freshwater wells were discovered during searches of the State files.

Year end mechanical integrity testing (MIT) confirmed the mechanical soundness of three of the four injection wells (Workover strategy development on Well 1-A (WDW-110) is underway). A wellhead pressure fall off survey conducted during the MIT testing was used to provide formation pressure information that was utilized in computer modeling of the injection zone. The resulting injection zone plume and pressure plots indicate that no adverse effects on the injection zone are likely as a result of 1991 injection operations, and generally, the behavior of the injection zone was as predicted.

Based on an analysis of the 1991 data, and the many previous years of safe injection operations at the Bay City Plant, future injection operations at the plant will be conducted in an environmentally safe manner.

TABLES

Table 1
Geologic Input Parameters
Hoechst Celanese Chemical Group, Inc., Bay City Plant

Level	Thickness (feet)	Por.	Perm. (darcy)	Visc. (Cp)	Comp. (1/Psi)
Overlying Shale Layer 1	908	0.145	1.5 E-5	0.74	5.00 E-5
Overlying Sand 1	365	0.34	1.00	0.73	5.00 E-6
Overlying Shale Layer 2	264	0.125	5.5 E-6	0.72	5.00 E-5
Overlying Sand 2	67	0.33	.37	0.72	5.00 E-6
Confining Shale 2	450	0.12	8.0 E-7	0.71	5.00 E-5
Upper Miocene Injection Sand	165	0.33	1.35	0.71	5.00 E-6
Confining Shale 2	113	0.12	8.0 E-7	0.71	5.00 E-5
Arresting Sand 1	107	0.31	.40	0.70	5.00 E-6
Arresting Shale 1	856	0.11	2.0 E-7	0.68	5.00 E-5
Arresting Sand 2	84	0.28	.40	0.67	5.00 E-6
Arresting Shale 2	738	0.105	1.6 E-7	0.65	5.00 E-5
Arresting Sand 3	129	0.28	.40	0.65	5.00 E-6
Confining Shale 3	150	0.10	1.3 E-8	0.64	5.00 E-5
Lower Miocene Injection Sand	203	0.32	1.30	0.64	5.00 E-6
Confining Shale 4	21	0.125	5.5 E-6	0.64	5.00 E-5
Arresting Sand 4	92	0.28	.90	0.64	5.00 E-6

Table 2
1991 Injection History by Well
Hoechst Celanese Chemical Group
Bay City Plant

Month	Well 1-A (WDW-110) Volume (gal)	Well 2 (WDW-14) Volume (gal)	Well 3 (WDW-32) Volume (gal)	Well 4 (WDW-49) Volume (gal)
January	8,392,300	4,687,200	3,258,700	3,258,700
February	7,741,400	3,185,300	2,378,900	2,419,200
March	8,570,900	2,857,000	2,678,400	2,633,800
April	7,689,600	3,715,200	3,024,000	2,980,800
May	7,008,500	2,990,900	2,812,300	2,633,800
June	7,300,800	4,753,000	1,782,000	2,764,800
July	7,276,300	7,365,600	324,000	2,540,200
August	7,231,700	6,517,400	3,348,000	0
September	7,300,800	3,709,400	2,937,600	1,457,300
October	7,499,500	3,214,100	3,214,100	2,990,900
November	72,000	8,640,000	4,190,400	6,598,100
December	0	9,061,900	3,905,300	5,133,600
Total Volume	76,083,800	60,696,000	33,799,700	35,411,200
Average Rate	156.8 gp	98.0 gp	67.2 gp	68.2 gp

Table 3
Shut-in Formation Pressures - October 1991*
Hoechst Celanese Chemical Group, Inc., Bay City Plant

UPPER MIOCENE INJECTION INTERVAL

Well	Pressure (psia)	Depth (ft)	Pressure Gradient (psig/ft)	Corrected Pressure @ 3440 Feet (bgl) (psig)
WDW-49	1581	3440	0.433	1566.3
	(1566.3 psig)			

* The pressure in the lower Miocene injection interval (WDW-110) was not determined due to the fact that the well would not accept any fluids and a proper bottom hole pressure fall off test could not be performed.

Table 4

Chemical Analyses of Acid Waste and Neutral Waste *

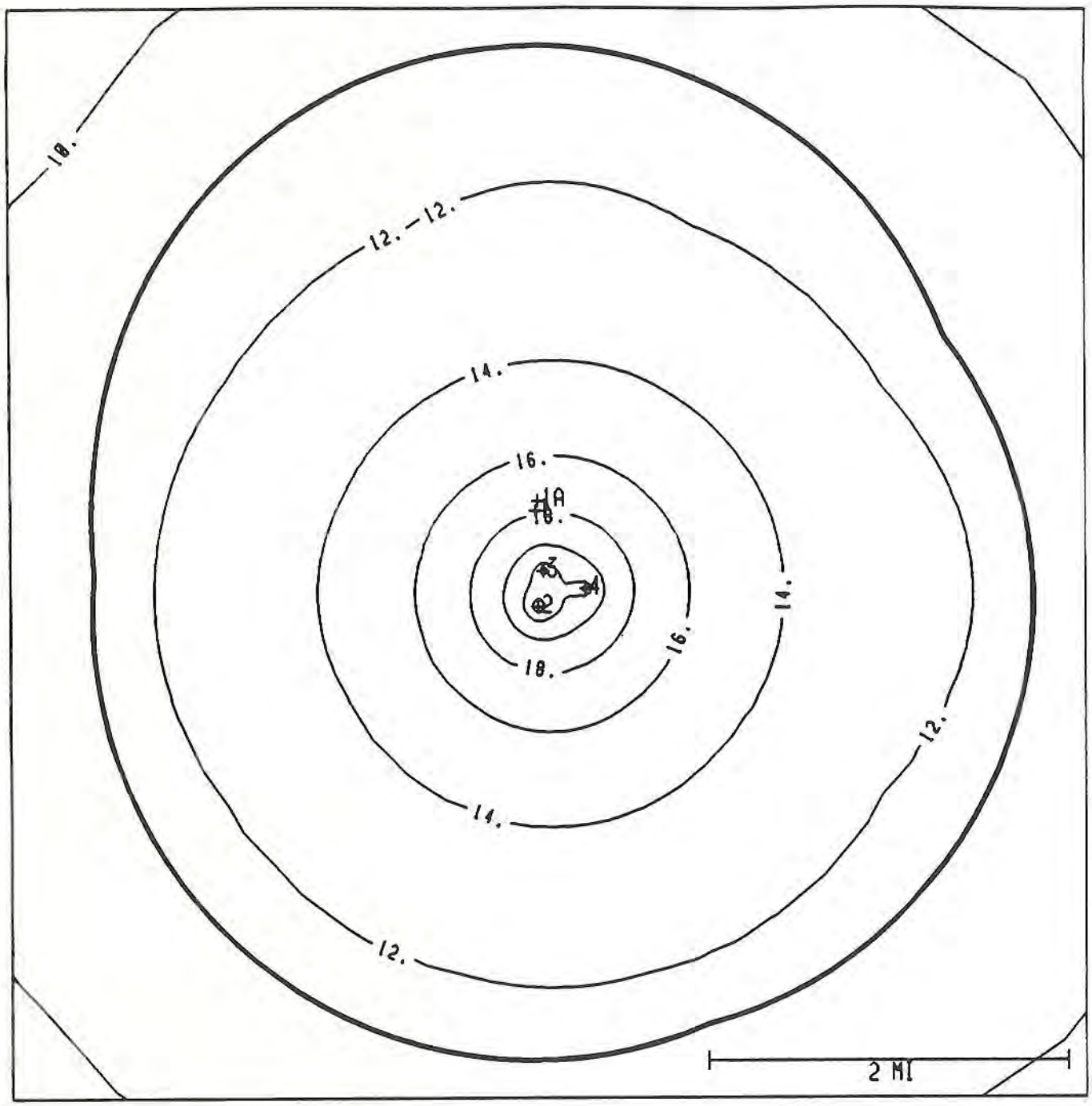
Analyses Done July 23, 1991

Hoechst Celanese Chemical Group, Inc., Bay City Plant

Analysis	Plant Outfall	"Acid" Well	"Neutral" Well(s)
Specific Conductance (µmhos)	340	578	488
Chlorinated Organics (ppm)	.68	2157	64
Alkalinity (ppm)	108	<1	280
Hardness (ppm)	90	178	80
Phosphorous - Ortho (ppm)	.30	.14	.30
Phosphorous - Total (ppm)	.30	.14	.30
Oil and Grease (ppm)	<5.0	<5.0	<5.0
Ash (ppm)	847	1447	1051
Water (%)	99.81	99.54	99.73
Nitrate (ppm)	<1	1.0	3.0
Total Organic Carbon (ppm)	13	2653	1425
Total Suspended Solids (ppm)	3.0	4.0	8.0
Total Dissolved Solids (ppm)	1872	1981	1303
pH	7.6	2.6	6.5
Chemical Oxygen Demand (ppm)	1527	11449	10451
Specific Gravity	1.0021	1.0044	1.0044
Total Cyanides (ppm)	<.005	<.005	<.005
Total Phenols (ppm)	<.005	.025	.075
Antimony (ppm)	<.005	<.005	<.005
Arsenic (ppm)	.016	.013	.010
Barium (ppm)	.40	.08	.90
Cadmium (ppm)	<.005	.051	.26
Calcium (ppm)	140	60	109
Chromium (ppm)	.017	.018	.017
Copper (ppm)	.009	.30	1.30
Lead (ppm)	<.005	.023	.013
Manganese (ppm)	.177	.024	.506
Mercury (ppm)	<.002	<.002	<.002
Nickel (ppm)	<.05	<.05	9.8
Sulfate (ppm)	1800	180	230
Selenium (ppm)	<.005	<.005	<.005
Silver (ppm)	<.005	<.005	<.005
Thallium (ppm)	<.005	<.005	<.005
Vanadium (ppm)	<.005	<.005	<.005
Zinc (ppm)	.071	.008	.159
Total Organic Halogen (ppm)	.68	2157	64

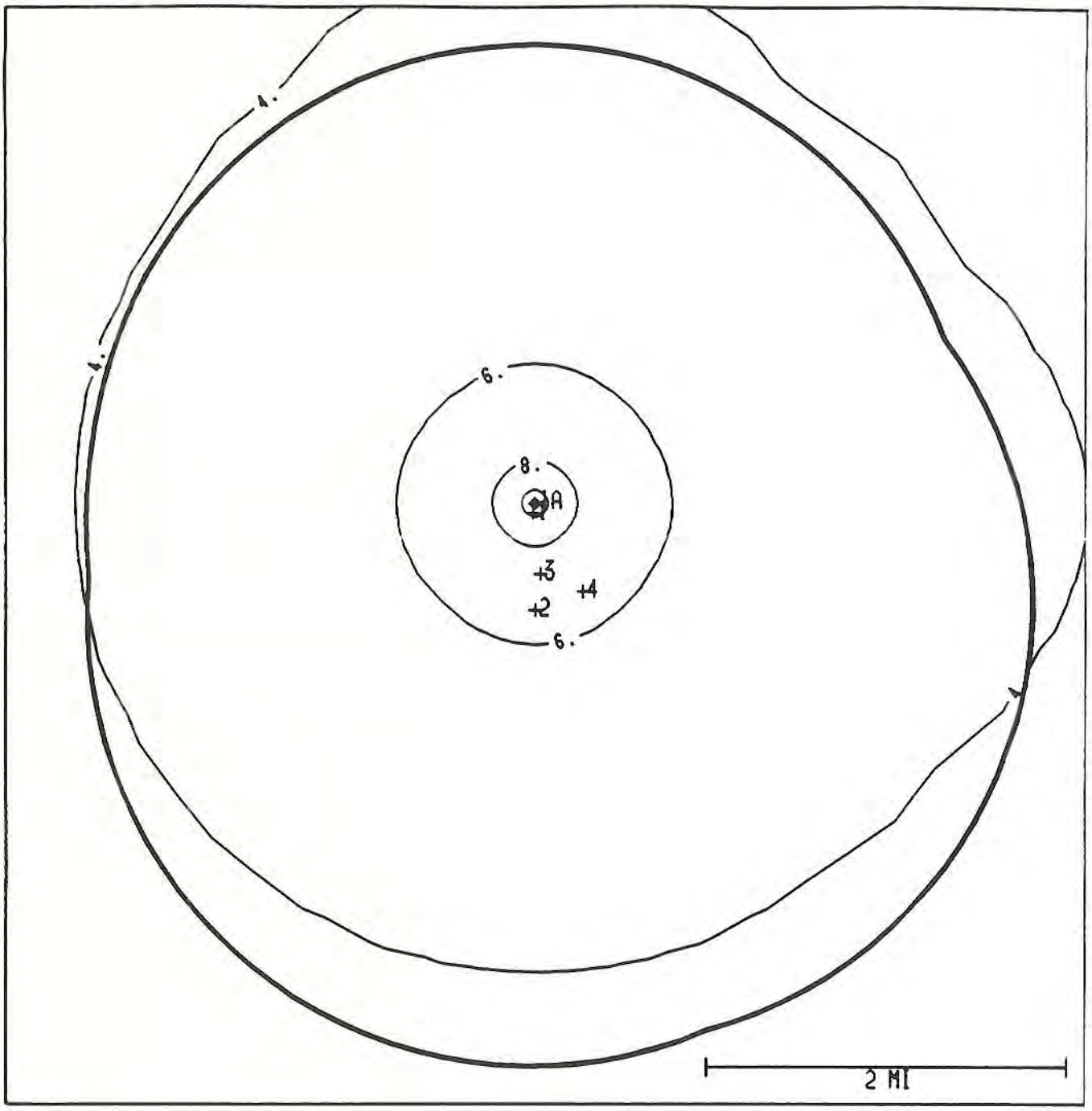
* Taken from regular bi-annual waste analyses performed at the Bay City Plant.

FIGURES



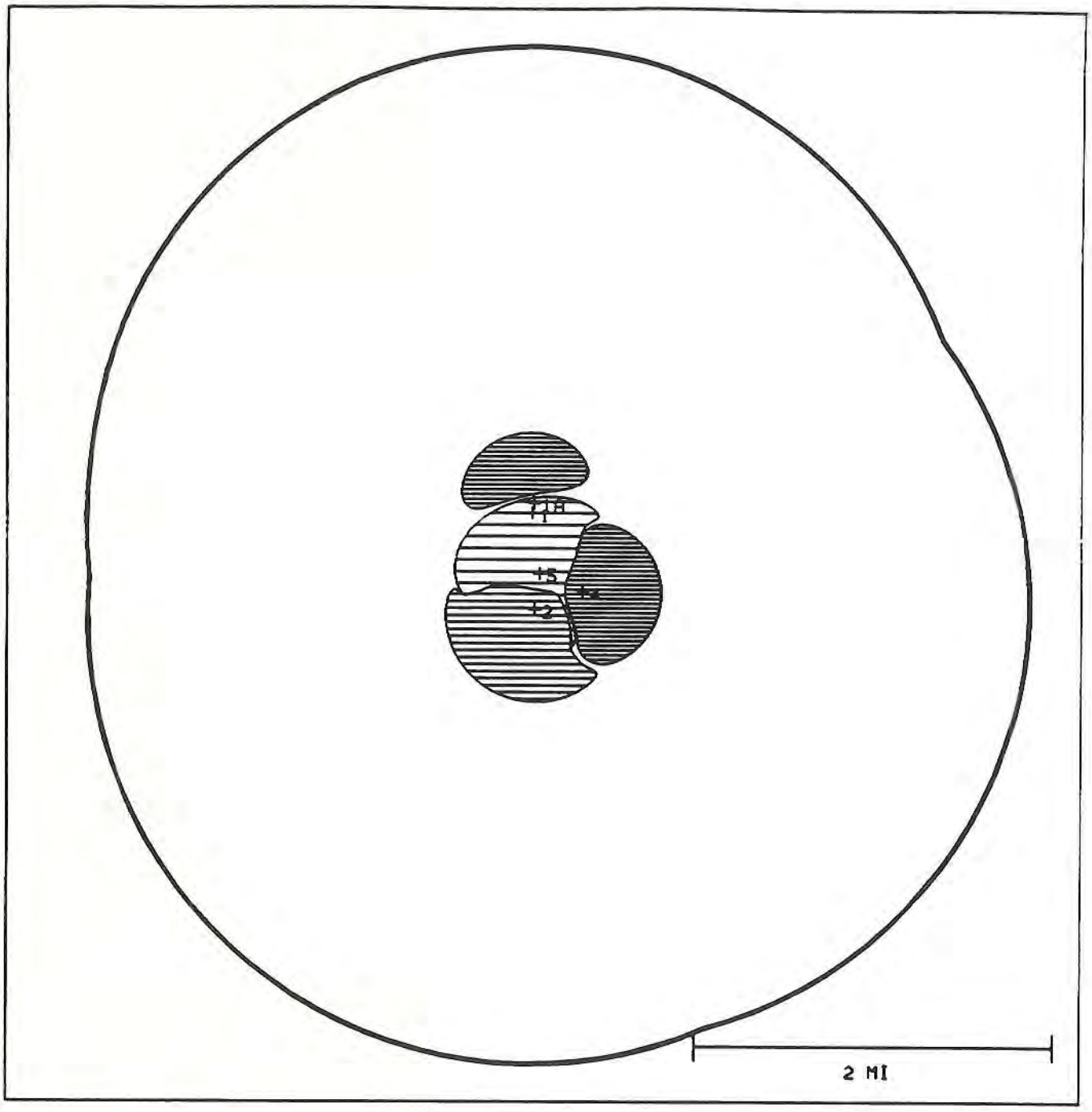
+ 1 = WDW-8
+ 2 = WDW-14
+ 3 = WDW-32
+ 4 = WDW-49
+ 1A = WDW-110
CI = 2.0 PSI

Figure 1
Pressure Contour Plot in Upper Miocene Injection Interval at the End of 1991
Hoechst Celanese Chemical Group, Inc., Bay City Plant



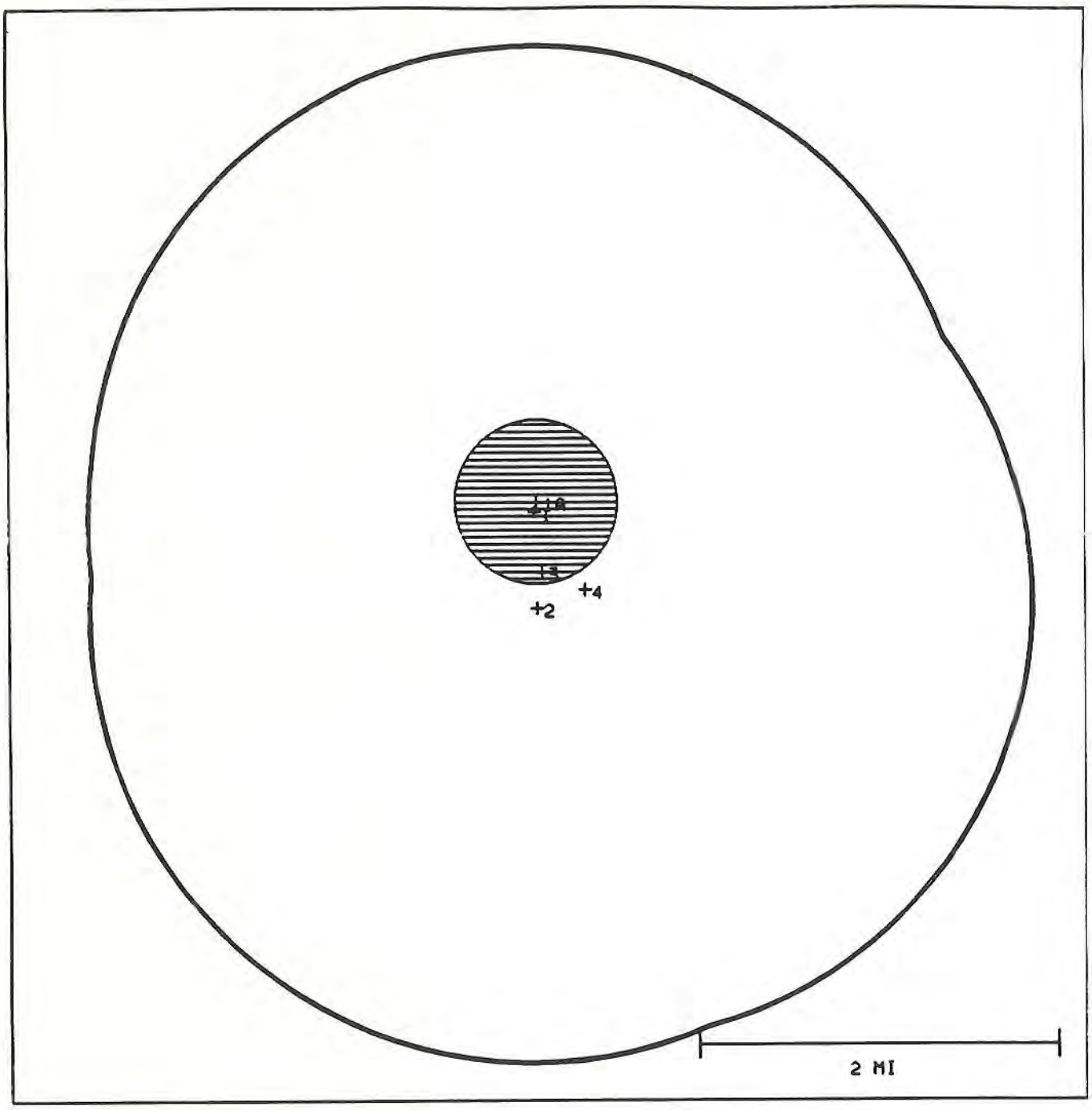
+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110
CI	=	2.0 PSI

Figure 2
Pressure Contour Plot in Lower Miocene Injection Interval
at the End of 1991
Hoechst Celanese Chemical Group, Inc., Bay City Plant



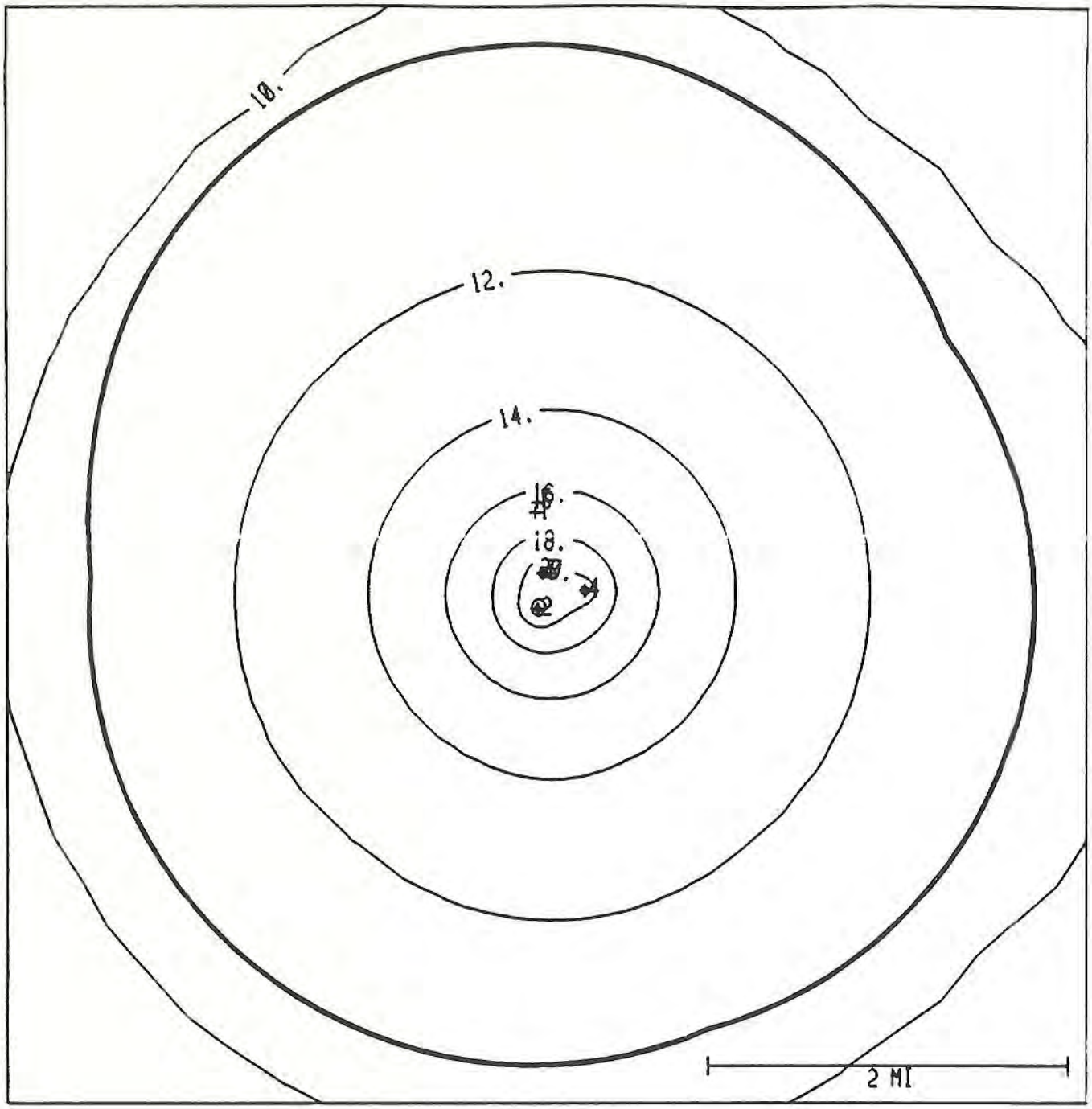
+ 1 = WDW-8
+ 2 = WDW-14
+ 3 = WDW-32
+ 4 = WDW-49
+ 1A = WDW-110

Figure 3
Composite Waste Plume in Upper Miocene Injection Interval at the End Of 1991
Hoechst Celanese Chemical Group, Inc., Bay City Plant



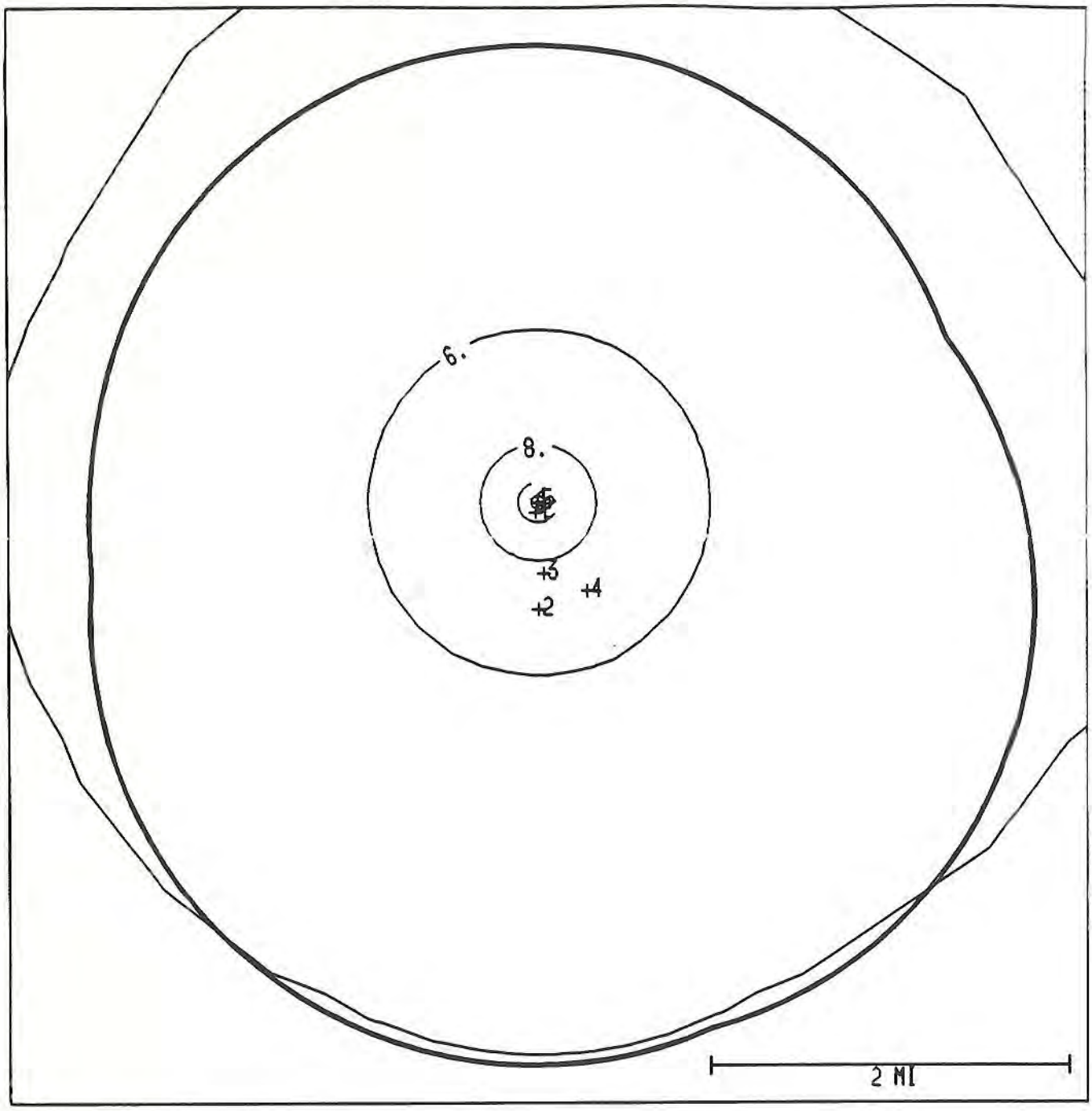
+ 1 = WDW-8
+ 2 = WDW-14
+ 3 = WDW-32
+ 4 = WDW-49
+ 1A = WDW-110

Figure 4
Waste Plume in Lower Miocene Injection Interval
at the End of 1991
Hoechst Celanese Chemical Group, Inc., Bay City Plant



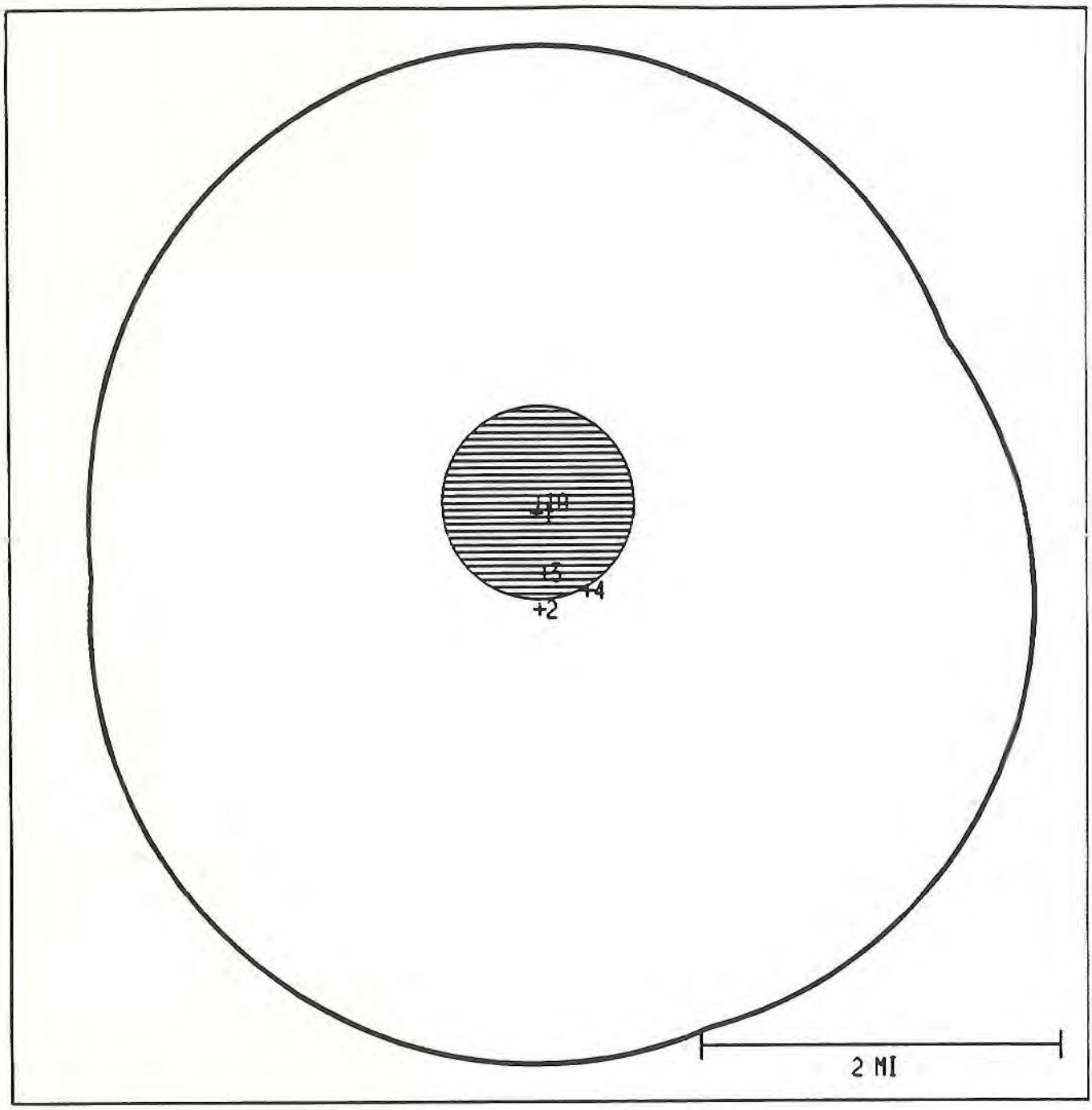
+ 1 = WDW-8
+ 2 = WDW-14
+ 3 = WDW-32
+ 4 = WDW-49
+ 1A = WDW-110
CI = 2.0 PSI

Figure 5
Pressure Contour Plot in Upper Miocene Injection Interval
at the End of 2000
Hoechst Celanese Chemical Group, Inc., Bay City Plant



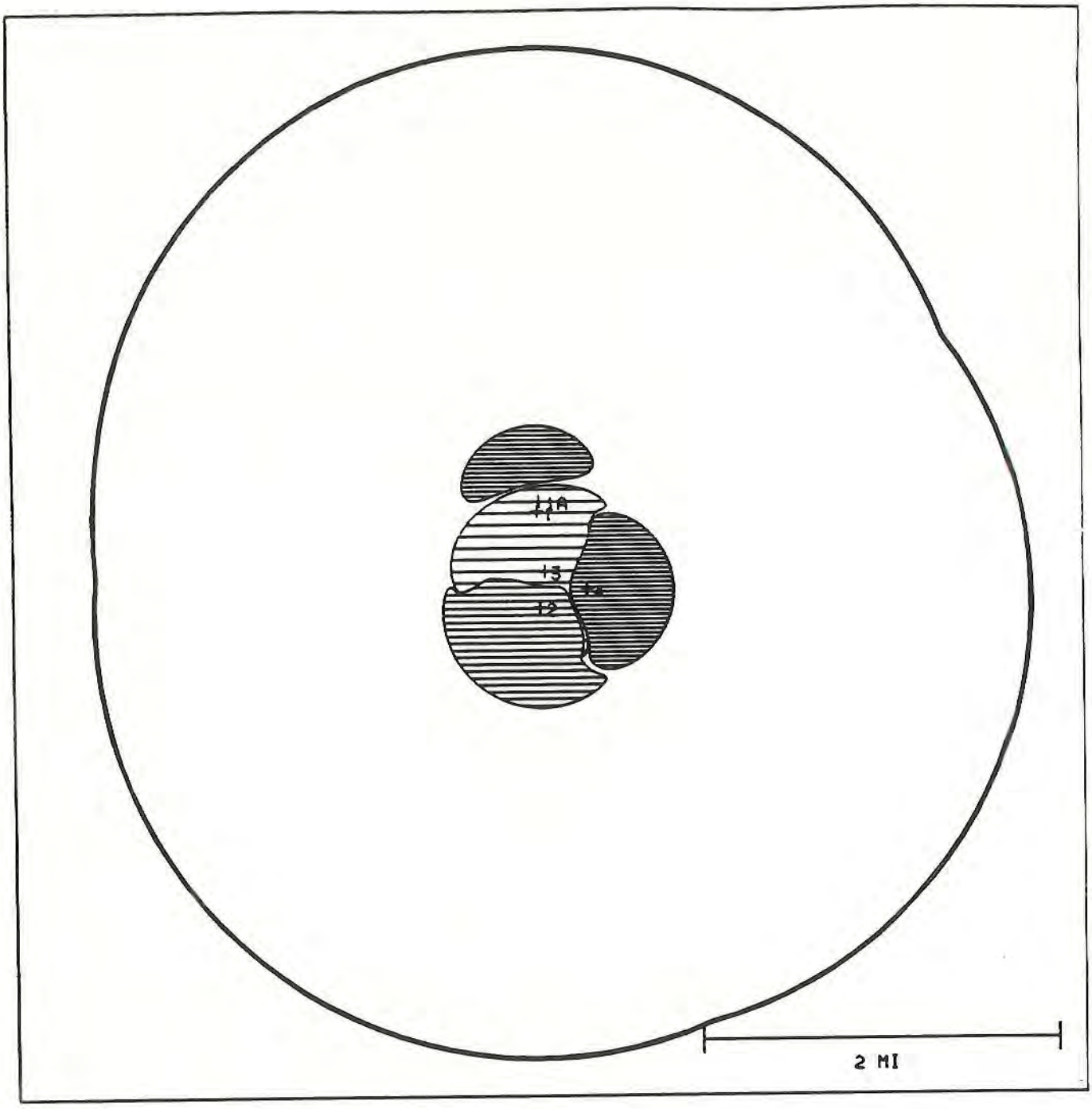
+ 1 = WDW-8
+ 2 = WDW-14
+ 3 = WDW-32
+ 4 = WDW-49
+ 1A = WDW-110
CI = 2.0 PSI

Figure 6
Pressure Contour Plot in Lower Miocene Injection Interval
at the End of 2000
Hoechst Celanese Chemical Group, Inc., Bay City Plant



+ 1 = WDW-8
+ 2 = WDW-14
+ 3 = WDW-32
+ 4 = WDW-49
+ 1A = WDW-110

Figure 7
Waste Plume in Lower Miocene Injection Interval
at the End of 2000
Hoechst Celanese Chemical Group, Inc., Bay City Plant



+ 1 = WDW-8
+ 2 = WDW-14
+ 3 = WDW-32
+ 4 = WDW-49
+ 1A = WDW-110

Figure 8
Composite Waste Plume in Upper Miocene Injection Interval at the End of 2000
Hoechst Celanese Chemical Group, Inc., Bay City Plant

APPENDICES

Appendix I
Letter From AIC -Regarding Freshwater and Non-Freshwater Artificial Penetrations

Agency Information Consultants, Inc.
PO Box 2181 Austin, Texas 78768-2181 Tel. (512) 478-8991 Fax (512) 478-5215

January 9, 1992

Mr. Greg Casey
E. I. DuPont de Nemours, Inc.
140 Cypress Station Dr., Ste 140
Houston, Texas 77090

Re: Annual Water Well Update
2 1/2 Mile Radius
Hoescht-Celanese
Bay City, Texas

Dear Mr. Casey,

Agency Information Consultants, Inc. (AIC) has performed a water well search within the area delineated on the attached map. The following steps were utilized by AIC for this project:

1. Transferred all "located" and "plotted" water well data from the (Texas Water Development Board) TWDB county highway maps onto the map provided by AIC within the Area Of Review (AOR).

2. Transferred all "located" water well data from the TWDB United States Geological Survey (USGS) 7.5 minute topographic maps within the AOR onto the map provided by AIC.

3. Obtained copies of the "located" and "plotted" water well schedules/logs for the water wells found within the AOR at the Texas Water Commission (TWC) central records.

4. Obtained copies of the water well logs for the "partially" numbered water wells which were found to be within the AOR.

The following is a brief explanation of terms:

Located water wells - wells whose sites have been verified in person by a TWDB or USGS staff member and spotted on a map at the TWDB.

Plotted water wells - wells whose sites have been determined from the information submitted on the water well logs and subsequently spotted on a TWDB county highway map by a TWDB staff member. Since June of 1986, the TWDB has stopped mapping these wells.

Partially numbered water wells - wells whose logs have been processed since June of 1986. These wells are given a State ID Number which establish it within a 2.5 minute quad.

AIC was able to identify **no** new water wells within a AOR. There are **no** new located water wells, **no** new plotted water wells and **no** new partially numbered water wells. The following is a listing of the wells.

LOCATED WATER WELLS
State ID Number
None Found

PLOTTED WATER WELLS
State ID Number
None Found

PARTIALLY NUMBERED WATER WELLS
State ID Number
None Found

Note: Frequently, there is more than one water well per State ID Number. This is due to a large concentration of wells, if greater than one, for each State ID Number will be listed out to the right of the column. The records for those wells which share a common State ID Number will be found stapled together.

AIC's research of water wells within the AOR was performed by an examination of the maps at the TWDB and the files within the TWC central records. Due to the fact that some water well schedules were never submitted by drillers and the unaccountability of privately drilled water wells, AIC is unable to provide 100% of the data in the AOR.

If you have any questions regarding this project or any future projects please call me at 512-478-8991.

Sincerely,

Richard McHale
Research Consultant

RM/sa

Agency Information Consultants, Inc.
PO Box 2181 Austin, Texas 78768-2181 Tel (512) 478-8991 Fax (512) 478-5215

January 08, 1992

E.I. Dupont de Nemours, Inc.
140 Cypress Station Drive, Suite 140
Houston, Texas 77090

Attention: Greg Casey

RE: Annual Review of Non-Freshwater Penetrations

Dear Mr. Casey,

As per your request, Agency Information Consultants, Inc. has reviewed the non-freshwater artificial penetrations within the 2.5 mile radius from the Waste Disposal Wells located on the Hoescht-Celanese Bay City Plant in Matagorda County for any changes in the existing wells or any new wells that have been drilled or permitted. The Texas Railroad Commission base map for Matagorda County showed no changes in the existing wells or any new wells that have been drilled or permitted since December 1990.

Should you have any questions about this project please give me a call.

Sincerely,

Alan Brawley

Alan Brawley

Appendix II
Modeling Results

```
# user=clousess pw=sowhat1
# QSUB -q economy          # specify class
# QSUB -r ym91              # specify job name
# QSUB -eo                 # combine Unix standard error and standard output
# QSUB -lT 550             # specify maximum time limit for job
# QSUB -lt 540             # specify maximum time for single operation
#
#project 7035-xxxxxx-001708.          # Project account number if desired
#
fetch SOURCE -t 'AQ12YY.CFT'        # Fetch source code
cft77 -a static -d p SOURCE           # Compile source code
#
# Temporarily it will be necessary to fetch and compile the following file
fetch DIFSUBB -t 'DIFSUBB.CFT'
cft77 -a static -d p DIFSUBB
#
# put segldr directives in a temporary file
cat > segd.d <<EOF                    # Create file segd.d - read until EOF
bin=SOURCE.o,DIFSUBB.o
lib=$APPDIR/nag/libnag.a
abs=aq12yy
dupentry=ignore
tree
m1(c1,c2,c3,c4,c5,c6)
endtree
segment=m1
modules=AQ12
endseg
segment=c1
modules=INPUT
endseg
segment=c2
modules=INTEG
endseg
segment=c3
modules=FLWSPL
endseg
segment=c4
modules=MONITR
endseg
segment=c5
modules=CNTOUR
endseg
segment=c6
modules=PTSLV
endseg
EOF
#
segldr -i segd.d            # Create executable based on directive file segd.d
#
aq12yy <<'EOF2' > summary   # Execute & read input until EOF2
TITLE    Celanese Annual Report 1991 (ym91.job)
YEAR     37.     00.                        TINJ, TPC
 16      2     6  14                        NLEV, NINJ, & INJECTION LEVELS
NOFAULT
GRID                                        CALCULATE DATA FOR PRESS CONTOUR PLOTS
4.                                          RANGE FOR GRID (MI)
2       28     37                           NCNTTP, & CONTOUR TIME PERIODS
    908.     .145  1.5E-5    0.74  5.00E-5   OVERLYING SHALE LAYER 1
    365.     .34     1.00    0.73  5.00E-6   OVERLYING SAND 1
    264.     .125  5.5E-6    0.72  5.00E-5   OVERLYING SHALE LAYER 2
     67.     .33      .37    0.72  5.00E-6   OVERLYING SAND 2
    450.     .12   8.0E-7    0.71  5.00E-5   CONFINING SHALE 1
    165.     .33     1.35    0.71  5.00E-6   UPPER MIOCENE INJECTION SAND
    113.     .12   8.0E-7    0.71  5.00E-5   CONFINING SHALE 2
    107.     .31      .40    0.70  5.00E-6   ARRESTING SAND 1
```

```
    856.     .11    2.0E-7     0.68  5.00E-5   ARRESTING SHALE 1
     84.     .28       .40     0.67  5.00E-6   ARRESTING SAND 2
    738.     .105   1.6E-7     0.65  5.00E-5   ARRESTING SHALE 2
    129.     .28       .40     0.65  5.00E-6   ARRESTING SAND 3
    150.     .10    1.3E-8     0.64  5.00E-5   CONFINING SHALE 3
    203.     .32      1.30     0.64  5.00E-6   LOWER MIOCENE INJECTION SAND
     21.     .125   5.5E-6     0.64  5.00E-5   CONFINING SHALE 4
     92.     .28       .90     0.64  5.00E-6   ARRESTING SAND 4
5  WELLS
    1   13671.9   16650.3
    2   13752.8   13841.1
    3   13900.6   14885.8
    4   15166.8   14370.9
    5   13746.2   16938.6
4    MONITOR LOCATIONS - 2.5 MILE
    1   13746.2   30139.0
    2   28367.0   14370.9
    3   13753.0     641.1
    4     553.0   13841.1
1964  28.4
        10
1965 155.3  98.3
        10    10
1966 181.4 181.4
        10    10
1967 248.7 231.8  64.5
        10    10    10
1968 282.5 347.6 194.5
        10    10    10
1969 311.2 344.1 162.8  97.3
        10    10    10    10
1970 310.0 258.6 275.5 291.1
        10    10    10    10
1971 323.3 188.5 189.4 196.7
        10    10    10    10
1972 299.7 155.3 161.7 173.6
        10    10    10    10
1973  28.2 149.6 213.0 237.0  79.0
        10    10    10    10    01
1974       116.8 151.8 177.2 282.1
              10    10    10    01
1975       113.9 123.6 172.7 218.0
              10    10    10    01
1976       109.4 175.5 219.9 231.6
              10    10    10    01
1977       156.1 178.9 216.4 249.1
              10    10    10    01
1978       151.4 154.0 259.9 251.3
              10    10    10    01
1979       130.9 206.0 230.3 329.9
              10    10    10    01
1980       241.3 127.4 175.2 274.1
              10    10    10    01
1981       178.6 137.1 121.5 180.1
              10    10    10    01
1982       118.1 120.7 105.7 149.2
              10    10    10    01
1983       110.6  96.7  98.8 154.7
              10    10    10    01
1984       110.1  96.8  95.9 130.7
              10    10    10    01
1985       109.9 100.9 105.3 108.0
              10    10    10    01
1986       126.1  75.3  65.0 171.1
              10    10    10    01
1987        78.0  79.1  78.4 209.2
```

```
                10     10     10     01
1988          86.8   74.0   69.9  194.3
                10     10     10     01
1989          70.3   66.1   61.5  145.2
                10     10     10     01
1990          80.5   70.0   69.0  168.8
                10     10     10     01
1991         115.4   64.3   67.3  144.7
                10     10     10     01
1992          98.0   67.2   68.2  156.8
                10     10     10     01
EOF2
#
dispose summary -d PR -t 'ym91.SUM/RAT=FTN' # dispose summary w/FTN attributes
dispose fort.7  -d PU -t 'ym91.MWF'         # dispose MWF file
dispose fort.8  -d PU -t 'ym91.PINJ'        # dispose PINJ file
dispose fort.9  -d PU -t 'ym91.PMON'        # dispose PMON file
dispose fort.10 -d PU -t 'ym91.PCNT'        # dispose PCNT file
dispose fort.11 -d PU -t 'ym91.UPP'         # dispose UPP file
```

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* * * Celanese Annual Report 1991 (ym91.job) * * *

 INJECTION PERIOD    ---       37.00  YEAR
 POST CLOSURE PERIOD ---        0.00  YEAR

 NO FAULT INCLUDED IN CALCULATION

 DEFAULT BORE RADIUS (0.5 FT) USED FOR ALL WELLS

 NO SKIN FACTORS APPLIED TO INJECTION WELLS

 PRESSURES CALCULATED ON A GRID FOR CONTOUR PLOTTING

 CONTOURS CALCULATED OUT TO   4.00     MILES

 THE CONTOUR PLOT DATA WILL BE CENTERED AT THE CENTROID
  OF ACTIVE WELLS IN EACH INJECTION LAYER

  CONTOURS CALCULATED FOR THE FOLLOWING YEAR :
  28      1991
  37      2000

 INJECTION HISTORY
    YEAR            WELL ID
              (  1) (  2) (  3) (  4) (  5)
   1 1964      28.4   0.0   0.0   0.0   0.0
                 10
   2 1965     155.3  98.3   0.0   0.0   0.0
                 10    10
   3 1966     181.4 181.4   0.0   0.0   0.0
                 10    10
   4 1967     248.7 231.8  64.5   0.0   0.0
                 10    10    10
   5 1968     282.5 347.6 194.5   0.0   0.0
                 10    10    10
   6 1969     311.2 344.1 162.8  97.3   0.0
                 10    10    10    10
   7 1970     310.0 258.6 275.5 291.1   0.0
                 10    10    10    10
   8 1971     323.3 188.5 189.4 196.7   0.0
                 10    10    10    10
   9 1972     299.7 155.3 161.7 173.6   0.0
                 10    10    10    10
  10 1973      28.2 149.6 213.0 237.0  79.0
                 10    10    10    10    01
  11 1974       0.0 116.8 151.8 177.2 282.1
                     10    10    10    01
  12 1975       0.0 113.9 123.6 172.7 218.0
                     10    10    10    01
  13 1976       0.0 109.4 175.5 219.9 231.6
                     10    10    10    01
  14 1977       0.0 156.1 178.9 216.4 249.1
                     10    10    10    01
  15 1978       0.0 151.4 154.0 259.9 251.3
                     10    10    10    01
  16 1979       0.0 130.9 206.0 230.3 329.9
                     10    10    10    01
  17 1980       0.0 241.3 127.4 175.2 274.1
                     10    10    10    01
  18 1981       0.0 178.6 137.1 121.5 180.1
                     10    10    10    01
  19 1982       0.0 118.1 120.7 105.7 149.2
                     10    10    10    01
  20 1983       0.0 110.6  96.7  98.8 154.7
```

			10	10	10	01
21	1984	0.0	110.1	96.8	95.9	130.7
			10	10	10	01
22	1985	0.0	109.9	100.9	105.3	108.0
			10	10	10	01
23	1986	0.0	126.1	75.3	65.0	171.1
			10	10	10	01
24	1987	0.0	78.0	79.1	78.4	209.2
			10	10	10	01
25	1988	0.0	86.8	74.0	69.9	194.3
			10	10	10	01
26	1989	0.0	70.3	66.1	61.5	145.2
			10	10	10	01
27	1990	0.0	80.5	70.0	69.0	168.8
			10	10	10	01
28	1991	0.0	115.4	64.3	67.3	144.7
			10	10	10	01
29	1992	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
30	1993*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
31	1994*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
32	1995*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
33	1996*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
34	1997*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
35	1998*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
36	1999*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01
37	2000*	0.0	98.0	67.2	68.2	156.8
			10	10	10	01

* 1992 INJECTION RATES PROJECTED FORWARD

INJECTION IN AQUIFER LEVELS 6 14

* * * Celanese Annual Report 1991 (ym91.job) * * *

INPUT PARAMETERS

LEVEL		THICKNESS FT	POROSITY	PERMEABILITY DARCY	VISCOSITY CP	COMPRESSIBILITY 1/PSI
1	OVERLYING SHALE LAYER 1	908.00	0.145	0.1500E-04	0.740	0.500E-04
2	OVERLYING SAND 1	365.00	0.340	1.000	0.730	0.500E-05
3	OVERLYING SHALE LAYER 2	264.00	0.125	0.5500E-05	0.720	0.500E-04
4	OVERLYING SAND 2	67.00	0.330	0.3700	0.720	0.500E-05
5	CONFINING SHALE 1	450.00	0.120	0.8000E-06	0.710	0.500E-04
6	UPPER MIOCENE INJECTION SAND	165.00	0.330	1.350	0.710	0.500E-05
7	CONFINING SHALE 2	113.00	0.120	0.8000E-06	0.710	0.500E-04
8	ARRESTING SAND 1	107.00	0.310	0.4000	0.700	0.500E-05
9	ARRESTING SHALE 1	856.00	0.110	0.2000E-06	0.680	0.500E-04
10	ARRESTING SAND 2	84.00	0.280	0.4000	0.670	0.500E-05
11	ARRESTING SHALE 2	738.00	0.105	0.1600E-06	0.650	0.500E-04
12	ARRESTING SAND 3	129.00	0.280	0.4000	0.650	0.500E-05
13	CONFINING SHALE 3	150.00	0.100	0.1300E-07	0.640	0.500E-04
14	LOWER MIOCENE INJECTION SAND	203.00	0.320	1.300	0.640	0.500E-05
15	CONFINING SHALE 4	21.00	0.125	0.5500E-05	0.640	0.500E-04
16	ARRESTING SAND 4	92.00	0.280	0.9000	0.640	0.500E-05

DERIVED PARAMETERS

LEVEL		STG. COEF.	VERT. LEAKANCE 1/YEAR	TRANSMISSIVITY DARCY-FT
1	OVERLYING SHALE LAYER 1	0.1985E-01	0.2226E-04	0.1362E-01
2	OVERLYING SAND 1	0.9540E-03	3.742	365.0
3	OVERLYING SHALE LAYER 2	0.5763E-02	0.2885E-04	0.1452E-02
4	OVERLYING SAND 2	0.1742E-03	7.648	24.79
5	CONFINING SHALE 1	0.9821E-02	0.2497E-05	0.3600E-03
6	UPPER MIOCENE INJECTION SAND	0.4291E-03	11.49	222.8
7	CONFINING SHALE 2	0.2466E-02	0.9943E-05	0.9040E-04
8	ARRESTING SAND 1	0.2755E-03	5.325	42.80
9	ARRESTING SHALE 1	0.1867E-01	0.3426E-06	0.1712E-03
10	ARRESTING SAND 2	0.2129E-03	7.087	33.60
11	ARRESTING SHALE 2	0.1609E-01	0.3326E-06	0.1181E-03
12	ARRESTING SAND 3	0.3270E-03	4.757	51.60
13	CONFINING SHALE 3	0.3270E-02	0.1350E-06	0.1950E-05
14	LOWER MIOCENE INJECTION SAND	0.5253E-03	9.977	263.9
15	CONFINING SHALE 4	0.4585E-03	0.4081E-03	0.1155E-03
16	ARRESTING SAND 4	0.2332E-03	15.24	82.80

INJECTION WELL #	ID	COORDINATES		DIST TO OTHER INJ WELLS (FT) (1)	(2)	(3)	(4)	(5)
1	(1)	13672.	16650.	0.0	2810.4	1779.3	2725.9	297.7
2	(2)	13753.	13841.	2810.4	0.0	1055.1	1510.0	3097.5
3	(3)	13901.	14886.	1779.3	1055.1	0.0	1366.9	2058.6
4	(4)	15167.	14371.	2725.9	1510.0	1366.9	0.0	2934.5
5	(5)	13746.	16939.	297.7	3097.5	2058.6	2934.5	0.0

PRESS MONITOR POINTS #	ID	COORDINATES		DIST TO INJ WELLS (FT) (1)	(2)	(3)	(4)	(5)
1	(1)	13746.	30139.	13488.9	16297.9	15254.0	15832.0	13200.4
2	(2)	28367.	14371.	14870.8	14623.8	14475.6	13200.2	14844.6
3	(3)	13753.	641.	16009.4	13200.0	14245.5	13802.4	16297.5
4	(4)	553.	13841.	13416.3	13199.8	13388.4	14623.4	13551.9

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 1 (1964)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.01	0.01	0.01	0.01	0.01
6	UPPER MIOCENE INJECTION SAND	4.97*	1.17	1.37	1.18	2.16
8	ARRESTING SAND 1	0.01	0.01	0.01	0.01	0.01
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	28.40	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	14.9	0.0	0.0	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	0.49	0.45	0.42	0.49
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 2 (1965)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.05	0.05	0.05	0.05	0.05
6	UPPER MIOCENE INJECTION SAND	31.38*	23.75*	13.19	11.62	15.85
8	ARRESTING SAND 1	0.13	0.13	0.13	0.13	0.13
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	155.30	98.30	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	96.6	51.7	0.0	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	4.27	4.21	4.19	4.57
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 3 (1966)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.11	0.11	0.11	0.11	0.11
6	UPPER MIOCENE INJECTION SAND	40.62*	40.62*	20.38	18.17	22.38
8	ARRESTING SAND 1	0.30	0.30	0.30	0.30	0.30
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	181.40	181.40	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	192.0	147.1	0.0	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	7.13	7.15	7.22	7.69
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 4 (1967)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.20	0.20	0.20	0.20	0.20
6	UPPER MIOCENE INJECTION SAND	58.87*	57.13*	39.04*	28.20	33.74
8	ARRESTING SAND 1	0.54	0.54	0.54	0.54	0.54
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	248.70	231.80	64.50	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	322.8	269.0	33.9	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				

6	UPPER MIOCENE INJECTION SAND	11.27	11.33	11.42	12.12
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 5 (1968)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.01	0.01	0.01	0.01	0.01
4	OVERLYING SAND 2	0.34	0.34	0.34	0.33	0.33
6	UPPER MIOCENE INJECTION SAND	77.59*	87.88*	71.71*	44.06	48.65
8	ARRESTING SAND 1	0.91	0.91	0.91	0.91	0.91
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	282.50	347.60	194.50	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	471.4	451.9	136.2	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	17.28	17.57	17.82	18.72
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 6 (1969)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.01	0.01	0.01	0.01	0.01
4	OVERLYING SAND 2	0.47	0.47	0.47	0.47	0.47
6	UPPER MIOCENE INJECTION SAND	87.58*	94.19*	75.03*	63.03*	55.76
8	ARRESTING SAND 1	1.31	1.31	1.31	1.31	1.31
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

WELL ID	(1)	(2)	(3)	(4)	(5)

INJECTION LEVEL					
6 UPPER MIOCENE INJECTION SAND	311.20	344.10	162.80	97.30	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
CUMULATIVE INJECTION TO DATE (MMGAL)	635.1	632.8	221.8	51.2	0.0

	PRESSURES AT MONITOR COORD (PSI)			
MONITOR ID	(1)	(2)	(3)	(4)
FORMATION LEVEL				
6 UPPER MIOCENE INJECTION SAND	21.17	21.65	21.81	22.69
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1991 (ym91.job) * * *

----------YEAR 7 (1970)----------

	PRESSURES AT INJECTION WELL COORD (PSI)				
WELL ID	(1)	(2)	(3)	(4)	(5)
FORMATION LEVEL					
2 OVERLYING SAND 1	0.02	0.02	0.02	0.02	0.02
4 OVERLYING SAND 2	0.63	0.63	0.63	0.63	0.63
6 UPPER MIOCENE INJECTION SAND	99.49*	97.51*	102.16*	100.58*	67.44
8 ARRESTING SAND 1	1.80	1.80	1.80	1.80	1.80
10 ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12 ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16 ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

	INJECTION RATES (GPM)				
WELL ID	(1)	(2)	(3)	(4)	(5)
INJECTION LEVEL					
6 UPPER MIOCENE INJECTION SAND	310.00	258.60	275.50	291.10	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
CUMULATIVE INJECTION TO DATE (MMGAL)	798.1	768.8	366.8	204.3	0.0

	PRESSURES AT MONITOR COORD (PSI)			
MONITOR ID	(1)	(2)	(3)	(4)
FORMATION LEVEL				
6 UPPER MIOCENE INJECTION SAND	26.65	27.58	27.52	28.35
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

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----------YEAR 8 (1971)----------

	PRESSURES AT INJECTION WELL COORD (PSI)				
WELL ID	(1)	(2)	(3)	(4)	(5)
FORMATION LEVEL					
2 OVERLYING SAND 1	0.03	0.03	0.03	0.03	0.03
4 OVERLYING SAND 2	0.74	0.74	0.74	0.74	0.73
6 UPPER MIOCENE INJECTION SAND	93.48*	78.77*	81.47*	79.18*	60.52
8 ARRESTING SAND 1	2.16	2.17	2.17	2.16	2.16
10 ARRESTING SAND 2	0.01	0.01	0.01	0.01	0.01
12 ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16 ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	323.30	188.50	189.40	196.70	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
CUMULATIVE INJECTION TO DATE (MMGAL)		968.2	868.0	466.4	307.7	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	25.62	26.16	26.02	26.88
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

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----------YEAR 9 (1972)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.03	0.03	0.03	0.03	0.03
4	OVERLYING SAND 2	0.81	0.81	0.81	0.81	0.81
6	UPPER MIOCENE INJECTION SAND	86.26*	69.84*	72.99*	71.60*	55.78
8	ARRESTING SAND 1	2.47	2.47	2.47	2.47	2.47
10	ARRESTING SAND 2	0.01	0.01	0.01	0.01	0.01
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	299.70	155.30	161.70	173.60	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
CUMULATIVE INJECTION TO DATE (MMGAL)		1125.8	949.7	551.4	399.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	24.57	25.00	24.83	25.64
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

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----------YEAR 10 (1973)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.04	0.04	0.04	0.04	0.04
4	OVERLYING SAND 2	0.84	0.85	0.85	0.84	0.84
6	UPPER MIOCENE INJECTION SAND	43.77*	63.91*	72.00*	73.92*	40.00
8	ARRESTING SAND 1	2.68	2.69	2.69	2.69	2.68
10	ARRESTING SAND 2	0.01	0.01	0.01	0.01	0.01
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	4.40	2.23	2.60	2.28	10.36*
16	ARRESTING SAND 4	0.58	0.56	0.57	0.56	0.58

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	28.20	149.60	213.00	237.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	79.00
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	1028.4	663.4	523.7	41.6

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	21.72	22.69	22.77	22.90
14	LOWER MIOCENE INJECTION SAND	0.94	0.85	0.78	0.92

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YEAR 11 (1974)

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.05	0.05	0.05	0.05	0.05
4	OVERLYING SAND 2	0.84	0.85	0.85	0.84	0.84
6	UPPER MIOCENE INJECTION SAND	31.53	50.02*	54.44*	56.91*	30.81
8	ARRESTING SAND 1	2.81	2.81	2.81	2.81	2.81
10	ARRESTING SAND 2	0.01	0.01	0.01	0.01	0.01
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	15.96	8.19	9.54	8.37	37.22*
16	ARRESTING SAND 4	2.31	2.25	2.28	2.26	2.31

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	116.80	151.80	177.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	282.10
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	1089.8	743.3	616.9	189.9

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	18.42	19.21	19.31	19.33
14	LOWER MIOCENE INJECTION SAND	3.57	3.25	3.00	3.50

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YEAR 12 (1975)

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.06	0.06	0.06	0.06	0.06
4	OVERLYING SAND 2	0.84	0.84	0.84	0.84	0.84
6	UPPER MIOCENE INJECTION SAND	28.82	46.65*	48.06*	53.45*	28.17
8	ARRESTING SAND 1	2.91	2.91	2.91	2.91	2.91
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00

14	LOWER MIOCENE INJECTION SAND	13.14	7.13	8.18	7.27	29.57*
16	ARRESTING SAND 4	2.62	2.57	2.60	2.58	2.62

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	113.90	123.60	172.70	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	218.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1149.7	808.3	707.7	304.6

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	16.88	17.64	17.73	17.72
14	LOWER MIOCENE INJECTION SAND	3.54	3.28	3.08	3.49

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YEAR 13 (1976)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.07	0.07	0.07	0.07	0.07
4	OVERLYING SAND 2	0.85	0.85	0.86	0.85	0.85
6	UPPER MIOCENE INJECTION SAND	32.43	50.50*	58.68*	63.52*	31.61
8	ARRESTING SAND 1	3.05	3.06	3.06	3.06	3.05
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	14.17	7.79	8.89	7.93	31.62*
16	ARRESTING SAND 4	3.00	2.95	2.98	2.96	3.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	109.40	175.50	219.90	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	231.60
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1207.2	900.6	823.4	426.4

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	17.68	18.59	18.66	18.64
14	LOWER MIOCENE INJECTION SAND	3.97	3.69	3.47	3.91

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YEAR 14 (1977)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.07	0.07	0.07	0.07	0.07
4	OVERLYING SAND 2	0.88	0.88	0.88	0.88	0.88
6	UPPER MIOCENE INJECTION SAND	34.48	58.80*	61.84*	65.57*	33.59
8	ARRESTING SAND 1	3.22	3.22	3.22	3.22	3.21
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	15.40	8.54	9.73	8.70	34.18*
16	ARRESTING SAND 4	3.40	3.35	3.37	3.35	3.40

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	156.10	178.90	216.40	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	249.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1289.3	994.7	937.2	557.4

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	18.47	19.45	19.58	19.57
14	LOWER MIOCENE INJECTION SAND	4.44	4.14	3.90	4.37

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YEAR 15 (1978)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.08	0.08	0.08	0.08	0.08
4	OVERLYING SAND 2	0.90	0.90	0.90	0.90	0.90
6	UPPER MIOCENE INJECTION SAND	35.19	59.08*	59.79*	71.94*	34.32
8	ARRESTING SAND 1	3.38	3.39	3.39	3.39	3.38
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	15.79	8.86	10.06	9.02	34.72*
16	ARRESTING SAND 4	3.68	3.63	3.66	3.64	3.68

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	151.40	154.00	259.90	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	251.30
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1369.0	1075.7	1073.9	689.6

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	18.94	20.01	20.11	20.04
14	LOWER MIOCENE INJECTION SAND	4.72	4.42	4.18	4.65

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YEAR 16 (1979)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.09	0.09	0.09	0.09	0.09
4	OVERLYING SAND 2	0.93	0.93	0.93	0.93	0.93
6	UPPER MIOCENE INJECTION SAND	35.89	57.18*	66.45*	68.70*	34.96
8	ARRESTING SAND 1	3.54	3.55	3.55	3.55	3.54
10	ARRESTING SAND 2	0.03	0.03	0.03	0.03	0.03
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	20.38	11.29	12.87	11.49	45.24*
16	ARRESTING SAND 4	4.47	4.40	4.44	4.41	4.47

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	130.90	206.00	230.30	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	329.90
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1437.8	1184.0	1195.0	863.1

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	19.26	20.27	20.37	20.36
14	LOWER MIOCENE INJECTION SAND	5.86	5.47	5.15	5.77

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YEAR 17 (1980)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.10	0.10	0.10	0.10	0.10
4	OVERLYING SAND 2	0.94	0.95	0.95	0.95	0.94
6	UPPER MIOCENE INJECTION SAND	34.55	69.48*	56.24*	60.76*	33.70
8	ARRESTING SAND 1	3.69	3.69	3.69	3.69	3.68
10	ARRESTING SAND 2	0.03	0.03	0.03	0.03	0.03
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	17.68	10.12	11.44	10.30	38.33*
16	ARRESTING SAND 4	4.49	4.43	4.46	4.44	4.49

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	241.30	127.40	175.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	274.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1564.7	1251.0	1287.2	1007.3

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	19.02	20.01	20.28	20.25
14	LOWER MIOCENE INJECTION SAND	5.60	5.26	5.00	5.52

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YEAR 18 (1981)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.10	0.10	0.10	0.10	0.10
4	OVERLYING SAND 2	0.94	0.95	0.95	0.95	0.94
6	UPPER MIOCENE INJECTION SAND	30.25	56.38*	51.64*	48.74*	29.53
8	ARRESTING SAND 1	3.78	3.78	3.78	3.78	3.78
10	ARRESTING SAND 2	0.03	0.03	0.03	0.03	0.03
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	12.56	7.59	8.46	7.71	26.13*
16	ARRESTING SAND 4	3.93	3.89	3.91	3.89	3.93

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	178.60	137.10	121.50	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	180.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1658.7	1323.2	1351.1	1102.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	17.50	18.26	18.48	18.51
14	LOWER MIOCENE INJECTION SAND	4.61	4.38	4.20	4.56

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YEAR 19 (1982)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.11	0.11	0.11	0.11	0.11
4	OVERLYING SAND 2	0.93	0.93	0.93	0.93	0.93
6	UPPER MIOCENE INJECTION SAND	25.84	43.60*	44.07*	41.57*	25.27
8	ARRESTING SAND 1	3.82	3.83	3.83	3.83	3.82
10	ARRESTING SAND 2	0.04	0.04	0.04	0.04	0.04
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	10.68	6.57	7.29	6.67	21.93*
16	ARRESTING SAND 4	3.54	3.51	3.52	3.51	3.54

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	118.10	120.70	105.70	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	149.20
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1720.8	1386.6	1406.7	1180.5

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				

6	UPPER MIOCENE INJECTION SAND	15.69	16.29	16.44	16.46
14	LOWER MIOCENE INJECTION SAND	4.10	3.91	3.76	4.06

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----------YEAR 20 (1983)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.11	0.11	0.11	0.11	0.11
4	OVERLYING SAND 2	0.90	0.91	0.91	0.91	0.90
6	UPPER MIOCENE INJECTION SAND	23.39	39.89*	38.39*	38.03*	22.90
8	ARRESTING SAND 1	3.85	3.85	3.85	3.85	3.85
10	ARRESTING SAND 2	0.04	0.04	0.04	0.04	0.04
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	10.86	6.59	7.33	6.69	22.51*
16	ARRESTING SAND 4	3.43	3.40	3.42	3.40	3.43

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	INJECTION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
6	UPPER MIOCENE INJECTION SAND	0.00	110.60	96.70	98.80	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	154.70
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1779.0	1437.5	1458.6	1261.8

PRESSURES AT MONITOR COORD (PSI)

	FORMATION LEVEL / MONITOR ID	(1)	(2)	(3)	(4)
6	UPPER MIOCENE INJECTION SAND	14.44	14.99	15.12	15.13
14	LOWER MIOCENE INJECTION SAND	4.03	3.84	3.69	3.99

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----------YEAR 21 (1984)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.12	0.12	0.12	0.12	0.12
4	OVERLYING SAND 2	0.89	0.89	0.89	0.89	0.89
6	UPPER MIOCENE INJECTION SAND	22.67	39.07*	37.64*	36.92*	22.17
8	ARRESTING SAND 1	3.88	3.88	3.88	3.88	3.87
10	ARRESTING SAND 2	0.04	0.04	0.04	0.04	0.04
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	9.47	5.87	6.50	5.95	19.32*
16	ARRESTING SAND 4	3.21	3.18	3.19	3.18	3.21

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

WELL ID	(1)	(2)	(3)	(4)	(5)

	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	110.10	96.80	95.90	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	130.70
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	1836.9	1488.4	1509.1	1330.6

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	13.83	14.36	14.49	14.50
14	LOWER MIOCENE INJECTION SAND	3.71	3.54	3.41	3.67

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----------YEAR 22 (1985)----------

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.12	0.12	0.12	0.12	0.12
4	OVERLYING SAND 2	0.87	0.87	0.87	0.87	0.87
6	UPPER MIOCENE INJECTION SAND	22.87	39.36*	38.45*	38.38*	22.35
8	ARRESTING SAND 1	3.91	3.91	3.91	3.91	3.91
10	ARRESTING SAND 2	0.05	0.05	0.05	0.05	0.05
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	8.12	5.14	5.66	5.21	16.26*
16	ARRESTING SAND 4	2.95	2.92	2.94	2.93	2.95

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	109.90	100.90	105.30	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	108.00
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	1894.7	1541.5	1564.5	1387.4

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	13.66	14.22	14.34	14.35
14	LOWER MIOCENE INJECTION SAND	3.35	3.22	3.11	3.32

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----------YEAR 23 (1986)----------

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.13	0.13	0.13	0.13	0.13
4	OVERLYING SAND 2	0.85	0.85	0.85	0.85	0.85
6	UPPER MIOCENE INJECTION SAND	20.42	38.50*	32.58*	30.61*	19.99
8	ARRESTING SAND 1	3.91	3.92	3.92	3.92	3.91
10	ARRESTING SAND 2	0.05	0.05	0.05	0.05	0.05
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.52	6.81	7.63	6.92	24.42*
16	ARRESTING SAND 4	3.29	3.25	3.27	3.26	3.29

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	126.10	75.30	65.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	171.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1961.0	1581.1	1598.7	1477.4

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	12.70	13.16	13.32	13.34
14	LOWER MIOCENE INJECTION SAND	3.99	3.78	3.62	3.94

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----------YEAR 24 (1987)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.13	0.13	0.13	0.13	0.13
4	OVERLYING SAND 2	0.83	0.83	0.83	0.83	0.83
6	UPPER MIOCENE INJECTION SAND	18.77	30.57*	30.82*	30.30*	18.38
8	ARRESTING SAND 1	3.91	3.91	3.91	3.91	3.91
10	ARRESTING SAND 2	0.05	0.05	0.05	0.05	0.05
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	13.77	8.01	9.01	8.14	29.54*
16	ARRESTING SAND 4	3.70	3.65	3.68	3.66	3.70

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	78.00	79.10	78.40	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	209.20
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2002.0	1622.7	1639.9	1587.4

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	11.86	12.28	12.37	12.38
14	LOWER MIOCENE INJECTION SAND	4.56	4.31	4.11	4.51

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----------YEAR 25 (1988)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.14	0.14	0.14	0.14	0.14
4	OVERLYING SAND 2	0.81	0.81	0.81	0.81	0.81
6	UPPER MIOCENE INJECTION SAND	18.11	30.97*	29.55*	28.57*	17.73
8	ARRESTING SAND 1	3.90	3.90	3.90	3.90	3.90
10	ARRESTING SAND 2	0.06	0.06	0.06	0.06	0.06
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	13.13	7.78	8.70	7.90	27.77*
16	ARRESTING SAND 4	3.78	3.74	3.76	3.75	3.78

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	86.80	74.00	69.90	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	194.30
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	2047.7	1661.6	1676.7	1689.6

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	11.37	11.77	11.88	11.89
14	LOWER MIOCENE INJECTION SAND	4.57	4.33	4.14	4.51

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----------YEAR 26 (1989)----------

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.14	0.14	0.14	0.14	0.14
4	OVERLYING SAND 2	0.79	0.79	0.79	0.79	0.79
6	UPPER MIOCENE INJECTION SAND	16.39	26.90*	26.49*	25.54*	16.06
8	ARRESTING SAND 1	3.88	3.88	3.88	3.88	3.88
10	ARRESTING SAND 2	0.06	0.06	0.06	0.06	0.06
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	10.47	6.47	7.15	6.56	21.41*
16	ARRESTING SAND 4	3.50	3.47	3.49	3.47	3.50

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	70.30	66.10	61.50	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	145.20
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	2084.6	1696.4	1709.0	1766.0

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.58	10.93	11.01	11.02
14	LOWER MIOCENE INJECTION SAND	4.06	3.88	3.73	4.02

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----------YEAR 27 (1990)----------

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.14	0.14	0.14	0.14	0.14
4	OVERLYING SAND 2	0.77	0.77	0.77	0.77	0.77
6	UPPER MIOCENE INJECTION SAND	16.92	28.89*	27.75*	27.18*	16.56
8	ARRESTING SAND 1	3.86	3.87	3.87	3.87	3.86
10	ARRESTING SAND 2	0.06	0.06	0.06	0.06	0.06
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01

14	LOWER MIOCENE INJECTION SAND	11.70	7.05	7.86	7.16	24.42*
16	ARRESTING SAND 4	3.59	3.55	3.57	3.56	3.59

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	80.50	70.00	69.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	168.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2127.0	1733.2	1745.3	1854.7

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.52	10.90	11.00	11.01
14	LOWER MIOCENE INJECTION SAND	4.26	4.06	3.89	4.22

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YEAR 28 (1991)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.14	0.14	0.14	0.14	0.14
4	OVERLYING SAND 2	0.76	0.76	0.76	0.76	0.76
6	UPPER MIOCENE INJECTION SAND	17.85	34.43*	28.47*	28.20*	17.45
8	ARRESTING SAND 1	3.87	3.87	3.87	3.87	3.87
10	ARRESTING SAND 2	0.06	0.06	0.06	0.06	0.06
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	10.40	6.41	7.11	6.50	21.31*
16	ARRESTING SAND 4	3.45	3.42	3.44	3.43	3.46

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	115.40	64.30	67.30	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	144.70
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2187.7	1767.0	1780.7	1930.9

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.76	11.19	11.33	11.34
14	LOWER MIOCENE INJECTION SAND	4.02	3.84	3.70	3.98

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YEAR 29 (1992)

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.15	0.15	0.15	0.15	0.15
4	OVERLYING SAND 2	0.75	0.75	0.75	0.75	0.75
6	UPPER MIOCENE INJECTION SAND	17.31	31.59*	28.04*	27.62*	16.93
8	ARRESTING SAND 1	3.86	3.87	3.87	3.87	3.86
10	ARRESTING SAND 2	0.07	0.07	0.07	0.07	0.07
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.04	6.71	7.46	6.81	22.85*
16	ARRESTING SAND 4	3.50	3.47	3.48	3.47	3.50

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	INJECTION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2239.2	1802.4	1816.6	2013.3

PRESSURES AT MONITOR COORD (PSI)

	FORMATION LEVEL / MONITOR ID	(1)	(2)	(3)	(4)
6	UPPER MIOCENE INJECTION SAND	10.55	10.96	11.09	11.09
14	LOWER MIOCENE INJECTION SAND	4.12	3.93	3.78	4.08

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YEAR 30 (1993)

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.15	0.15	0.15	0.15	0.15
4	OVERLYING SAND 2	0.74	0.74	0.74	0.74	0.74
6	UPPER MIOCENE INJECTION SAND	17.20	31.48*	27.93*	27.51*	16.82
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.07	0.07	0.07	0.07	0.07
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.06	6.74	7.49	6.84	22.87*
16	ARRESTING SAND 4	3.52	3.49	3.51	3.49	3.52

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	INJECTION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2290.8	1837.7	1852.4	2095.8

PRESSURES AT MONITOR COORD (PSI)

	FORMATION LEVEL / MONITOR ID	(1)	(2)	(3)	(4)
6	UPPER MIOCENE INJECTION SAND	10.45	10.85	10.98	10.98
14	LOWER MIOCENE INJECTION SAND	4.15	3.95	3.80	4.10

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YEAR 31 (1994)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.15	0.15	0.15	0.15	0.15
4	OVERLYING SAND 2	0.73	0.73	0.73	0.73	0.73
6	UPPER MIOCENE INJECTION SAND	17.11	31.40*	27.85*	27.43*	16.73
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.07	0.07	0.07	0.07	0.07
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.08	6.76	7.51	6.85	22.89*
16	ARRESTING SAND 4	3.54	3.51	3.53	3.51	3.54

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2342.3	1873.0	1888.3	2178.3

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.36	10.77	10.89	10.90
14	LOWER MIOCENE INJECTION SAND	4.17	3.97	3.82	4.12

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YEAR 32 (1995)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.15	0.15	0.15	0.15	0.15
4	OVERLYING SAND 2	0.73	0.73	0.73	0.73	0.73
6	UPPER MIOCENE INJECTION SAND	17.04	31.33*	27.78*	27.35*	16.66
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.08	0.08	0.08	0.08	0.08
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.10	6.77	7.52	6.87	22.91*
16	ARRESTING SAND 4	3.56	3.53	3.54	3.53	3.56

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2393.9	1908.4	1924.2	2260.7

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.29	10.70	10.82	10.83
14	LOWER MIOCENE INJECTION SAND	4.18	3.99	3.84	4.14

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YEAR 33 (1996)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.15	0.15	0.15	0.15	0.15
4	OVERLYING SAND 2	0.72	0.72	0.72	0.72	0.72
6	UPPER MIOCENE INJECTION SAND	16.98	31.27*	27.72*	27.29*	16.60
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.08	0.08	0.08	0.08	0.08
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.11	6.79	7.54	6.89	22.93*
16	ARRESTING SAND 4	3.58	3.54	3.56	3.55	3.58

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2445.4	1943.7	1960.0	2343.2

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.23	10.64	10.76	10.77
14	LOWER MIOCENE INJECTION SAND	4.20	4.01	3.86	4.16

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YEAR 34 (1997)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.15	0.16	0.16	0.16	0.15
4	OVERLYING SAND 2	0.72	0.72	0.72	0.72	0.72
6	UPPER MIOCENE INJECTION SAND	16.93	31.22*	27.67*	27.24*	16.55
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.08	0.08	0.08	0.08	0.08
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.13	6.81	7.56	6.91	22.95*
16	ARRESTING SAND 4	3.60	3.56	3.58	3.57	3.60

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2496.9	1979.1	1995.9	2425.7

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				

6	UPPER MIOCENE INJECTION SAND	10.18	10.59	10.71	10.72
14	LOWER MIOCENE INJECTION SAND	4.22	4.03	3.88	4.18

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 35 (1998)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.16	0.16	0.16	0.16	0.16
4	OVERLYING SAND 2	0.71	0.71	0.71	0.71	0.71
6	UPPER MIOCENE INJECTION SAND	16.89	31.17*	27.62*	27.20*	16.51
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.09	0.09	0.09	0.09	0.09
12	ARRESTING SAND 3	0.02	0.02	0.02	0.02	0.02
14	LOWER MIOCENE INJECTION SAND	11.15	6.83	7.58	6.93	22.97*
16	ARRESTING SAND 4	3.62	3.58	3.60	3.59	3.62

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2548.5	2014.4	2031.8	2508.1

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.14	10.55	10.67	10.67
14	LOWER MIOCENE INJECTION SAND	4.24	4.05	3.89	4.20

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 36 (1999)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.16	0.16	0.16	0.16	0.16
4	OVERLYING SAND 2	0.71	0.71	0.71	0.71	0.71
6	UPPER MIOCENE INJECTION SAND	16.85	31.13*	27.59*	27.16*	16.47
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.09	0.09	0.09	0.09	0.09
12	ARRESTING SAND 3	0.02	0.02	0.02	0.02	0.02
14	LOWER MIOCENE INJECTION SAND	11.17	6.85	7.60	6.95	22.99*
16	ARRESTING SAND 4	3.63	3.60	3.62	3.61	3.64

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

WELL ID	(1)	(2)	(3)	(4)	(5)

	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	2600.0	2049.8	2067.7	2590.6

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.10	10.51	10.63	10.64
14	LOWER MIOCENE INJECTION SAND	4.26	4.07	3.91	4.22

* * * Celanese Annual Report 1991 (ym91.job) * * *

YEAR 37 (2000)

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.16	0.16	0.16	0.16	0.16
4	OVERLYING SAND 2	0.71	0.71	0.71	0.71	0.71
6	UPPER MIOCENE INJECTION SAND	16.82	31.10*	27.55*	27.13*	16.44
8	ARRESTING SAND 1	3.86	3.86	3.86	3.86	3.86
10	ARRESTING SAND 2	0.09	0.09	0.09	0.09	0.09
12	ARRESTING SAND 3	0.02	0.02	0.02	0.02	0.02
14	LOWER MIOCENE INJECTION SAND	11.19	6.87	7.62	6.97	23.00*
16	ARRESTING SAND 4	3.65	3.62	3.64	3.62	3.65

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	98.00	67.20	68.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	156.80
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	2651.6	2085.1	2103.5	2673.1

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	10.07	10.48	10.60	10.60
14	LOWER MIOCENE INJECTION SAND	4.28	4.08	3.93	4.23

* * * Celanese Annual Report 1991 (ym91.job) * * *

RESIDUAL UPWARD PENETRATION INTO CONFINING LAYERS -- [FEET]
CALCULATED USING INJECTION HISTORY FROM 1964 TO 2000

CONFINING LAYERS	THICKNESS [FEET]	WELLS (1)	(2)	(3)	(4)	(5)
1	908.0	0.007	0.007	0.007	0.007	0.007
3	264.0	0.021	0.021	0.021	0.021	0.021
5	450.0	0.067	0.088	0.083	0.081	0.055
7	113.0	-0.211	-0.297	-0.277	-0.270	-0.166

9	856.0	-0.002	-0.002	-0.002	-0.002	-0.002
11	738.0	0.000	0.000	0.000	0.000	0.000
13	150.0	0.001	0.001	0.001	0.001	0.002
15	21.0	-1.839	-0.793	-0.971	-0.816	-4.724

* PENETRATION GREATER THAN CONFINING LAYER THICKESS

HOECHST CELANESE CHEMICAL GROUP

BAY CITY FACILITY

MECHANICAL INTEGRITY TEST AND ANNULUS PRESSURE TEST

WDW-32 (WELL NO. 3)

WDW-14 (WELL NO. 2)

WDW-49 (WELL NO. 4)

WDW-110 (WELL NO. 1-A)

Prepared By:

Golden StrataServices, Inc.
711 Louisiana, Suite 1600
Houston, Texas 77002
(713)228-7000

December 4, 1991

File Name: *C:\14007R1.DOC*

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Hoechst Celanese

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509
409 245 4871

June 25, 1992
KW-112-92

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MUNIC. FAC. BRANCH, 6W-M

Mr. Oscar Cabra, Jr., P.E.
Chief - Municipal Facilities (6w-M)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Re: Mechanical Integrity Test Reports for Injection Wells WDW-14, WDW-32, WDW-49, and WDW-110 covering the periods of May 4, 1990 to May 4, 1991 and May 4, 1991 to May 4, 1992
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas Registration No. 30134

Dear Mr. Cabra:

This letter is in response to your June 18, 1992 letter (Addendum I) to Mr. I.O. Coleman, Jr. Environmental Section Leader, concerning the falloff test results for Injection Wells WDW-14, WDW-32, WDW-49 and WDW-110 covering the periods of May 4, 1990 to May 4, 1991 and May 4, 1991 to May 4, 1992 per 40 CFR 146.68(e)(1). Enclosed are copies of the mechanical integrity test (MIT) reports for the year 1990 and 1991 (Addendum II-1990 MIT Report and Addendum III-1991 MIT Report), which includes the falloff test results for the above mentioned periods.

If you need any additional information, please do not hesitate to telephone me at (409)241-4123 or Mr. I. O. Coleman, Jr. at (409)241-4197.

Sincerely yours,

Kaymartha Williams

Kaymartha Williams
Environmental Engineer

Attach.

ADDENDUM I

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202-2733

June 18, 1992

CERTIFIED MAIL P 176 166 855 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman
Hoechst Celanese Chemical Group, Inc.
P.O. Box 509
Bay City, TX 77404-0509

Dear Mr. Coleman:

Our records indicate that Hoechst Celanese Chemical Group, Inc. (Celanese) has not submitted falloff tests for Well Nos. WDW-14, WDW-32, WDW-49, and WDW-110 as required by Condition No. 8 of the December 11, 1991 reissuance approval letter (May 4, 1990 petition approval). Condition No. 8 states:

> Hoechst Celanese shall annually submit to EPA the results of bottom hole pressure surveys for WDW-14, WDW-32, WDW-49, WDW-110, and WDW-277 (if drilled). These surveys shall have been performed after shutting in each well for a period of time sufficient to allow the pressure in the injection interval to reach equilibrium, in accordance with 40 CFR 146.68(e)(1). This annual report shall include a comparison of reservoir parameters determined from the falloff tests with parameters used in the approved no migration petition.

According to 40 CFR 146.68(e)(1), Celanese is required to annually monitor the pressure buildup in the injection zone, including at a minimum, a shut down of the well for a time sufficient to conduct a valid observation of the pressure falloff curve.

Celanese has not submitted the results of falloff tests for the period May 4, 1990 to May 4, 1991. These tests should have been submitted to the EPA Region 6 office no later than May 4, 1991. In addition, Celanese has not submitted the results of falloff tests for the period May 4, 1991 to May 4, 1992. These tests should have been submitted to the EPA Region 6 office no later than May 4, 1992. As stated in the original petition approval letter mentioned above, "Noncompliance with any of these conditions is grounds for termination of the exemption in accordance with 40 CFR 148.24(a)(1)." Consequently, Celanese has jeopardized its exemption to the land disposal restrictions by not fulfilling Condition No. 8.

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Celanese should submit an annual report for Well Nos. WDW-14, WDW-32, WDW-49, and WDW-110 covering the time periods May 4, 1990 to May 4, 1991; and May 4, 1991 to May 4, 1992 by July 17, 1992. These reports should include an analyzable falloff test for each well performed according to the enclosed guideline. If the above deadlines cannot be met, a valid justification should immediately be provided by letter.

If you have any questions, please contact Phil Dellinger or Joe Kordzi at (214) 655-7160.

Sincerely,

Oscar Cabra, Jr., P.E.
Chief
Municipal Facilities (6w-M)

cc: Ben Knape

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 WDW-32 (WELL #3) 2

2.1 FIELD ACTIVITY REPORT 2

2.2 RADIOACTIVE TRACER (RAT) SURVEY 2

2.3 ANNULUS PRESSURE TEST 2

FIGURE 2.1 WELL SCHEMATIC WDW-32 (WELL #3) 3

3.0 WDW-14 (WELL #2) 4

3.1 FIELD ACTIVITY REPORT 4

3.2 RADIOACTIVE TRACER (RAT) SURVEY 4

3.3 ANNULUS PRESSURE TEST 4

FIGURE 3.1 WELL SCHEMATIC WDW-14 (WELL #2) 5

4.0 WDW-49 (WELL #4) 6

4.1 FIELD ACTIVITY REPORT 6

4.2 RADIOACTIVE TRACER SURVEY 6

4.3 ANNULUS PRESSURE TEST 7

FIGURE 4.1 WELL SCHEMATIC WDW-49 (WELL #4) 8

5.0 WDW-110 (WELL #1-A) 9

5.1 FIELD ACTIVITIES 9

5.2 RADIOACTIVE TRACER (RAT) SURVEY 9

5.3 ANNULUS PRESSURE TEST 10

6 W-SU
JUN 2 9 1992

APPENDICES

APPENDIX A RADIOACTIVE TRACER SURVEY ANALYSIS WDW-32 (WELL #3) 1

APPENDIX B ANNULUS PRESSURE TEST WDW-32 (WELL #3) 1

APPENDIX C RADIOACTIVE TRACER SURVEY ANALYSIS WDW-14 (WELL #2) 1

APPENDIX D ANNULUS PRESSURE TEST WDW-14 (WELL #2) 1

APPENDIX E RADIOACTIVE TRACER SURVEY ANALYSIS WDW-49 (WELL #4) 1

APPENDIX F ANNULUS PRESSURE TEST WDW-49 (WELL #4) 1

APPENDIX G AMBIENT MONITORING WDW-49 (WELL #4) 1

APPENDIX H ANNULUS PRESSURE WDW-110 (WELL #1-A) 1

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1.0 INTRODUCTION

The attached report details the data and test results associated with the mechanical integrity testing of Hoechst Celanese Chemical's Class I injection wells WDW-49 (Well #4), WDW-110 (Well #1-A), WDW-32, (Well #3), and the WDW-14 (Well #2). These active injection wells are located at the Hoechst Celanese facility near Bay City, Texas.

Golden StrataServices, Inc. (GSS) commenced operations on Monday, October 28, 1991, and completed testing of the four wells on Friday, November 1, 1991. Radioactive Tracer (RAT) surveys and annulus pressure test were completed on the wells, with the exception of the RAT survey for WDW-110 (Well #1-A). GSS was unable to run the RAT on the WDW-110 because the well would not take flow at the time of the test. Ambient monitoring was performed on WDW-49 (Well #4).

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2.0 WDW-32 (WELL #3)

2.1 FIELD ACTIVITY REPORT

Monday, October 28, 1991

Pressured up annulus to 1,076 psi. Observed pressure for 30 minutes, pressure dropped to 1,071 psi. Bled pressure to 300 psi. Annulus test successful. Rigged up Atlas Wireline to run RAT survey. Ran base log, ejected 5 slugs, ran after survey base log. Observed no indication of upward migration from RAT slugs. Rigged down Atlas.

2.2 RADIOACTIVE TRACER (RAT) SURVEY

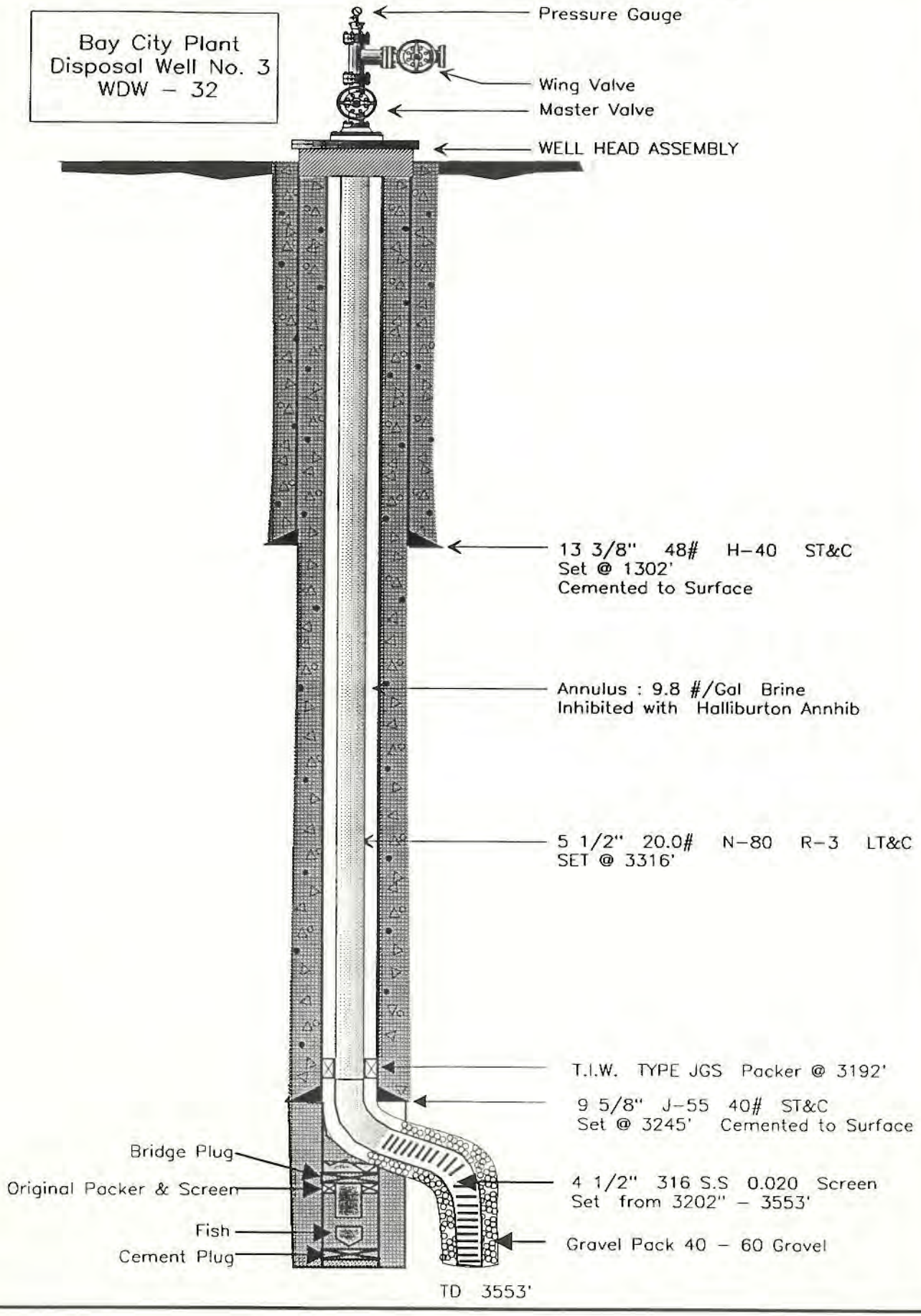
1. Ran base log from 2948' to 3252'.
2. Ran repeat base log from 2940' to 3246'.
3. Ran five (5) minute stationary check, reading at 3170'.
4. Made multiple pass survey #1 with a radioactive slug ejected at 2900' and a pump rate of 20 gpm.
5. Ran a stationary check at 3,175'. Watched slug pass tool and ran check for 15 minutes more.
6. Ran a stationary check at 3,220'. Watched slug pass tool and ran check for 15 minutes more. Pump rate at 80 gpm.
7. Ran Gamma Ray base log after survey.

2.3 ANNULUS PRESSURE TEST

The annulus was pressured up to 1076 psi and observed for 30 minutes. Annulus pressure after 30 minutes was 1071 psi, which is <1% drop in pressure and is well within the Texas Water Commission's 5% requirement.

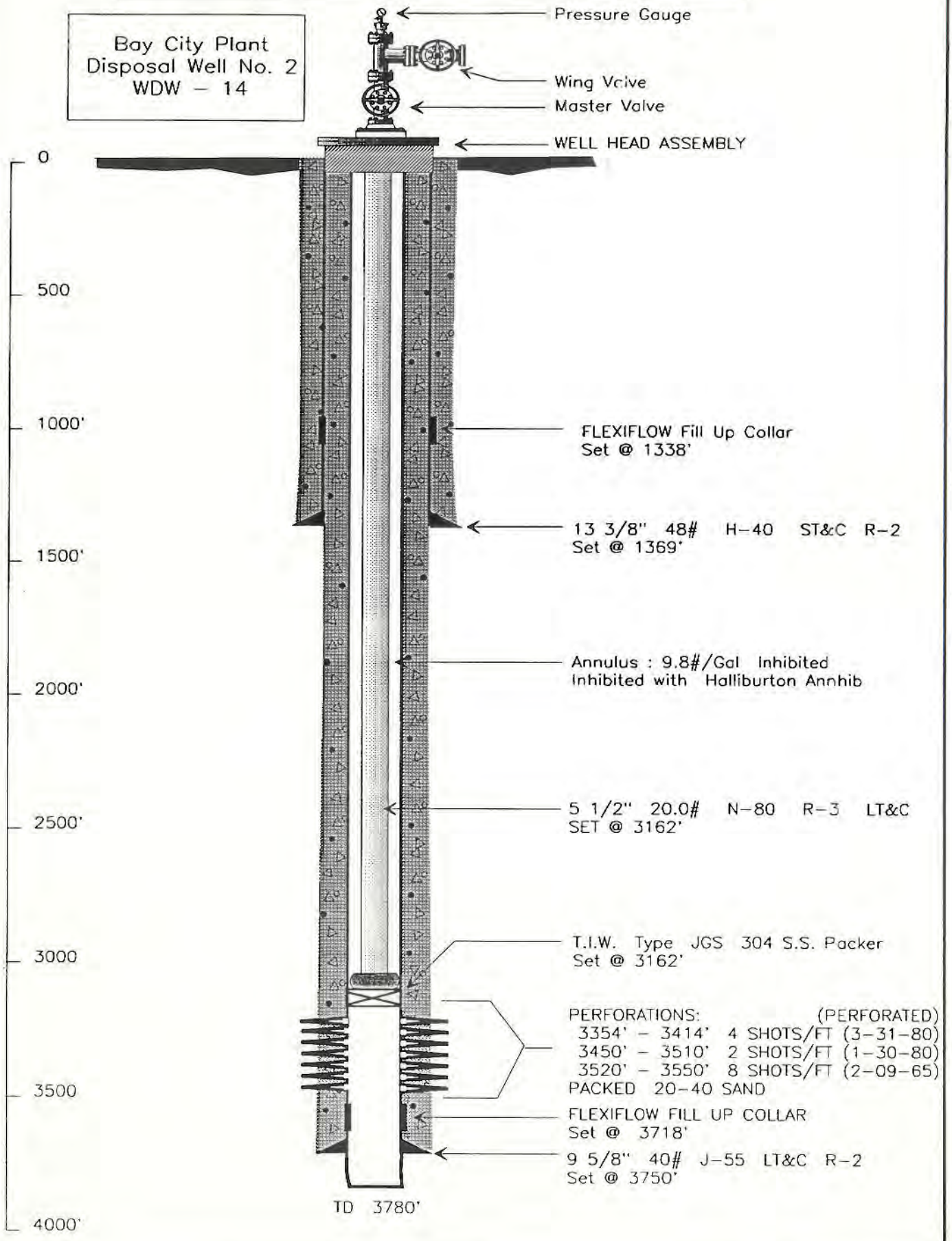
HOECHST CELANESE CHEMICAL GROUP, INC.

Bay City Plant
Disposal Well No. 3
WDW – 32



HOECHST CELANESE CHEMICAL GROUP, INC.

Bay City Plant
Disposal Well No. 2
WDW – 14



4.0 WDW-49 (WELL #4)

4.1 FIELD ACTIVITY REPORT

Wednesday, October 30, 1991

Pressured annulus to 1,088 psi. Observed pressure for 30 minutes. Pressure decreased to 1,083 psi. Annulus pressure test successful. Rigged up wireline to run Radioactive Tracer (RAT) survey. Unable to get 1-11/16" tracer tools through swab valve. Attempted to change out swab valve. Master valve did not hold, leaking effluent. Will pump brine down well and change master valve October 31, 1991. Rigged down wireline and moved to WDW-110 (Well #1-A).

Thursday, October 31, 1991

Rigged up B & G Vacuum Service. Pumped 85 bbls of brine down well. Replaced 6" 300# master valve and 2" 300# swab valve. Rigged up wireline to run RAT survey. Ran two (2) base logs. Power outage at wellsite. Pulled out of hole and closed well in for night.

Friday, November 1, 1991

Rigged up wireline to run RAT survey. Ran survey. No indication of upward migration observed. Rigged down wireline. Final Report.

4.2 RADIOACTIVE TRACER SURVEY

On November 1, 1991, Atlas Wireline Services was rigged up to run the RAT survey. The RAT was performed with the following runs:

1. Ran base line gamma ray log from 3,450' back to 2,940'.
2. Ran correlation log from 3,480' back to 2,940'.
3. Ran correlation repeat log from 3,480' back to 2,920'.
4. Made multiple pass survey #1 with a radioactive slug ejected at 3,000' and a pump rate of 20 gpm.
5. Made multiple pass survey #2 with a radioactive slug ejected at 3,150' and a pump rate of 20 gpm.

6. Ran stationary check #1, shot slug at 3,350', pump rate at 100 gpm.

7. Ran stationary check #2, shot slug at 3,348', pump rate at 100 gpm.

8. Ran after survey base log from 3,470' back to 2,960'.

The RAT showed no indication of upward migration behind the protection casing.

4.3 ANNULUS PRESSURE TEST

The annulus pressure test was performed with 1,088 psi at the start of the test and observed for 30 minutes per Texas Water Commission requirements. At the end of the test, pressure was recorded at 1,083 psi, which is a 1% pressure loss. This pressure loss is well within the Texas Water Commission's requirement of 5%.

3.0 WDW-14 (WELL #2)

3.1 FIELD ACTIVITY REPORT

Tuesday, October 30, 1991

Pressured up annulus to 900 psi. Monitored well for 1 hour. Pressure decreased to 880 psi. Bled pressure back to 300 psi. Annulus test successful. Rigged up Atlas Wireline to run RAT survey. Ejected 3 slugs. No indication of upward migration noted. Rigged down Atlas Wireline.

3.2 RADIOACTIVE TRACER (RAT) SURVEY

On October 29, 1991, Atlas Wireline Services was rigged up to run the Radioactive tracer (RAT survey. The RAT was performed with the following runs:

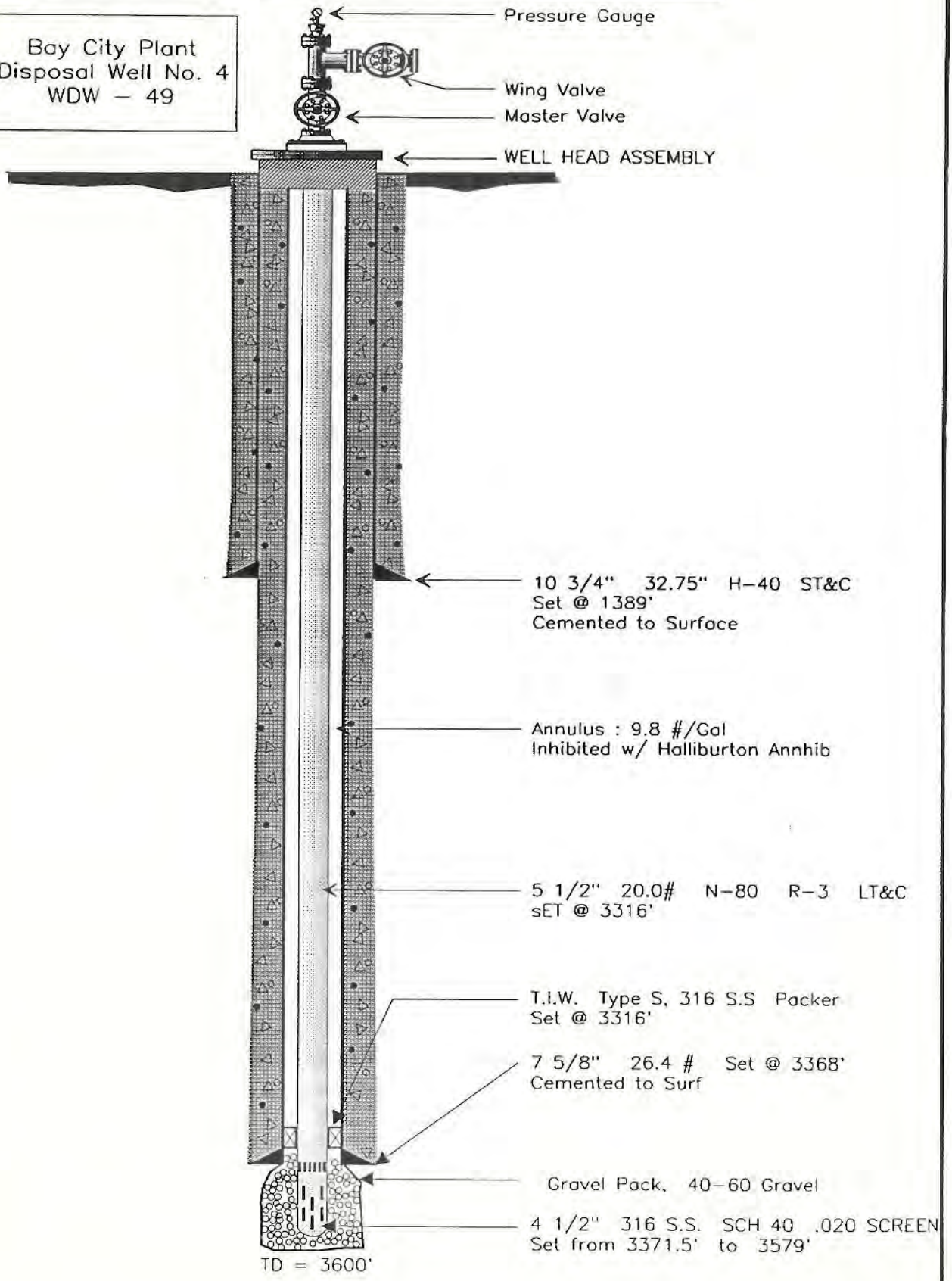
1. Ran a Gamma Ray base log from 2,800' to 3,472'.
2. Ran a stationary check at 3,150', with a pump rate of 20 gpm.
3. Made multiple pass survey #1, with slug ejected at 2,950' and a pump rate of 20 gpm.
4. Ran a stationary check at 3,335'. Ejected slug and recorded for 30 minutes.
5. Ran a stationary check at 3,335'. Ejected slug and recorded for 30 minutes.
6. Ran an after survey base log from 2,800' to 3,348'.
7. Ran a repeat after survey base log from 2,790' to 3,348'.

3.3 ANNULUS PRESSURE TEST

The annulus was pressured up to 900 psi and monitored for one (1) hour. Pressure decreased to 880 psi, which is a 2% drop in pressure, and is well within the Texas Water Commission's 5% requirement.

HOECHST CELANESE CHEMICAL GROUP, INC.

Bay City Plant
Disposal Well No. 4
WDW – 49



5.0 WDW-110 (WELL #1-A)

5.1 FIELD ACTIVITIES

Thursday, October 31, 1991

Pressured annulus to 850 psi. Pressure decreased to 840 psi. Pressure test successful. Rigged up Atlas to run RAT survey. Ran 2 base logs, unable to inject. Well not taking fluid. Pulled out of hole and rigged down Atlas. Moved back to Well #4.

Friday, November 1, 1991

Bled tubing pressure to 180 psi. Recovered 6.5 bbls. Rigged up Halliburton, pumped 26 bbls. Pressured up to 800 psi. Pressure bled back to 130 psi. Pressured up to 830 psi. Surged back to 200 psi. Pressured up to 850 psi with 600 bbls at 1/2 rpm. Pressure not bleeding off. Bled back to 350 psi. Closed well in. Operations shut down.

5.2 RADIOACTIVE TRACER (RAT) SURVEY

Golden StrataServices was unable to run the Radioactive Tracer Survey on the #1-A because the well would not take flow at the time of the test.

5.3 ANNULUS PRESSURE TEST

The annulus pressure test was performed with 850 psi at the start of the test and observed for 60 minutes per Texas Water Commission requirements. At the end of the test, pressure was recorded at 840 psi, which is a 1% pressure loss. This pressure loss is well within the Texas Water Commission's requirement of 5%.

APPENDIX A
RADIOACTIVE TRACER SURVEY ANALYSIS
WDW-32 (WELL #3)

EVALUATION OF RADIOACTIVE TRACER SURVEY
INJECTION WELL NO. 3
WDW-32

LOG DATA

Date Run:	October 28, 1991
Logging Service Company	Western Atlas International
Tubing Size and Depth Set	5 1/2"
Casing Size and Depth:	9 5/8" set at 3245'
Packer Depth	3192'±

BASELINE GAMMA-RAY LOG

This baseline gamma-ray (G/R) log was run from 3245'± to 2940'±. The purpose of the initial baseline G/R log is to demonstrate repeatability of the logging tools. A comparison of both baseline G/R runs shows good repeatability between the two runs.

BEFORE SURVEY BASELINE GAMMA-RAY LOG 2

A baseline G/R was run from 3245'± to 2947'±. The log is useful for the following comparisons against additional RAT logging runs.

1. The G/R curves are used as depth control points against other runs during the RAT.
2. The baseline G/R is compared against the final G/R log to check for anomaly areas that could indicate upward migration along a cement channel.

STATISTICAL CHECK NO. 1

A five minute statistical check was performed with the logging tool set at 3170'±. The purpose of the statistical check is to identify the magnitude of variations in the recording equipment. This information is used to identify an anomaly area. For example, for an area to show an anomaly, the G/R reading must be greater than the maximum variation of the statistical check. The maximum variation is estimated to be 1/2 of a log division.

CHASE SURVEY 1

The multiple passes portion of the RAT provides a check for upward migration. In this instance, one slug was ejected at a depth of 2900'± and it was tracked as it was pumped down the tubing. The pumping rate for this test was 20 gpm and four (4) individual passes were made with two detectors as the slug moved from 2900'± to 3245'±. Both curves are illustrated on the multiple passes portion of the log. The relatively low flow rate of 20 gpm was necessary to allow sufficient time for the logging tools to be lowered to make multiple passes and record the progress of the radioactive slug. A flow rate higher than 20 gpm would have caused the slug to move so fast that only a few passes could be made resulting in incomplete coverage of the movement. A summary of the individual passes is given below:

a. Pass 1 - The slug was released at 2900'± and the tool lowered below the tracer material and logged upward. The slug was recorded inside the tubing with its primary peak at 2935'±. A smaller secondary peak occurs between 2894'± and 2898'±. This secondary is probably a result of a small leakage of tracer material following the initial ejection.

b. Pass 2 - The slug was recorded inside the tubing with its peak at 3021'±. The slug has moved downward 86'± since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. This is seen by the shape of the G/R response. The secondary peak seen in pass 1 is not observable.

c. Pass 3 - The slug was recorded inside tubing with its peak at 3115'±. The slug has moved downward 94'± since pass 2 and 180'± since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. No upward migration is observed.

d. Pass 4 - The slug is in the injection interval with a very small peak at 3194'±. The slug has moved downward 79'± since pass 3 and 259'± since pass 1. The slug shape indicates that tracer material is being injected into the adjacent sands. No clear tracer peaks are evident indicating fluid injection

FIRST STATIONARY READING ON TIME DRIVE

The stationary survey checks for upward migration under a high flow rate condition. In this case, a radioactive slug was released above 3175'± and the recording done on a time drive basis. Fluid was pumped into the well at 80 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3175') for 15 minutes. Since the slug was released above the detector, its passage is indicated on the log. Pumping was continued for the remainder of the 15 minute period while recording. No second G/R peak was detected and as such no upward migration was detected.

SECOND STATIONARY READING ON TIME DRIVE

This pass is identical to the previous pass but serves as a double check of the equipment and the presence of upward migration. A radioactive slug was released at 3220'± and the recording done on a time drive basis. Fluid was pumped into the well at 80 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3220') for 15 minutes. Since the slug is released above the detector, its passage is indicated on the log. Pumping is continued for the remainder of the 15 minute period while recording. No second G/R peak was detected and as such no upward migration was detected.

AFTER SURVEY BASELINE GAMMA-RAY LOG

Immediately after the secondary stationary survey, the logging tool was lowered to 3250'± and an after survey baseline G/R log was recorded. The purpose of this log is to compare it with the before survey baseline G/R log to look for anomaly areas. These areas would appear as "hot spots" or areas in which the G/R readings have been elevated above background levels. A comparison of these logs indicated no anomaly areas or indications of upward movement.

Western Atlas International

ATLAS WIRELINE SERVICES

November 1991

Golden Strata Services, Inc.
Suite 1600
711 Louisiana
Houston, TX 77002

ATTN: Bob Hall

RE: Effluent Disposal Well No. 3
Celanese Plant Matagorda County, Texas

Dear Bob:

In October, a Radioactive Tracerlog was run to insure mechanical integrity of the aforementioned well. This is an interpretation of the Radioactive Tracer Survey.

A Gamma Ray Base Log was run for depth correlation and to obtain the normal radioactivity of the downhole environment. A main and a repeat before Log Base Logs were run to compare to the after log.

Statistical checks were done in the top and bottom detectors to insure stability of the detectors and the instrument. The statistical shows that the tools are stable and in good condition. (Depth 3170 ft.).

Procedure:

First slug was shot at 2900 ft. Pump rate was 20 GPM for chasing R/A material downhole. There were 4 passes made.

Pump rate was at 100 GPM for the stationary checks taken at 3175 ft. and at 3220 ft. A 3 minute stat check was recorded before shooting and a 15 minute statistical check was recorded after injecting.

Injection Passes:
Injection Rate 20 GPM

Injected Slug:
Depth 2900 ft.

All passes, were overlaid and labeled to show that the slug was moving downhole. There is no significant leak off of the R/A material and shows to be going down in a proper manner. The slug is dissipating on the fourth and final pass at a depth of 3188 to 3196 ft.

The injection passes show that the injected R/A material is moving down and is not coming back around.

Stationary Checks:
Injection Rate 100 GPM

1st Stationary Check:
Depth 3175 ft.

The tool is stationary at 3175 ft., the monitoring is set on time drive. (Time was run bottom up). The R/A slug was shot and the R/A slug was monitored going past the detectors. The detection of the R/A material was not monitored again. Thus the R/A material never returned to the area for the time we were monitoring. Slug moving down.

2nd Stationary Check:
Depth 3220 ft.

The R/A slug was shot and the R/A slug was monitored going past the detectors and not returning.

After Survey Base Log:

This pass shows an increase in gamma ray activity in the 3185 to 3195 ft. region. This is in comparison to the before log base log.

In conclusion, there is no evidence that there is flow coming around and coming back up. All monitoring indicates a sound injection well.

Sincerely,

Freeman Hill, III
Reservoir and Completion Analyst
(713) 972-5736

FH/cd

Western Atlas International

ATLAS WIRELINE SERVICES

NUCLEAR TRACER LOG

FILE NO.

API NO.

FINAL PRINT

COMPANY HOECHST CELANESE CORPORATION

WELL EFFLUENT DISPOSAL WELL NO. 3

FIELD CELANESE PLANT

COUNTY MATAGORDA STATE TEXAS

LOCATION:
N/A

SEC N/A TWP N/A RGE N/A

OTHER SERVICES

PERMANENT DATUM GROUND LEVEL ELEV. N/A
LOGGING MEASURED FROM K.B. 17.0 FT. ABOVE P.D.
DRILLING MEASURED FROM K.B.

ELEVATIONS
KB N/A
DF N/A
GL N/A

DATE	10/28/91	
RUN	1	
SERVICE ORDER	82441	
DEPTH-DRILLER	N/A	
DEPTH-LOGGER	3242.0'	
BOTTOM LOGGED INTERVAL	3242.07	
TOP LOGGED INTERVAL	2950.0'	
TYPE FLUID IN HOLE	WATER	
SALINITY PPM CL.	N/A	
DENSITY LB/GAL.	N/A	
LEVEL	FULL	
MAX. REC. TEMP. DEG. F	N/A	
OPR. RIG TIME	8.0 HRS.	
EQUIP. NO. / LOC.	H.L. 6345	EL CAMPO
RECORDED BY	HUBBLE	
WITNESSED BY	BOB HALL	

BOREHOLE RECORD

NO.	BIT	FROM	TO

FOLD HERE

IN MAKING INTERPRETATIONS OF LOGS OUR EMPLOYEES WILL GIVE CUSTOMER THE BENEFIT OF THEIR BEST JUDGEMENT, BUT SINCE ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS, WE CANNOT, AND WE DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION. WE SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COST, DAMAGES, OR EXPENSES WHATSOEVER INCURRED OR SUSTAINED BY THE CUSTOMER RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR EMPLOYEES.

CASING RECORD

SIZE	WGT	FROM	TO

REMARKS

N/A = NOT AVAILABLE
FIRST SLUG WAS SHOT @ 2900'. PUMP RATE WAS 20 GPM FOR CHASING
R/A MATERIAL DOWN HOLE.

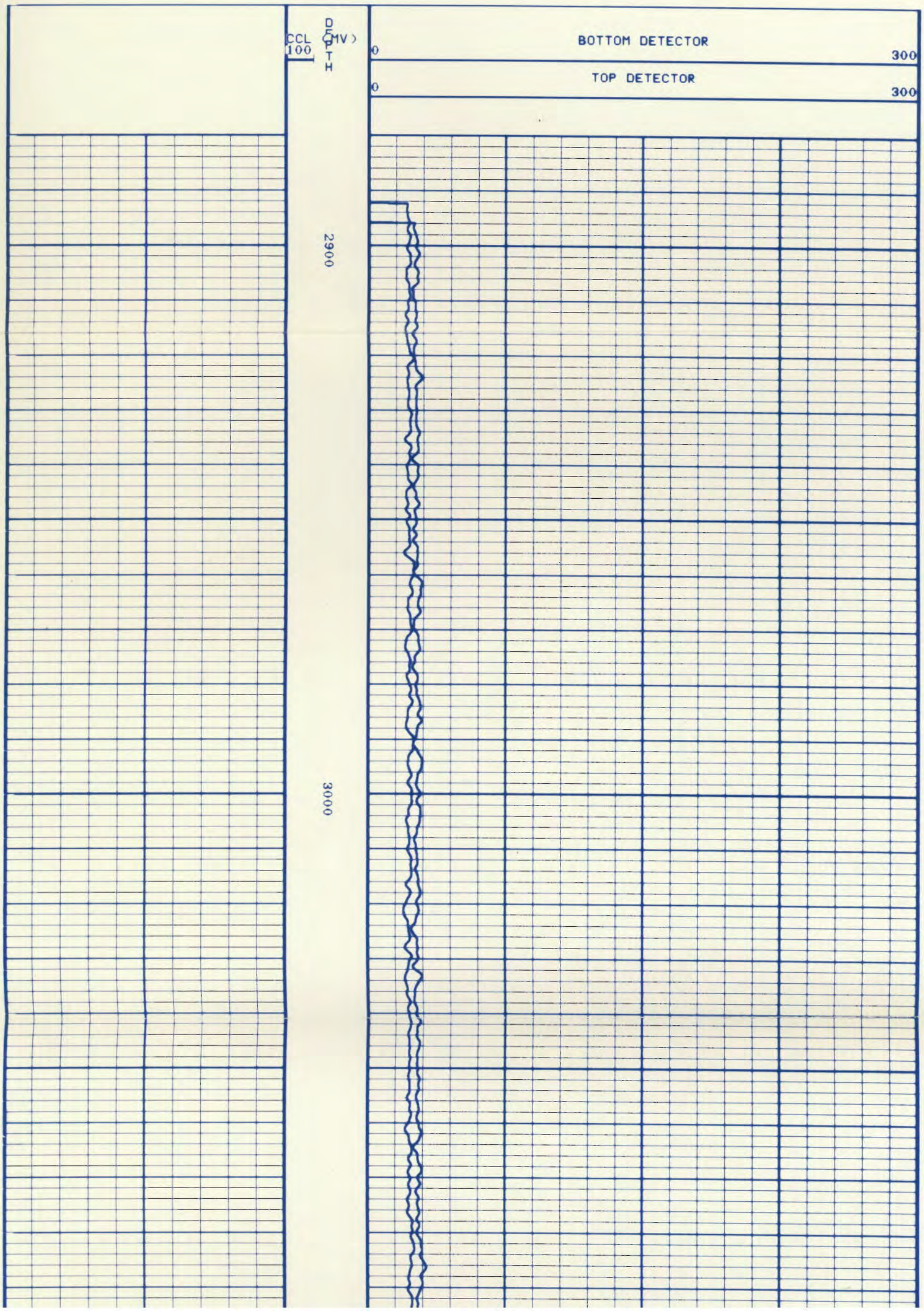
PUMP RATE WAS 80 GPM FOR THE STATIONARY CHECKS TAKEN @ 3175' & 3220'. ON BOTH OF THESE STATIONARY CHECKS. A 3 MINUTES STAT CHECK WAS RECORDED BEFORE SHOOTING SLUG. A 15 MINUTE STAT CHECK WAS RECORDED AFTER SHOOTING SLUG.

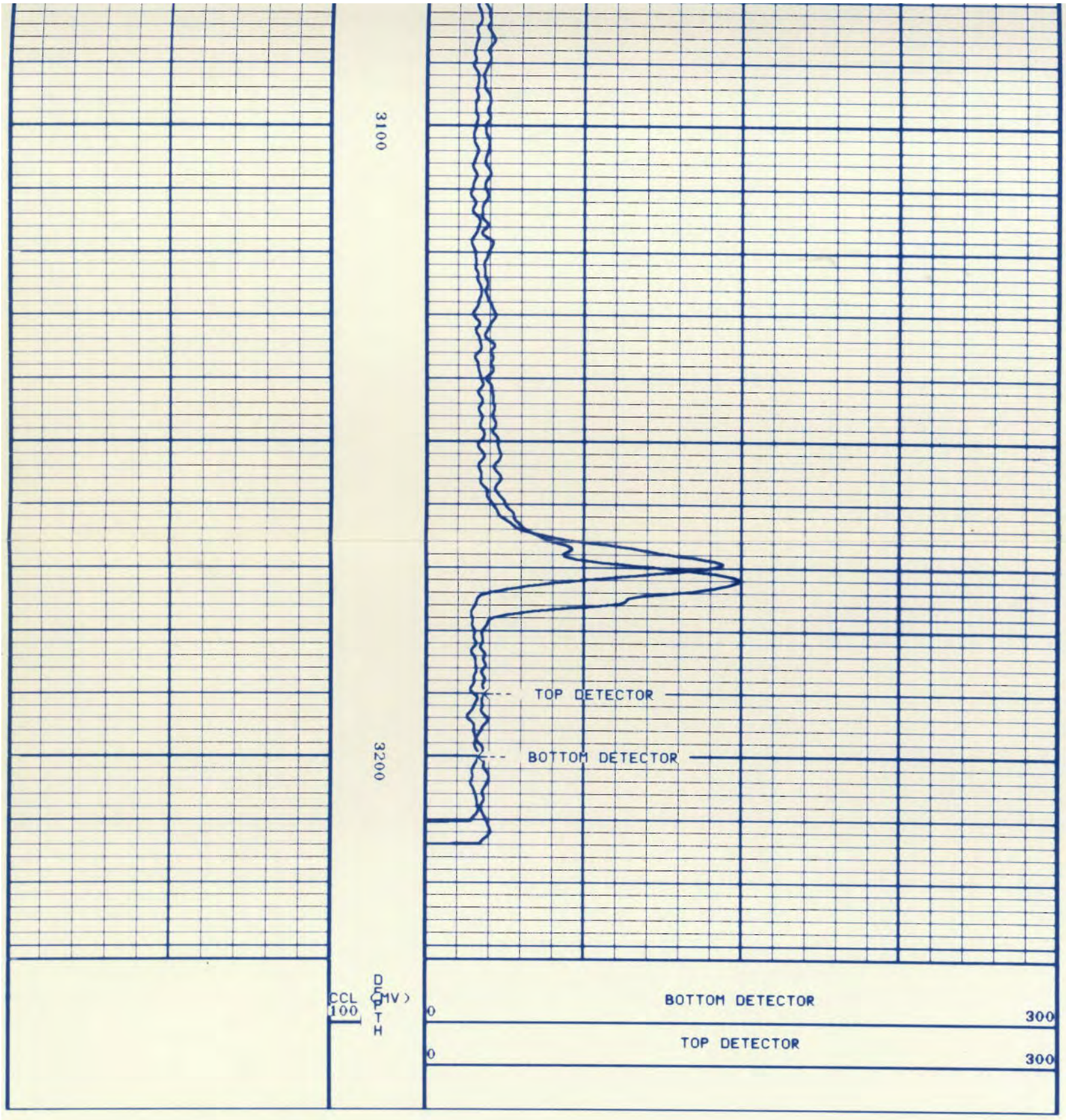
EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	SERIES NO.	POSITION
		CCL			

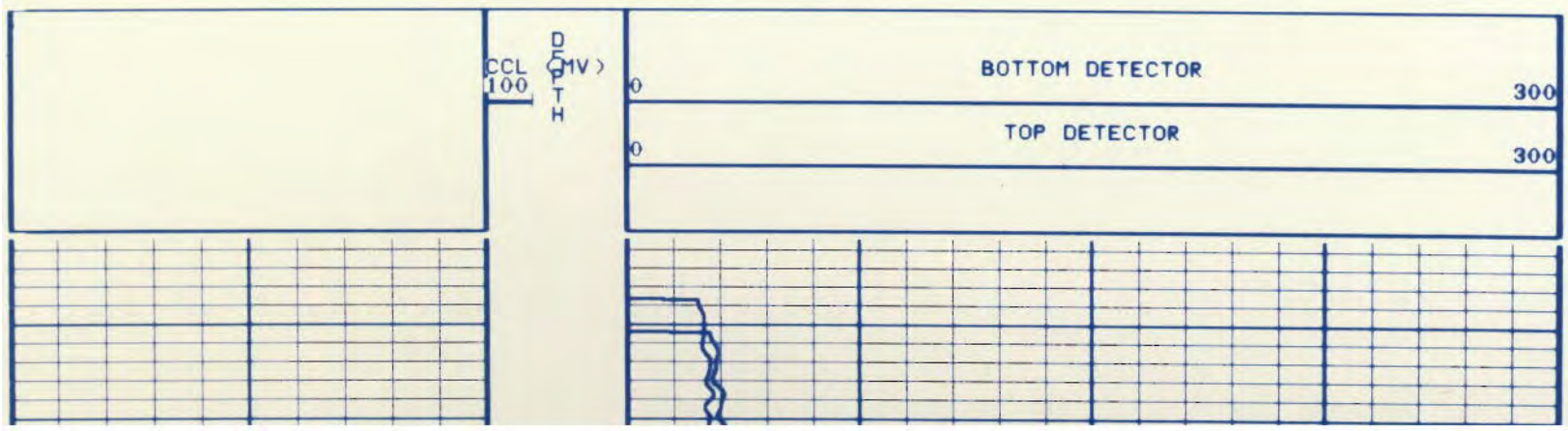
SHOOT SLUG @ 3220

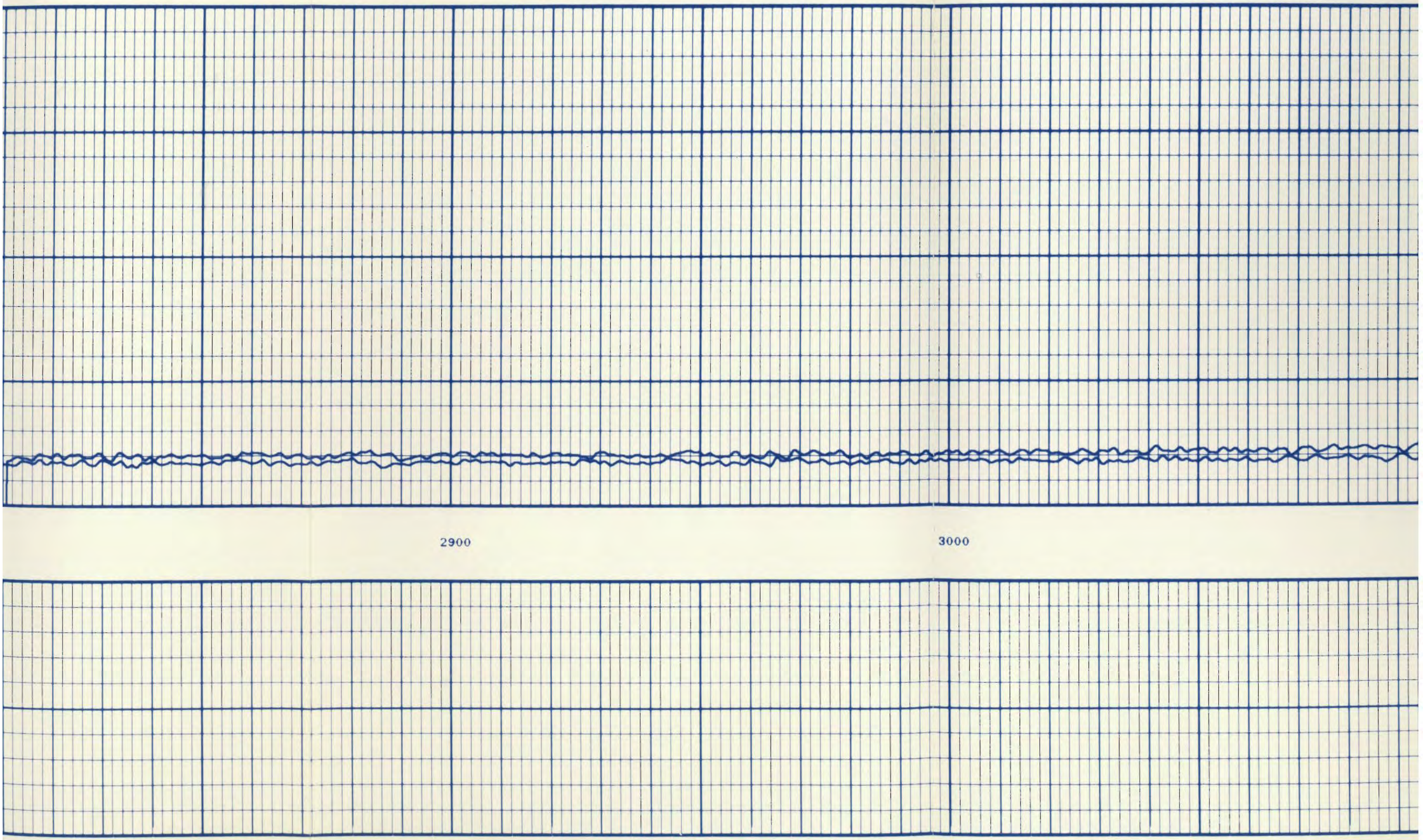
SHOOT SLUG @ 3220

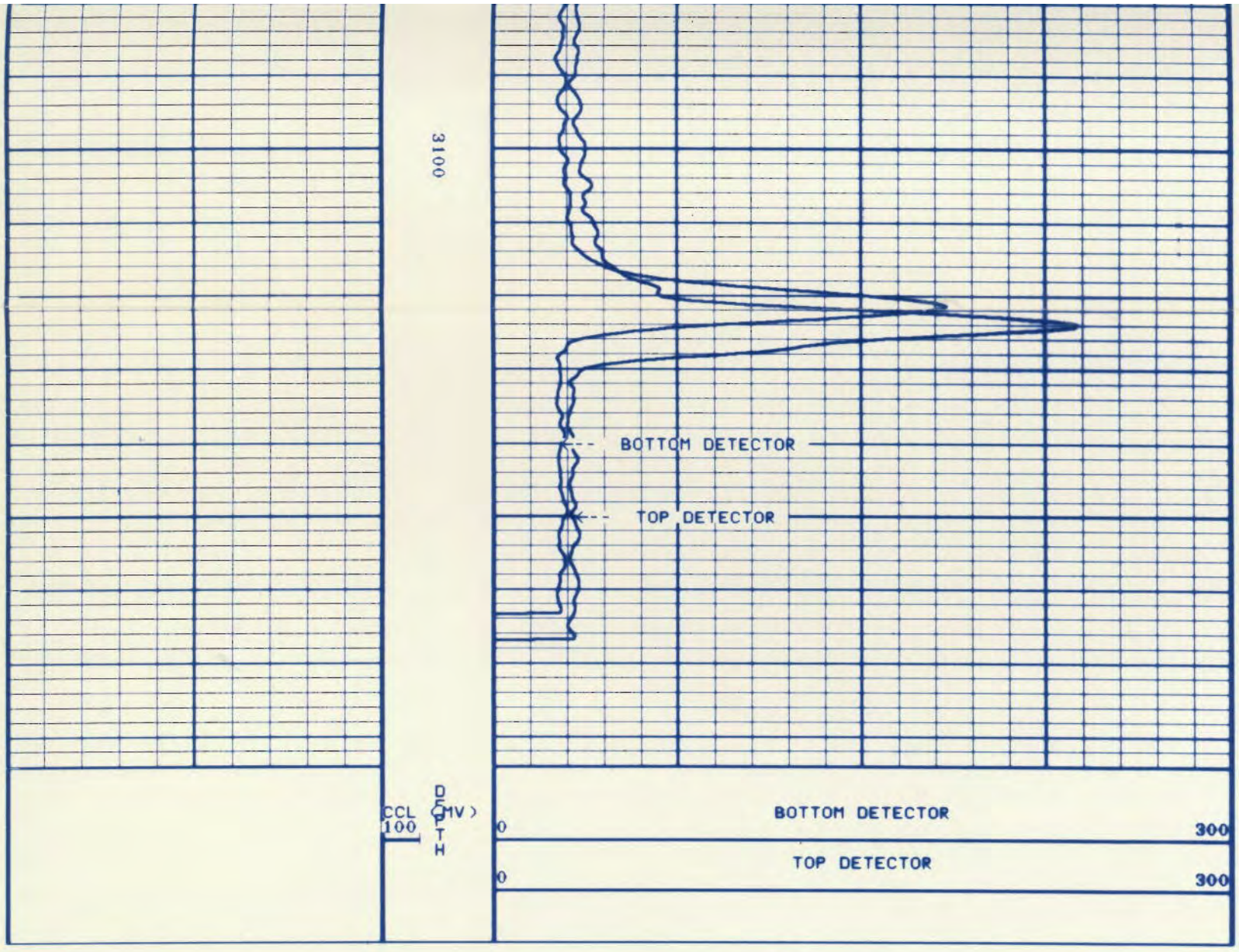




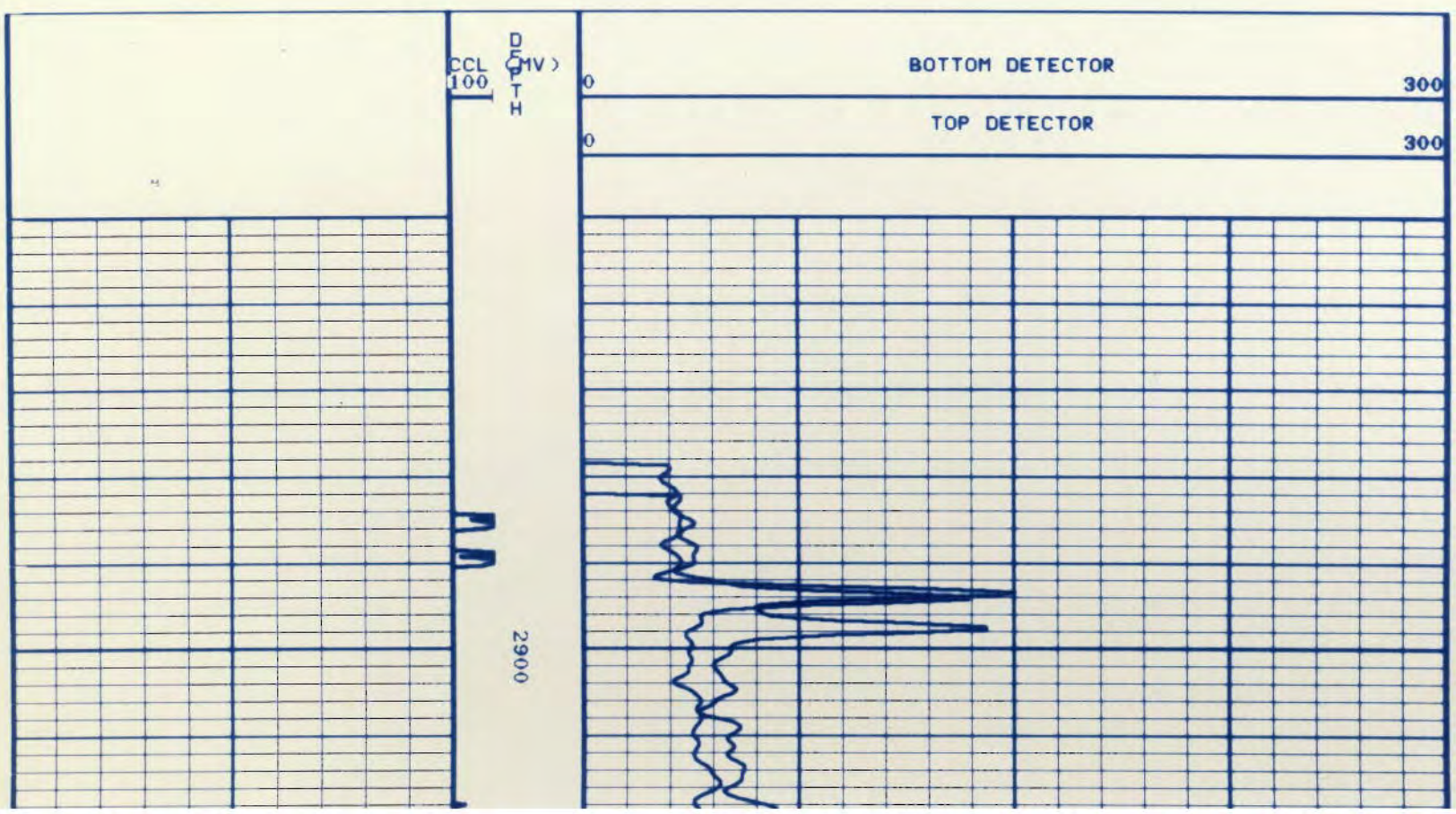
SHOOT SLUG @ 3175

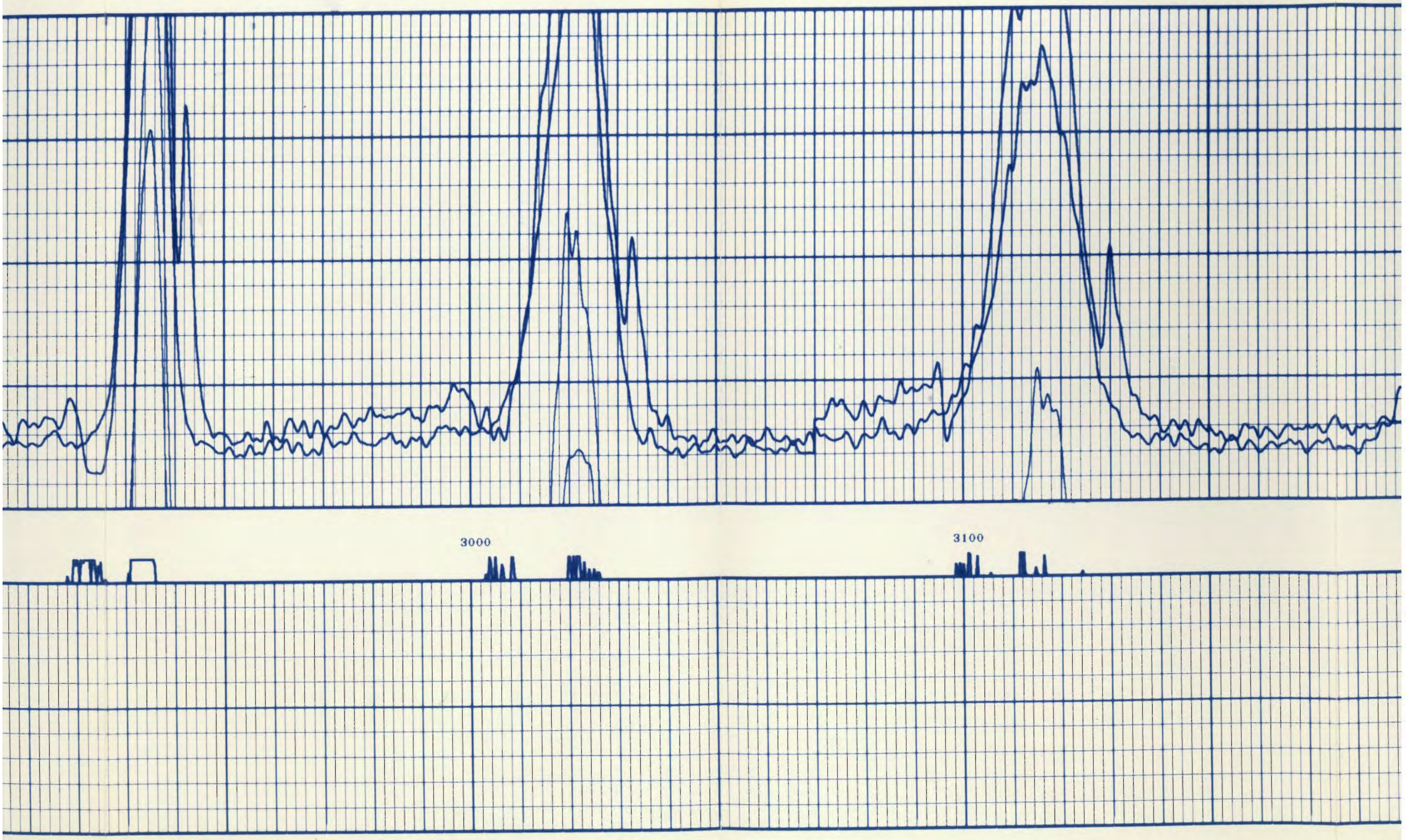


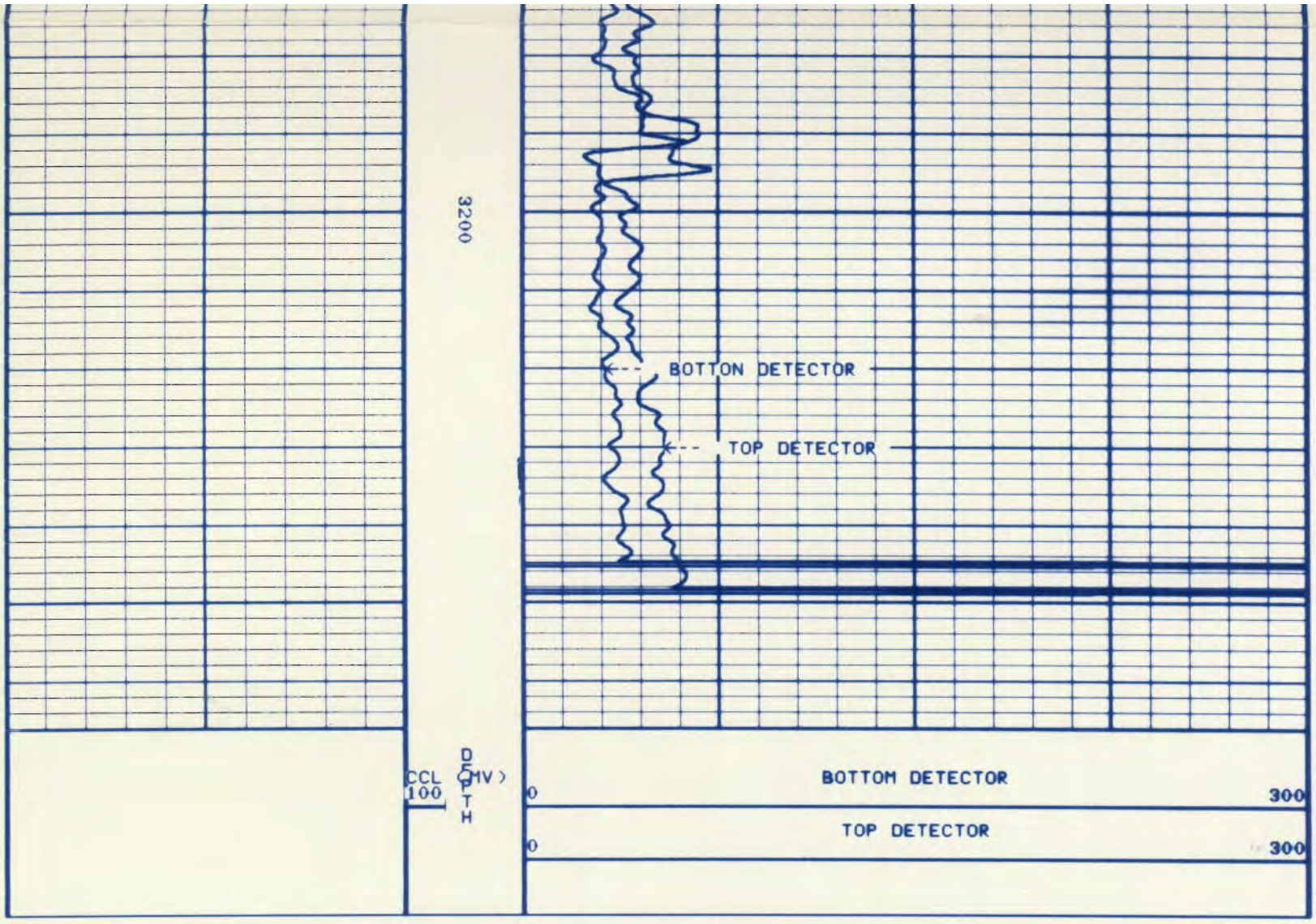

2900
3000



SHOT SLUG @ 2900




3000
3100



RUN STAT CHECH AT 3220′
WATCH SLUG GO BY TOOL
RUN CHECK FOR 15 MIN.
PUMP RATE AT 80 GPM

****

FILE: 14

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	3,6	FT,IN
TDET	0	FT,IN
CCL	7,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 3

SERVICE: D 439A FILE: 14 DATE: 10/28/91

REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 16:58:25

MODE: RECORD

VDC(V)

0 1000

CCL

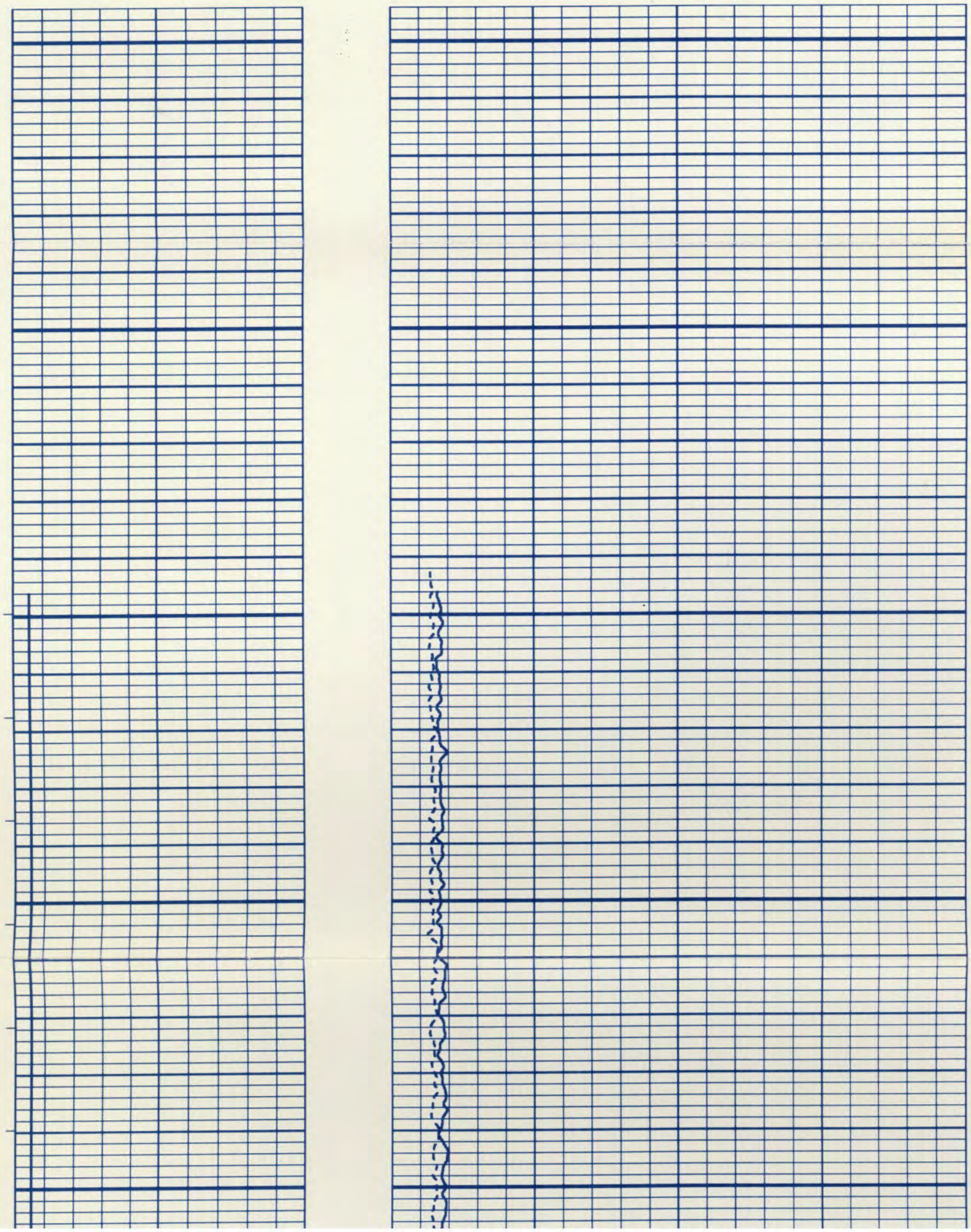
100 0

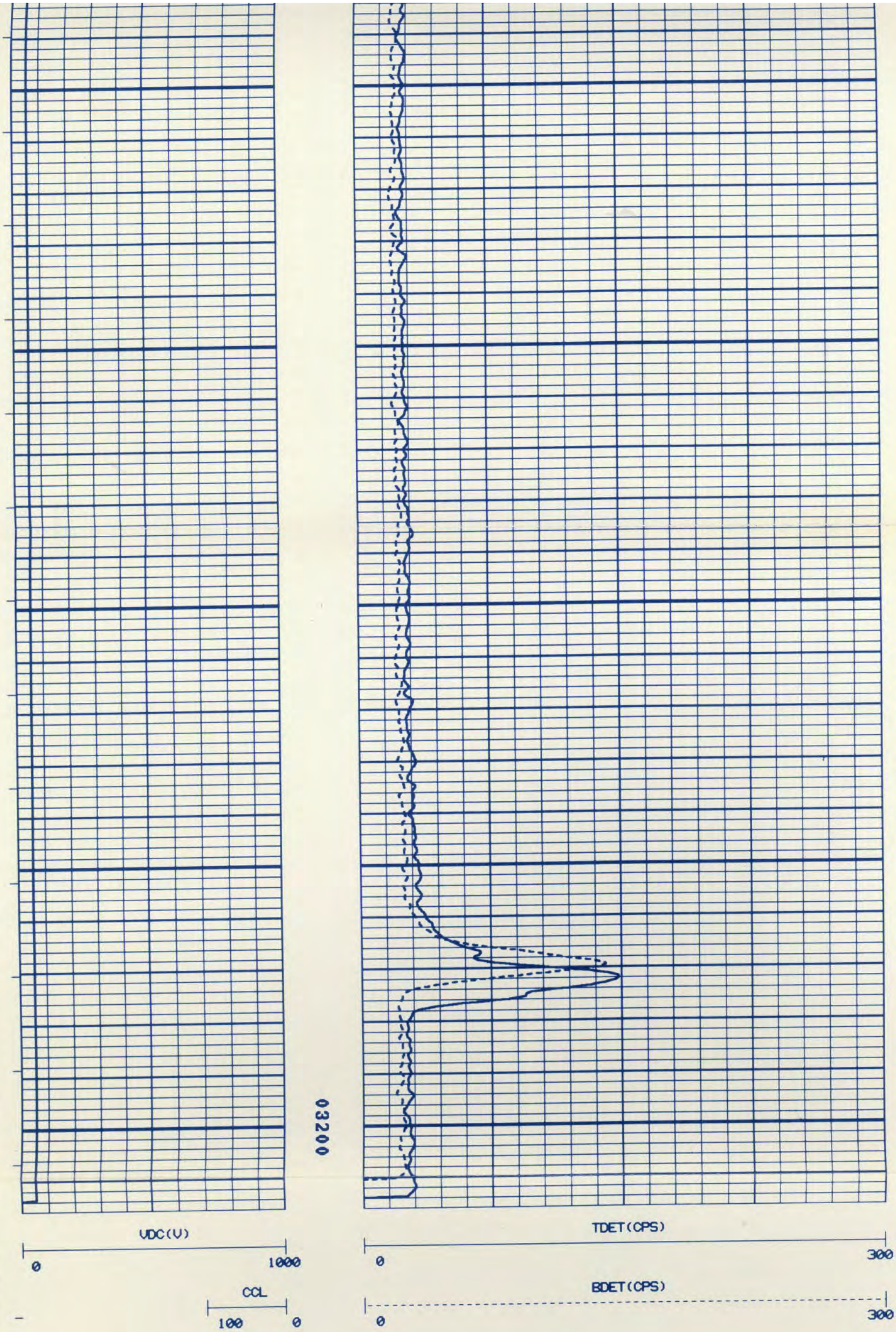
TDET(CPS)

0 300

BDET(CPS)

0 300





FILE: 14

FILE: 14

RUN STAT CHECH AT 3175'
WATCH SLUG GO BY TOOL
RUN CHECH FOR 15 MIN. MORE

FILE: 13

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	3,6	FT,IN
TDET	0	FT,IN
CCL	7,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

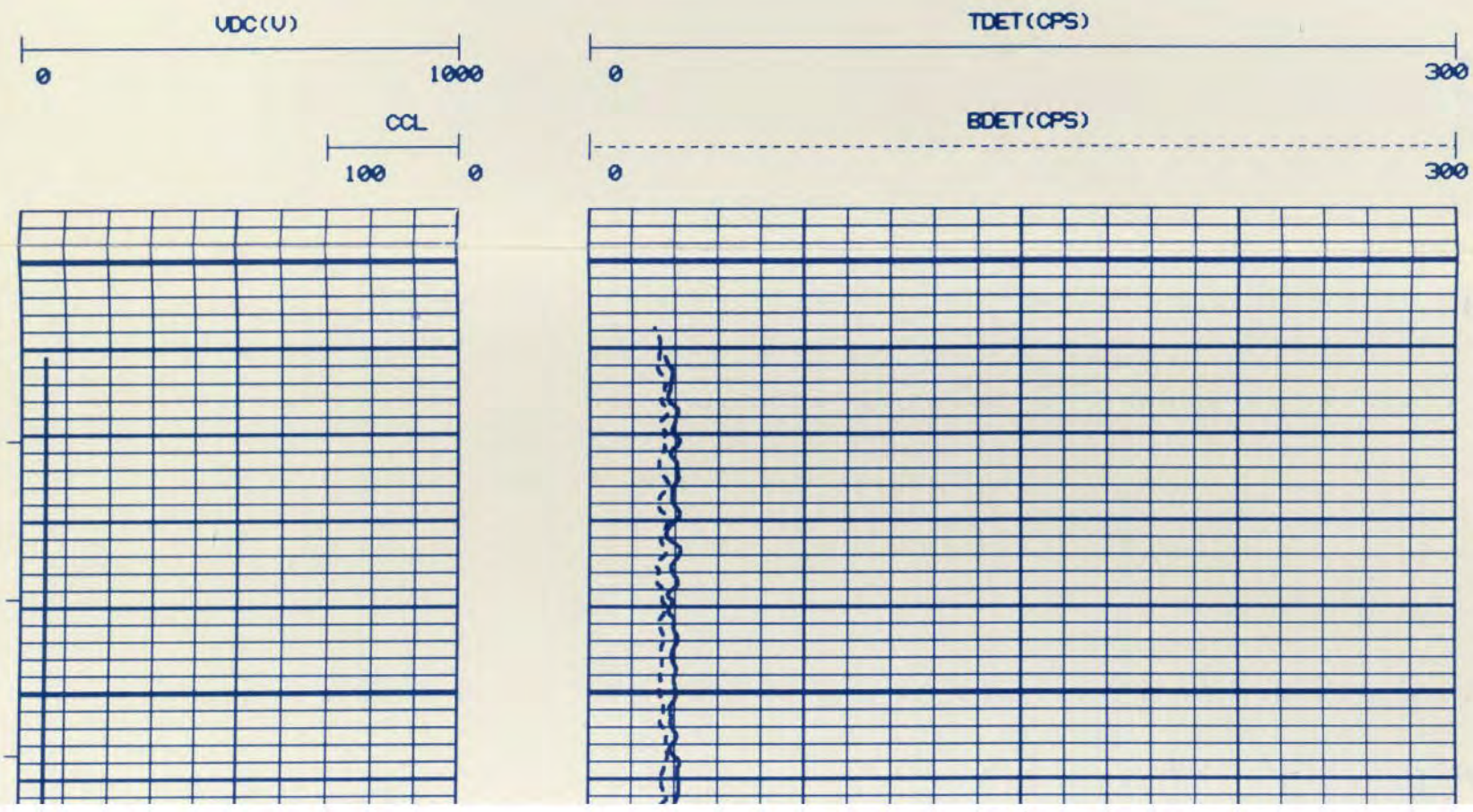
*** NONE ***

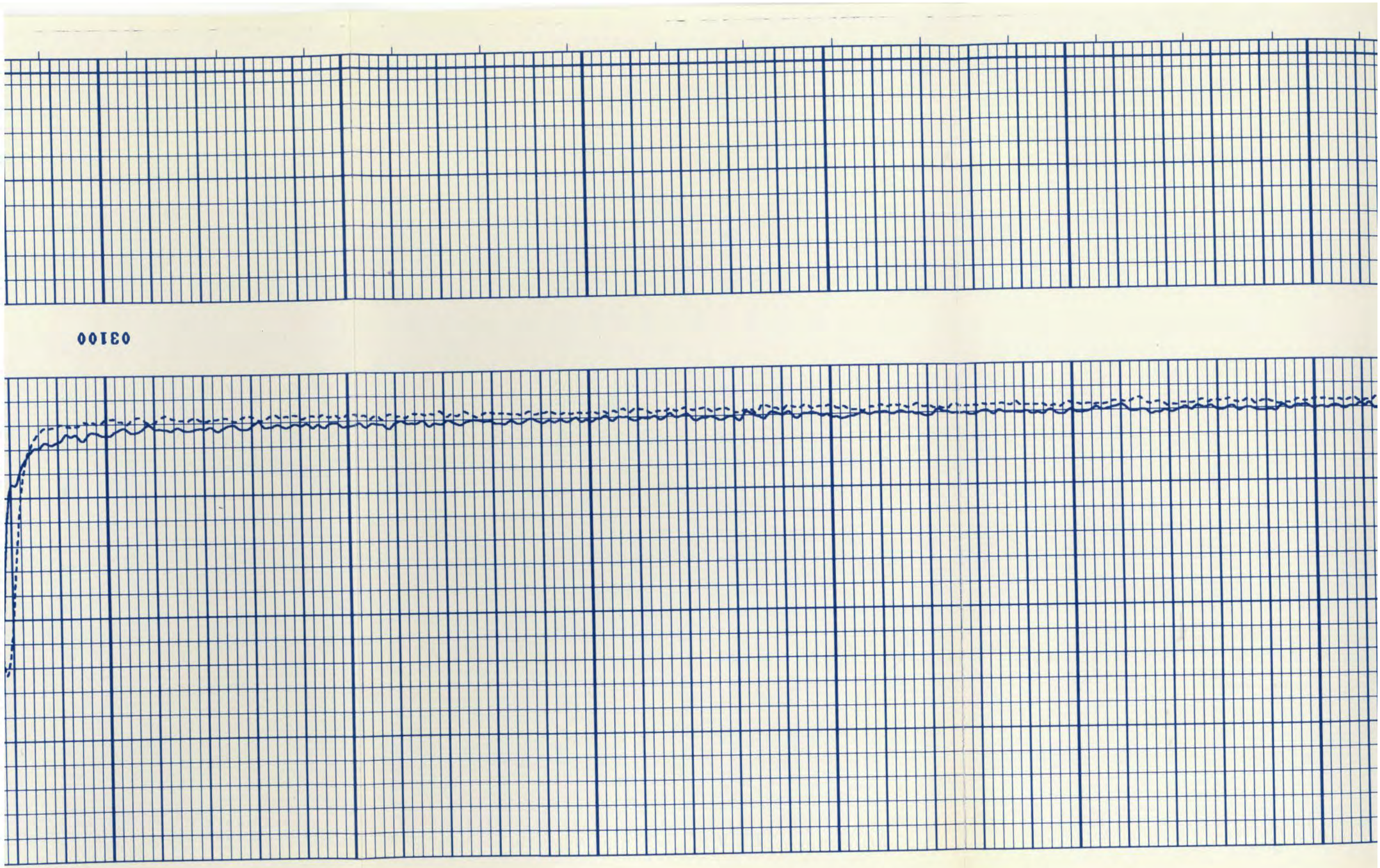
DISPLAY SCALE CHANGES

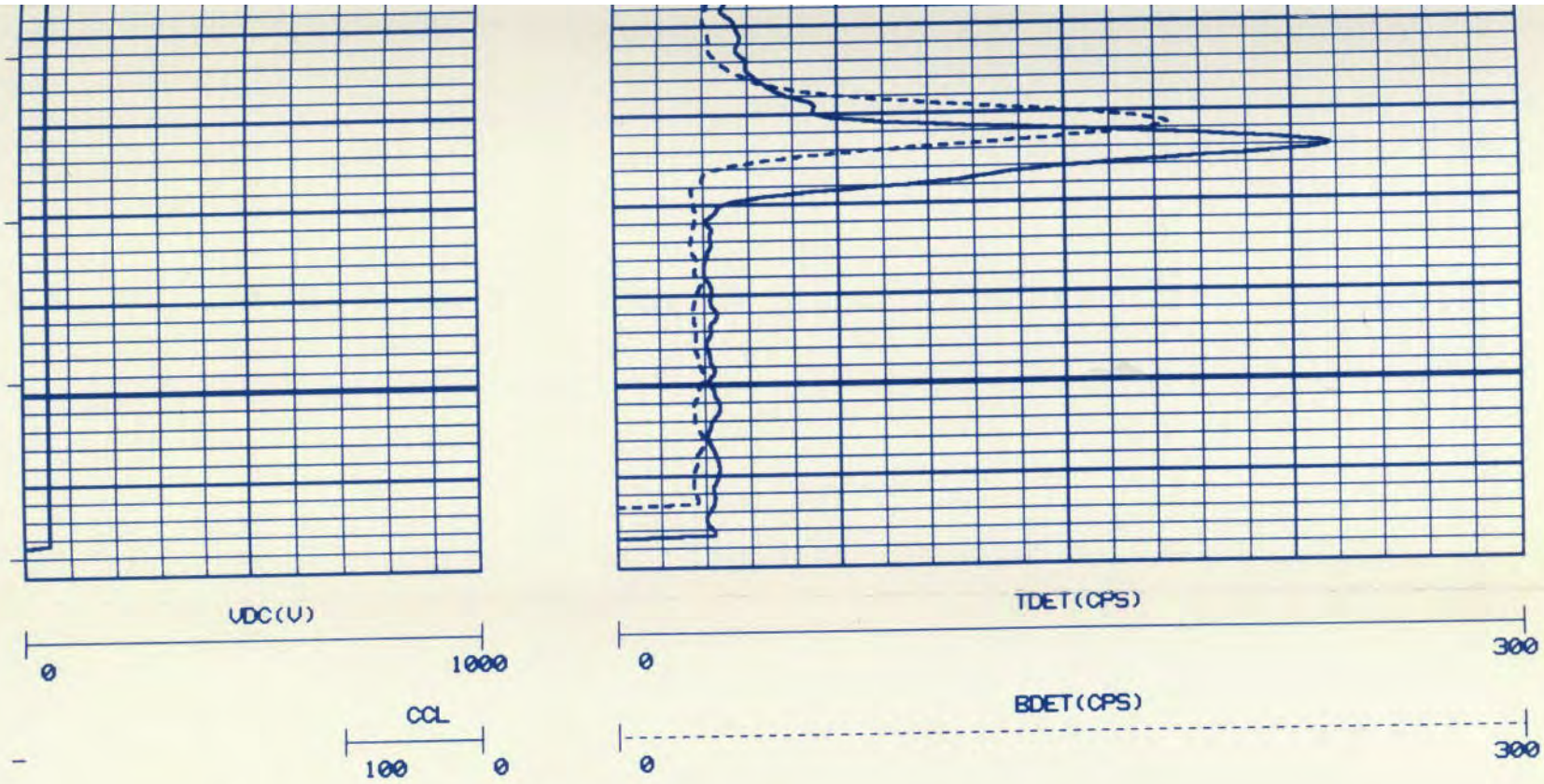
*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION
WELL NAME: EFFLUENT DISPOSAL WELL NO. 3
SERVICE: D 439A FILE: 13 DATE: 10/28/91
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1
TRIP: 1
TIME: 16:34:58
MODE: RECORD




03100



FILE: 13

SHOT SLUG AT 2900'
PUMP RATE AT 20 GPM
CHASED SLUG W/ FILE NOS. 8 - 9 - 10 - 1

FILE: 11

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	3,6	FT,IN
TDET	0	FT,IN
CCL	7,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

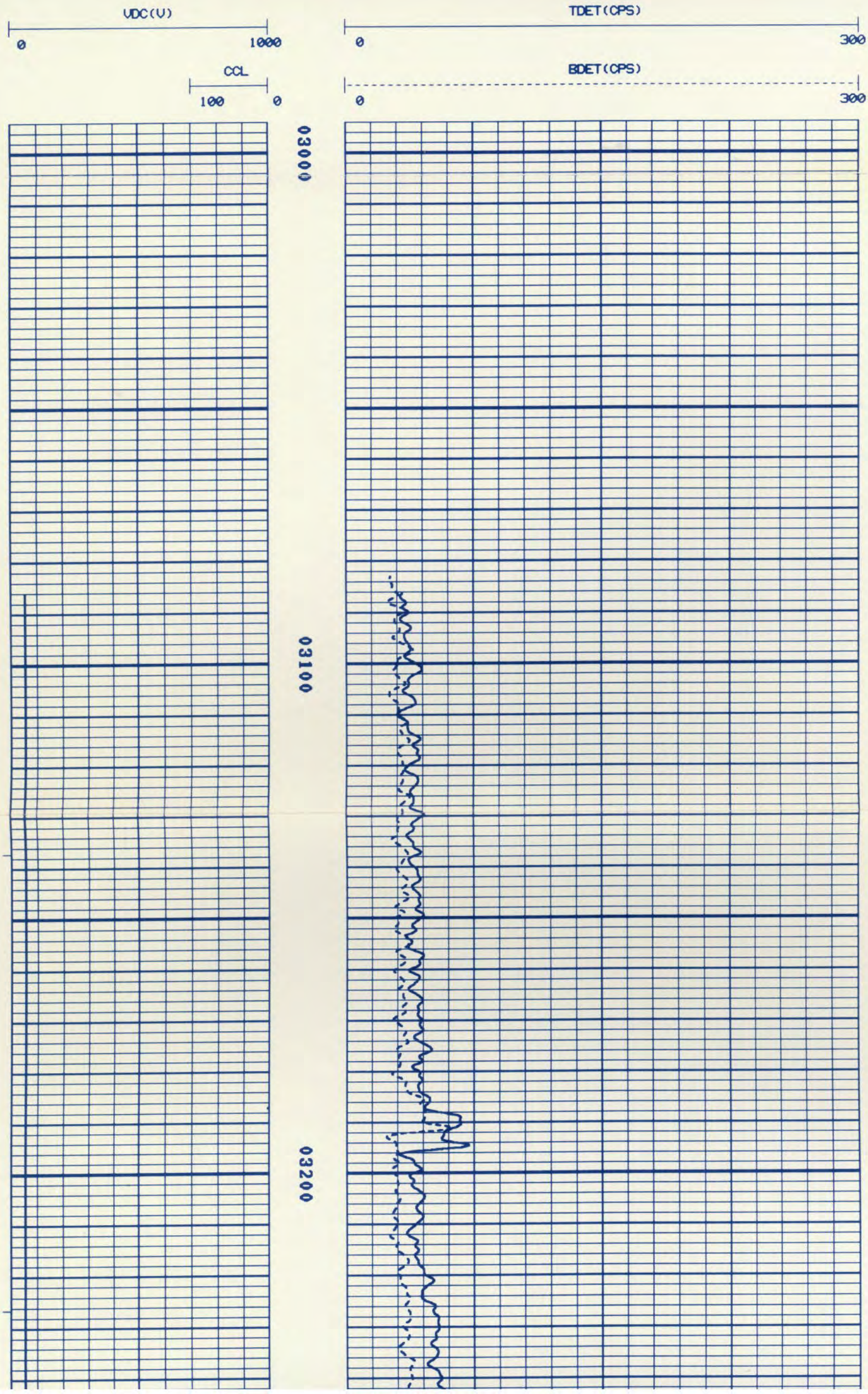
COMPANY: HOECHST CELANESE CORPORATION
WELL NAME: EFFLUENT DISPOSAL WELL NO. 3
SERVICE: D 439A FILE: 11 DATE: 10/28/91
REVISION: FSYS256 REV:G002 VER:2.0

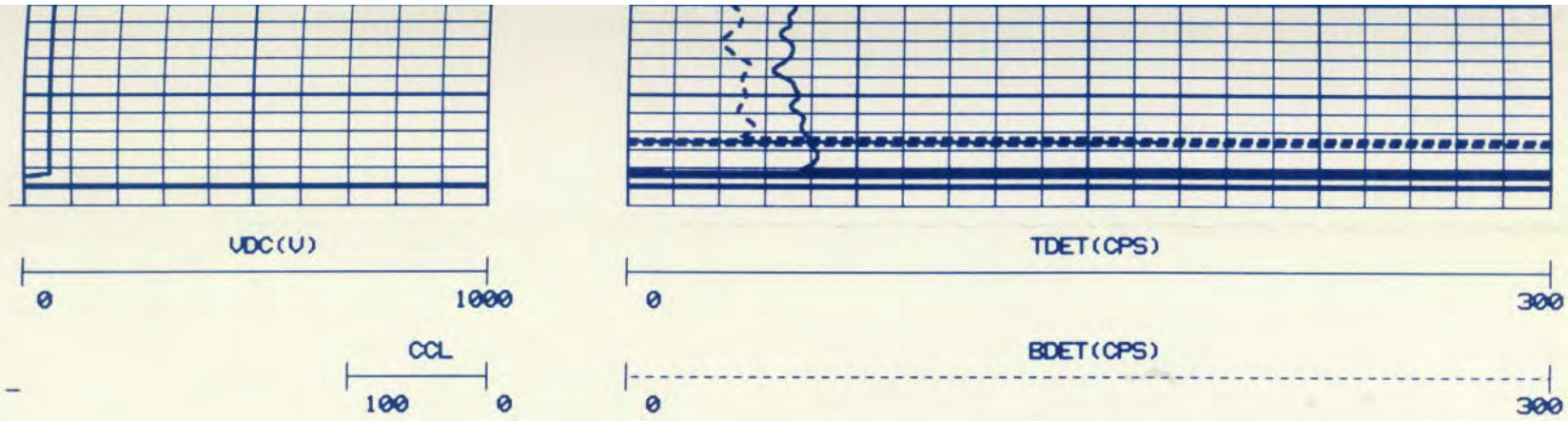
RUN: 1
TRIP: 1
TIME: 16:04:39
MODE: RECORD

UDC(V) TDET(CPS)

REVISION: FSYS256 REV:G002 VER:2.0

MODE: RECORD





FILE: 11

****
****

FILE: 10

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	3,6	FT,IN
TDET	0	FT,IN
CCL	7,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

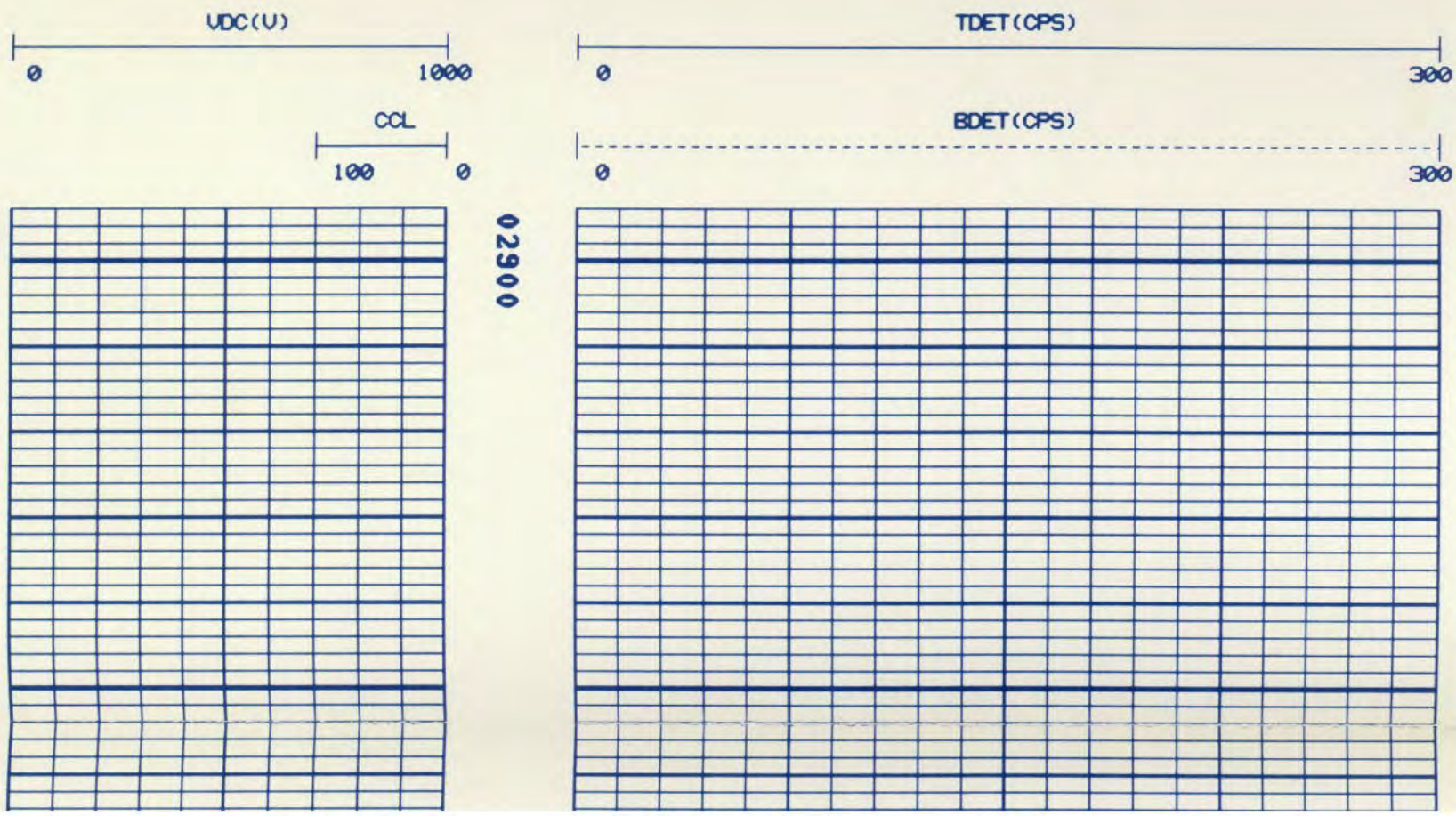
*** NONE ***

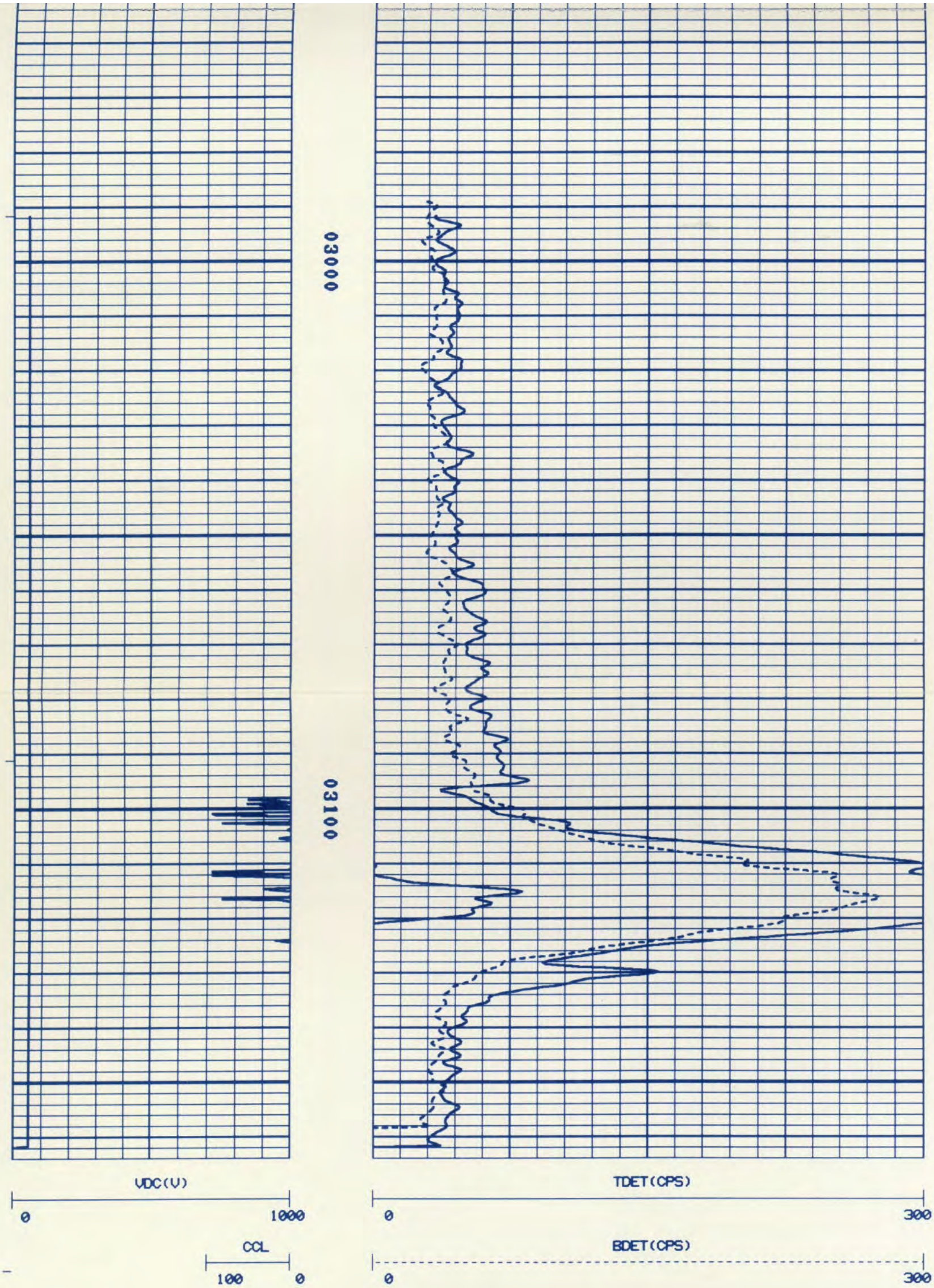
DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION
WELL NAME: EFFLUENT DISPOSAL WELL NO. 3
SERVICE: D 439A FILE: 10 DATE: 10/28/91
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1
TRIP: 1
TIME: 16:01:09
MODE: RECORD





FILE: 10

FILE: 9

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	3.6	FT.IN

CURVE	PHYS. DELAY	UNITS
BDET	3,6	FT,IN
TDET	0	FT,IN
CCL	7,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

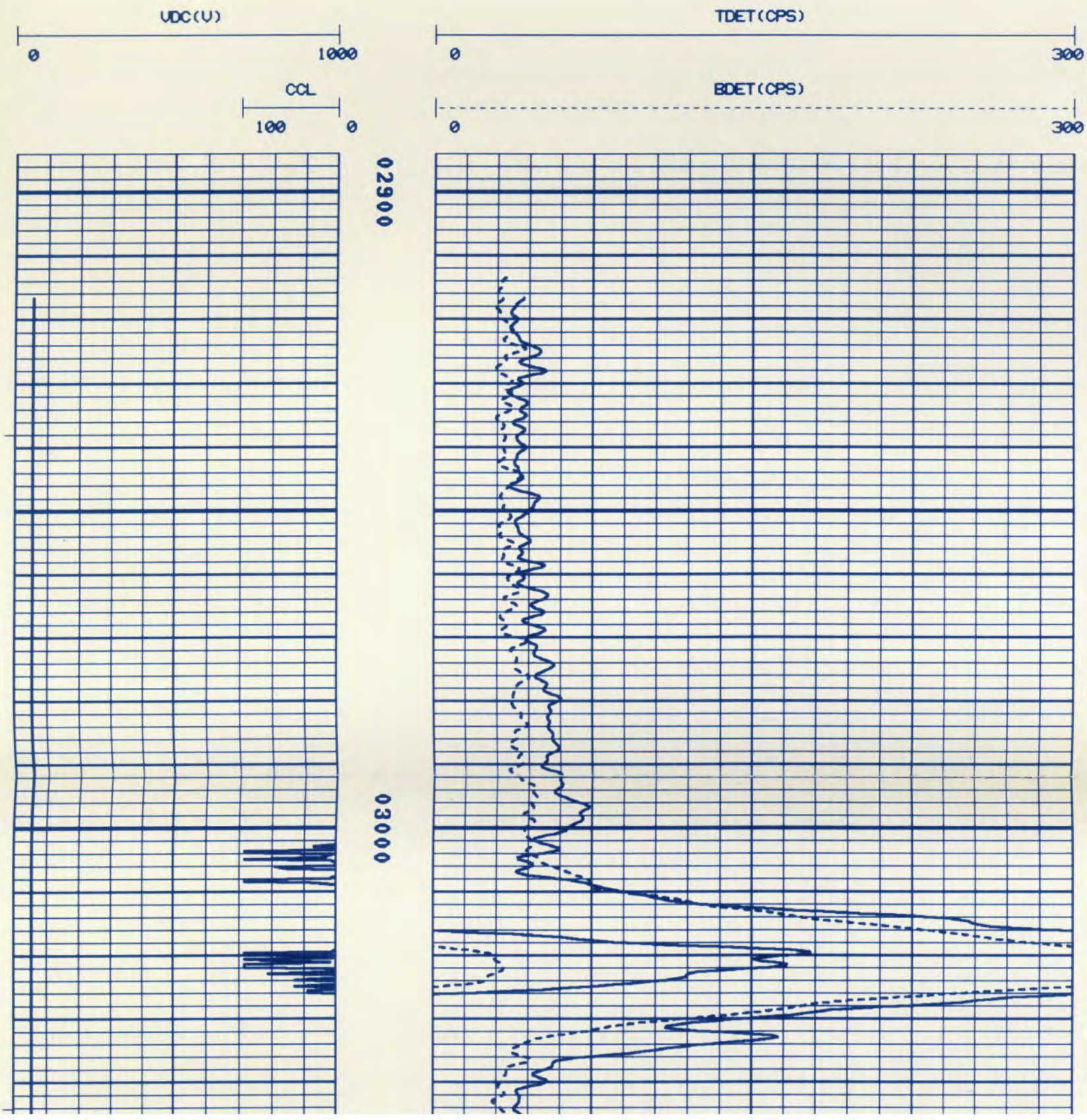
*** NONE ***

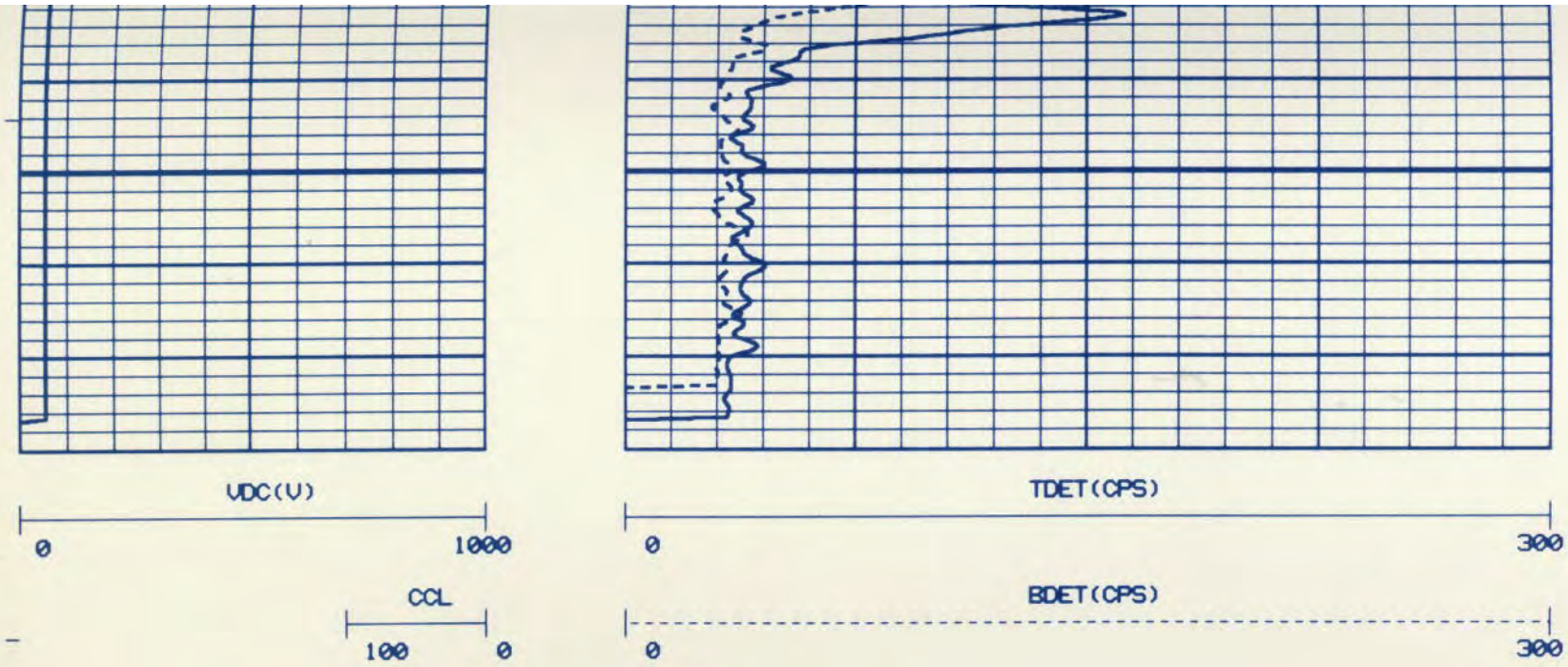
COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 3 TRIP: 1

SERVICE: D 439A FILE: 9 DATE: 10/28/91 TIME: 15:58:22

REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD





FILE: 9

****

FILE: 8

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	3,6	FT,IN
TDET	0	FT,IN
CCL	7,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

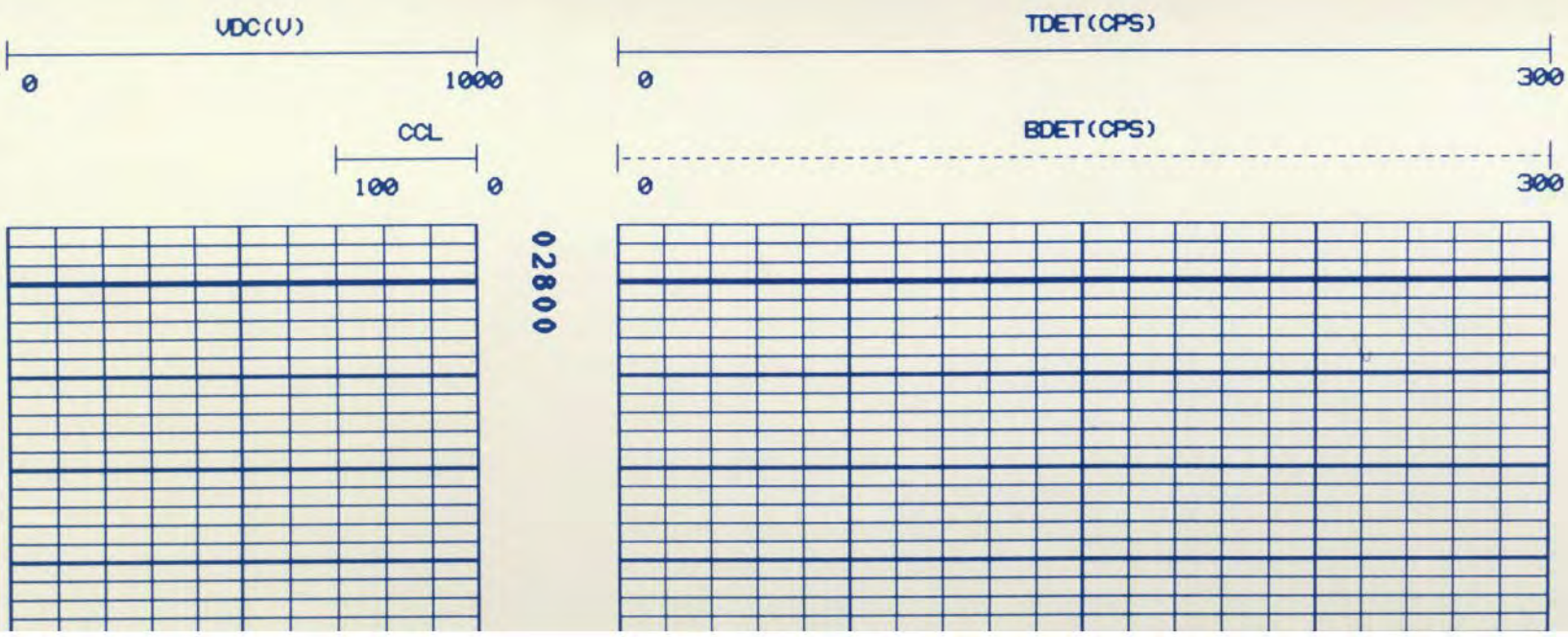
*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

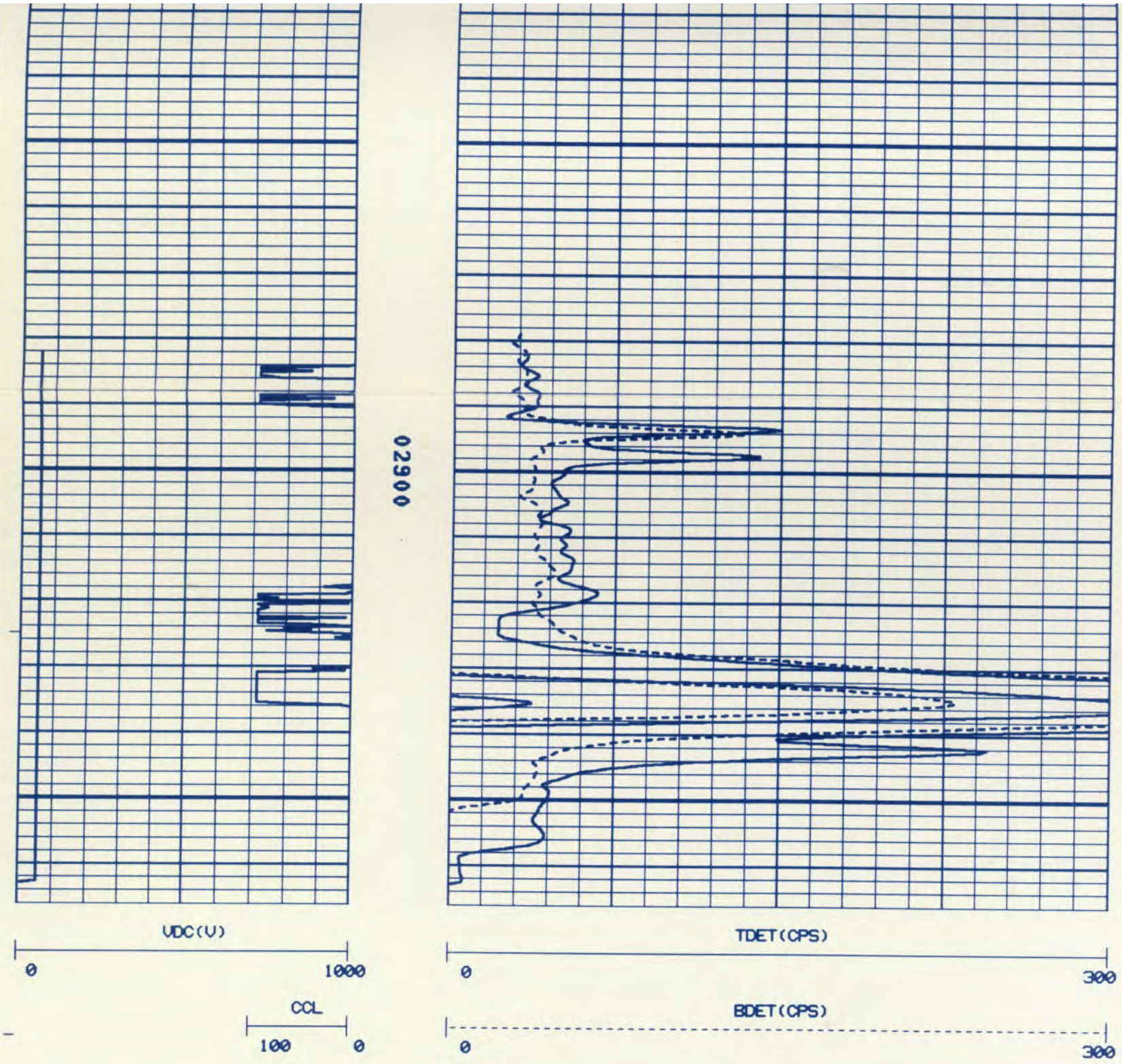
WELL NAME: EFFLUENT DISPOSAL WELL NO. 3 TRIP: 1

SERVICE: D 439A FILE: 8 DATE: 10/28/91 TIME: 15:56:19

REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD



02800



FILE: 8

****

5 MIN. STAT CHECK
READING AT 3170'

****

FILE: 1

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	3,6	FT,IN
TDET	0	FT,IN
CCL	7,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 3

SERVICE: D 439A FILE: 1 DATE: 10/28/91

REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 15:03:04

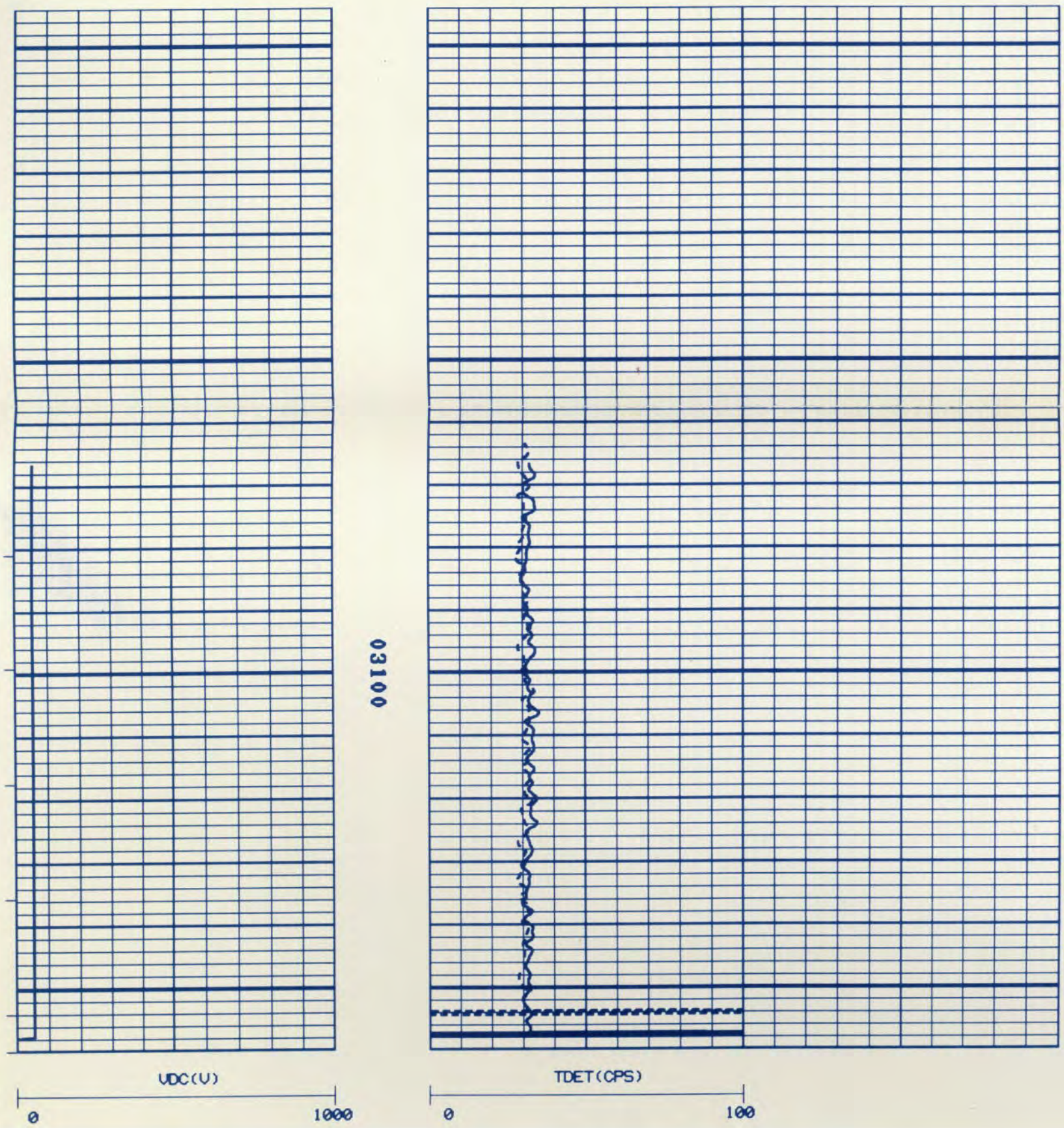
MODE: RECORD

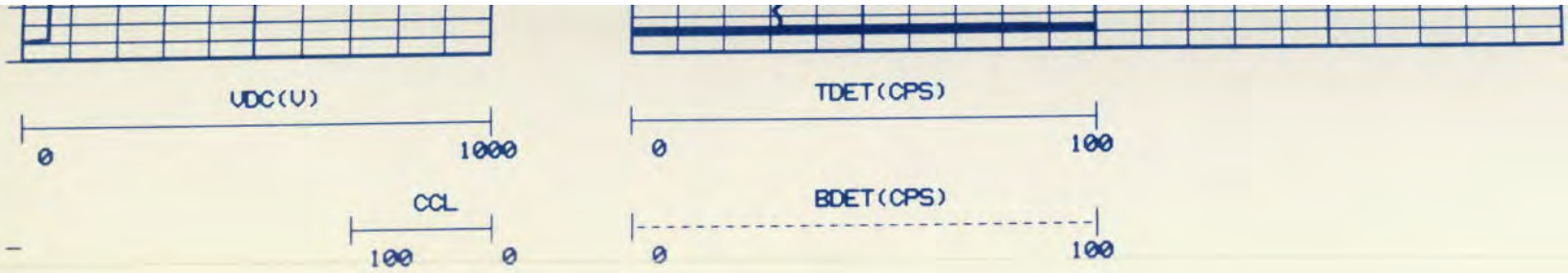
VDC(V) 0 1000

CCL 100 0

TDET(CPS) 0 100

BDET(CPS) 0 100





FILE: 1

****

5" MAIN LOG
GR BASE LOG

****

FILE: 2

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
GR	0	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORTATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 3

SERVICE: F 372B FILE: 2 DATE: 10/28/91

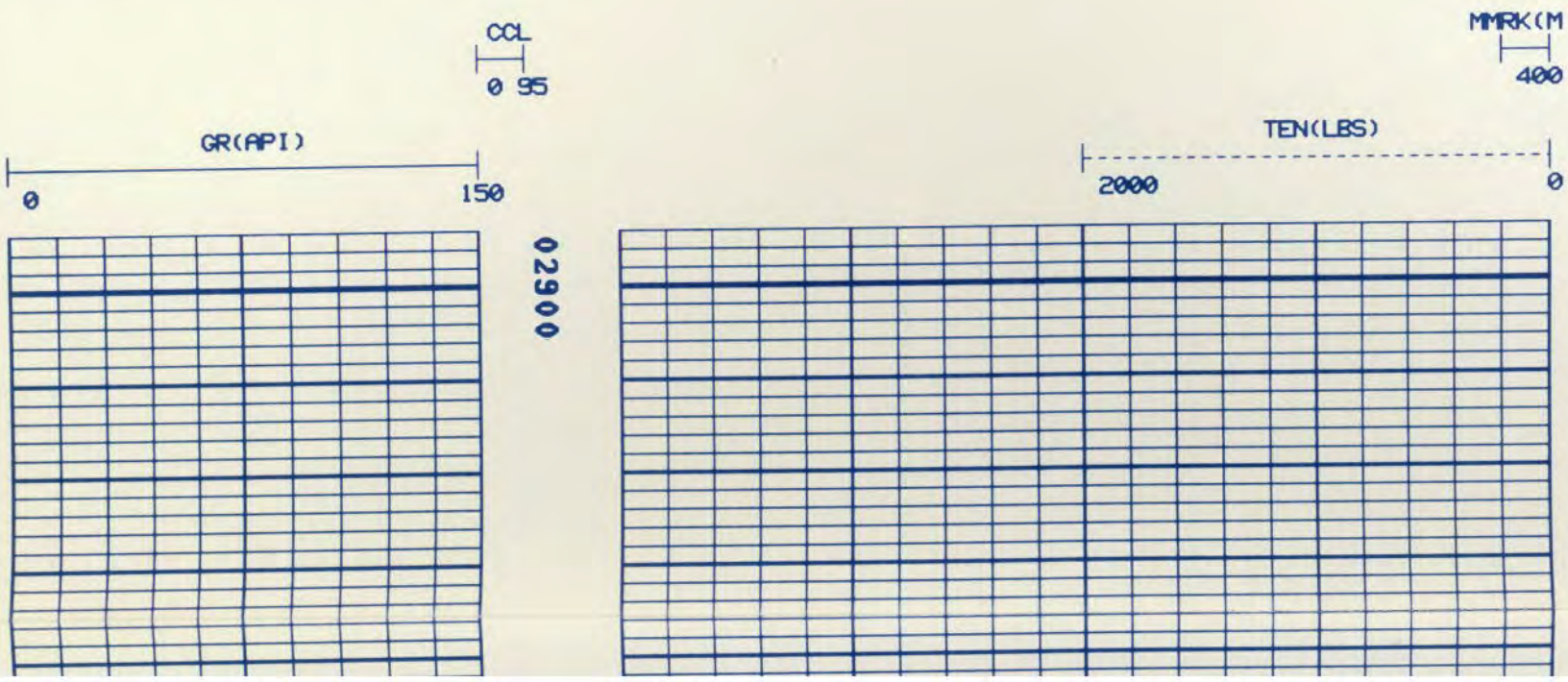
REVISION: FSYS256 REV:G002 VER:2.0

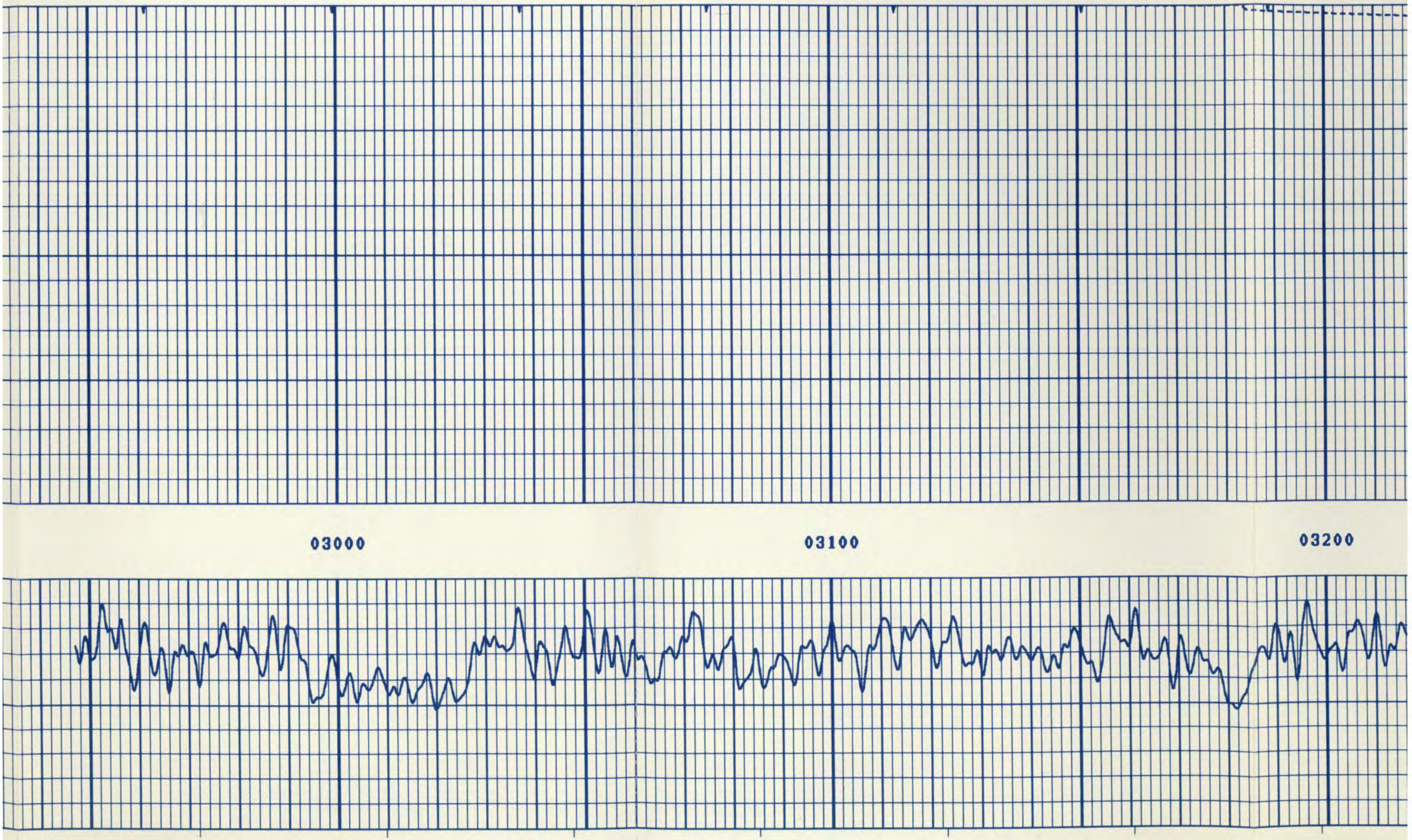
RUN: 1

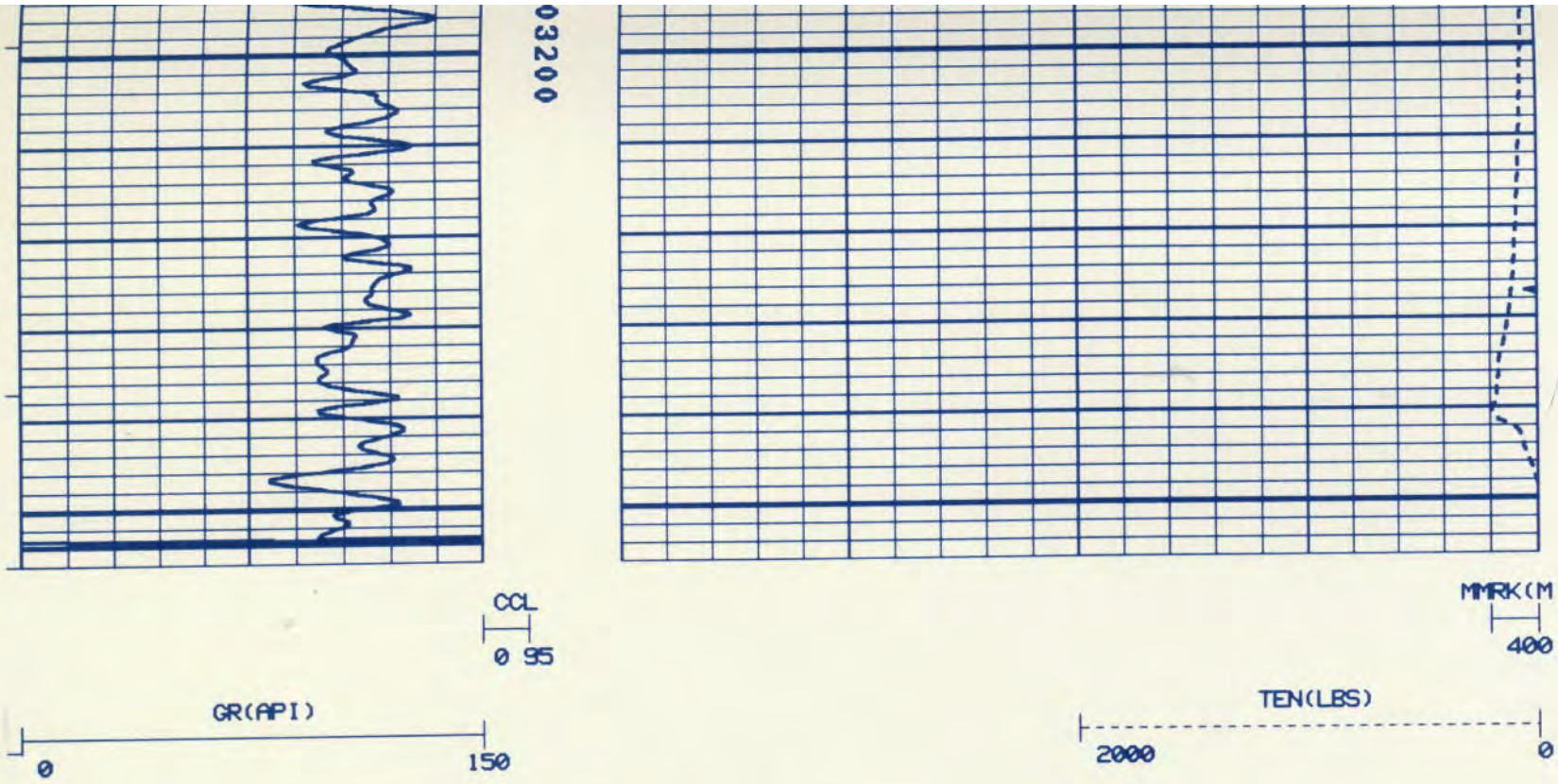
TRIP: 1

TIME: 14:45:01

MODE: RECORD




03000
03100
03200



FILE: 2

****

REPEAT SECTION

****

FILE: 1

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
GR	0	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORTATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 3

SERVICE: F 372B FILE: 1 DATE: 10/28/91

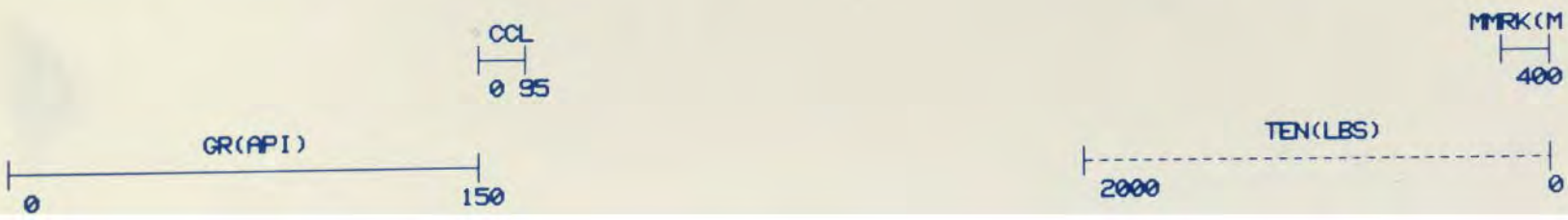
REVISION: FSYS256 REV:G002 VER:2.0

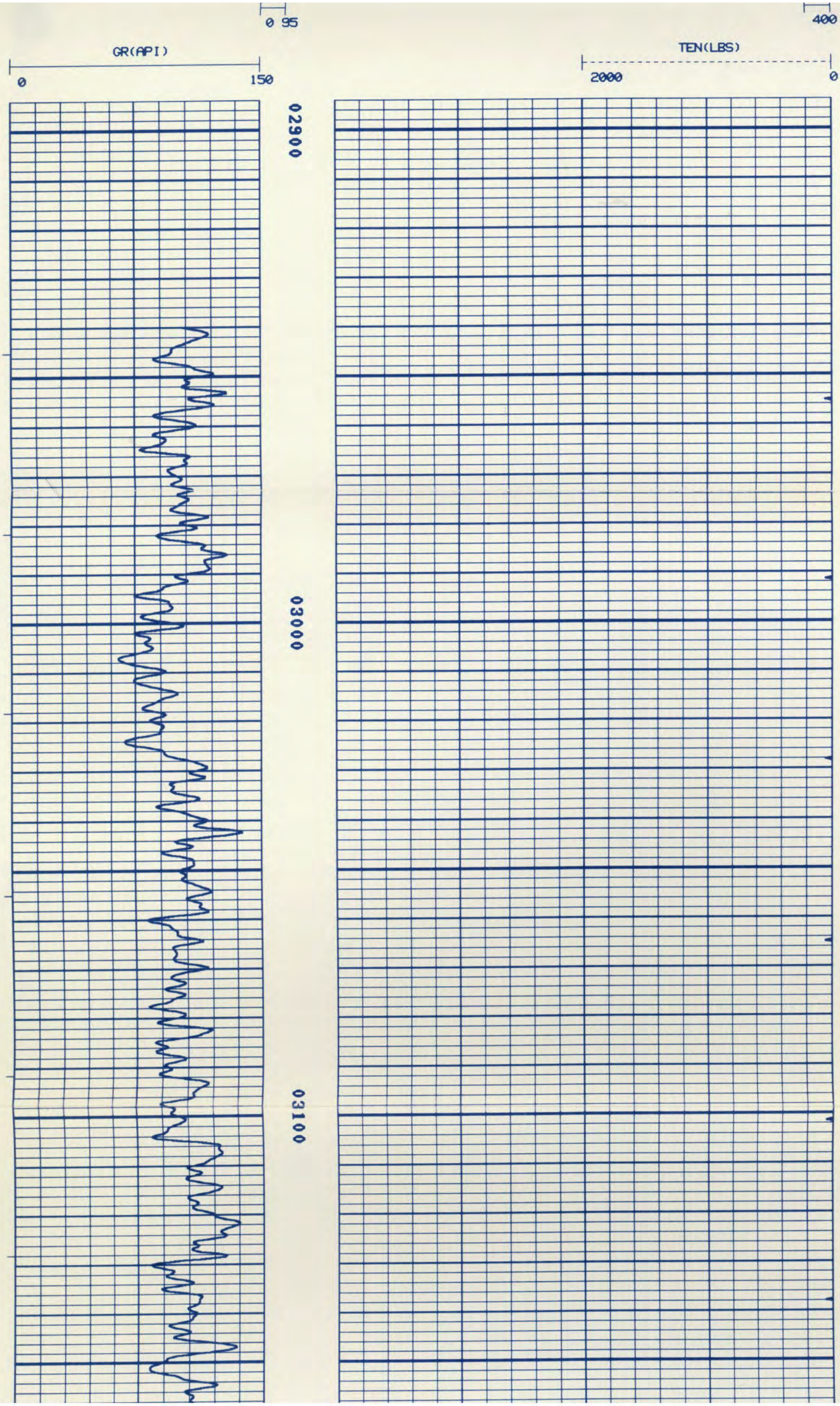
RUN: 1

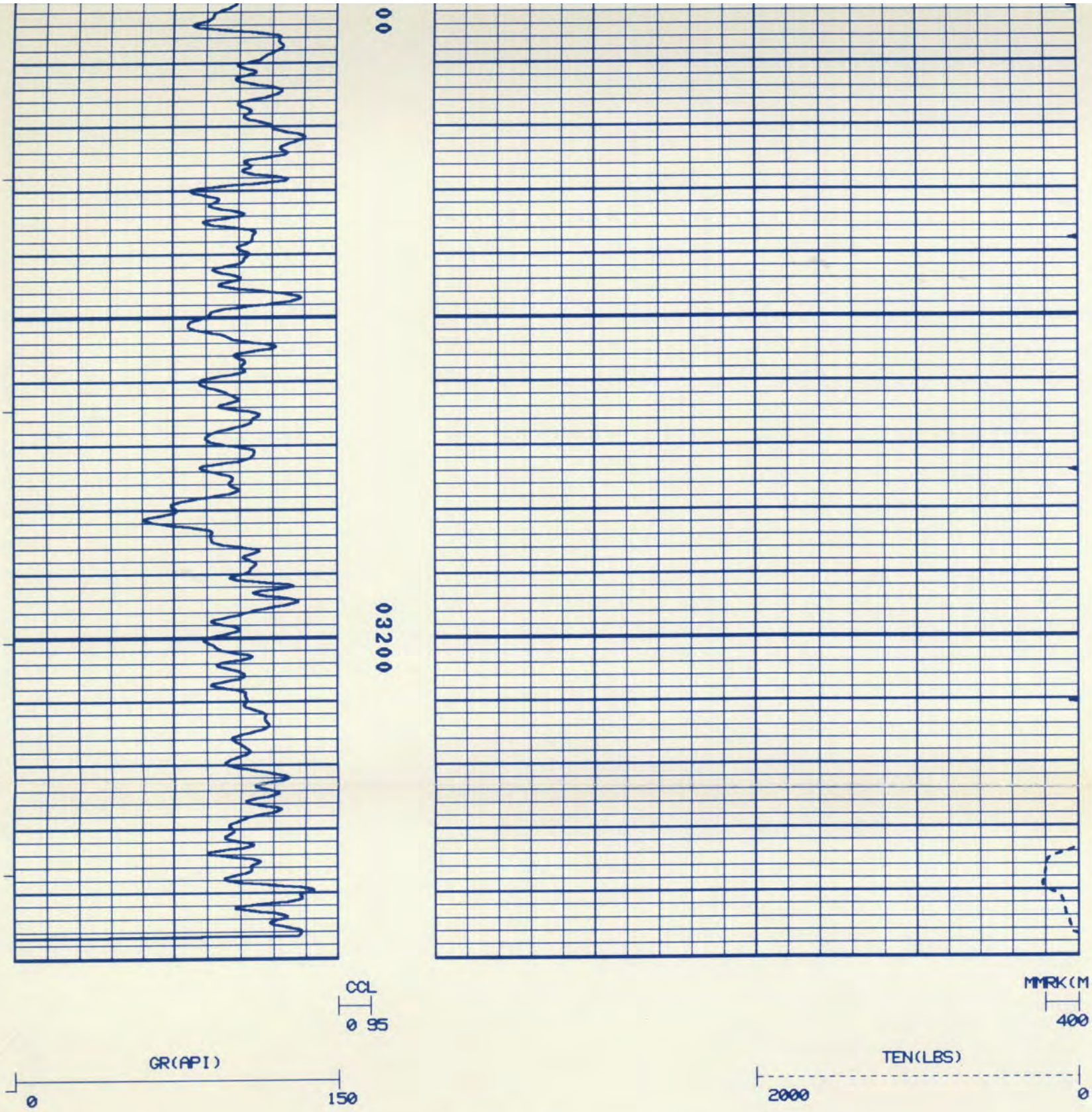
TRIP: 1

TIME: 14:30:20

MODE: RECORD




0 95
GR(API)
0
150
02900
03000
03100
400
TEN(LBS)
2000
0



FILE: 1

****

APPENDIX B
ANNULUS PRESSURE TEST WDW-32 (WELL #3)

APPENDIX C
RADIOACTIVE TRACER SURVEY ANALYSIS
WDW-14 (WELL #2)

EVALUATION OF RADIOACTIVE TRACER SURVEY
INJECTION WELL NO. 2
WDW-14

LOG DATA

Date Run:	October 29, 1991
Logging Service Company	Western Atlas International
Tubing Size and Depth Set	5 1/2"
Packer Depth	3162' (log measured depth)
Casing Size and Depth:	9 5/8" set at TD'

RUN 1 - BASELINE GAMMA-RAY LOG

This baseline G/R log was run from 3466'± to 2800'±. The purpose of the initial baseline G/R log is to demonstrate repeatability of the logging tools. A comparison of both baseline G/R runs shows good repeatability between the two runs.

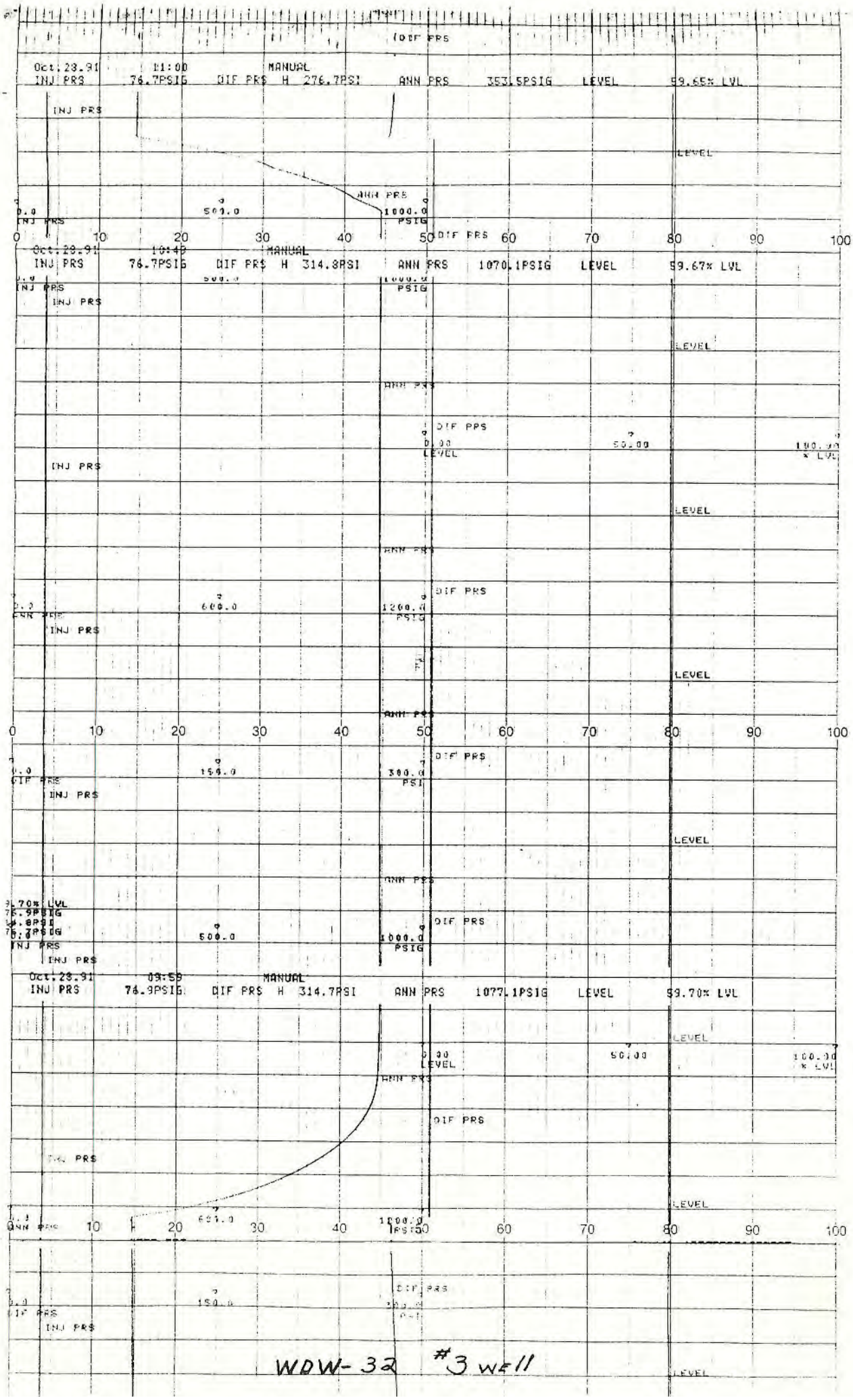
BEFORE SURVEY BASELINE GAMMA-RAY LOG 2

A baseline G/R was run from 3474'± to 2800'±. The log is useful for the following comparisons against additional RAT logging runs.

1. The G/R curves are used as depth control points against other runs during the RAT.
2. The baseline G/R is compared against the final G/R log to check for anomaly areas that could indicate upward migration along a cement channel.

STATISTICAL CHECK NO. 1

A ten minute statistical check was performed with the logging tool set at 3150'± while pumping at 20 gallons per minute (gpm). The purpose of the statistical check is to identify the magnitude of variations in the recording equipment. This information is used to identify an anomaly area. For example, for an area to show an anomaly, the G/R reading must be greater than the maximum variation of the statistical check. The maximum variation is estimated to be 1/2 of a log division.


DIF PRS
Oct.28.91 11:00 MANUAL
INJ PRS 76.7PSIG DIF PRS H 276.7PSI ANN PRS 3531.5PSIG LEVEL 59.65% LVL
INJ PRS
LEVEL
ANN PRS
0.0 500.0 1000.0
PSIG
0 10 20 30 40 50 60 70 80 90 100
Oct.28.91 10:40 MANUAL
INJ PRS 76.7PSIG DIF PRS H 314.8PSI ANN PRS 1070.1PSIG LEVEL 59.67% LVL
INJ PRS
PSIG
LEVEL
ANN PRS
DIF PRS
0.00 50.00 100.00
LEVEL
% LVL
INJ PRS
LEVEL
ANN PRS
DIF PRS
0.0 600.0 1200.0
PSIG
INJ PRS
LEVEL
ANN PRS
0 10 20 30 40 50 60 70 80 90 100
DIF PRS
0.0 150.0 300.0
PSI
INJ PRS
LEVEL
ANN PRS
DIF PRS
500.0 1000.0
PSIG
INJ PRS
Oct.28.91 09:59 MANUAL
INJ PRS 76.9PSIG DIF PRS H 314.7PSI ANN PRS 1077.1PSIG LEVEL 59.70% LVL
LEVEL
0.00 50.00 100.00
LEVEL
% LVL
ANN PRS
DIF PRS
INJ PRS
LEVEL
0.0 500.0 1000.0
ANN PRS PSI
0 10 20 30 40 50 60 70 80 90 100
DIF PRS
0.0 150.0 300.0
DIF PRS PSI
INJ PRS
LEVEL

WDW-32 #3 WELL

g. Pass 7 - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3235'±. The slug has moved downward 25'± since pass 6 and 285'± since pass 1. The radioactive slug has spread slightly.

h. Pass 8 - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3250'±. The slug has moved downward 15'± since pass 7 and 300'± since pass 1. No upward migration is noted.

i. Pass 9 - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3270'±. The slug has moved downward 20'± since pass 8 and 320'± since pass 1.

j. Pass 10 - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3294'±. The slug has moved downward 24'± since pass 9 and 344'± since pass 1.

k. Pass 11 - The main body of the radioactive slug is in the 9 5/8" casing. The slug was recorded with its peak at 3322'±. The slug has moved downward 28'± since pass 10 and 372'± since pass 1.

l. Pass 12 - The main body of the radioactive slug is in the 9 5/8" casing near the top of the permitted injection interval. The slug was recorded with its peak at 3350'±. The slug has moved downward 28'± since pass 11 and 400'± since pass 1.

m. Pass 13 - The main body of the radioactive slug is in the 9 5/8" casing in the permitted injection interval. The slug was recorded with its peak at 3368'±. The slug has moved downward 18'± since pass 12 and 418'± since pass 1. The slug shape indicates that tracer material is being injected into the adjacent sands.

n. Pass 14 - The main body of the radioactive slug is in the 9 5/8" casing in the permitted injection interval. The slug was recorded with its peak at 3390'±. The slug has moved downward 22'± since pass 13 and 440'± since pass 1. The slug shape indicates that tracer material is being injected into the adjacent sands.

A radioactive slug was released at 3335'± and the recording done on a time drive basis. Fluid is pumped into the well at 100 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3335') for 30 minutes. Since the slug is released above the detector, its passage is indicated on the log. Pumping is continued for the remainder of the 30 minute period while recording. No second G/R peak was detected and as such no upward migration was detected.

AFTER SURVEY BASELINE GAMMA-RAY LOG

Immediately after the secondary stationary survey, the logging tool was lowered to 3350'± and an after survey baseline G/R log was recorded. The purpose of this log is to compare it with the before survey baseline G/R log to look for anomaly areas. These areas would appear as "hot spots" or areas in which the G/R readings have been elevated above background levels. A comparison between the before and after baseline G/R logs indicates the following:

1. The spike indicated at 3334'± is residual tracer material left on the casing following the two stationary readings. A similar response was noticed on the previous radioactive tracer survey run one year ago.

2. The interval extending from 3170'± to 3350'± has elevated radioactivity readings over the initial baseline log. This interval corresponds to the 9 5/8" casing immediately below the packer. The best explanation is that the pipe scale that has accumulated in this interval has a affinity for the radioactive tracer. This results in a very small portion of the tracer sticking to the casing wall.

SECOND AFTER SURVEY BASELINE GAMMA-RAY LOG

The second baseline gamma-ray survey had almost identical results as the run described above.

Western Atlas International
A Litton/Dresser Company

ATLAS WIRELINE SERVICES

November 21, 1991

Golden Strata Services, Inc.
Suite 1600
711 Louisiana
Houston, TX 77002

ATTN: Bob Hall

SUBJ: Log Interpretation of Effluent Disposal Well #2
as per telephone request by Freeman Hill, III

Dear Mr. Hall:

This is an interpretation of the Radioactive Tracer Survey run on October 29, 1991 at the Bay City Celanese Plant on the Effluent Disposal Well #2.

A Gamma Ray Base Log was run for depth correlation and to obtain the normal radioactivity of the downhole environment. This information also acts as a baseline for the After Log Survey.

Statistical checks were done in the top and bottom detectors to establish stability of the logging tools. This check verifies that the tool was stable and in good condition.

1st Injection Pass: Files 3-19
Radioactive Iodine was injected into the wellbore with a pump rate of 20 gpm at a depth of 2950' and was first detected moving downhole at 2980'. The radioactive material was followed downhole with sequential passes (files 3-15) showing that the mechanics of the well were in proper working order down to a depth of 3370'. Each pass shows some residual material being left scattered throughout the casing below the packer, probably due to the heavy build-up of scale in the casing. At 3370' (File 16), the radioactive material shows to be decreasing in intensity and being pumped away into formation. This depth was verified with three more consecutive passes (Files 17-19).

2nd and 3rd Injection Passes: Files 20 & 21
The pump rate was increased to 100 gpm and a three minute stationary statistical check was recorded at 3335'; showing that there was not any radioactive material present in the wellbore. Then the isotope was introduced and recorded moving downhole by the tool; and a thirty minute stationary recording was made to establish that the injected fluid was not channeling up the backside of the casing (File 20). This procedure was repeated and completely agrees with the previous check (File 21).

Golden Strata Services, Inc.
November 21, 1991
Page 2

An After Log Survey check with a repeat section was run over the entire interval indicating no noticeable contamination left at or near the wellbore except at 3333', which a minute amount appears to be collected in a casing collar. The After Log Survey also shows some residual material left inside the casing due to the amount of scale build-up on the casing walls below the packer; where the turbulence is greatly decreased, thus allowing the increased build-up of scale.

In my opinion, the only problem is that the major injection point that is visible by the log is at 3370', which is above the perforations, but still within the appropriate disposal zone.

Regards,

David Hubble

David Hubble
Sr. Completion Eng.

DH/cd

Note:
Well #2 was perforated from 3,254'-3,414' @ 4 spf on March 31, 1980. These perforations have been added to the latest schematic.

Golden Stratasources

ATLAS WIRELINE SERVICES
Western Atlas International

NUCLEAR TRACER LOG

FILE NO.

API NO.

FINAL PRINT

COMPANY HOECHST CELANESE CORPORATION
WELL EFFLUENT DISPOSAL WELL NO. 2
FIELD CELANESE PLANT
COUNTY MATAGORDA STATE TEXAS

LOCATION:
N/A

SEC N/A TWP N/A RGE N/A

OTHER SERVICES

PERMANENT DATUM GROUND LEVEL ELEV. N/A
LOGGING MEASURED FROM K.B. 11.0 FT. ABOVE P.D.
DRILLING MEASURED FROM K.B.

ELEVATIONS
KB N/A
DF N/A
GL N/A

IN MAKING INTERPRETATIONS OF LOGS OUR EMPLOYEES WILL GIVE CUSTOMER THE BENEFIT OF THEIR BEST JUDGEMENT, BUT SINCE ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS, WE CANNOT, AND WE DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION. WE SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COST, DAMAGES, OR EXPENSES WHATSOEVER INCURRED OR SUSTAINED BY THE CUSTOMER RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR EMPLOYEES.

DATE	10/29/91	
RUN	1	
SERVICE ORDER	82442	
DEPTH-DRILLER	3500'+	
DEPTH-LOGGER	3462.0'	
BOTTOM LOGGED INTERVAL	3462.0'	
TOP LOGGED INTERVAL	2800.0'	
TYPE FLUID IN HOLE	WATER	
SALINITY PPM CL.	N/A	
DENSITY LB/GAL.	N/A	
LEVEL	FULL	
MAX. REC. TEMP. DEG. F	N/A	
OPR. RIG TIME	8.0 HRS.	
EQUIP. NO. / LOC.	H.L. 6345	EL CAMPO
RECORDED BY	HUBBLE	
WITNESSED BY	BOB HALL	

BOREHOLE RECORD

NO.	BIT	FROM	TO

FOLD HERE

CASING RECORD

SIZE	WGT	FROM	TO
5.5"T		0.0'	3162.0'
9 5/8"		0.0'	T.D.

REMARKS RUN (1)

EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	SERIES NO.	POSITION
1	1	CCL			

ACTED STUDIED LOG

AFTER SURVEY BASE LOG
FILE NOS. 6 & 7

FILE: 7

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
GR	0	FT,IN
CCL	16,9	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

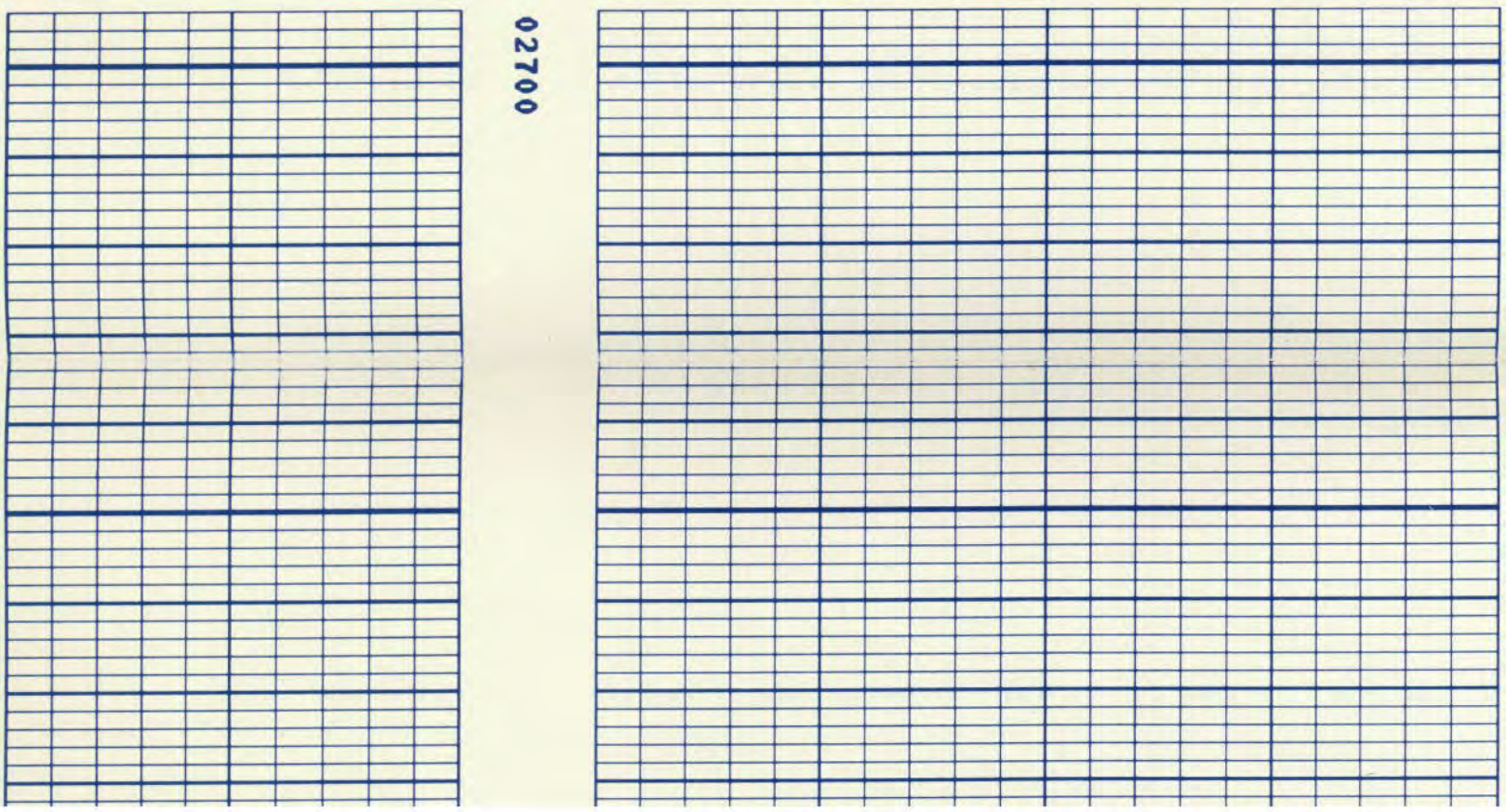
DISPLAY SCALE CHANGES

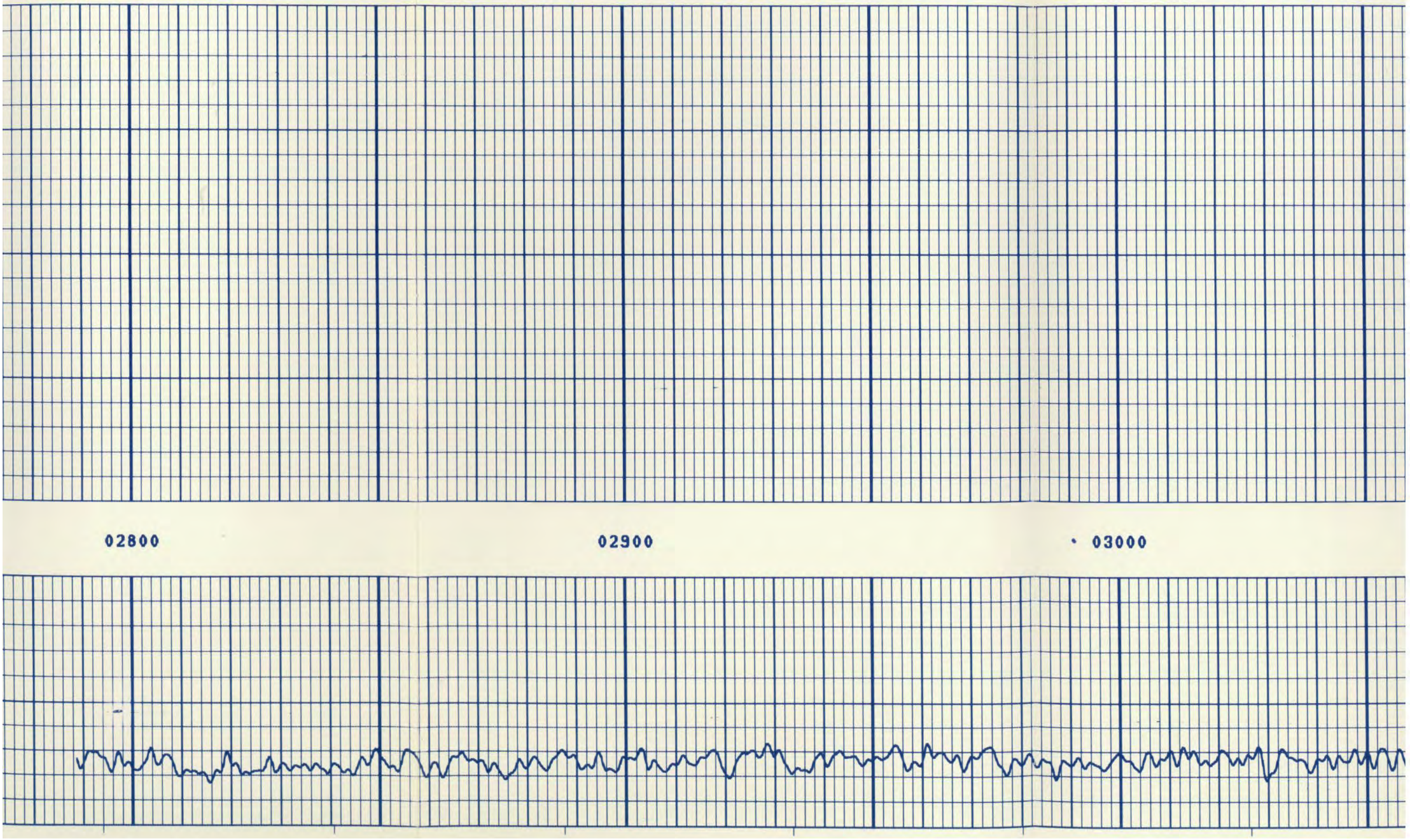
*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION
RUN: 1
WELL NAME: EFFLUENT DISPOSAL WELL NO. 2
TRIP: 1
SERVICE: D 372B FILE: 7 DATE: 10/29/91
TIME: 17:35:14
REVISION: FSYS256 REV:G002 VER:2.0
MODE: RECORD

CCL
100 0

GR(API)
150 500

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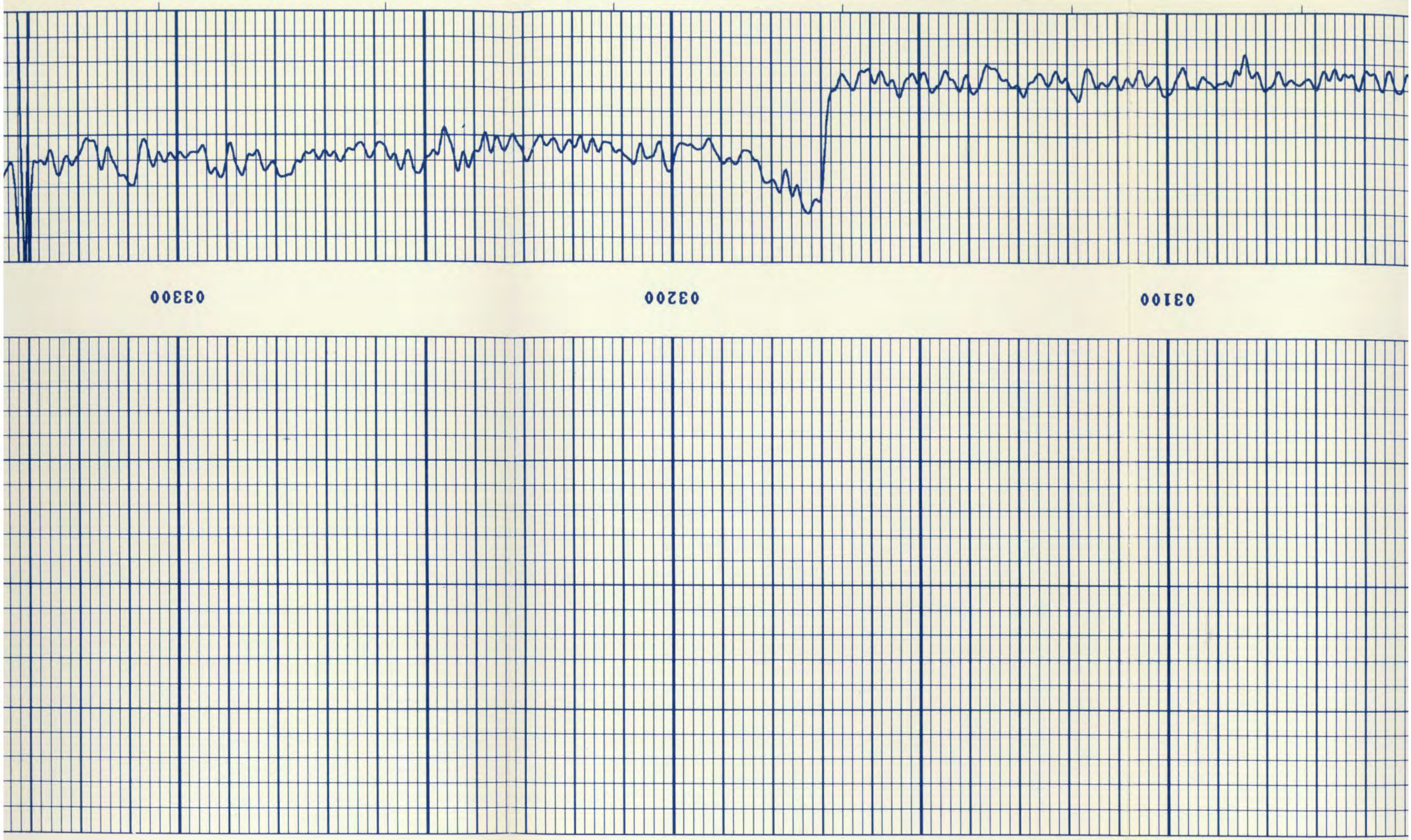
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FILE: 7

****

****

FILE: 6

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
GR	0	FT,IN
CCL	16,9	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 372B FILE: 6 DATE: 10/29/91

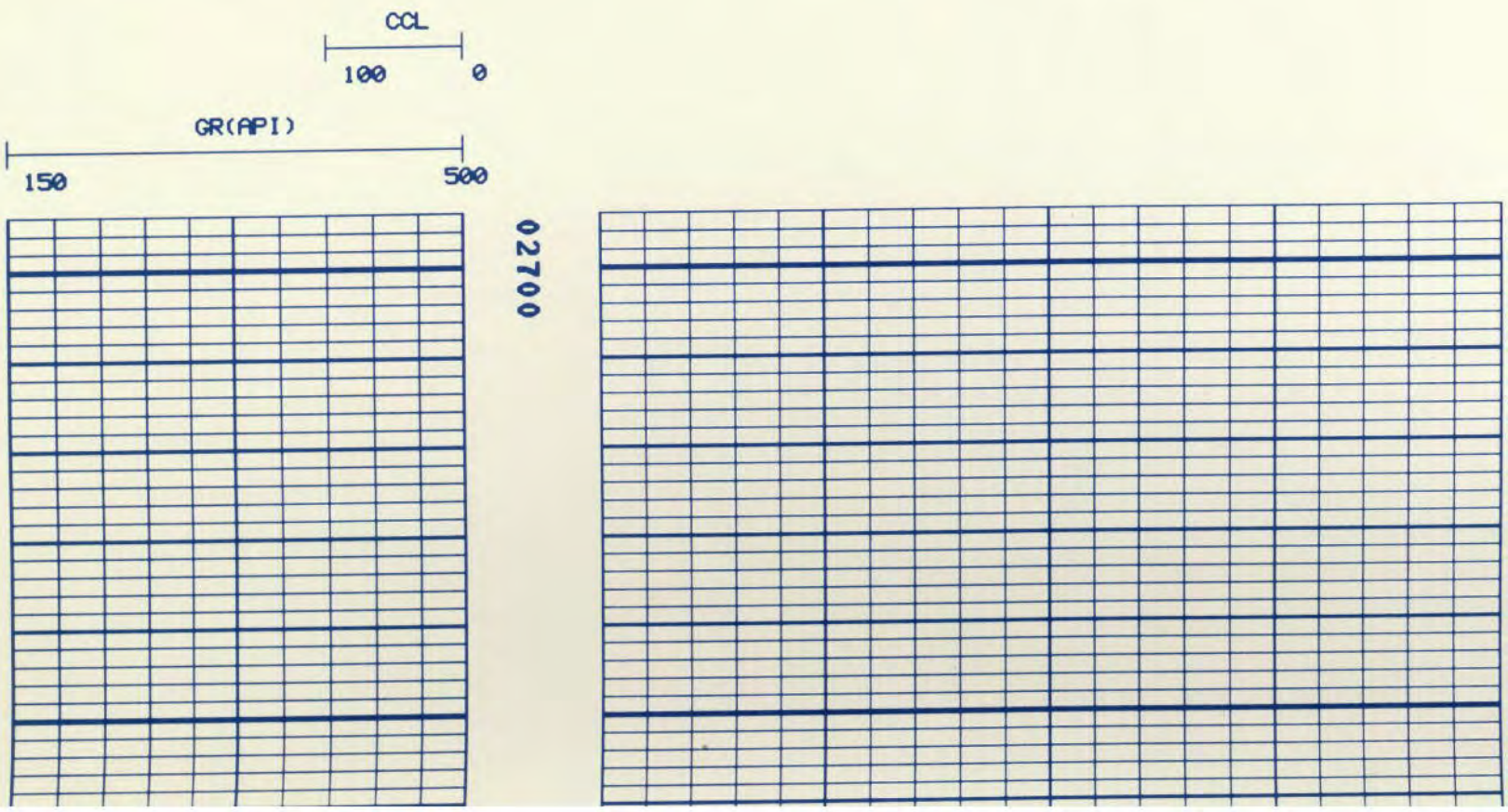
REVISION: FSYS256 REV:G002 VER:2.0

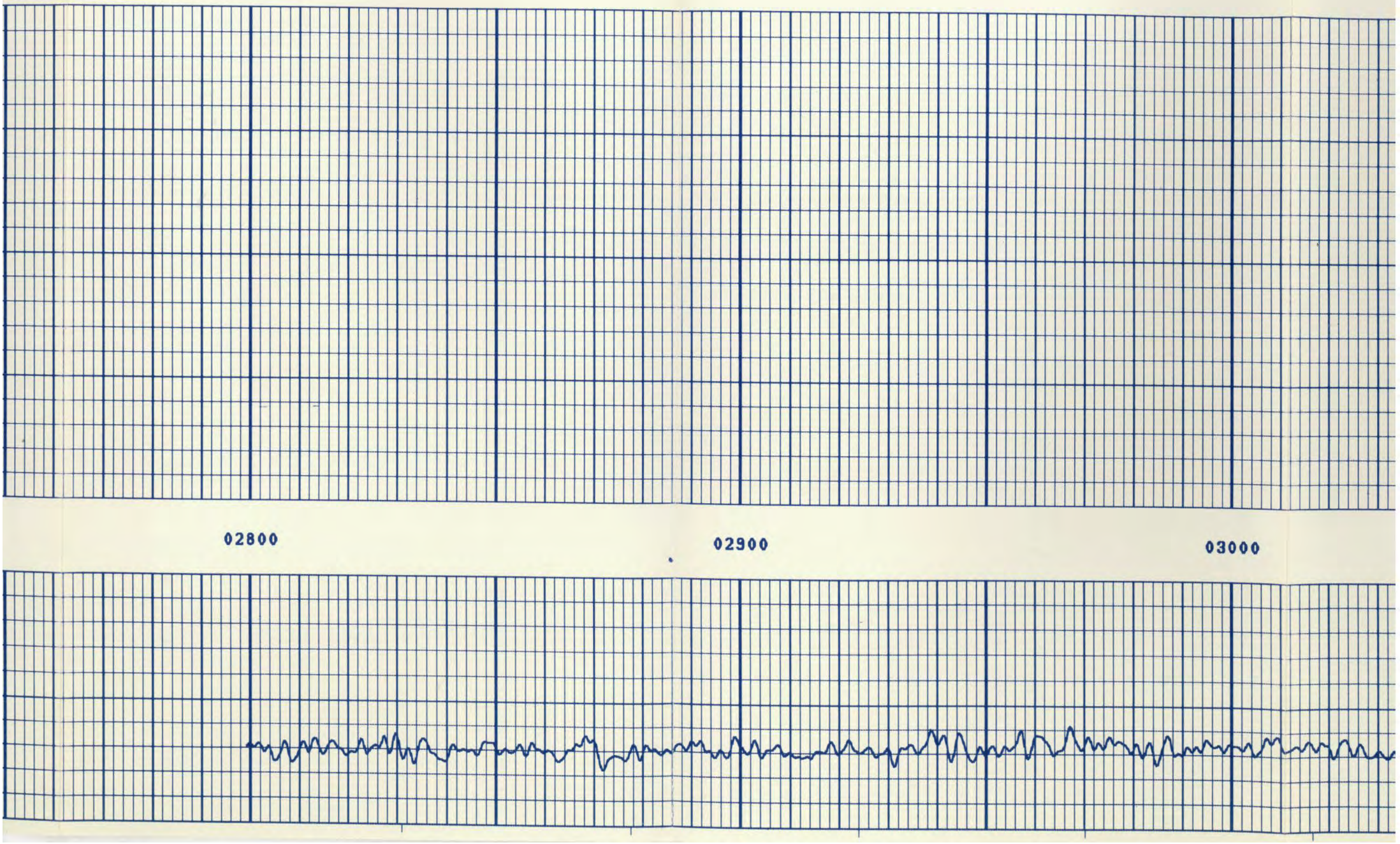
RUN: 1

TRIP: 1

TIME: 17:20:59

MODE: RECORD

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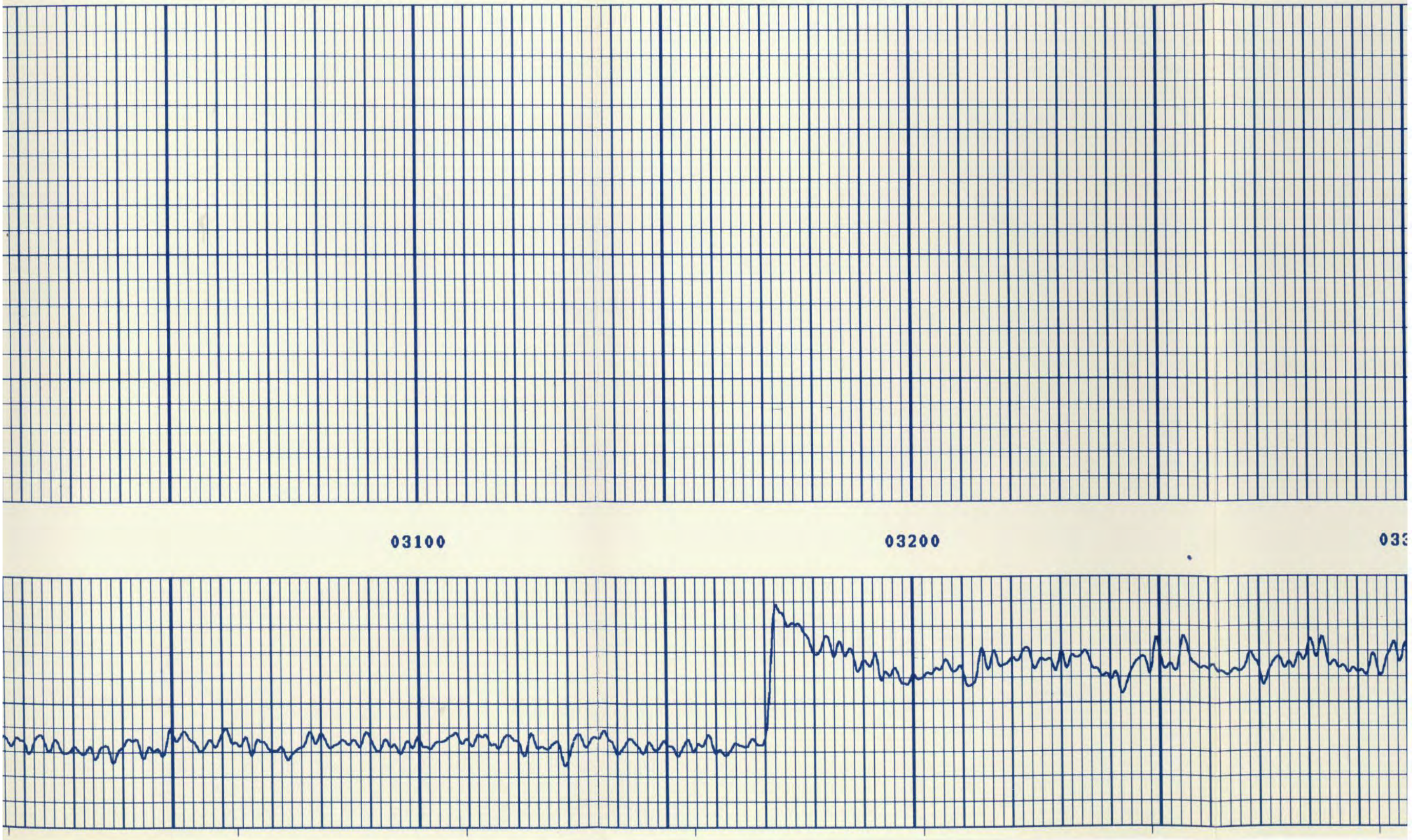
02900
03000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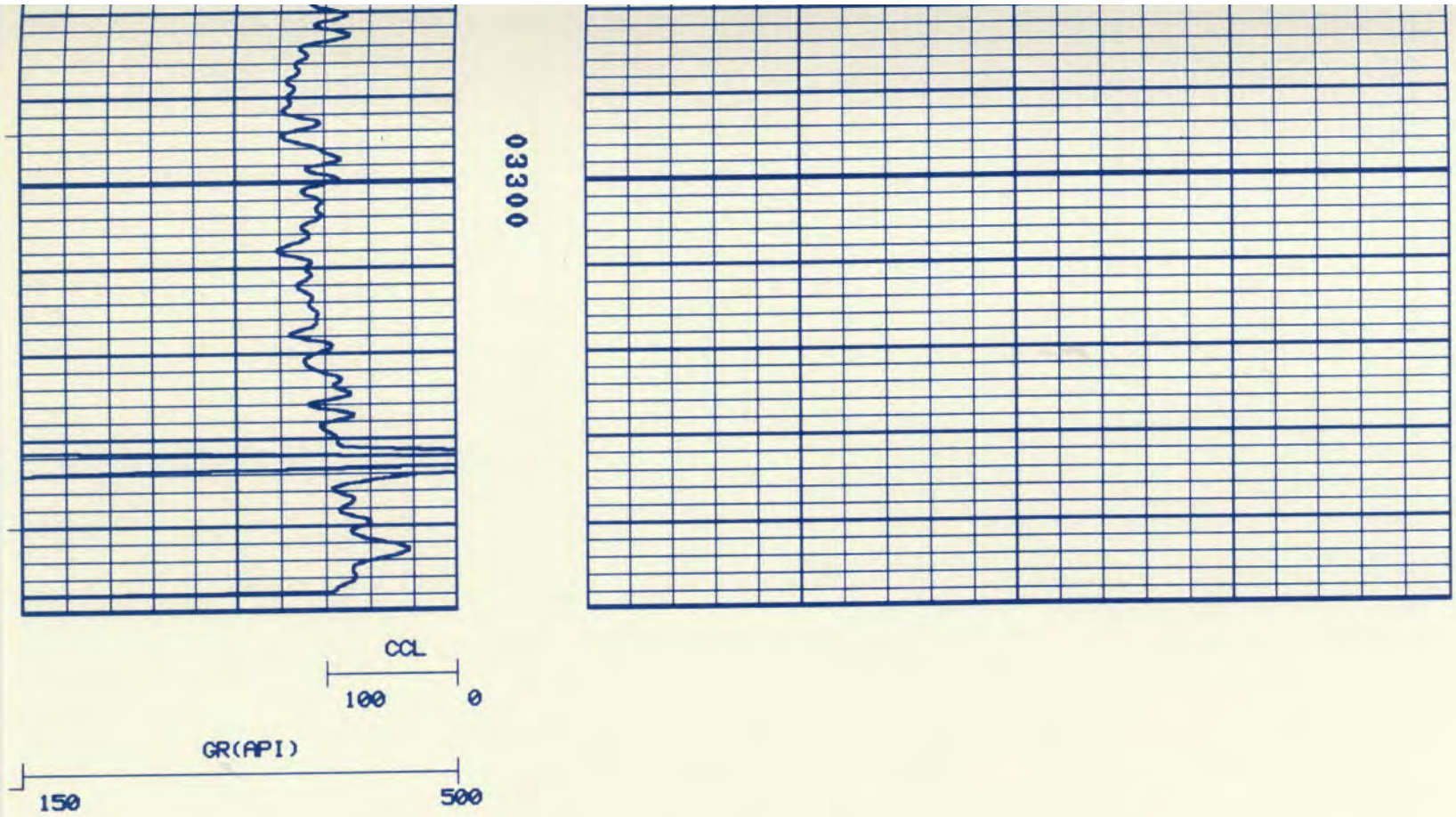
03200
033



FILE: 6

RUN STAT CHECK AT 3335'
SHOT SLUG AND RECORDED 30 MIN.
REPEATED SAME PROCEEDURE
FILES NO. 20 & 21

FILE: 21

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

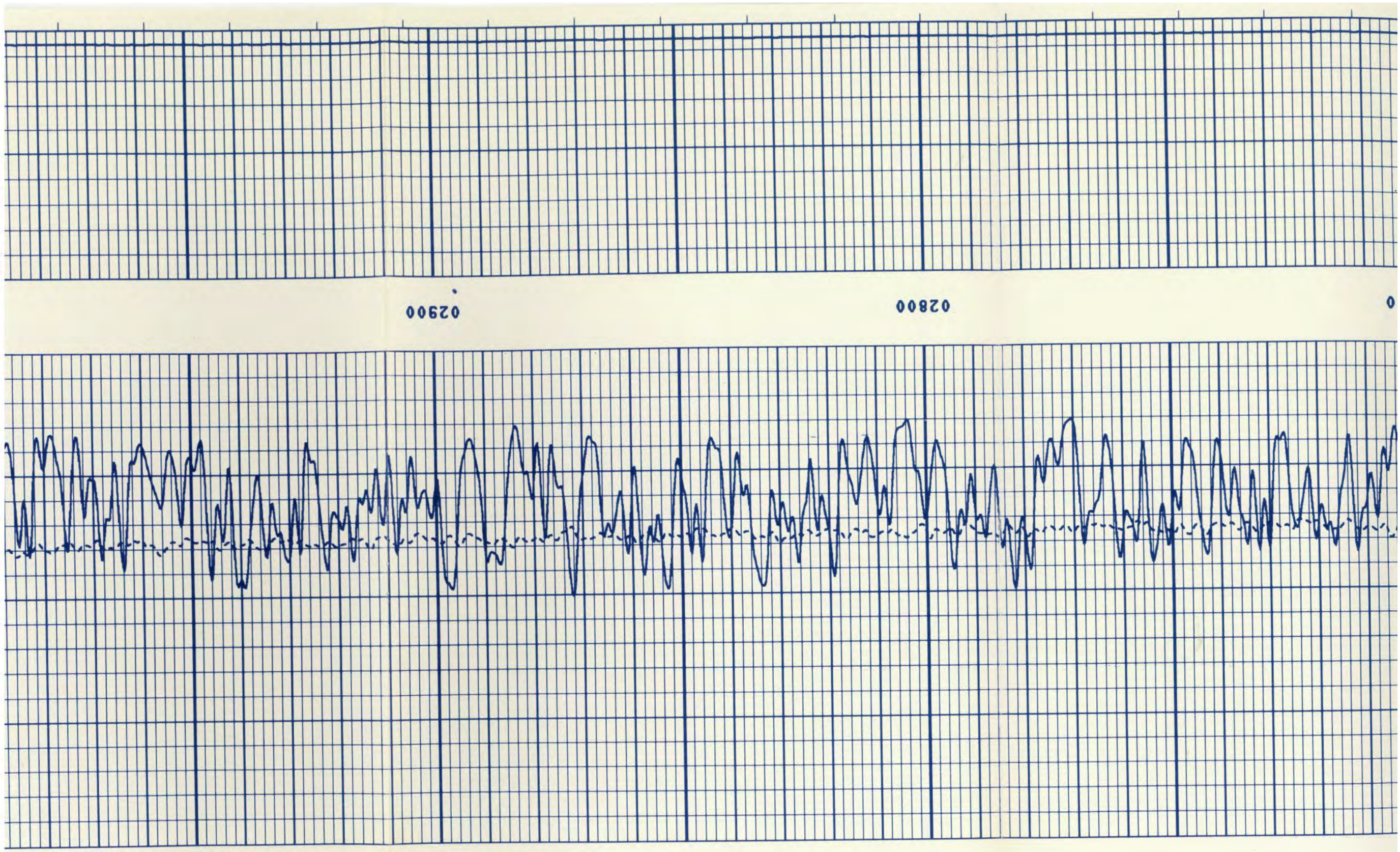
*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION
WELL NAME: EFFLUENT DISPOSAL WELL NO. 2
SERVICE: D 439A FILE: 21 DATE: 10/29/91
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1
TRIP: 1
TIME: 16:05:24
MODE: RECORD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02800
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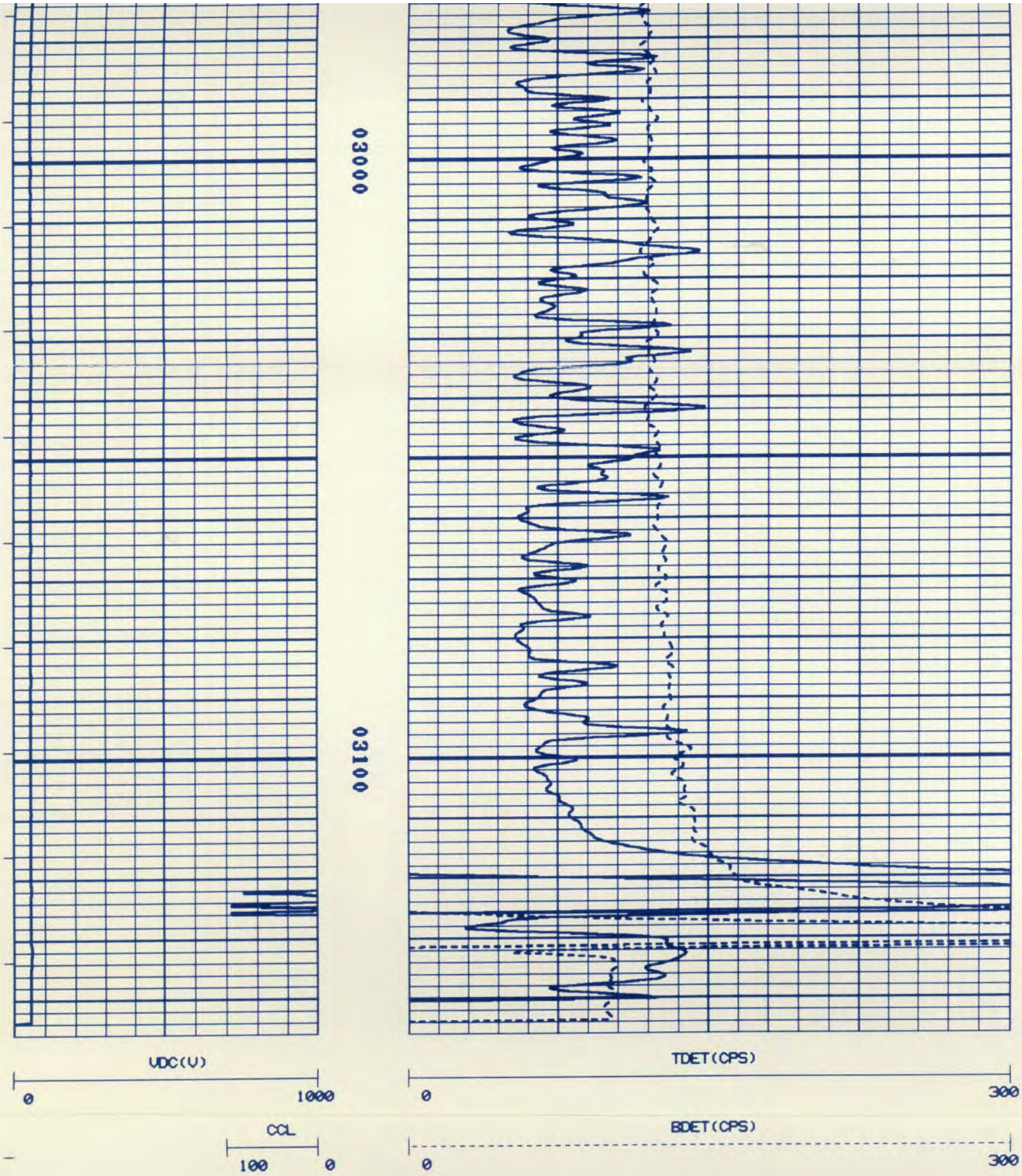
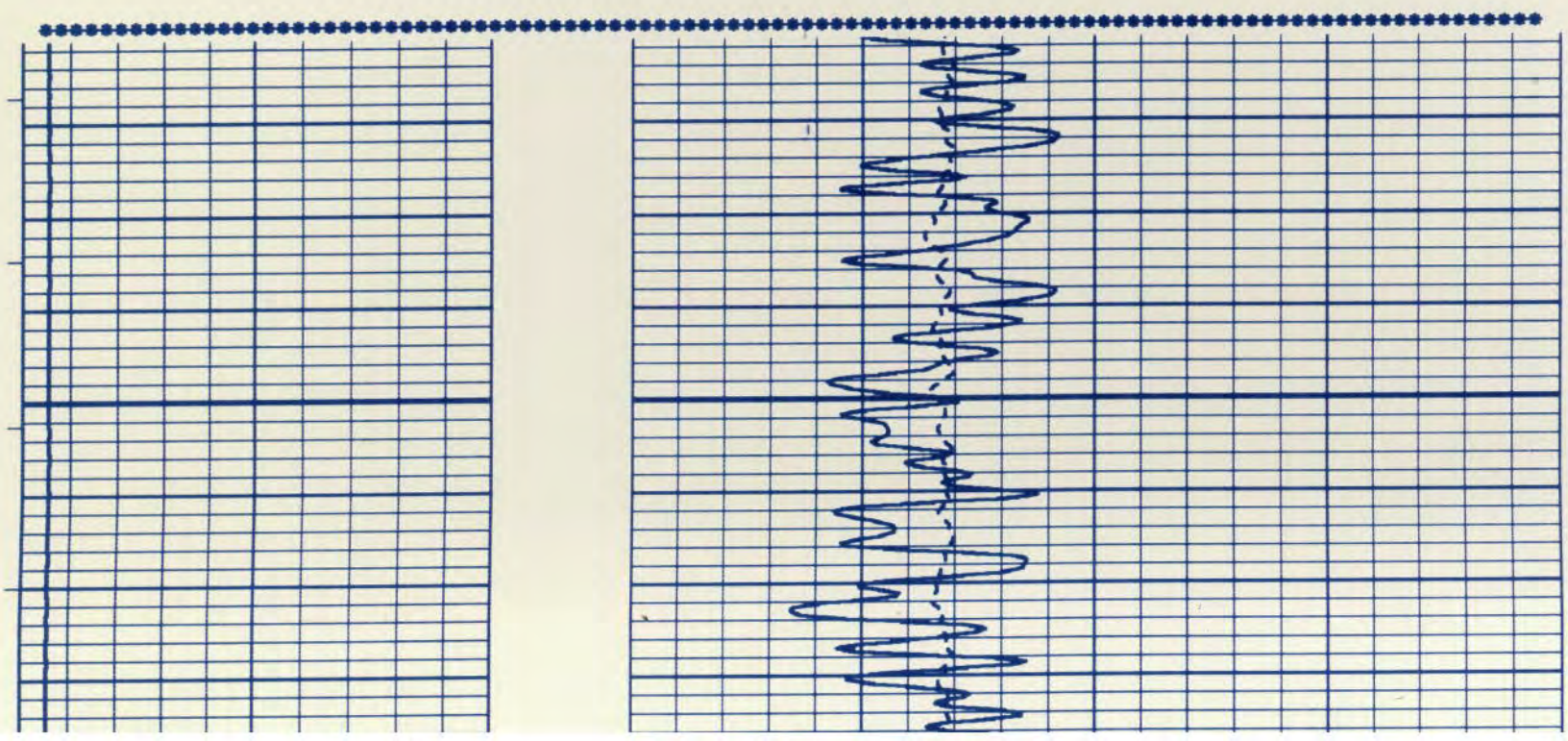
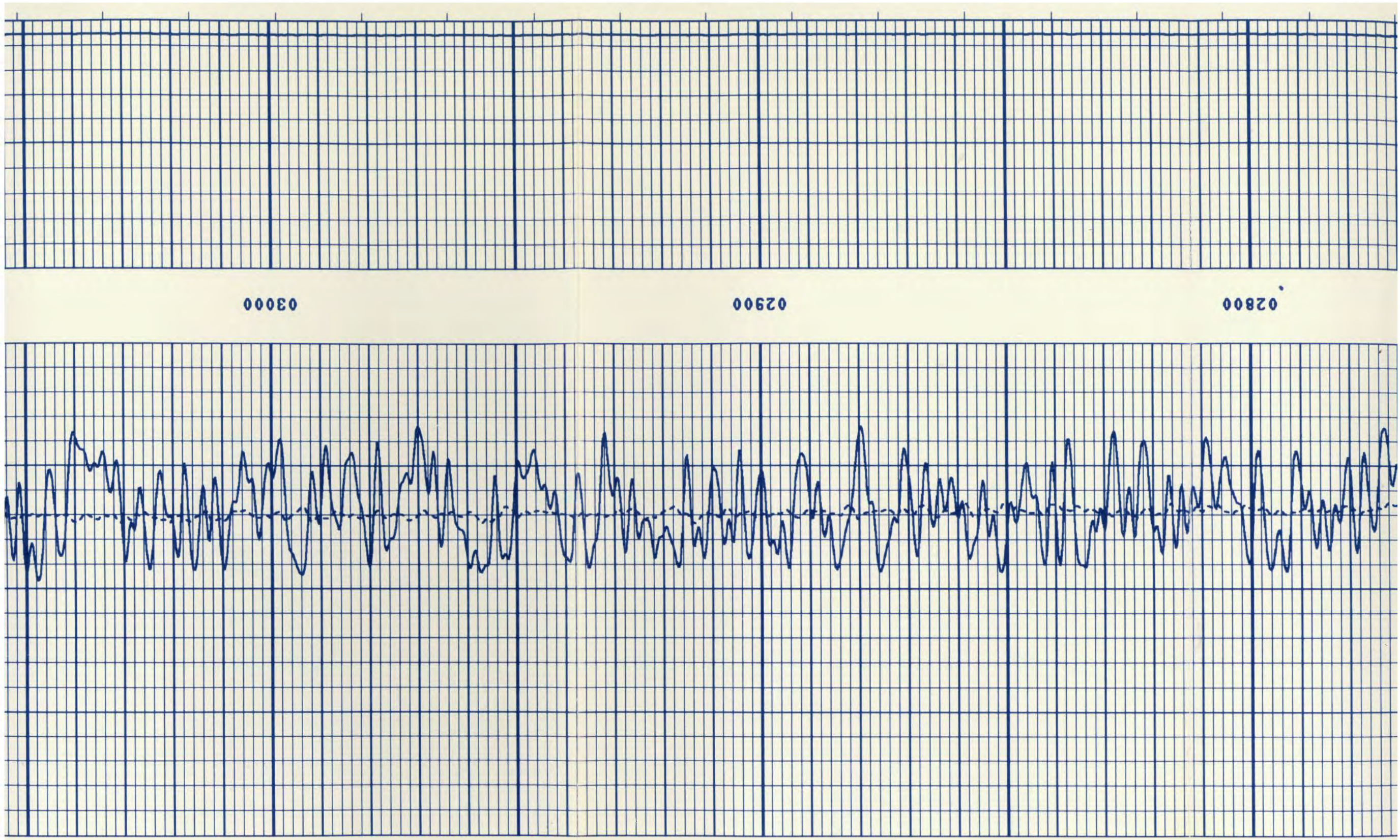


FILE: 21

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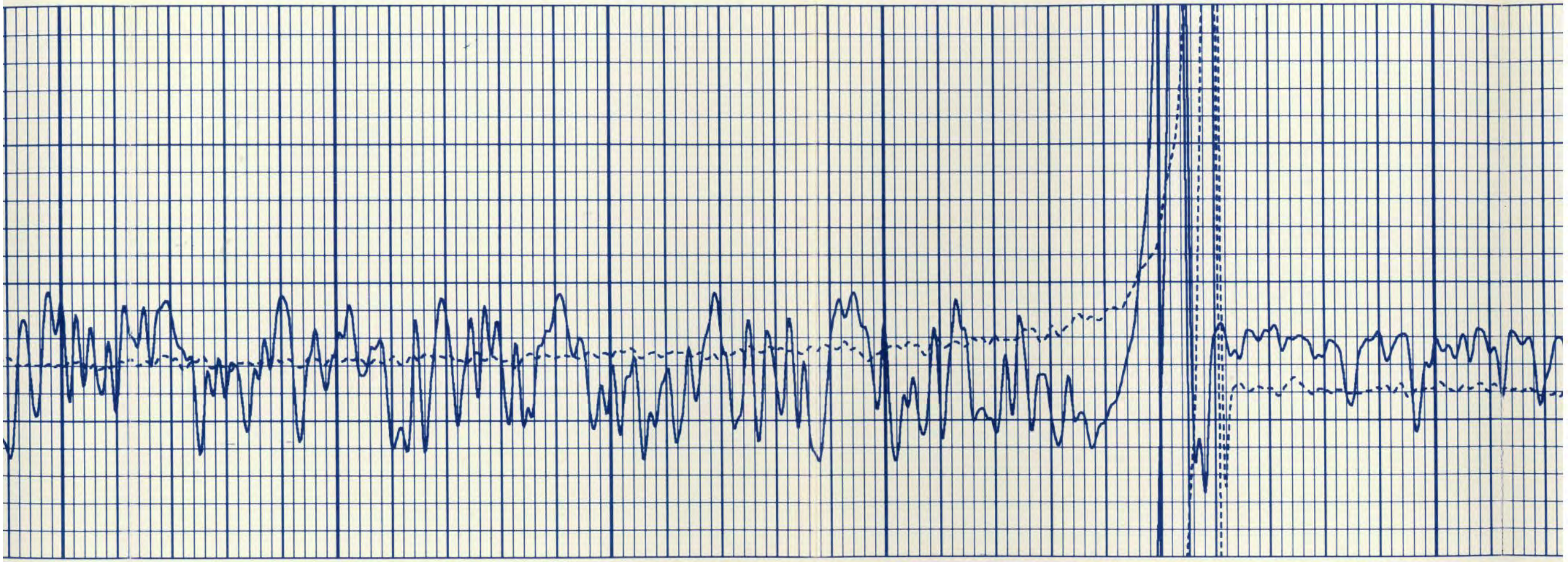
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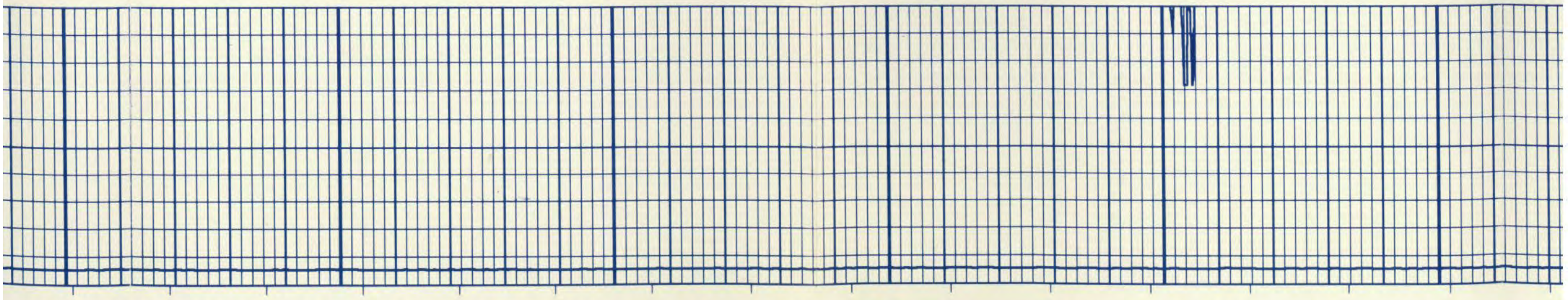
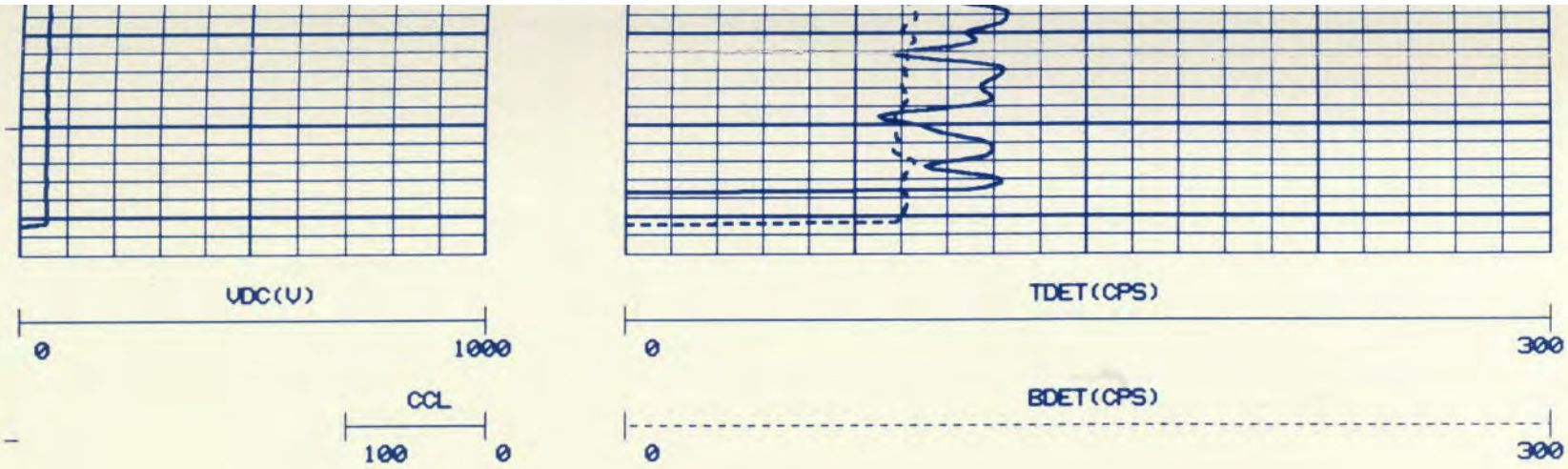
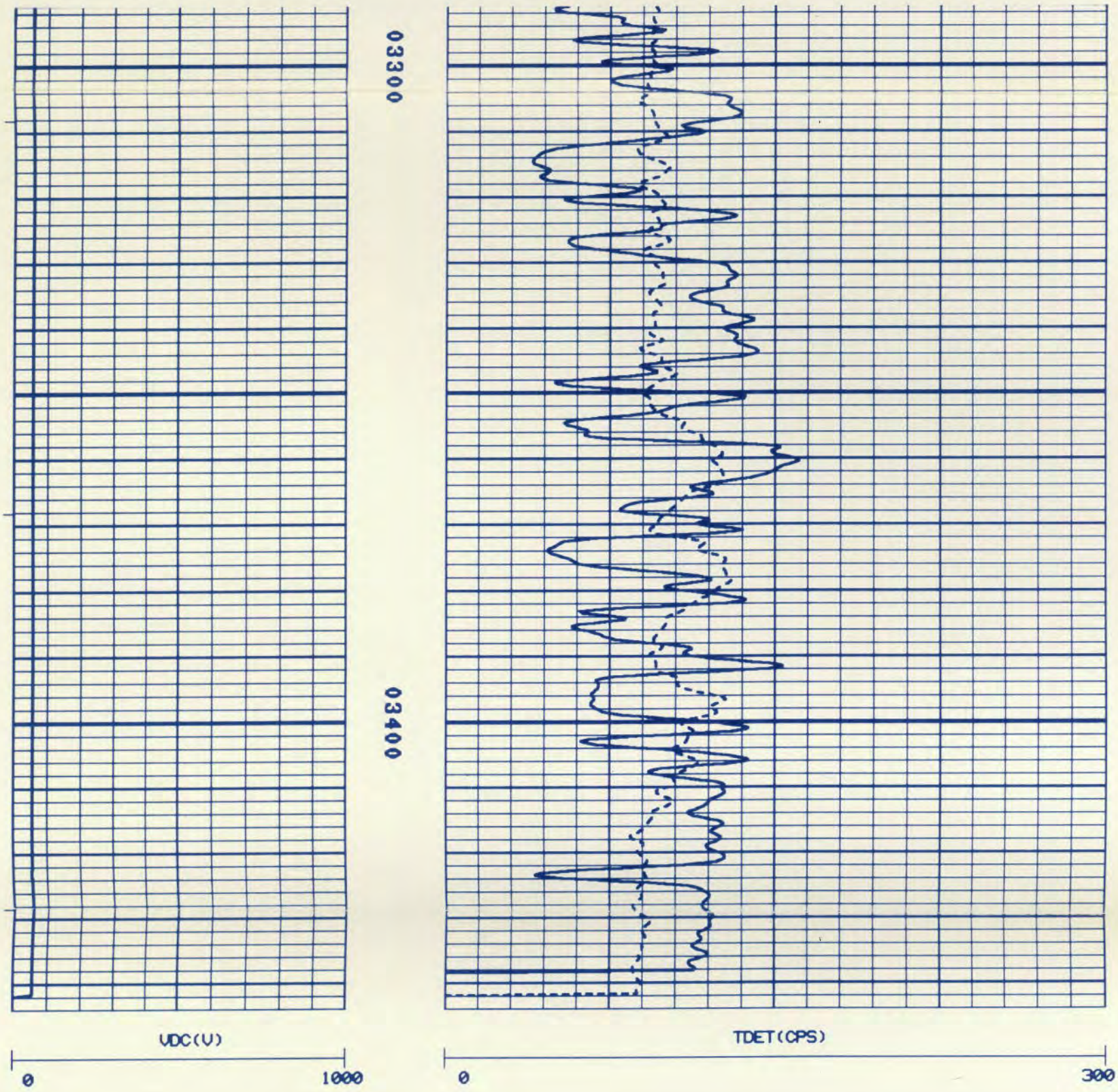
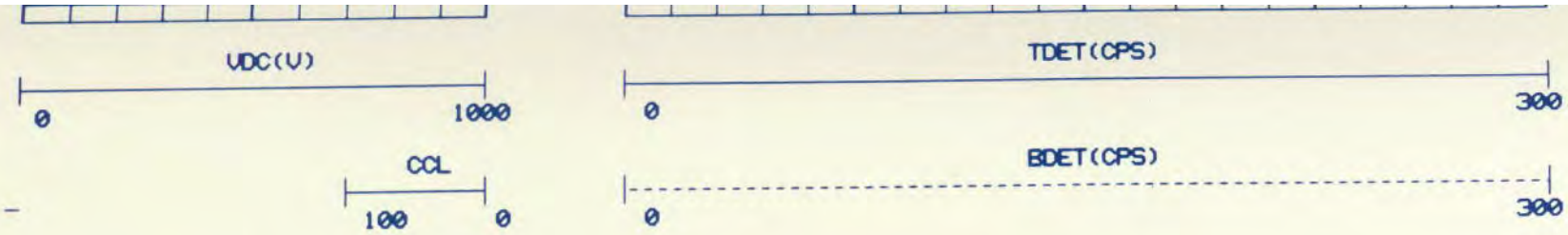




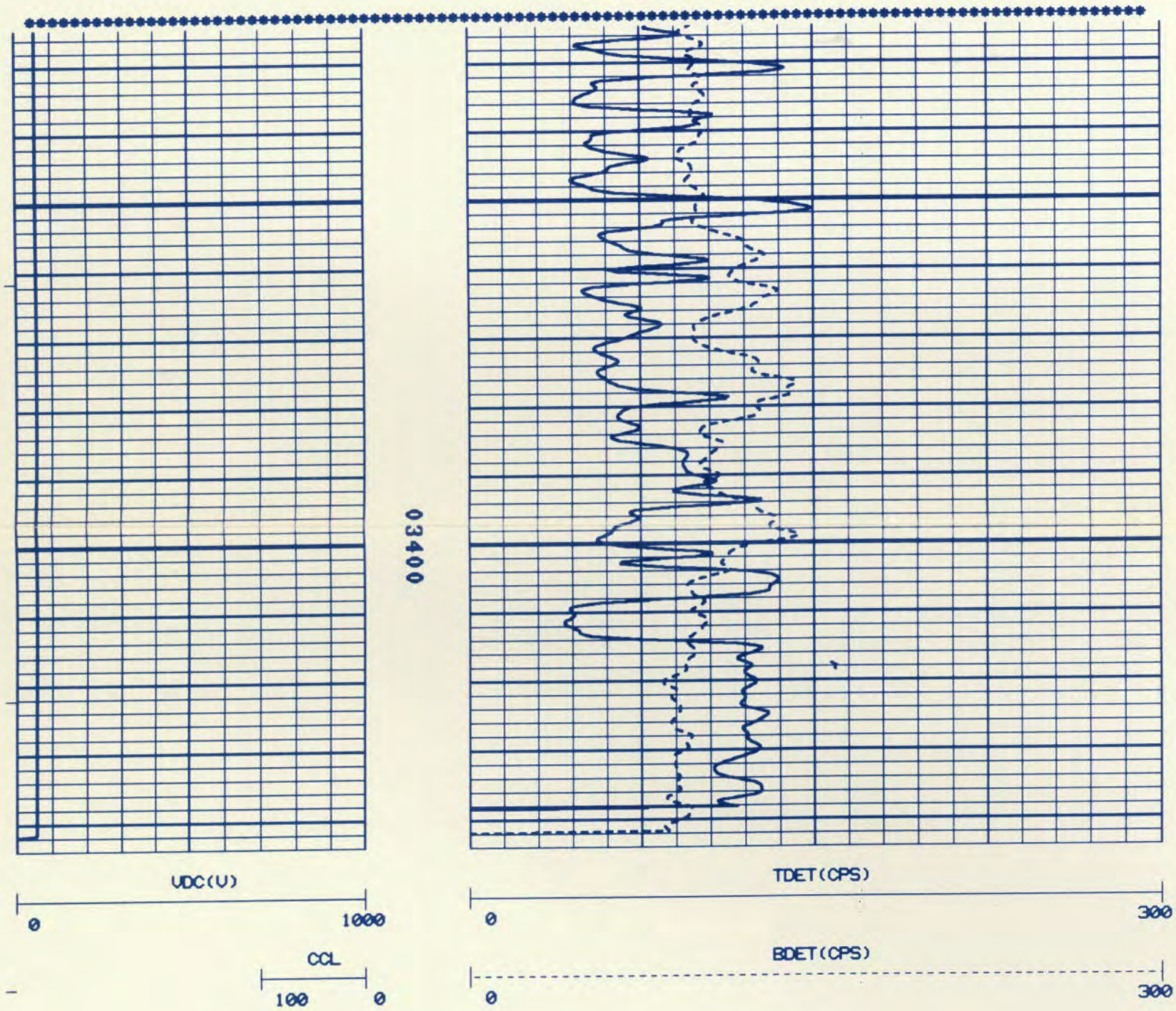
FILE: 20

SHOT SLUG 2950′
PUMP RATE AT 20 GPM
CHASED SLUG DOWN HOLE-
W/FILES 3 THRU 19

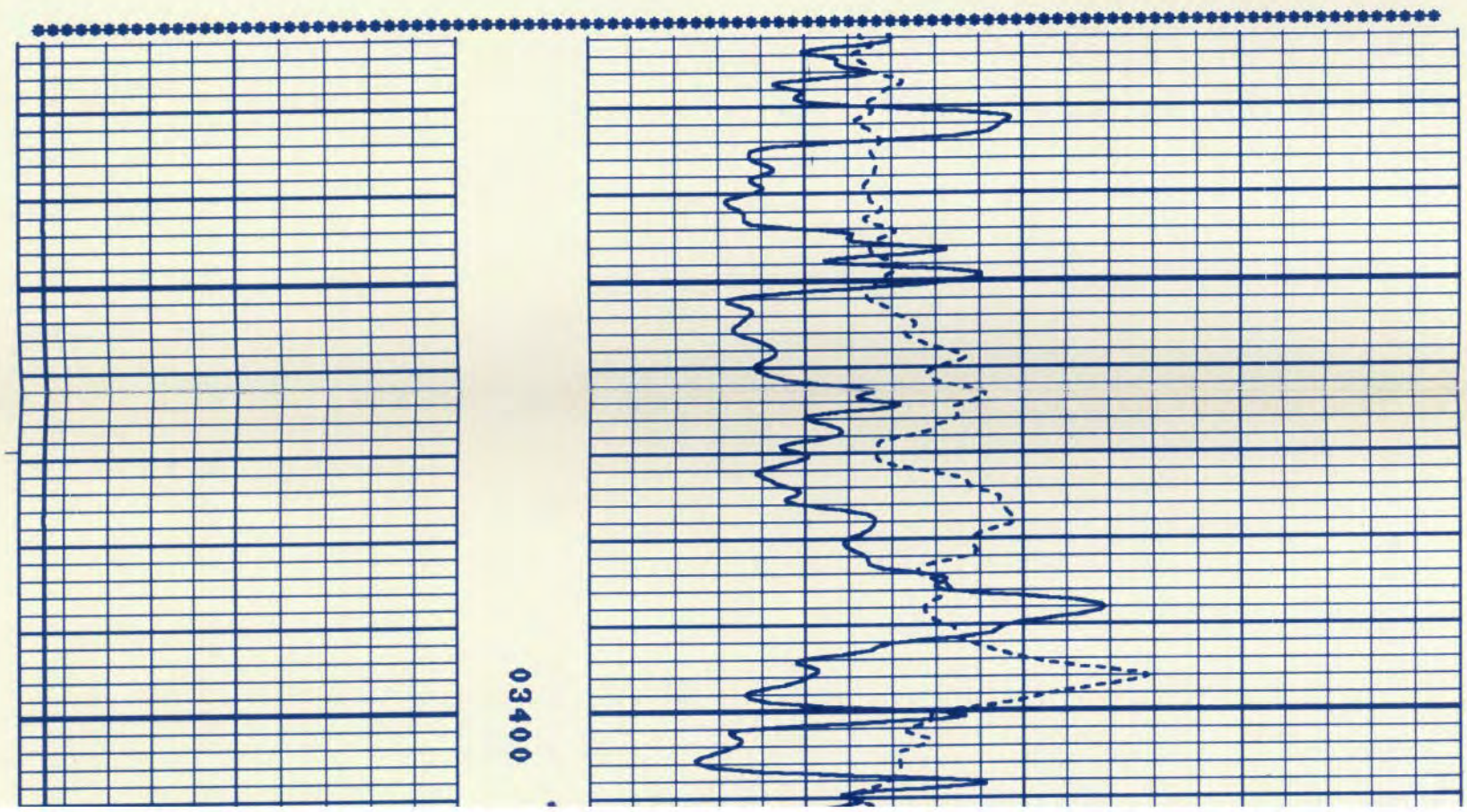


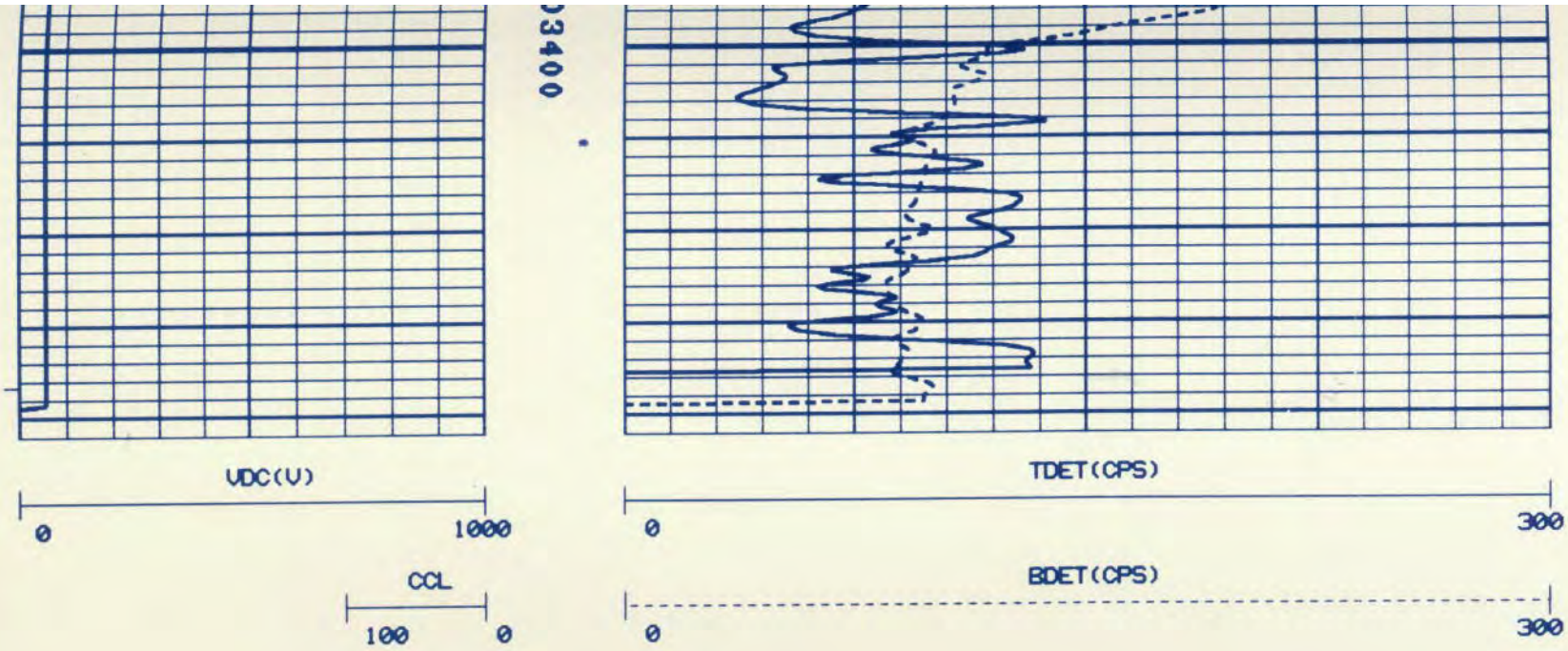


FILE: 19



FILE: 18





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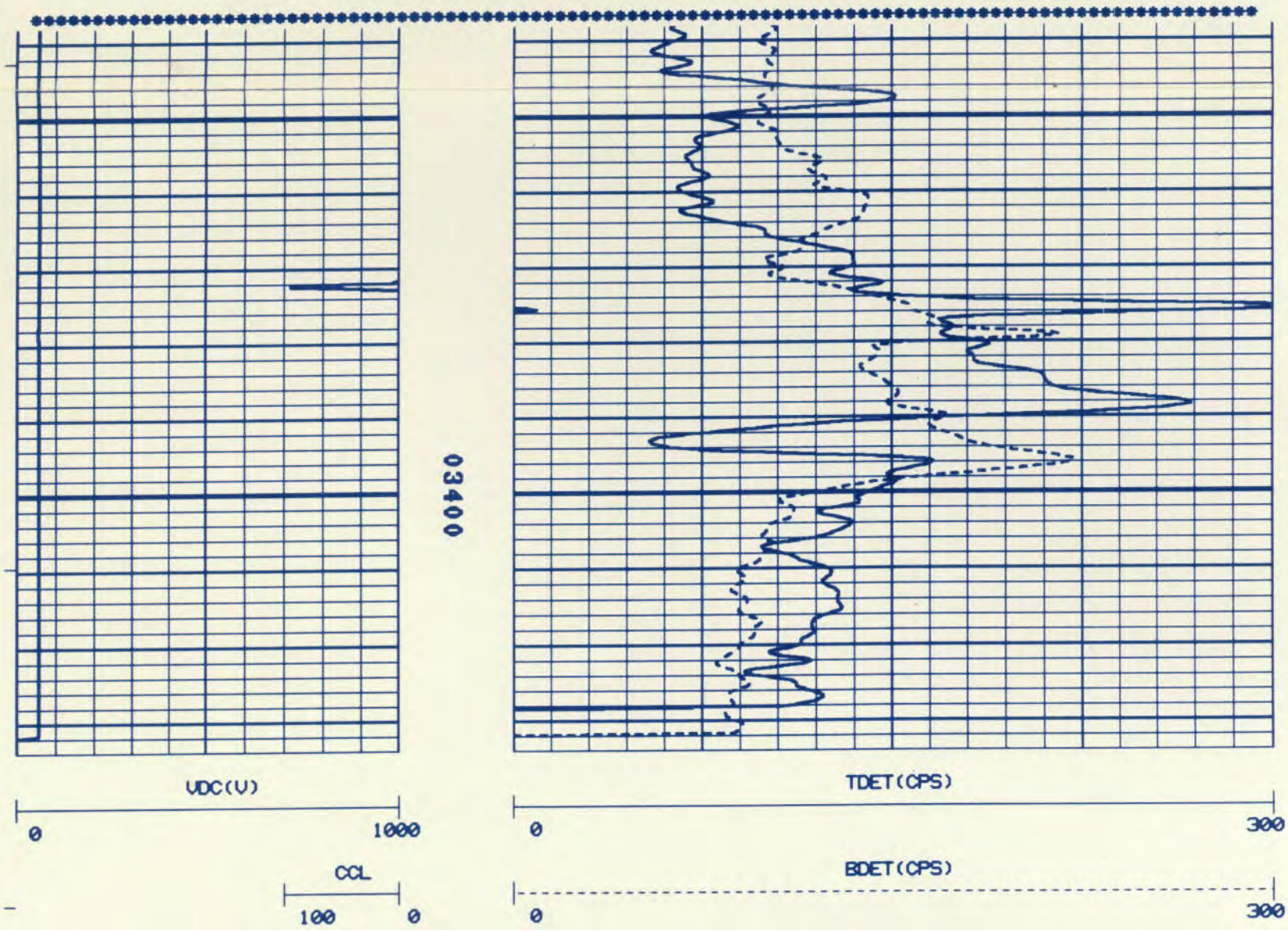

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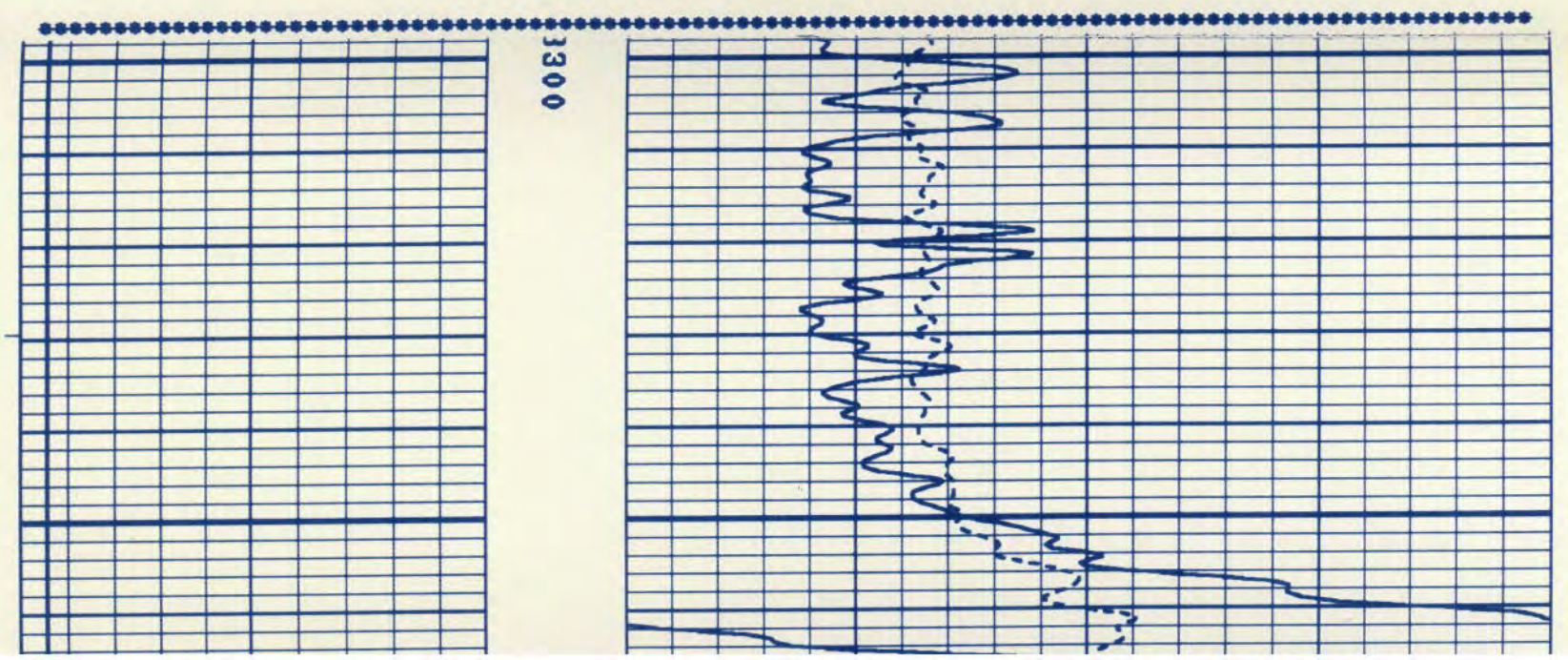

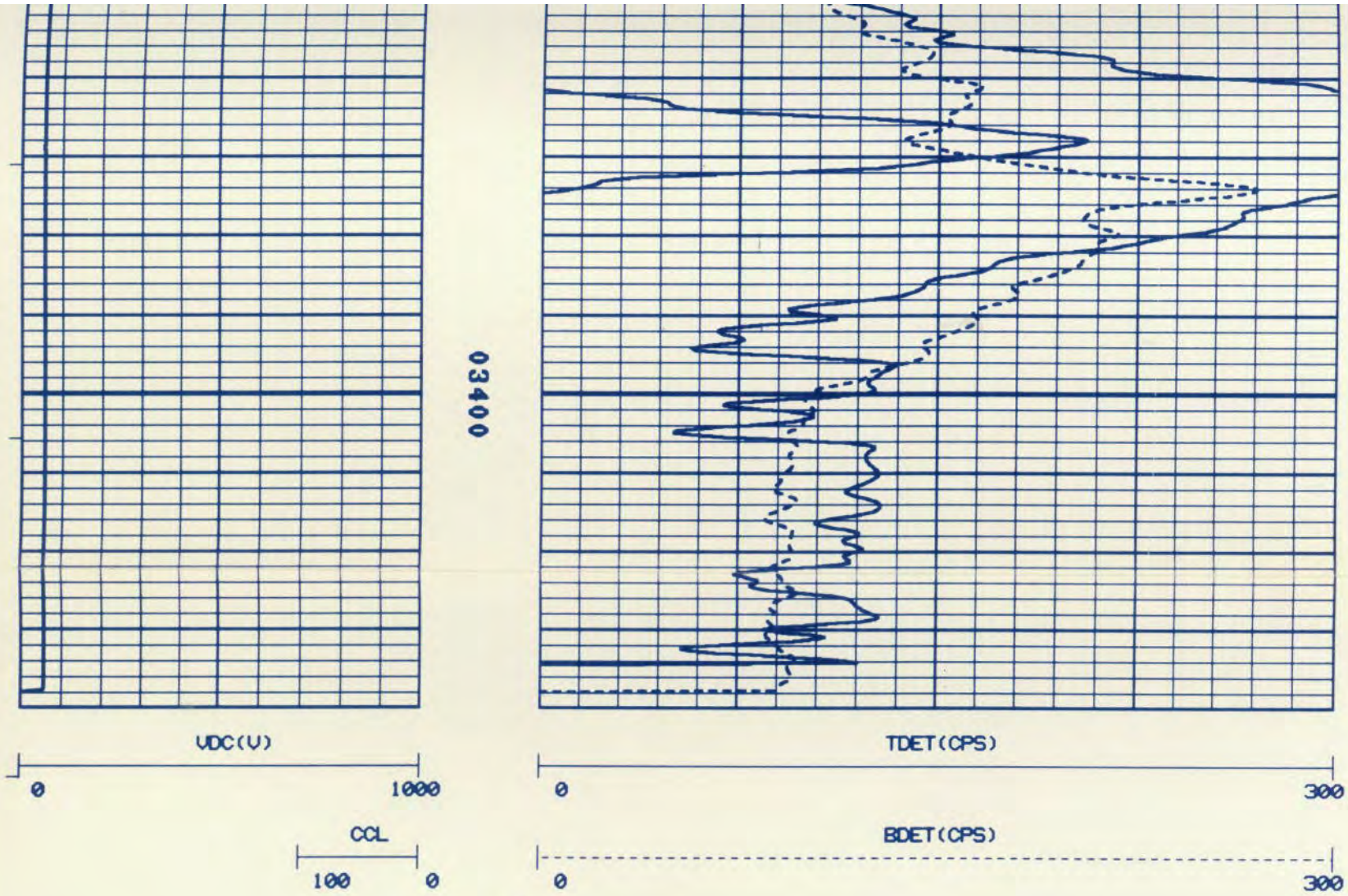

FILE: 15

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FILE: 14

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

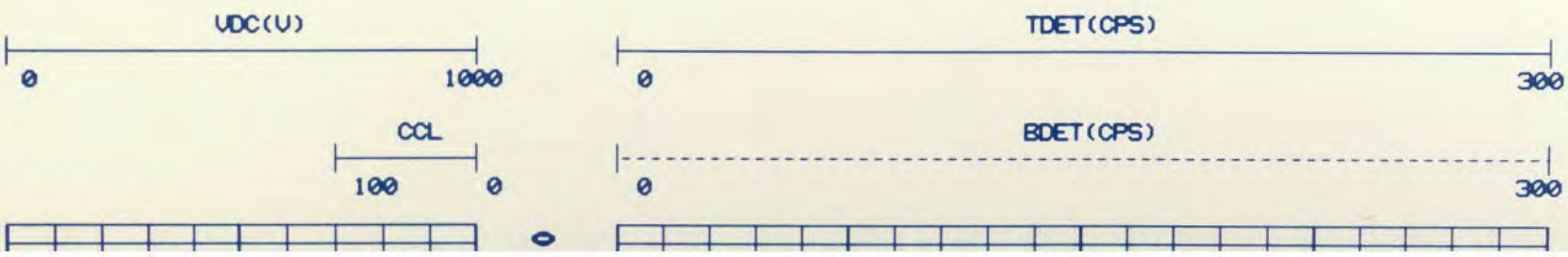
*** NONE ***

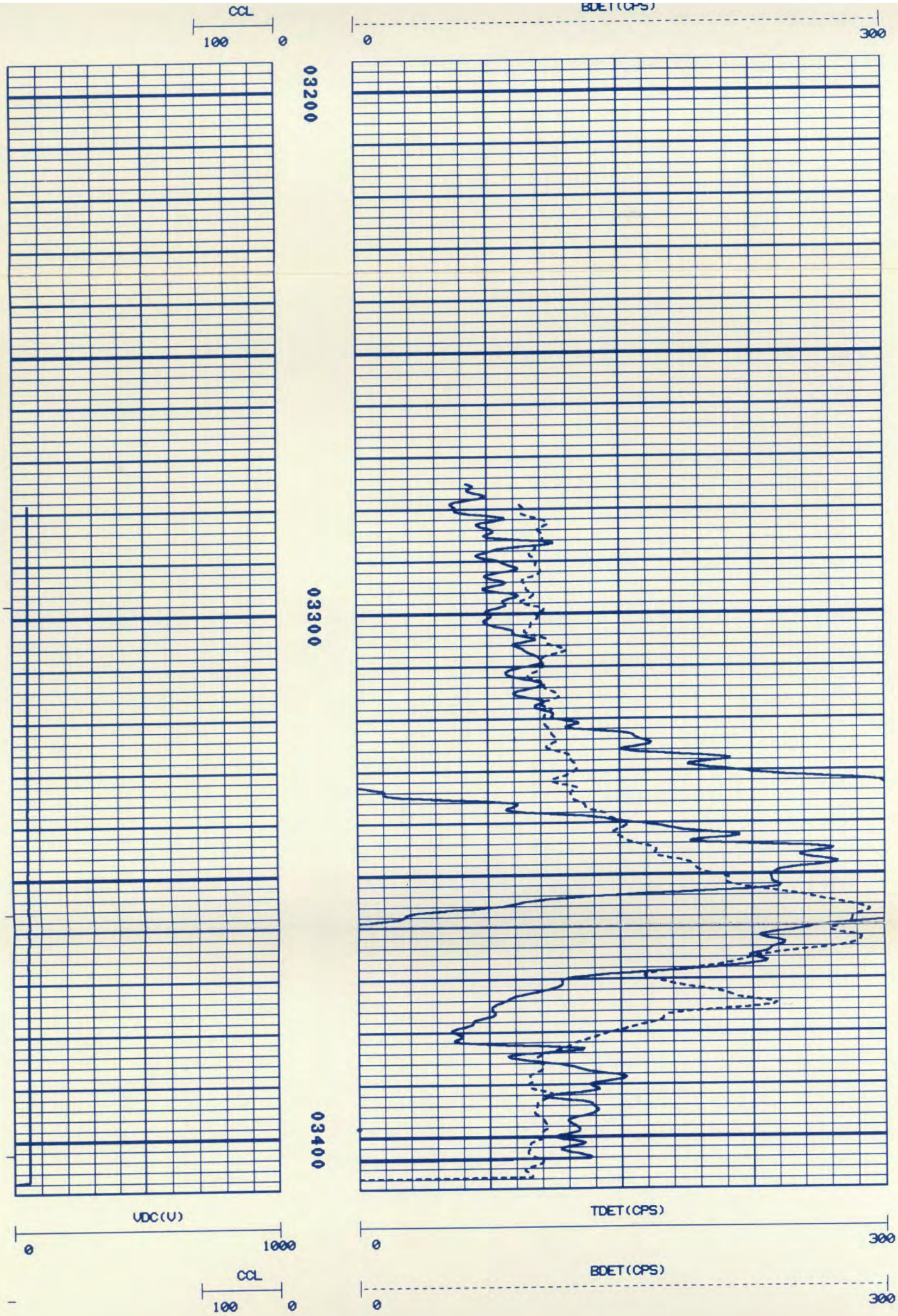
COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2 TRIP: 1

SERVICE: D 439A FILE: 14 DATE: 10/29/91 TIME: 12:44:55

REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD





FILE: 14

FILE: 13

CURVE DELAY REPORT

FILE: 13

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 13 DATE: 10/29/91

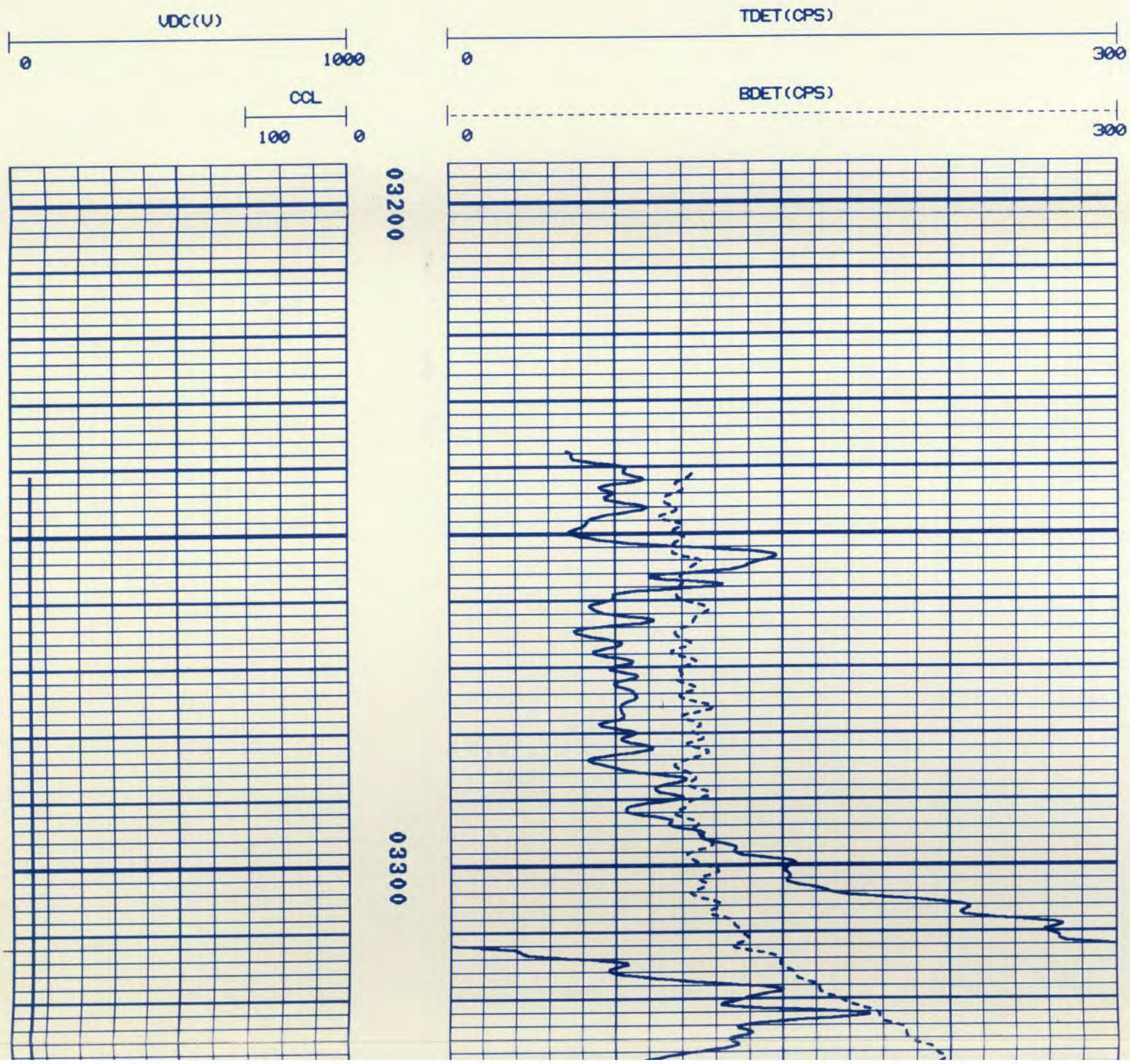
REVISION: FSYS256 REV:G002 VER:2.0

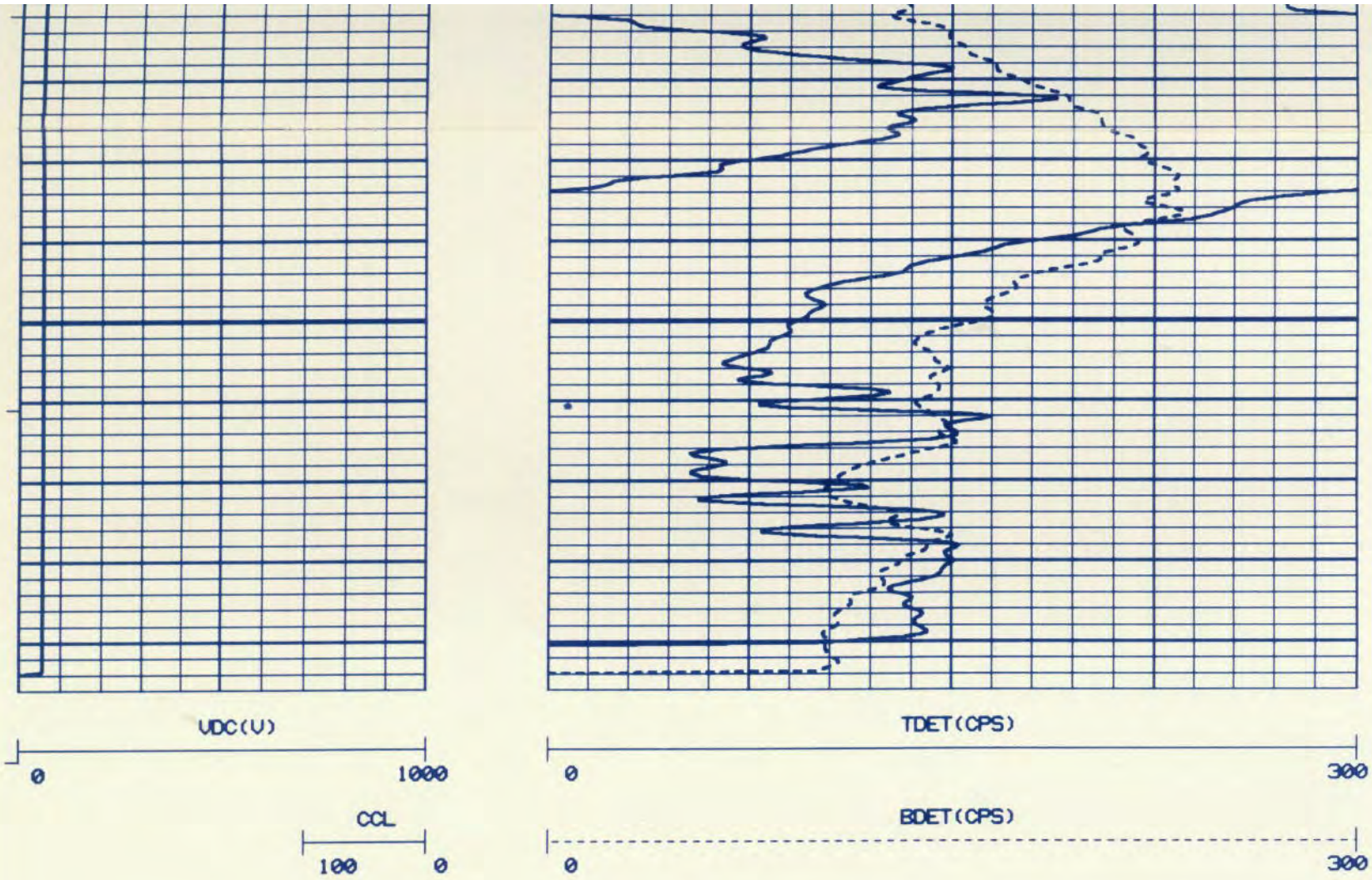
RUN: 1

TRIP: 1

TIME: 12:41:18

MODE: RECORD





FILE: 13

FILE: 12

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 12 DATE: 10/29/91

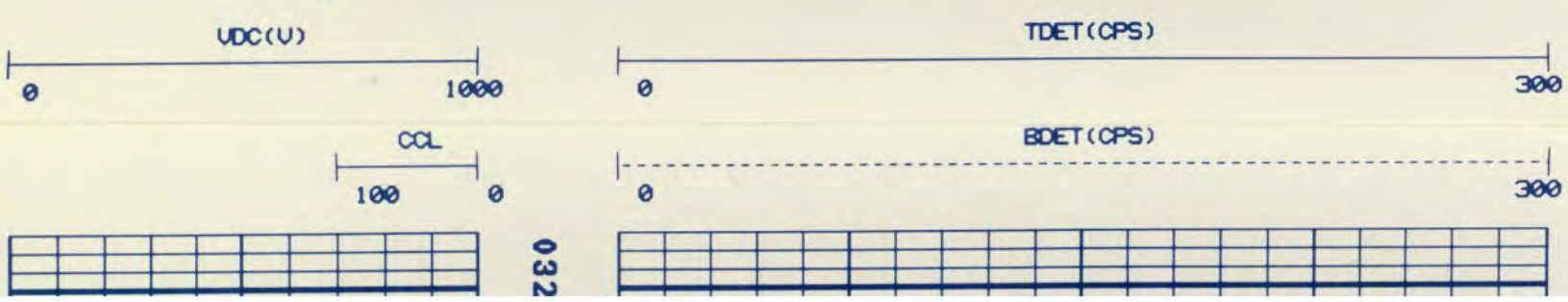
REVISION: FSYS256 REV:G002 VER:2.0

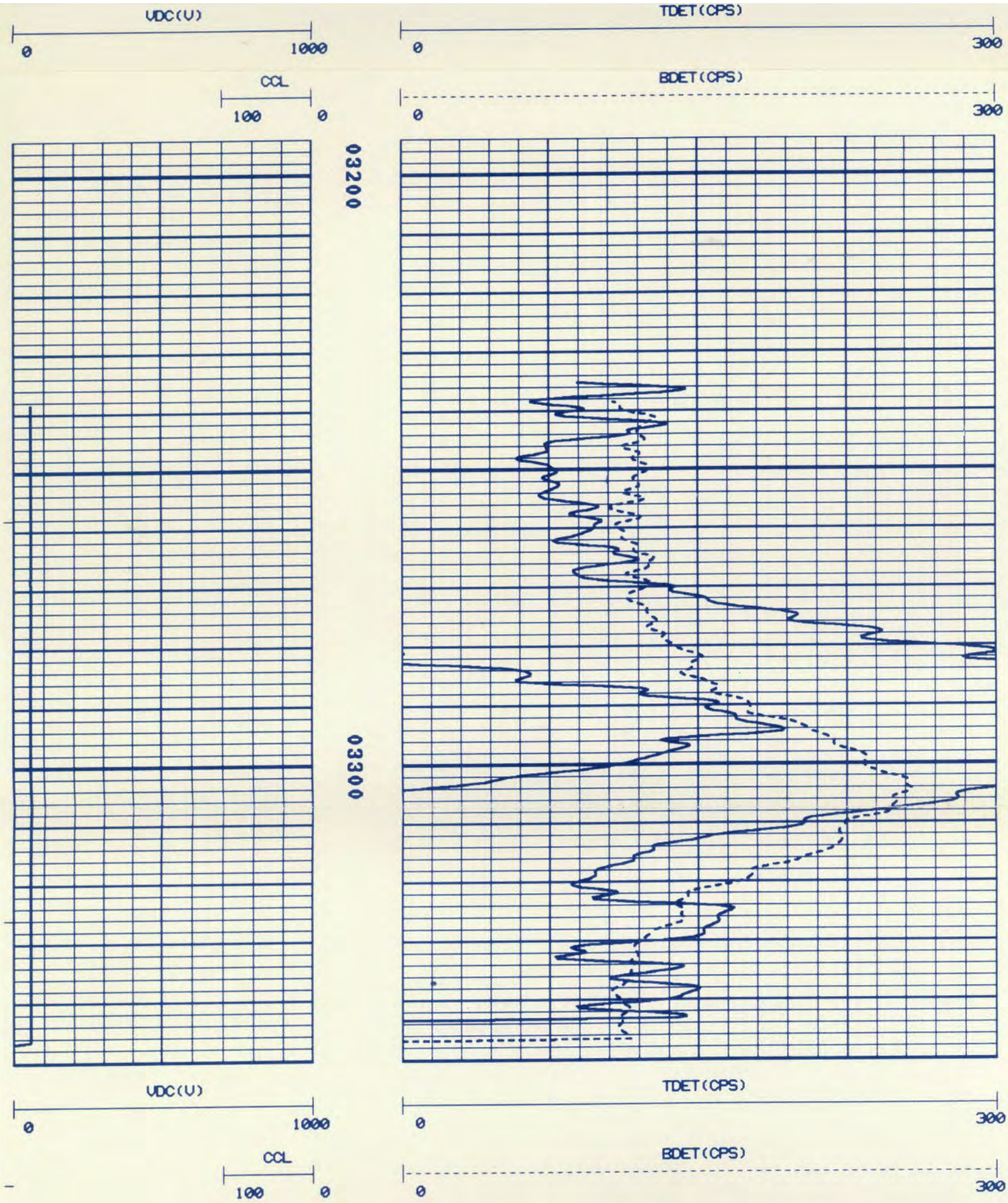
RUN: 1

TRIP: 1

TIME: 12:38:22

MODE: RECORD





FILE: 12

FILE: 11

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 11 DATE: 10/29/91

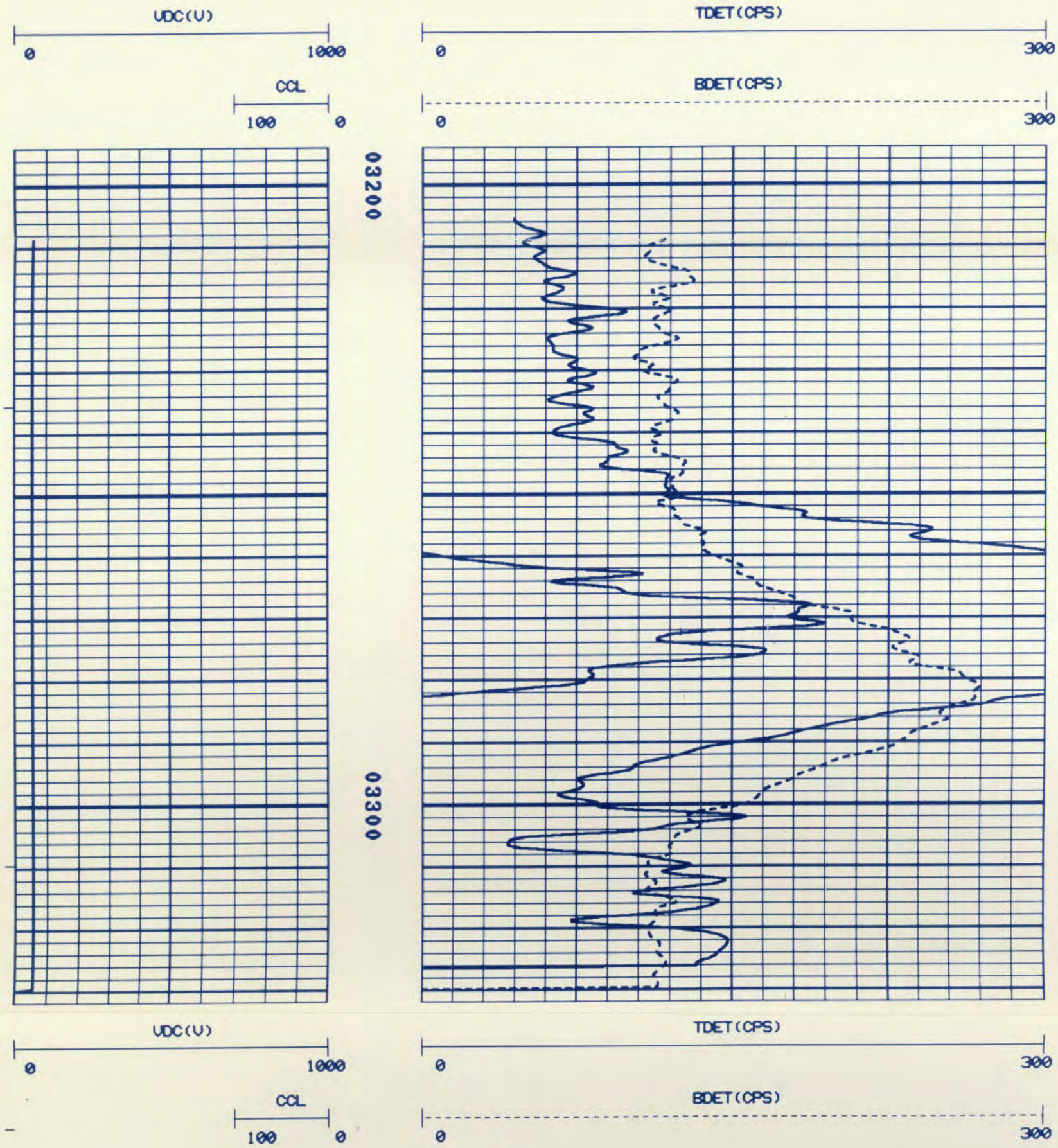
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 12:35:35

MODE: RECORD



0 1000 0 300

CCL BDET(CPS)

100 0 0 300

FILE: 11

****

****

FILE: 10

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2 TRIP: 1

SERVICE: D 439A FILE: 10 DATE: 10/29/91 TIME: 12:33:22

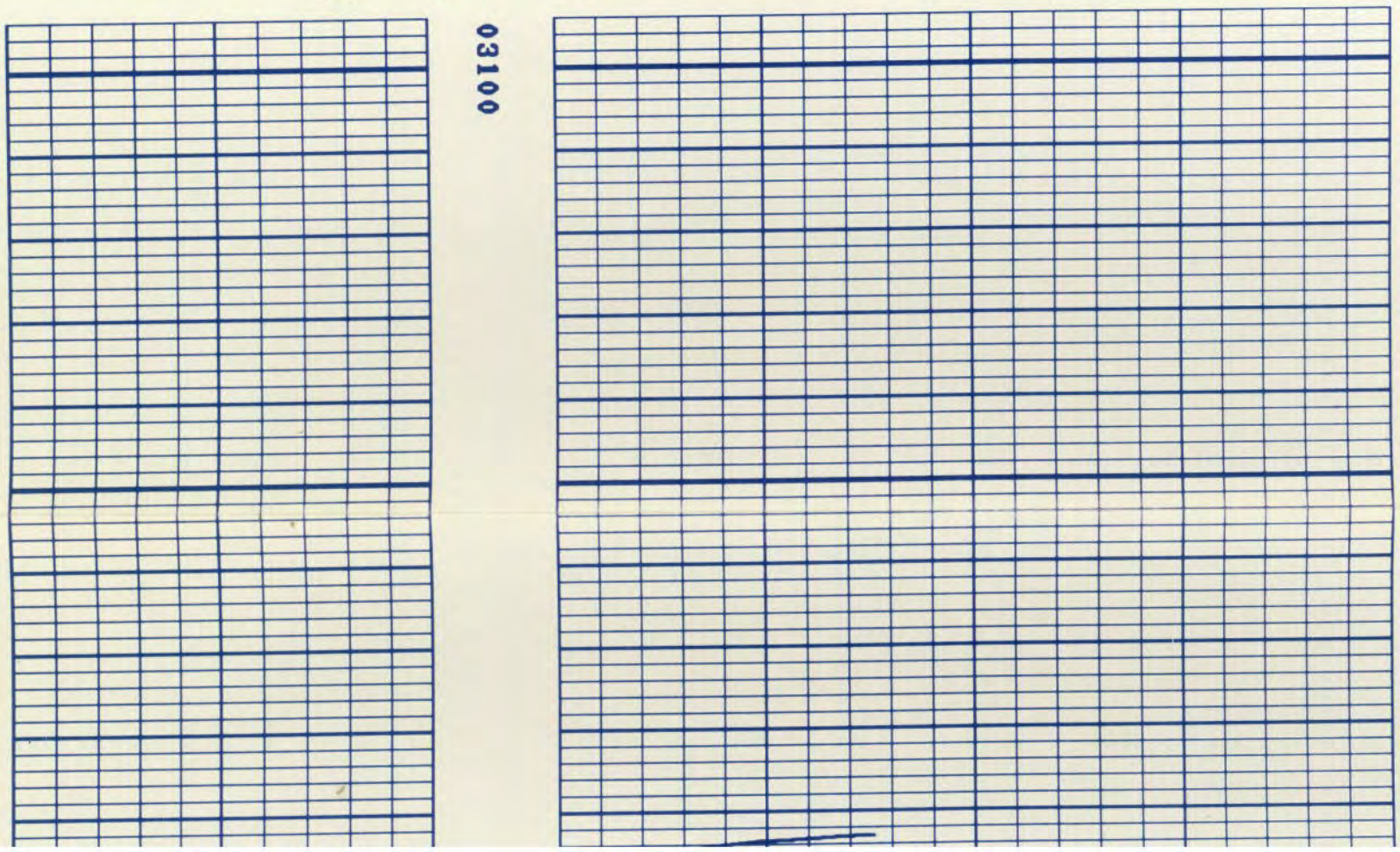
REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD

VDC(V) TDET(CPS)

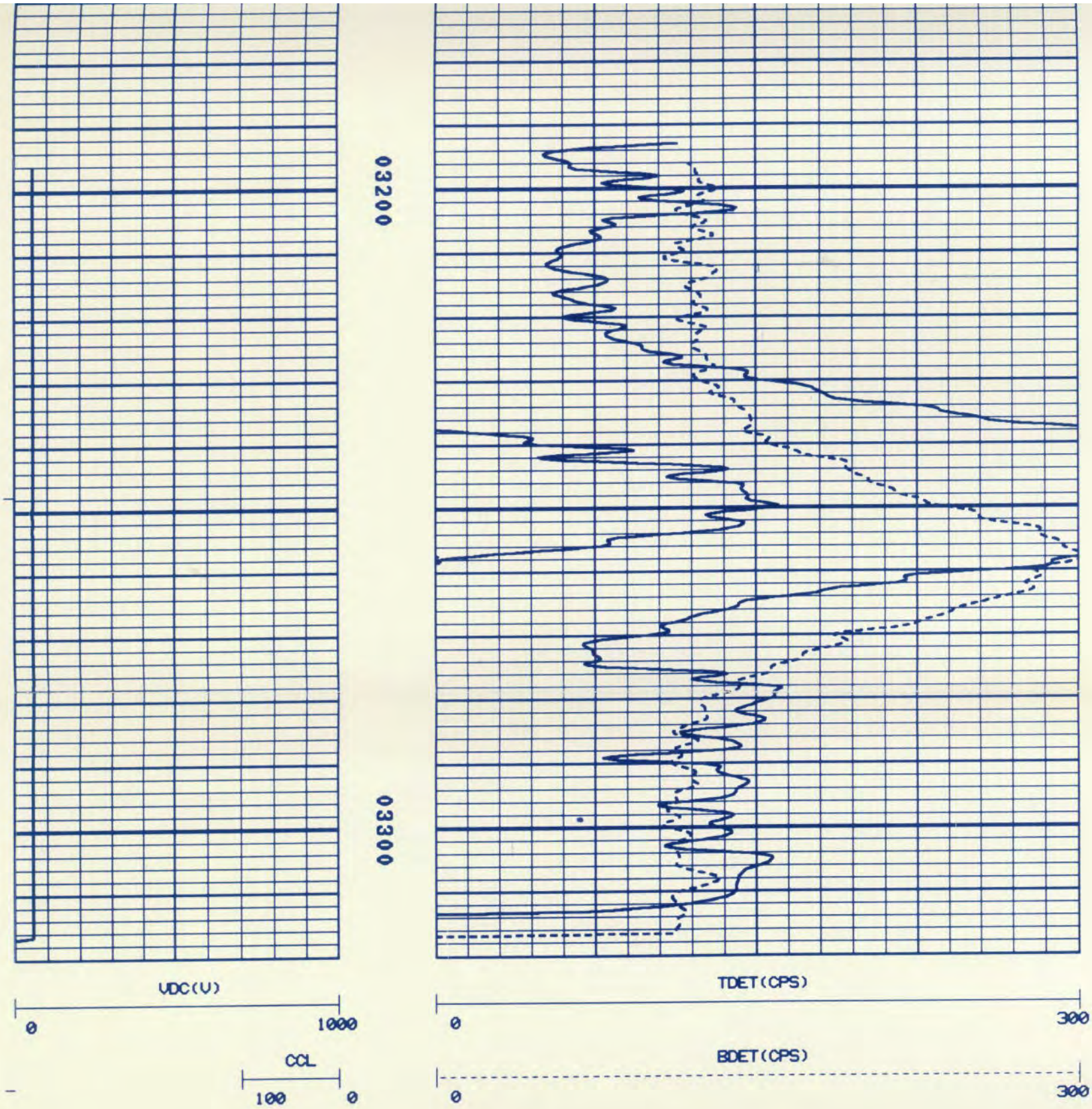
0 1000 0 300

CCL BDET(CPS)

100 0 0 300



03100



FILE: 10

****
****

FILE: 9

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 9 DATE: 10/29/91

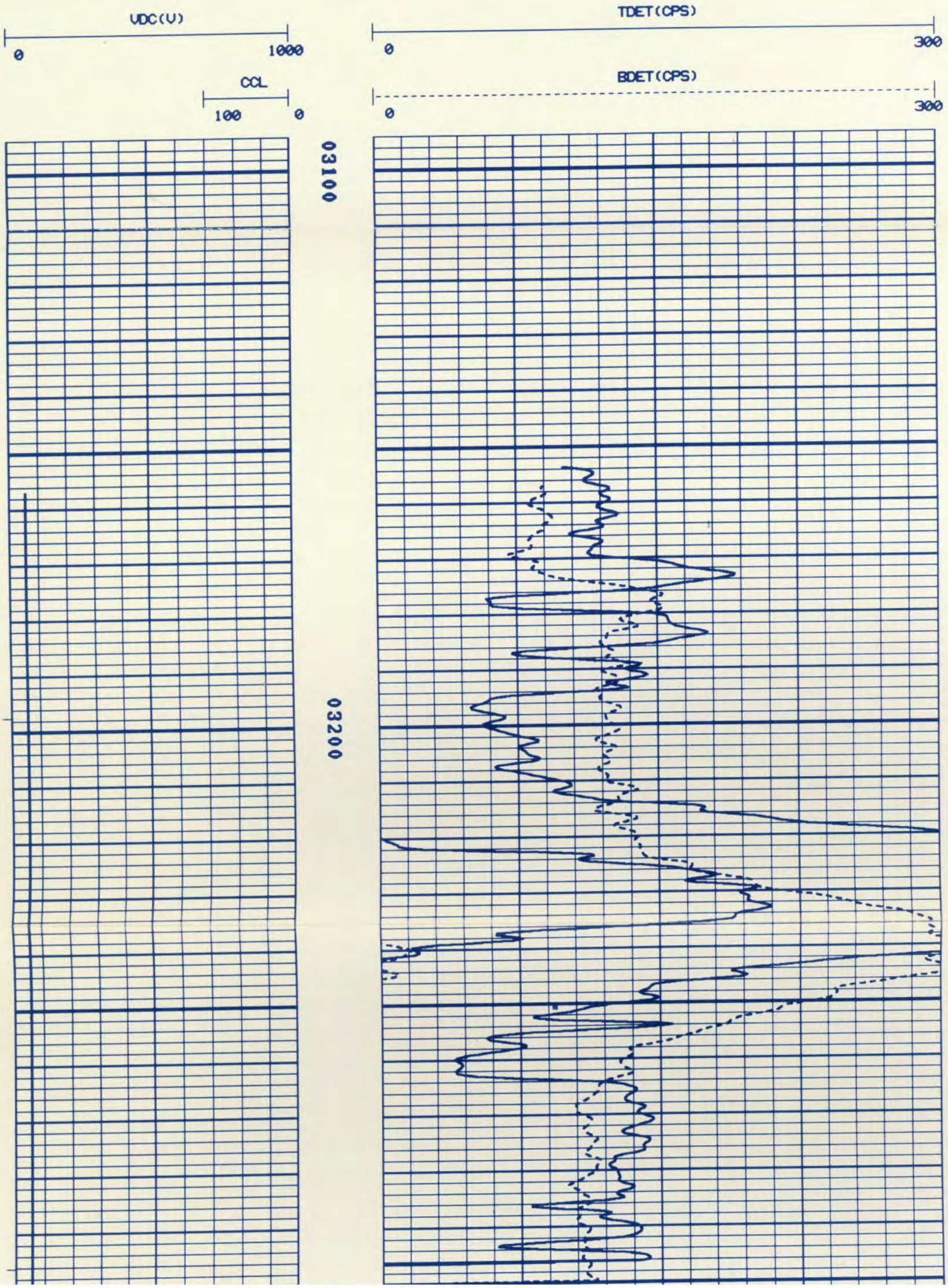
REVISION: FSYS256 REV:G002 VER:2.0

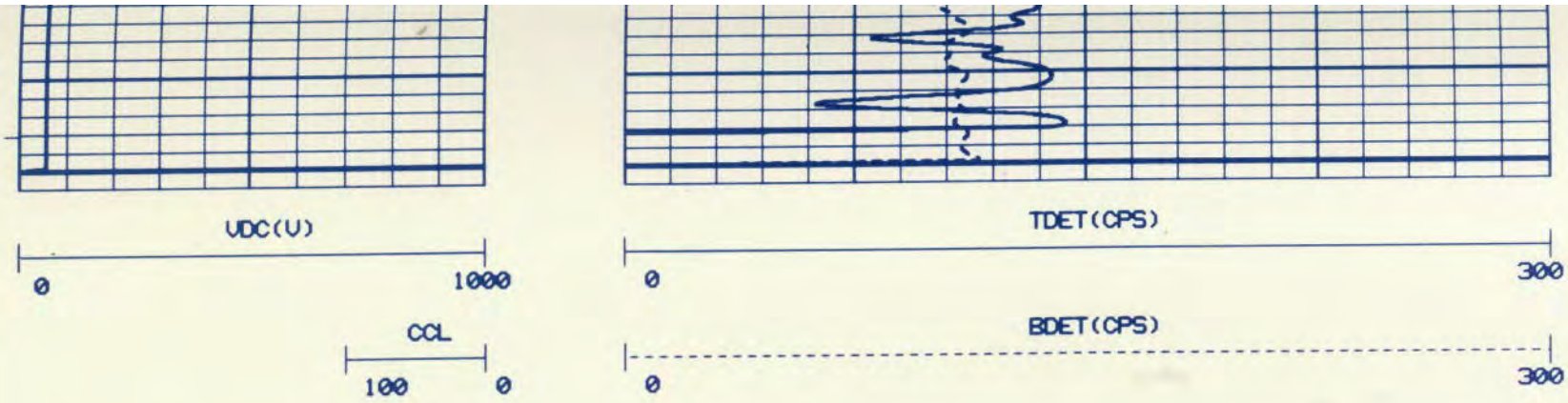
RUN: 1

TRIP: 1

TIME: 12:30:59

MODE: RECORD





FILE: 9

****

****

FILE: 8

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 8 DATE: 10/29/91

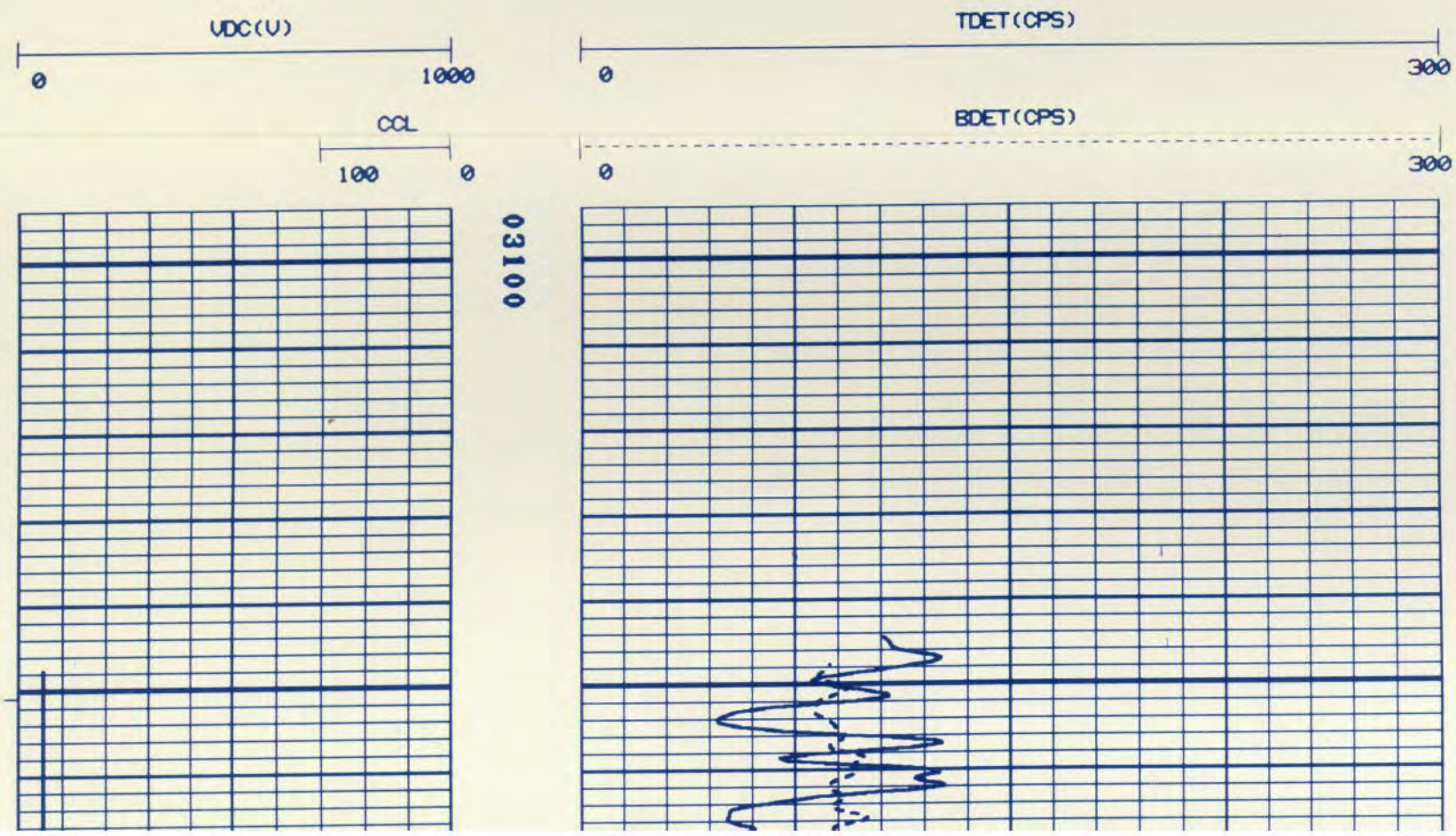
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

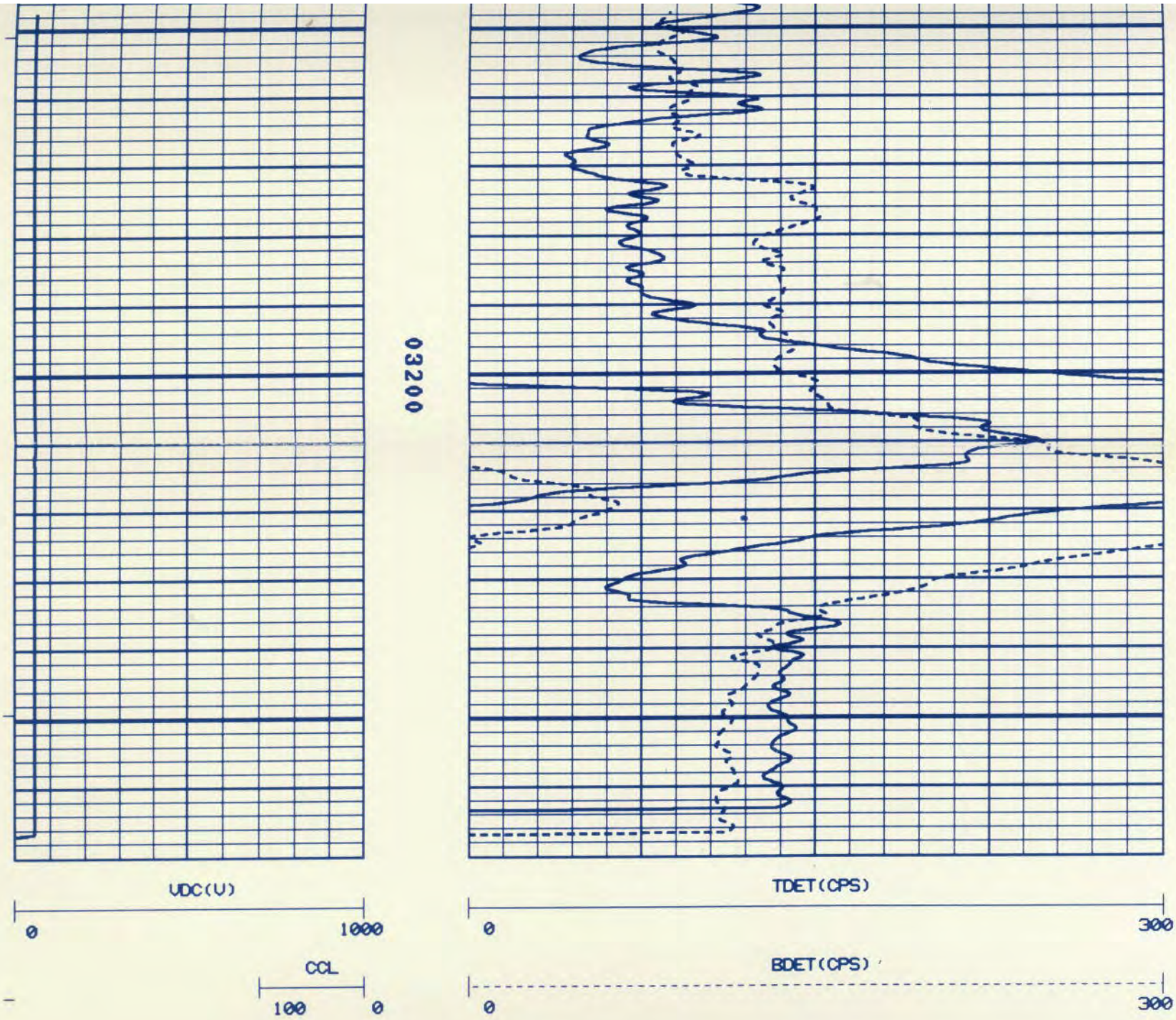
TRIP: 1

TIME: 12:28:28

MODE: RECORD



03100



FILE: 8

****
****

FILE: 7

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2 TRIP: 1

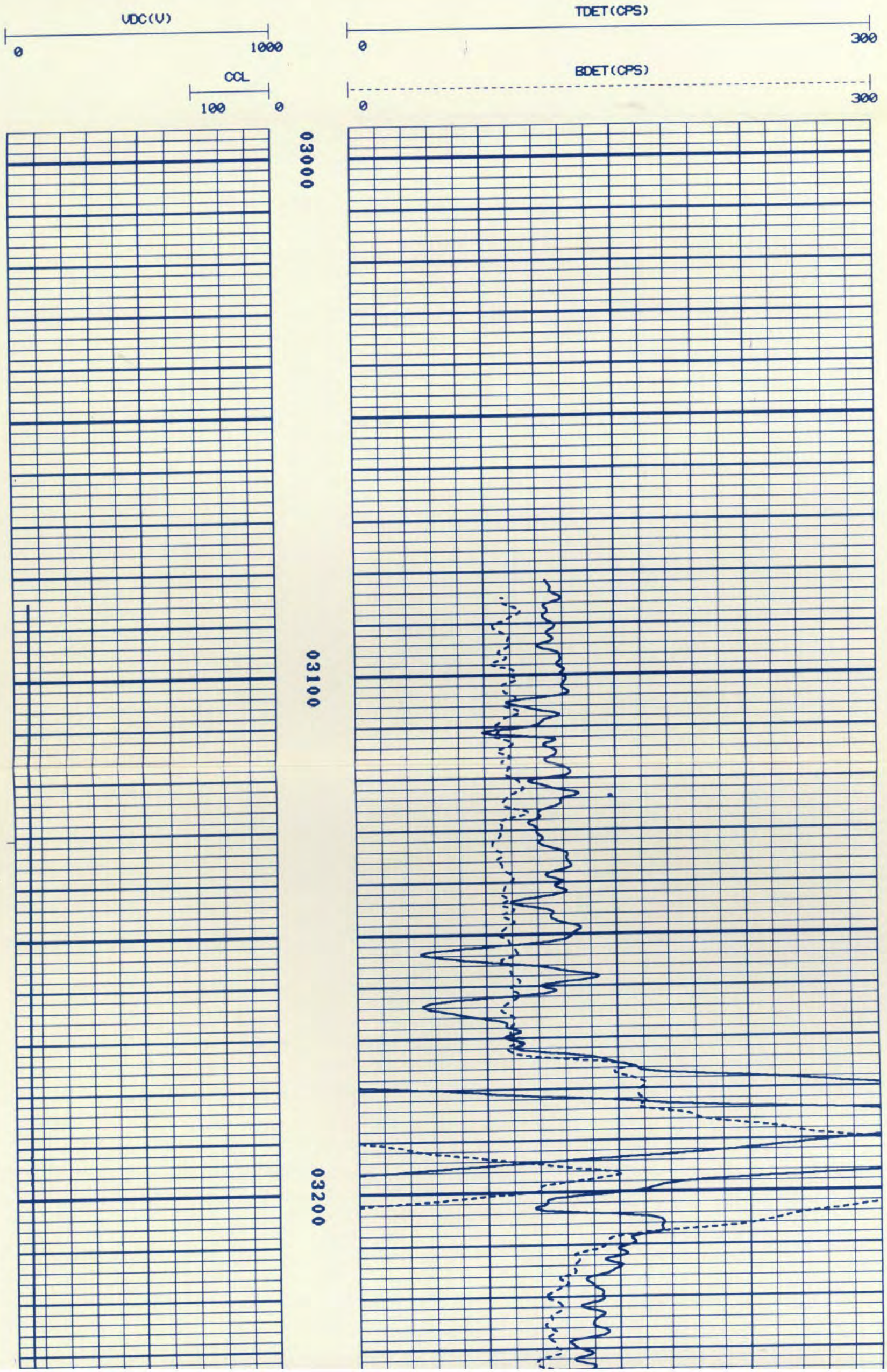
SERVICE: D 439A FILE: 7 DATE: 10/29/91 TIME: 12:25:45

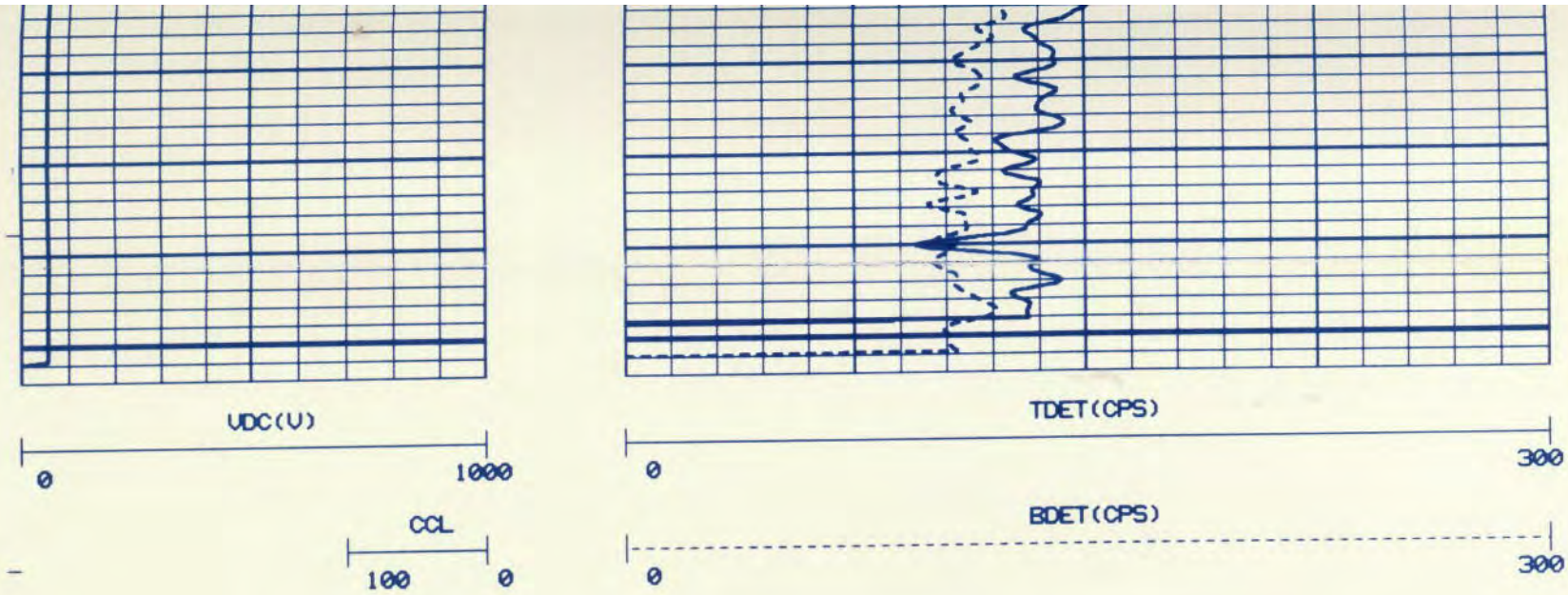
REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 7 DATE: 10/29/91 TIME: 12:25:45

REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD





FILE: 7

****

FILE: 6

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 6 DATE: 10/29/91

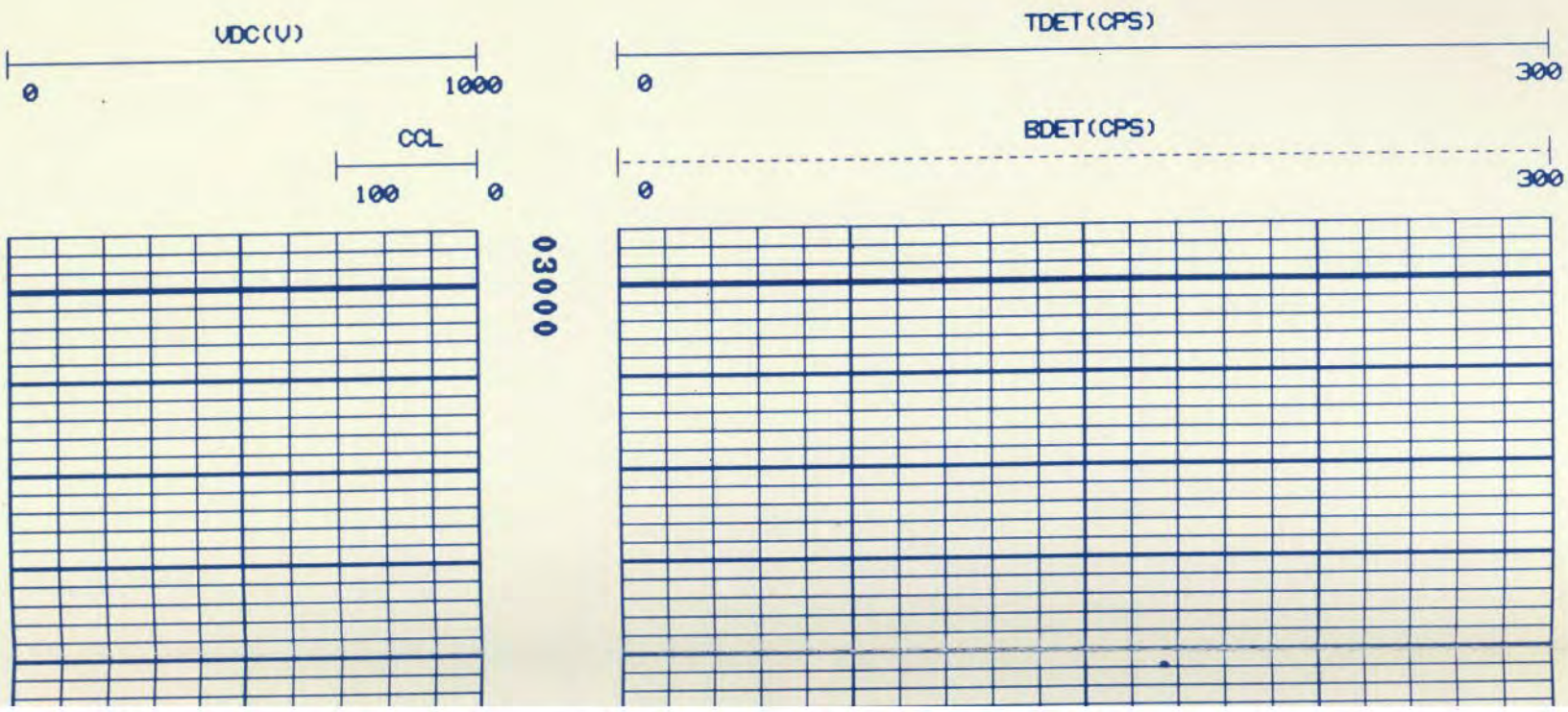
REVISION: FSYS256 REV:G002 VER:2.0

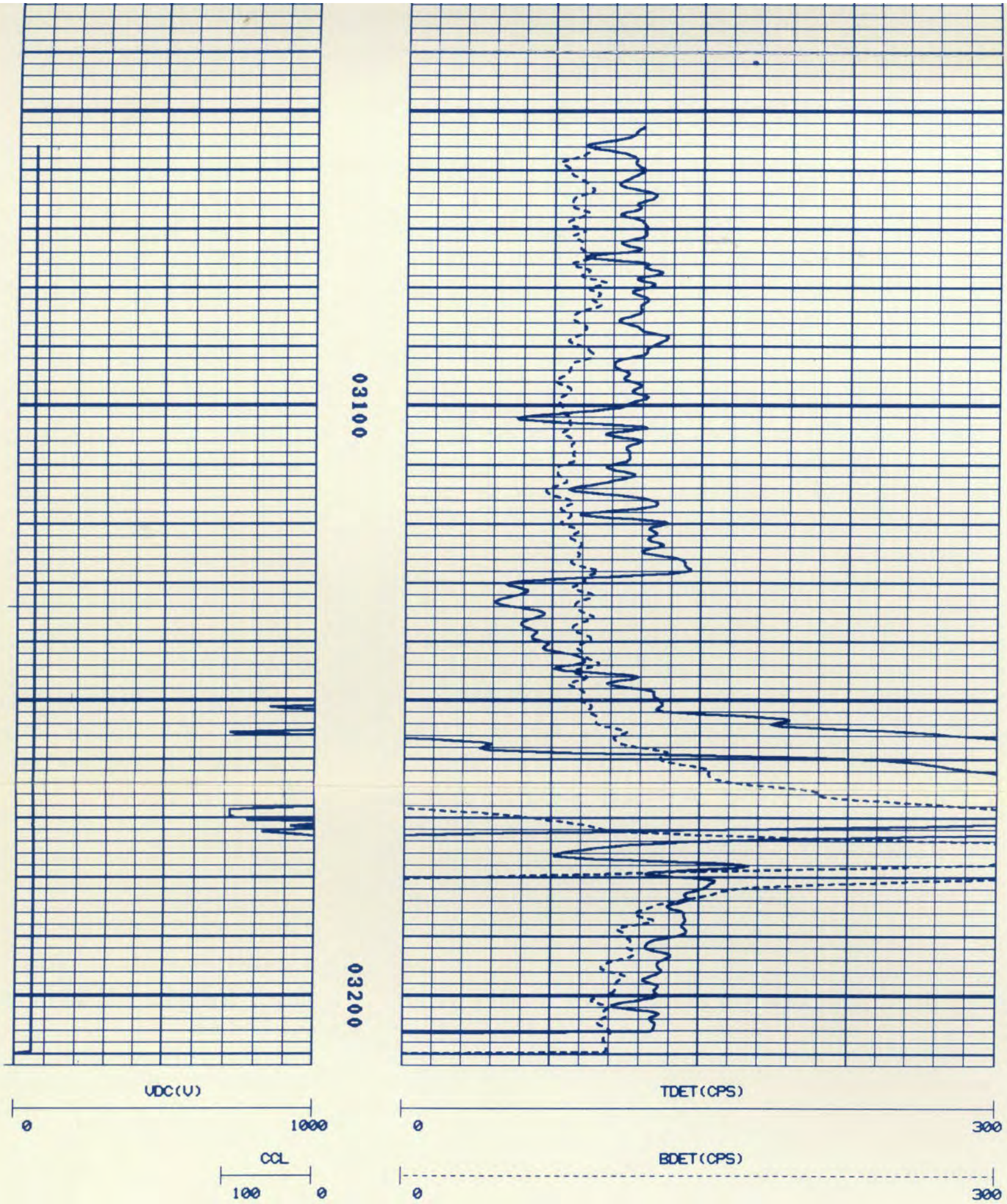
RUN: 1

TRIP: 1

TIME: 12:23:17

MODE: RECORD





FILE: 6

****

****

FILE: 5

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 5 DATE: 10/29/91

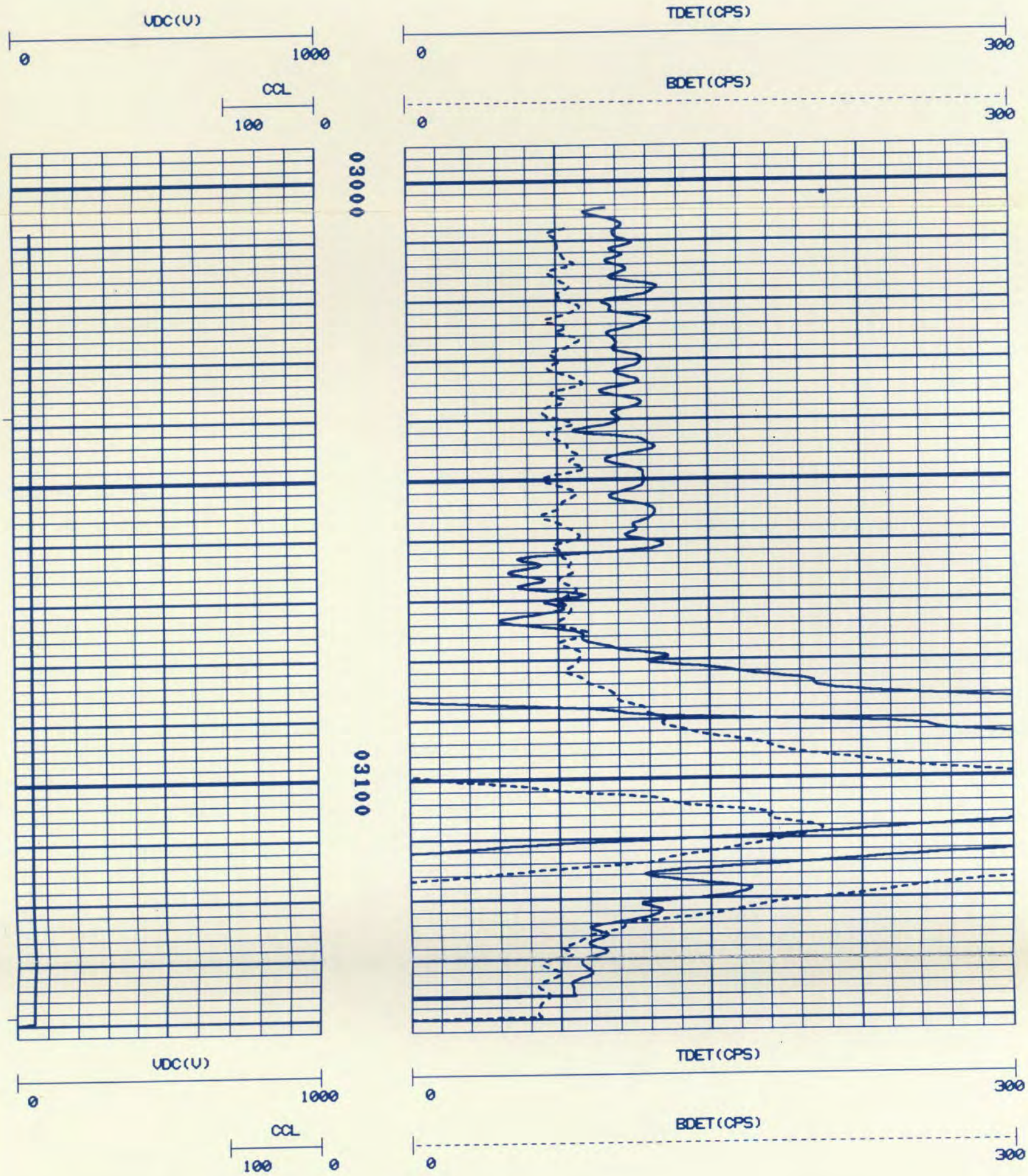
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 12:21:02

MODE: RECORD



FILE: 5

0 1000 0 300

CCL BDET(CPS)

100 0 0 300

FILE: 5

****

****

FILE: 4

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2 TRIP: 1

SERVICE: D 439A FILE: 4 DATE: 10/29/91 TIME: 12:18:44

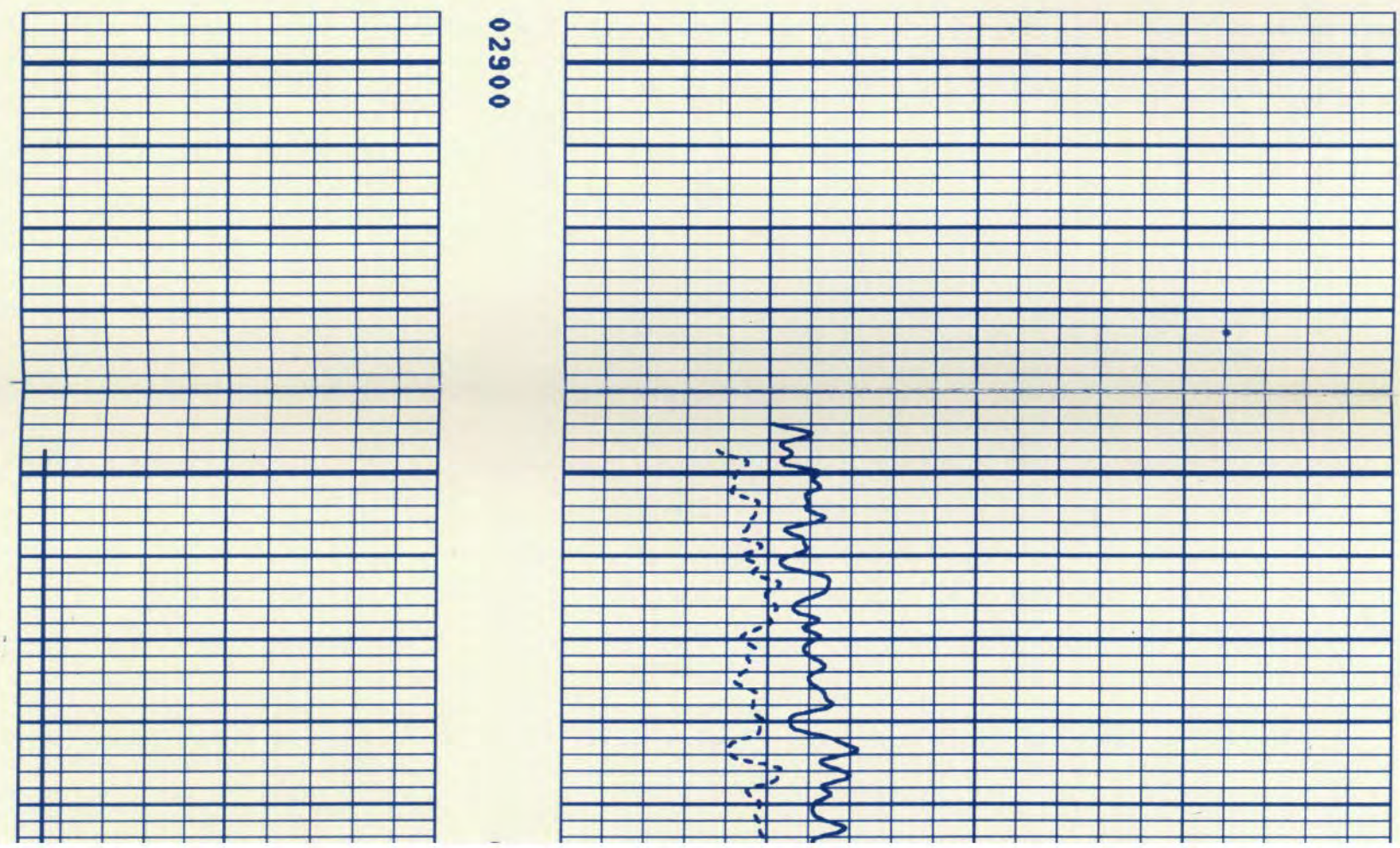
REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD

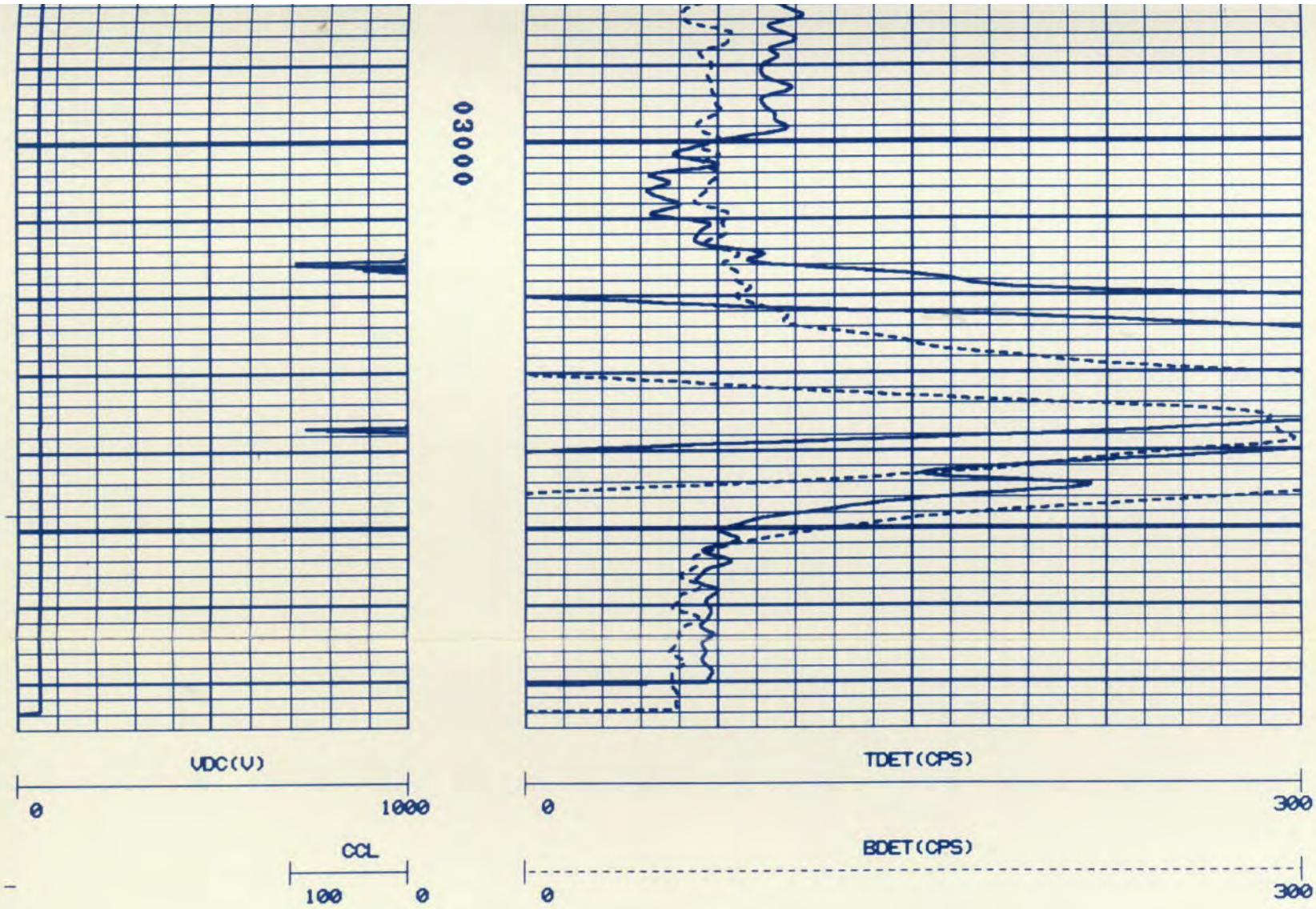
VDC(V) TDET(CPS)

0 1000 0 300

CCL BDET(CPS)

100 0 0 300





FILE: 4

****
****

FILE: 3

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

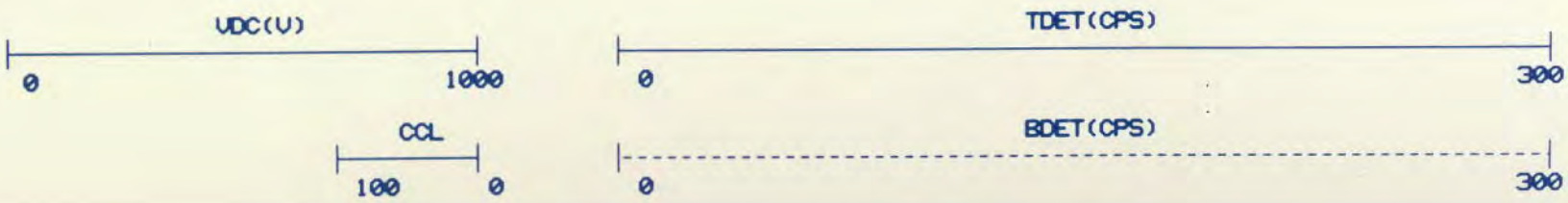
*** NONE ***

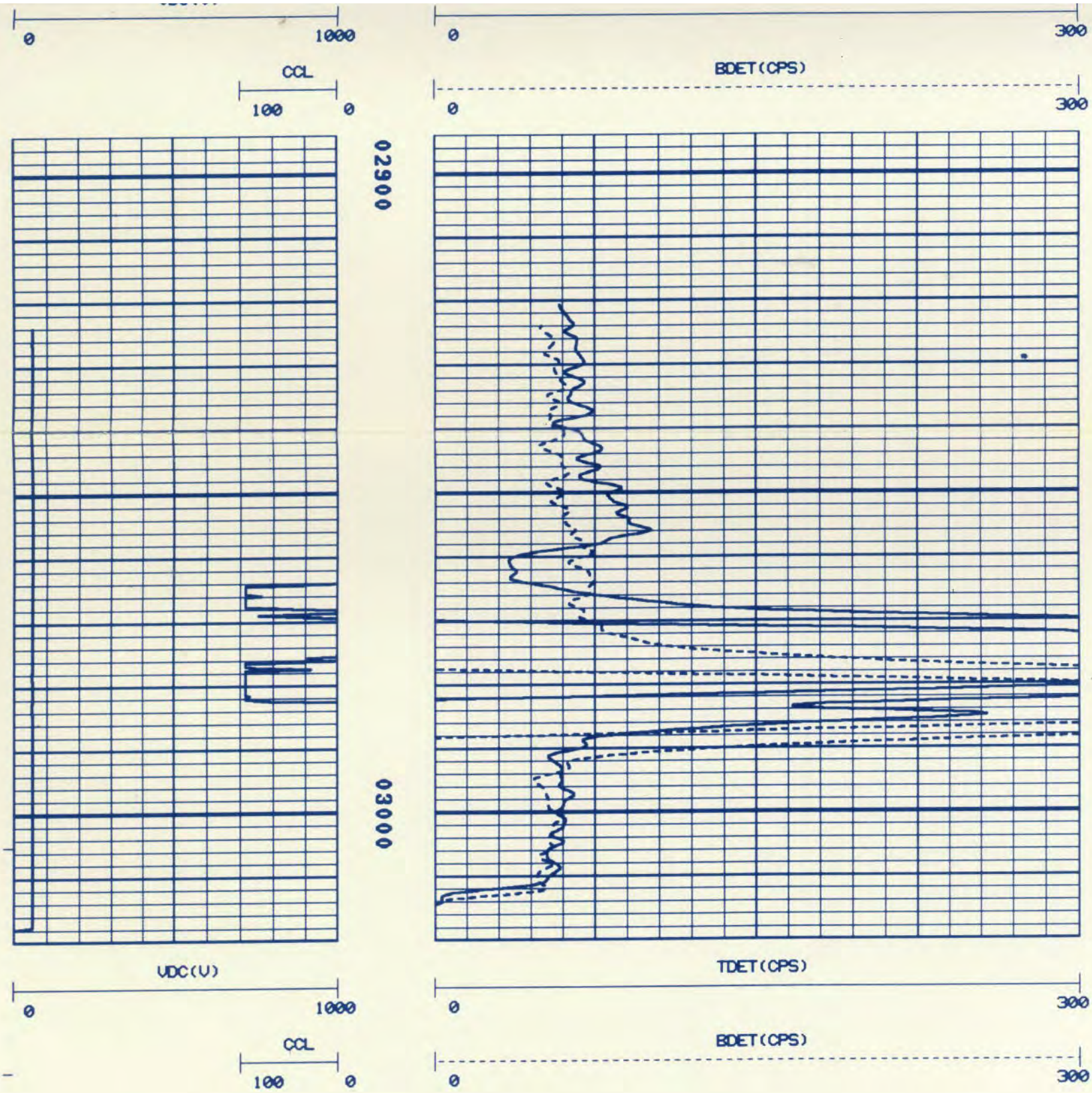
COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2 TRIP: 1

SERVICE: D 439A FILE: 3 DATE: 10/29/91 TIME: 12:16:47

REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD





FILE: 3

STAT CHECK AT 3150′
PUMP RATE AT 20 GPM

FILE: 1

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
BDET	0	FT,IN
TDET	3,6	FT,IN
CCL	6,6	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 439A FILE: 1 DATE: 10/29/91

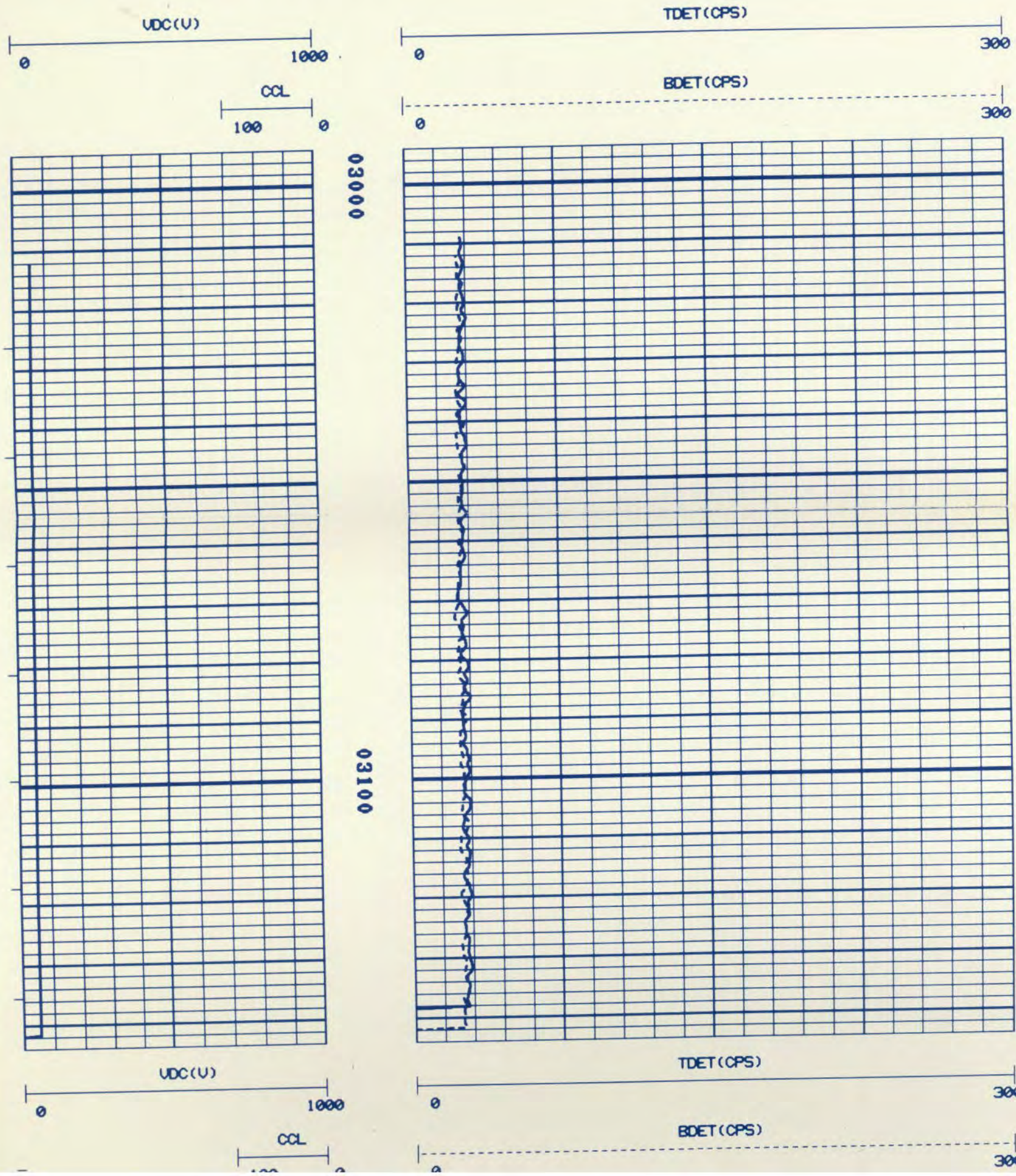
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 11:51:38

MODE: RECORD



0 1000 0 300

CCL BDET(CPS)

100 0 0 300

FILE: 1

****

GR BASE LOG
MAIN LOG

****

FILE: 2

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
GR	0	FT,IN
CCL	16,9	FT,IN
ACCL	6,6	FT,IN
RCCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 2

SERVICE: D 372B FILE: 2 DATE: 10/29/91

REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 11:18:50

MODE: RECORD

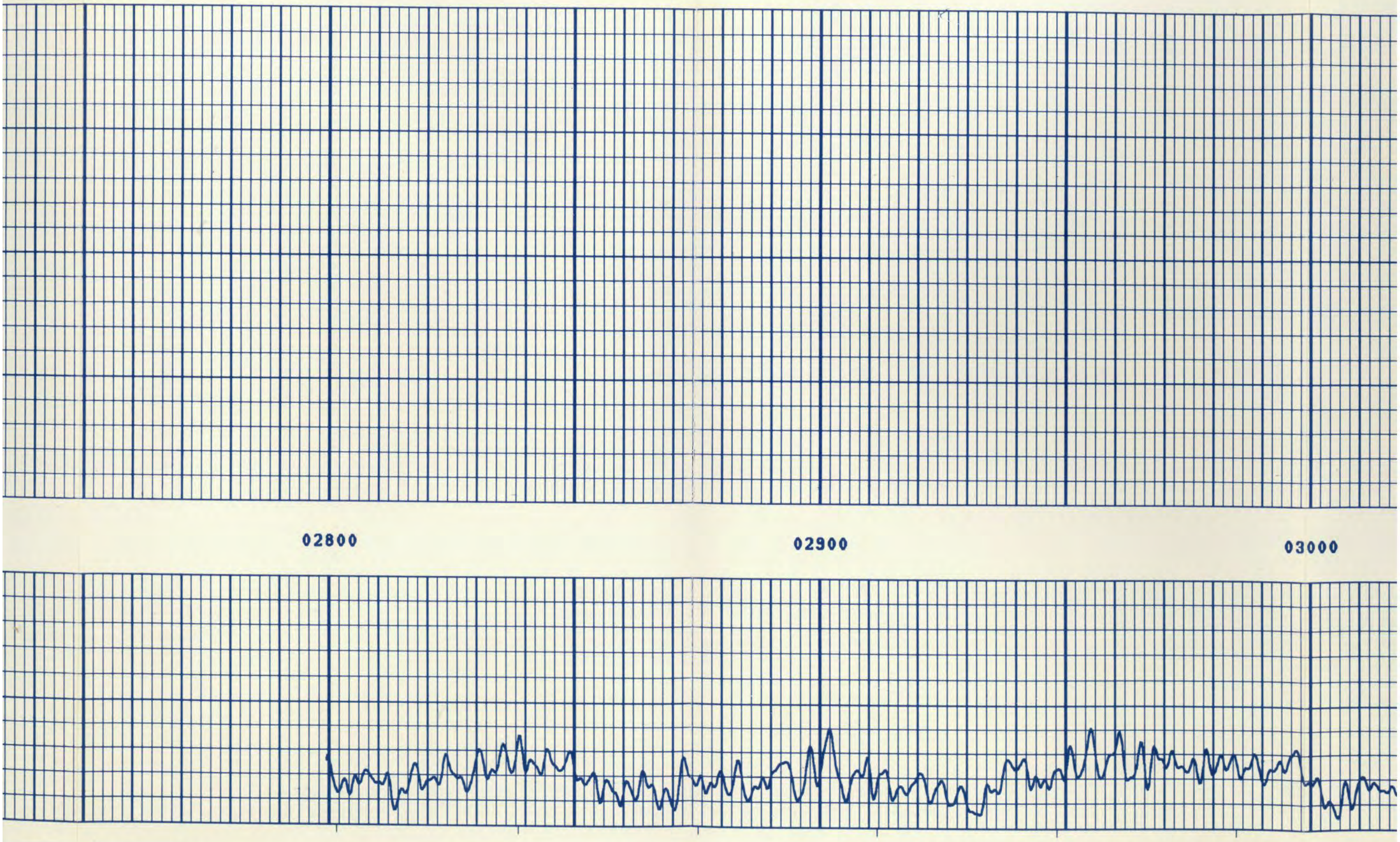
CCL

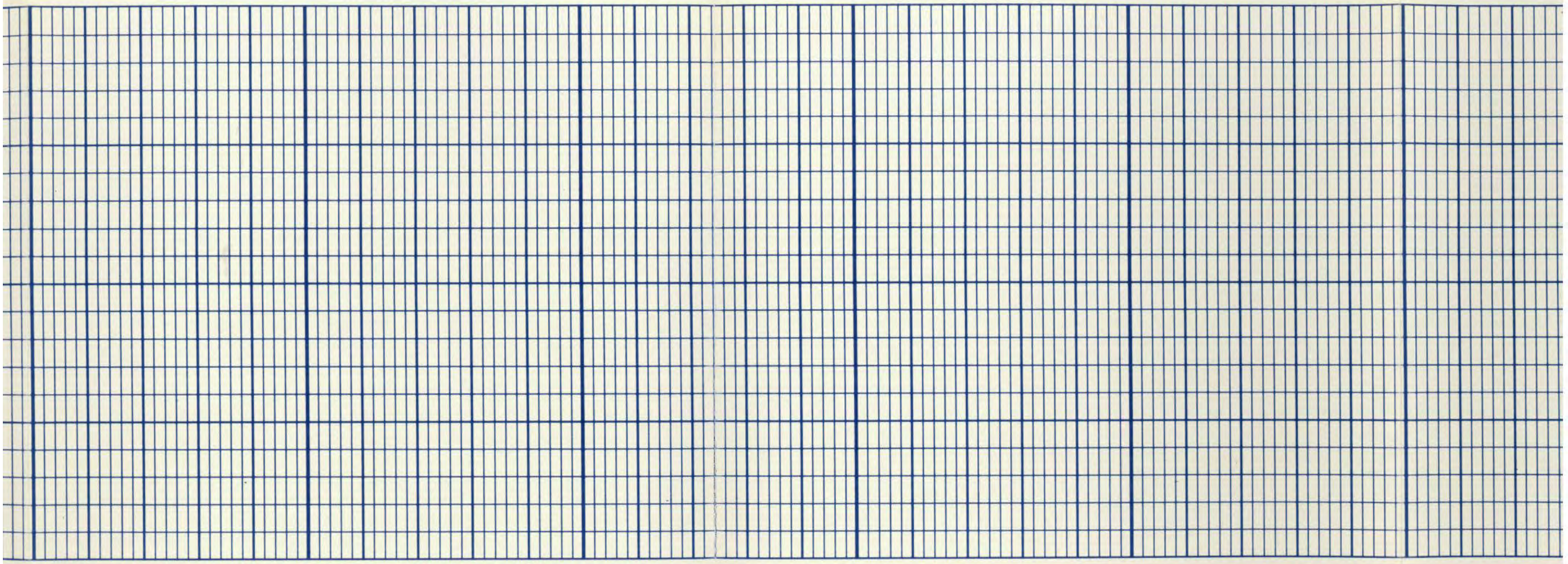
100 0

GR(API)

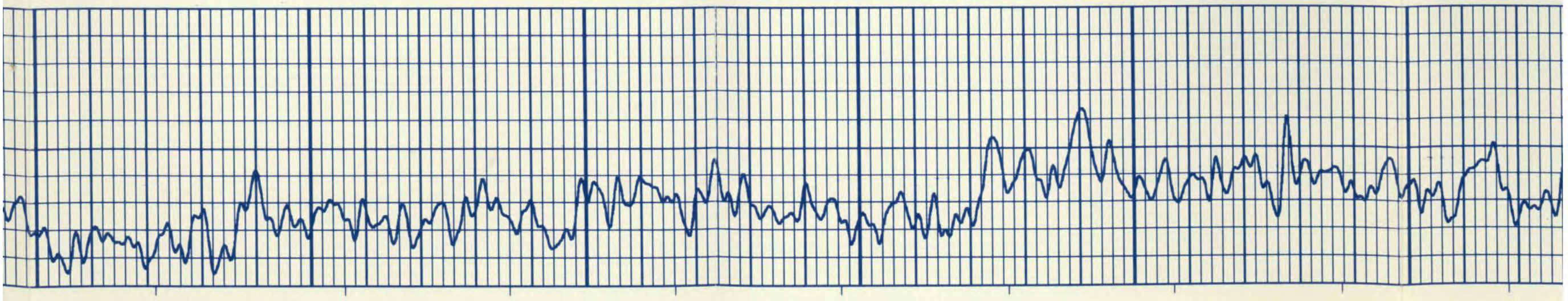
100 300

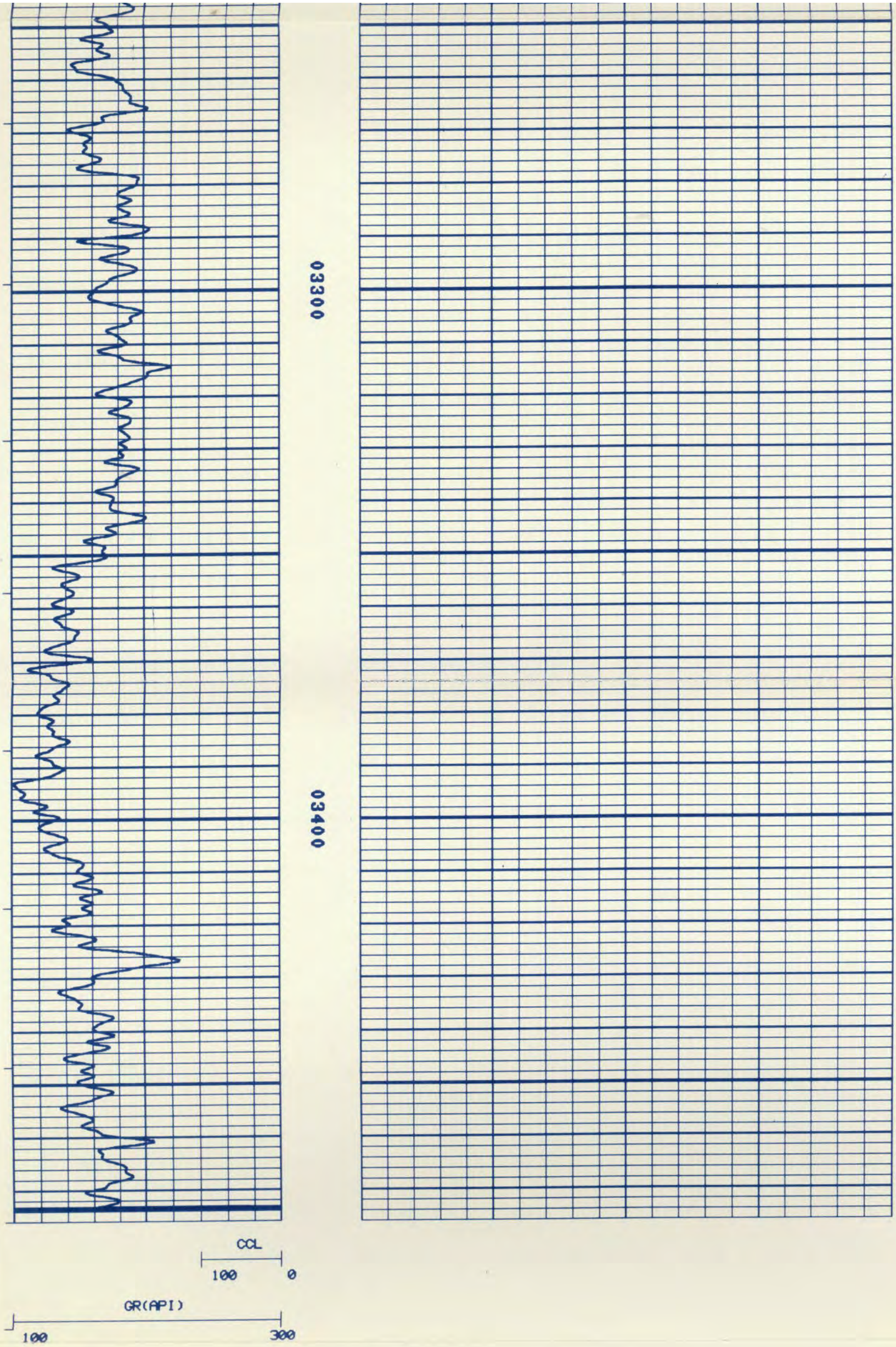
02700


02800
02900
03000



03000 03100 03200





FILE: 2

FILE: 1

FILE: 2

****

****

FILE: 1

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

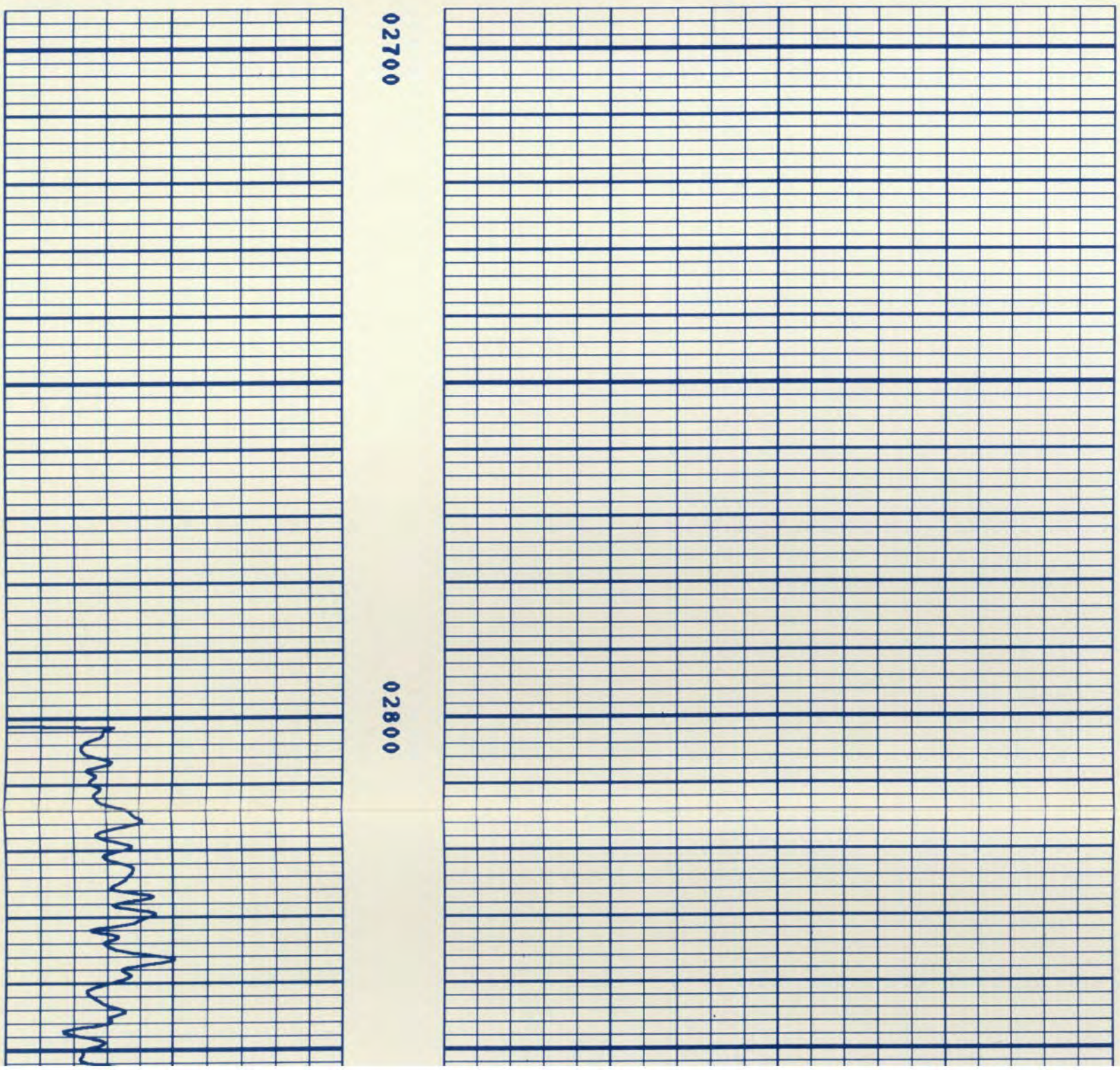
COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 2			TRIP:	1
SERVICE:	D 372B	FILE: 1	DATE: 10/29/91	TIME:	10:46:38
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK

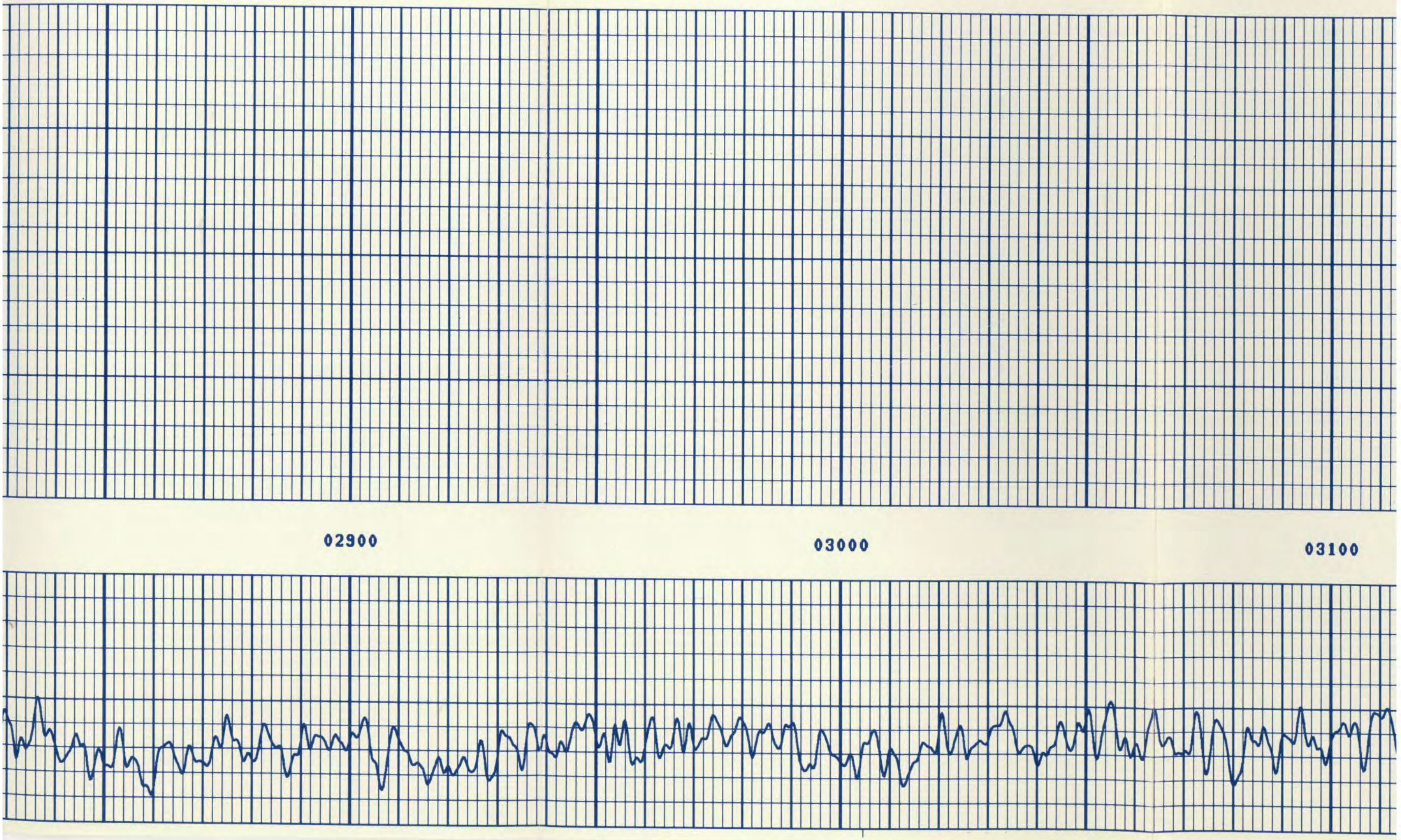
CCL

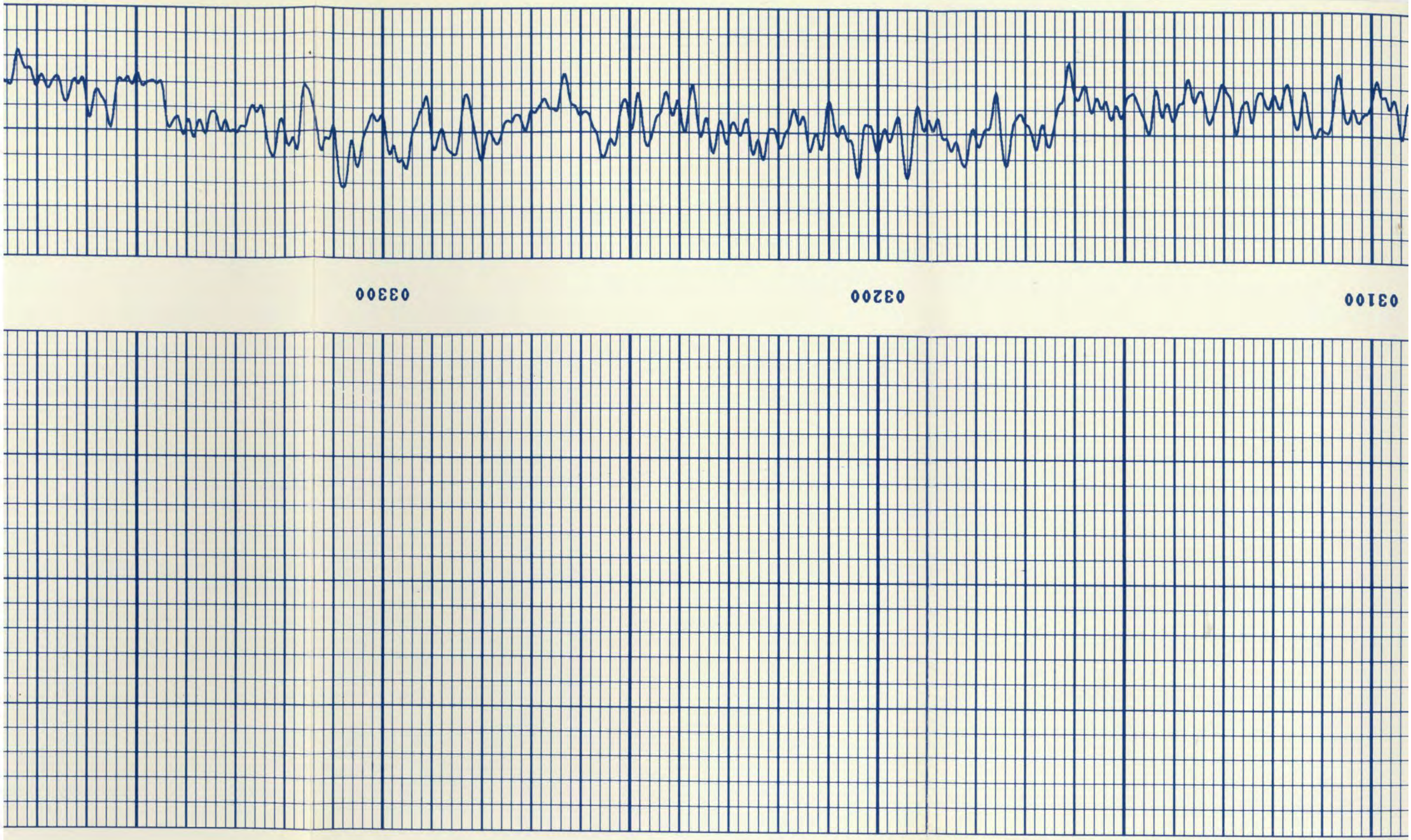
100 0

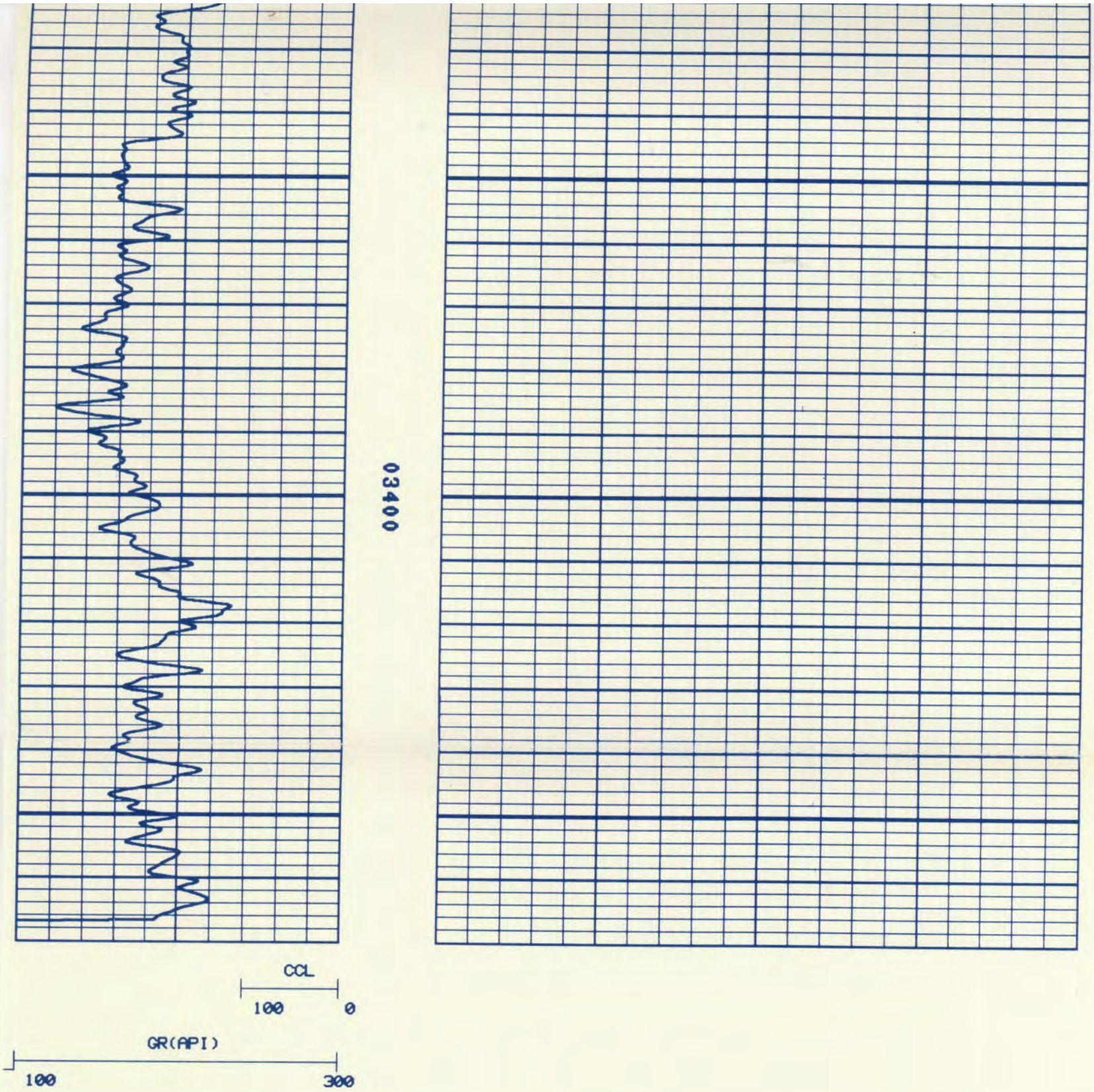
GR(API)

100 300



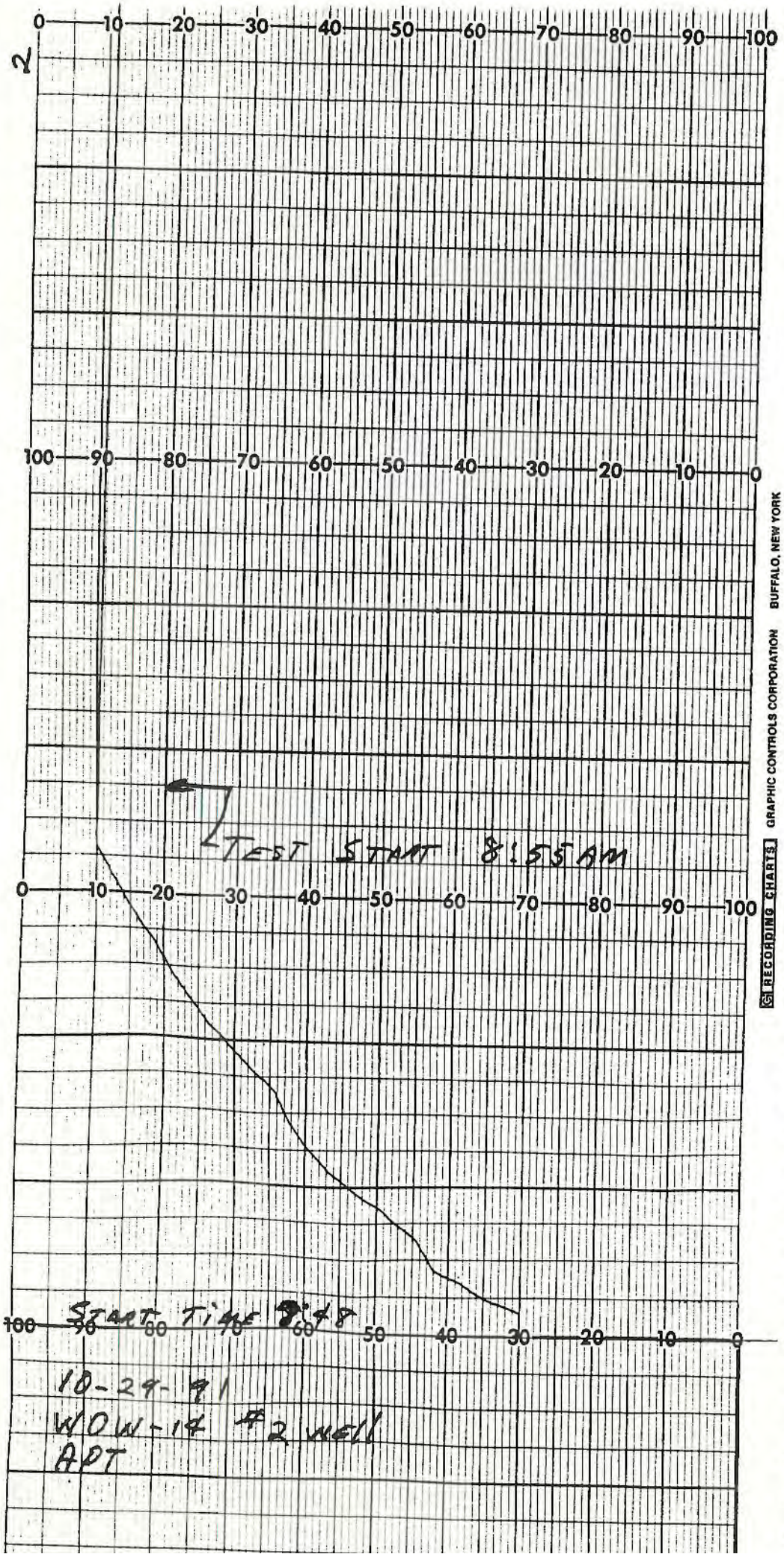

02900
03000
03100

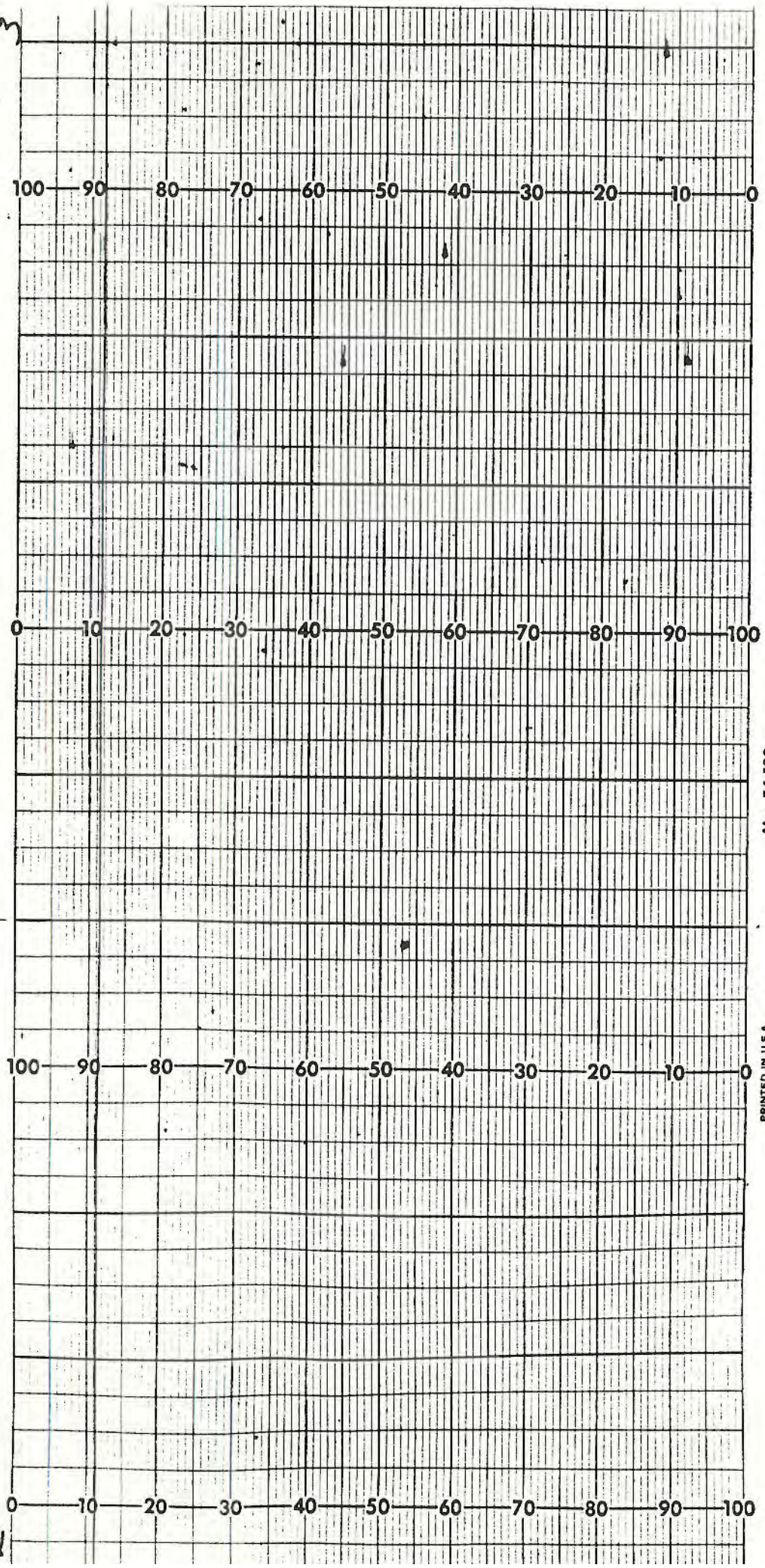

03300
03200
03100



FILE: 1

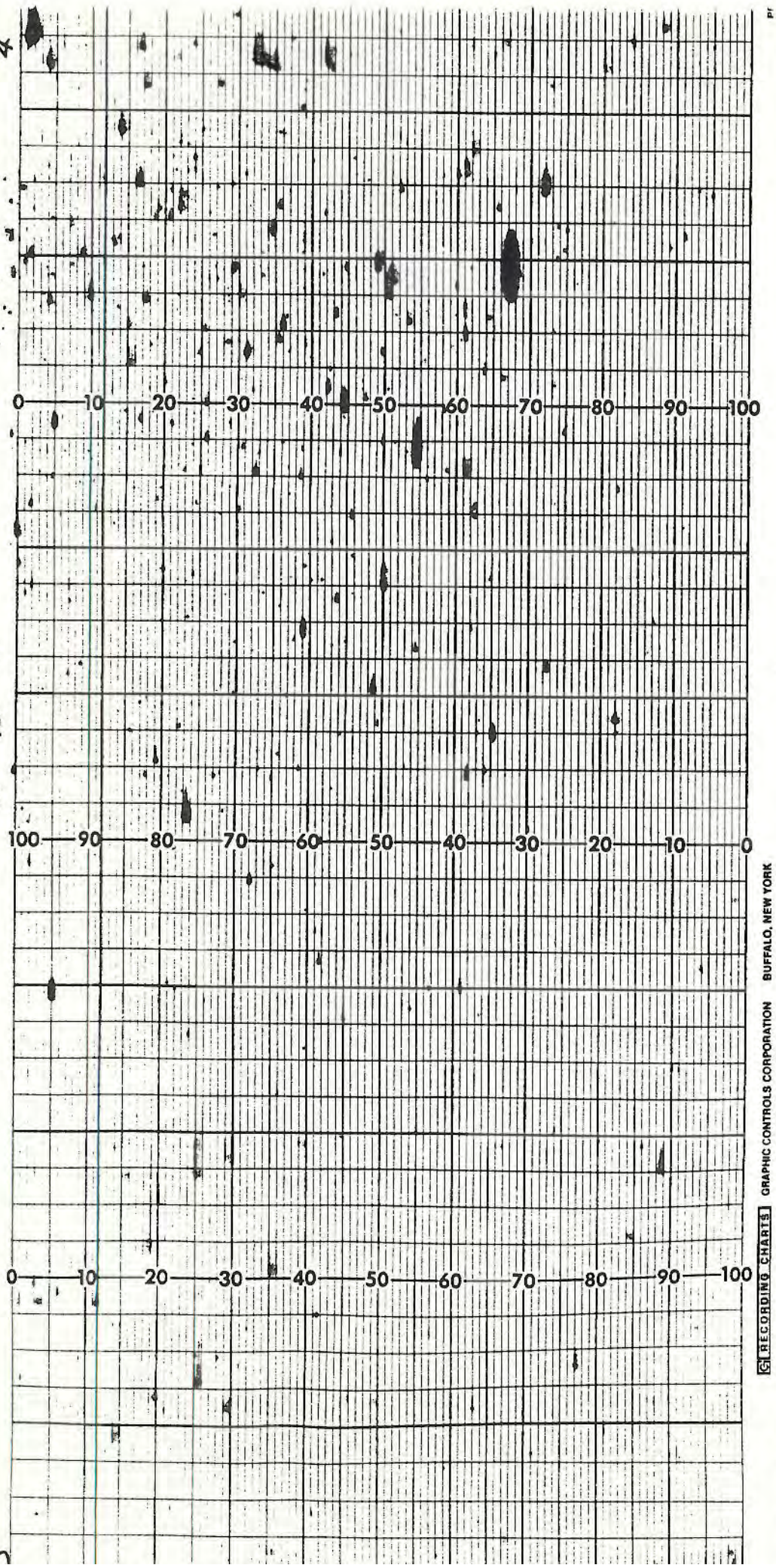
APPENDIX D
ANNULUS PRESSURE TEST WDW-14 (WELL #2)


0 10 20 30 40 50 60 70 80 90 100
2
100 90 80 70 60 50 40 30 20 10 0
TEST START 8:55 AM
0 10 20 30 40 50 60 70 80 90 100
START TIME 8:48
100 90 80 70 60 50 40 30 20 10 0
10-29-91
WOW-14 #2 WELL
APT
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK
RECORDING CHARTS

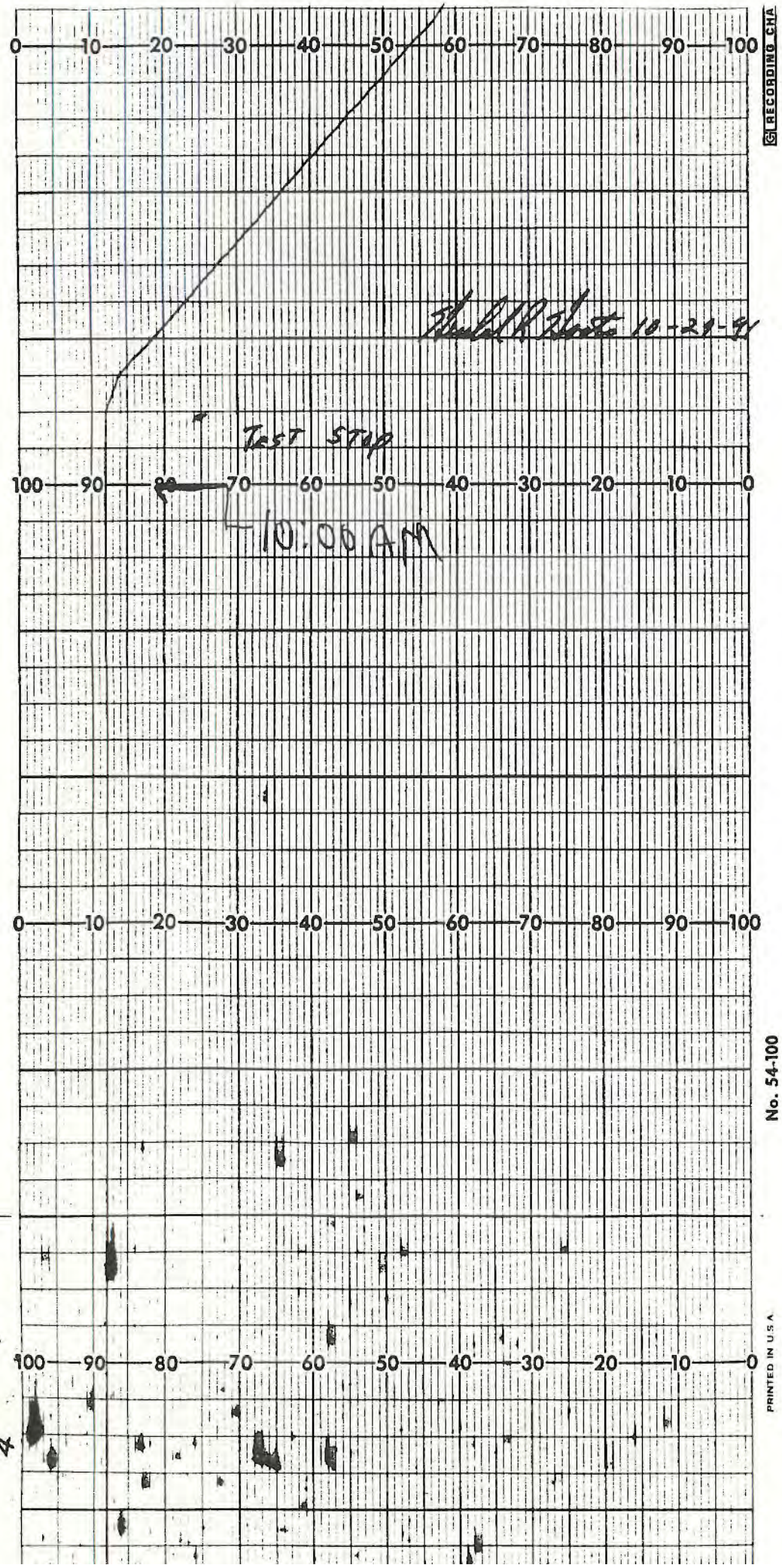


No. 54-100

PRINTED IN U.S.A.



G RECORDING CHARTS GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK


0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
TEST STOP
10:00 AM
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
4
RECORDING CHA
No. 54-100
PRINTED IN U.S.A.

100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
5
RECORDING CHARTS
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

APPENDIX E
RADIOACTIVE TRACER SURVEY ANALYSIS
WDW-49 (WELL #4)

EVALUATION OF RADIOACTIVE TRACER SURVEY
INJECTION WELL NO. 4
WDW-49

LOG DATA

Date Run:	November 1, 1991
Logging Service Company	Western Atlas International
Tubing Size and Depth Set	5 1/2"
Casing Size and Depth:	7 5/8"" set at 3368'
Packer Depth	3316'±

BASELINE GAMMA-RAY LOG

This baseline G/R log was run from 3420'± to 2995'±. The purpose of the initial baseline G/R log is to demonstrate repeatability of the logging tools. A comparison of both baseline G/R runs shows good repeatability between the two runs.

BEFORE SURVEY BASELINE GAMMA-RAY LOG 2

A baseline G/R was run from 3420'± to 2994'±. The log is useful for the following comparisons against additional RAT logging runs.

1. The G/R curves are used as depth control points against other runs during the RAT.
2. The baseline G/R is compared against the final G/R log to check for anomaly areas that could indicate upward migration along a cement channel.

BEFORE SURVEY BASELINE GAMMA-RAY LOG 3

A baseline G/R was run from 3464'± to 2990'±. Unlike the previous two baseline logs, this run was made using the lower sensitivity detector. It can also be used as a diagnostic comparison against the final gamma ray runs.

BEFORE SURVEY BASELINE GAMMA-RAY LOG 4

A fourth baseline gamma-ray (G/R) was run from 3450'± to 2994'±. This run was made using the lower sensitivity detector and served as a repeat run. It can also be used as a diagnostic comparison against the final gamma ray runs.

CHASE SURVEY NO. 1

The multiple passes portion of the RAT provides a check for upward migration. In this instance, one slug was ejected at a depth of 3000'± and it was tracked as it was pumped down the tubing. The pumping rate for this test was 20 gpm and seven (7) individual passes were made with two detectors as the slug moved from 3082'± to 3468'±. Both curves are illustrated on the multiple passes portion of the log. The relatively low flow rate of 20 gpm was necessary to allow sufficient time for the logging tools to be lowered to make multiple passes and record the progress of the radioactive slug. A flow rate higher than 20 gpm would have caused the slug to move so fast that only a few passes could be made resulting in incomplete coverage of the movement. A summary of the individual passes is given below:

a. Pass 1 - The slug was released at 3000'± and the tool lowered below the tracer material and logged upward. The slug was recorded inside the tubing with its primary peak at 3045'±.

b. Pass 2 - The slug was recorded inside the tubing with its peak at 3114'±. The slug has moved downward 69'± since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. This is seen by the shape of the G/R response.

c. Pass 3 - The slug was recorded inside tubing with its peak at 3220'±. The slug has moved downward 106'± since pass 2 and 175'± since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. No upward migration is observed.

d. Pass 4 - The slug is in the injection tubing with its peak at 3323'±. The slug has moved downward 3'± since pass 3 and 178'± since pass 1.

e. Pass 5 - The slug is in the injection interval with its peak at 3428'±. The slug has moved downward 105'± since pass 4 and 283'± since pass 1. The peak is very diminished and indicated injection into the adjacent sands. No upward movement is observed.

f. Pass 6 - The slug is in the injection interval with its peak at 3464'±. The slug has moved downward 36'± since pass 5 and 319'± since pass 1. The peak is very diminished and indicates injection into the adjacent sands. No upward movement is observed.

g. Pass 7 - The slug is in the injection interval with its peak at 3464'±. The slug has moved downward 0'± since pass 6 and 319'± since pass 1. The peak is very diminished and indicates injection into the adjacent sands. No upward and downward movement is observed.

CHASE SURVEY NO. 2

The second multiple passes portion of the RAT provides an additional check for upward migration. In this instance, one slug was ejected at a depth of 3150'± and it was tracked as it was pumped down the tubing. The pumping rate for this test was 20 gpm and six (6) individual passes were made with two detectors as the slug moved from 3140'± to 3470'±. Both curves are illustrated on the multiple passes portion of the log. The relatively low flow rate of 20 gpm was necessary to allow sufficient time for the logging tools to be lowered to make multiple passes and record the progress of the radioactive slug. A flow rate higher than 20 gpm would have caused the slug to move so fast that only a few passes could be made resulting in incomplete coverage of the movement. A summary of the individual passes is given below:

a. Pass 1 - The slug was released at 3150'± and the tool lowered below the tracer material and logged upward. The slug was recorded inside the tubing with its primary peak at 3180'±.

b. Pass 2 - The slug was recorded inside the tubing with its peak at 3244'±. The slug has moved downward 64'± since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. This is seen by the shape of the G/R response.

c. Pass 3 - The slug was recorded inside tubing with its peak at 3315'±. The slug has moved downward 71'± since pass 2 and 135'± since pass 1. The radioactive slug has spread out slightly by the passes of the logging tool. No upward migration is observed.

d. Pass 4 - The slug is in the injection interval with its peak at 3422'±. The slug has moved downward 107'± since pass 3 and 242'± since pass 1. The peak is diminished and indicated injection into the adjacent sands. No upward movement is observed.

e. Pass 5 - The slug is in the injection interval with its peak at 3463'±. The slug has moved downward 42'± since pass 4 and 284'± since pass 1. The peak is very diminished and indicated injection into the adjacent sands. No upward movement is observed.

f. Pass 6 - The slug is in the injection interval with its peak at 3464'±. The slug has moved downward 1'± since pass 5 and 285'± since pass 1. No upward and downward movement is observed.

FIRST STATIONARY READING ON TIME DRIVE

The stationary survey checks for upward migration under a high flow rate condition. In this case, a radioactive slug was released above 3350'± and the recording done on a time drive basis. Fluid was pumped into the well at 100 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3350') for 15 minutes. Since the slug was released above the detector, its passage is indicated on the log. Pumping was continued for the remainder of the 15 minute period while recording. No second G/R peak was detected and as such no upward migration was detected.

SECOND STATIONARY READING ON TIME DRIVE

This pass is identical to the previous pass but serves as a double check of the equipment and the presence of upward migration. A radioactive slug was released at 3348'± and the recording done on a time drive basis. Fluid was pumped into the well at 100 gallons per minute (gpm) while recording the background radioactivity at a stationary point (3348') for 15 minutes. Since the slug is released above the detector, its passage is indicated on the log. Pumping is continued for the remainder of the 15 minute period while recording. No second G/R peak was detected and as such no upward migration was detected.

AFTER SURVEY BASELINE GAMMA-RAY LOG

After the secondary stationary survey, the logging tool was lowered to 3468'± and an after survey baseline G/R log was recorded. The purpose of this log is to compare it with the before survey baseline G/R log to look for anomaly areas. These areas would appear as "hot spots" or areas in which the G/R readings have been elevated above background levels. A comparison of these logs indicated no anomaly areas or indications of upward movement.

Western Atlas International
A Litton/Dresser Company

ATLAS WIRELINE SERVICES

November 18, 1991

Golden Strata Services, Inc.
Suite 1600
711 Louisiana
Houston, TX 77002

ATTN: Bob Hall

RE: Effluent Disposal Well No. 4
Celanese Plant Matagorda County, Texas

Dear Bob:

On November 1 a Radioactive Tracerlog was run to insure mechanical integrity of the aforementioned well. This is an interpretation of the Radioactive Tracer Survey.

A Gamma Ray Base Log was run for depth correlation and to obtain the normal radioactivity of the downhole environment. Two before Log Base Logs of the detectors were run to compare to the after log.

Statistical checks were done in the top and bottom detectors to insure stability of the detectors and the instrument. The statistical shows that the tools are stable and in good condition.

Procedure:

First slug was shot at 3000 ft. Pump rate was 20 GPM for chasing R/A material downhole. There were 7 passes made. Second slug was shot at 3150 ft. Pump rate was 20 GPM for chasing R/A material downhole. There were 6 passes made.

Pump rate was at 100 GPM for the stationary checks taken at 3350 ft. and at 3348 ft. A 3 minute stat check was recorded before shooting and a 15 minute statistical check was recorded after injecting.

Injection Passes:
Injection Rate 20 GPM

1st Injected Slug:
Depth 3000 ft.

All passes, except the 7th one, were overlaid and labeled to show that the slug was moving downhole. There is no significant leak off of the R/A material and shows to be going down in a proper manner.

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1st Stat
Depth 3

The tool is
was run bott
slug was moni
was not monit
the time we we

2nd Stationary
Depth 3348 ft.

The R/A slug was
and not returning.

After Survey Base Lo

This pass shows there
increasing to a large
Before Log Base Log.

In conclusion, there is
back up. All monitoring

Sincerely,

Freeman Hill, III

Freeman Hill, III
Reservoir and Completion Analy
(713) 972-5736

FH/cd

Western Atlas International

2nd Injected Slug:
Depth 3150 ft.

All passes, except the 5th and 6th passes were overlaid and labeled to show that the slug was moving downhole. There is no significant leak off of the R/A material and shows to be going down in a proper manner.

The injection passes show that the injected R/A material is moving down and is not coming back around.

Stationary Checks:
Injection Rate 100 GPM

1st Stationary Check:
Depth 3350 ft.

The tool is stationary at 3350 ft., the monitoring is set on time drive. (Time was run bottom up). (Depth Delays are on). The R/A slug was shot and the R/A slug was monitored going past the detectors. The detection of the R/A material was not monitored again. Thus the R/A material never returned to the area for the time we were monitoring. Slug moving downhole.

2nd Stationary Check:
Depth 3348 ft.

The R/A slug was shot and the R/A slug was monitored going past the detectors and not returning.

After Survey Base Log:

This pass shows there to be R/A material at 3410 to 3414 ft. and 3428 ft. increasing to a large peak at 3460 to 3465 ft. This is in comparison to the Before Log Base Log.

In conclusion, there is no evidence that there is flow coming around and coming back up. All monitoring indicates a sound injection well.

Sincerely,

Freeman Hill, III

Freeman Hill, III
Reservoir and Completion Analyst
(713) 972-5736

FH/cd

ATLAS WIRELINE SERVICES

Western Atlas International

NUCLEAR TRACER LOG

FILE NO.	COMPANY HOECHST CELANESE CORPORATION
	WELL EFFLUENT DISPOSAL WELL NO. 4
API NO.	FIELD CELANESE PLANT
	COUNTY MATAGORDA STATE TEXAS
FINAL	LOCATION: N/A SEC N/A TWP N/A RGE N/A

OTHER SERVICES

PERMANENT DATUM GROUND LEVEL ELEVATION N/A FT.
LOG MEASURED FROM K.B. 12 FT. ABOVE PERMANENT DATUM
DRILL. MEAS. FROM K.B.

ELEVATIONS
KB N/A
DF N/A
GL N/A

DATE	11/1/91
RUN	1
SERVICE ORDER	32445
DEPTH-DRILLER	3500
DEPTH-LOGGER	3476
BOTTOM LOGGED INTERVAL	3476
TOP LOGGED INTERVAL	2954
TYPE FLUID IN HOLE	WATER
SALINITY PPM CL.	N/A
DENSITY LB/GAL.	N/A
LEVEL	FULL
MAX. REC. TEMP. DEG. F	N.A
OPR. RIG TIME	8.5 HOURS
EQUIP. NO. / LOCATION	H.L. 6345 EL CAMPO
RECORDED BY	HUBBLE
WITNESSED BY	BOB HALL

BOREHOLE RECORD

NUMBER	BIT	FROM	TO

IN MAKING INTERPRETATIONS OF LOGS OUR EMPLOYEES WILL GIVE CUSTOMER THE BENEFIT OF THEIR BEST JUDGEMENT, BUT SINCE ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS, WE CANNOT, AND WE DO NOT GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATION. WE SHALL NOT BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COST, DAMAGES, OR EXPENSES WHATSOEVER INCURRED OR SUSTAINED BY THE CUSTOMER RESULTING FROM ANY INTERPRETATION MADE BY ANY OF OUR EMPLOYEES.

FOLD HERE

CASING RECORD

SIZE	WEIGHT	FROM	TO

REMARKS

N/A = NOT AVAILABLE
FIRST SLUG WAS SHOT @ 3000'. PUMP RATE WAS 20 GPM FOR CHASING
R/A MATERIAL DOWN HOLE. THERE WERE 7 PASSES MADE.
SECOND SLUG WAS SHOT @ 3150'. PUMP RATE WAS 20 GPM FOR CHASING
R/A MATERIAL DOWN HOLE. THERE WERE 6 PASSES MADE.

PUMP RATE WAS 100 CPM FOR THE STATIONARY CHECKS TAKEN @ 3350' & 3348'.
A 3 MINUTE STAT CHECK WAS RECORDED BEFORE SHOOTING & A 15 MINUTE STAT
CHECK WAS RECORDED AFTER INJECTING.

EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	SERIES NO.	POSITION
1	1	GR			

AFTER SURVEY BASE LOG

AFTER SURVEY BASE LOG

****

FILE: 18

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 18 DATE: 11/01/91

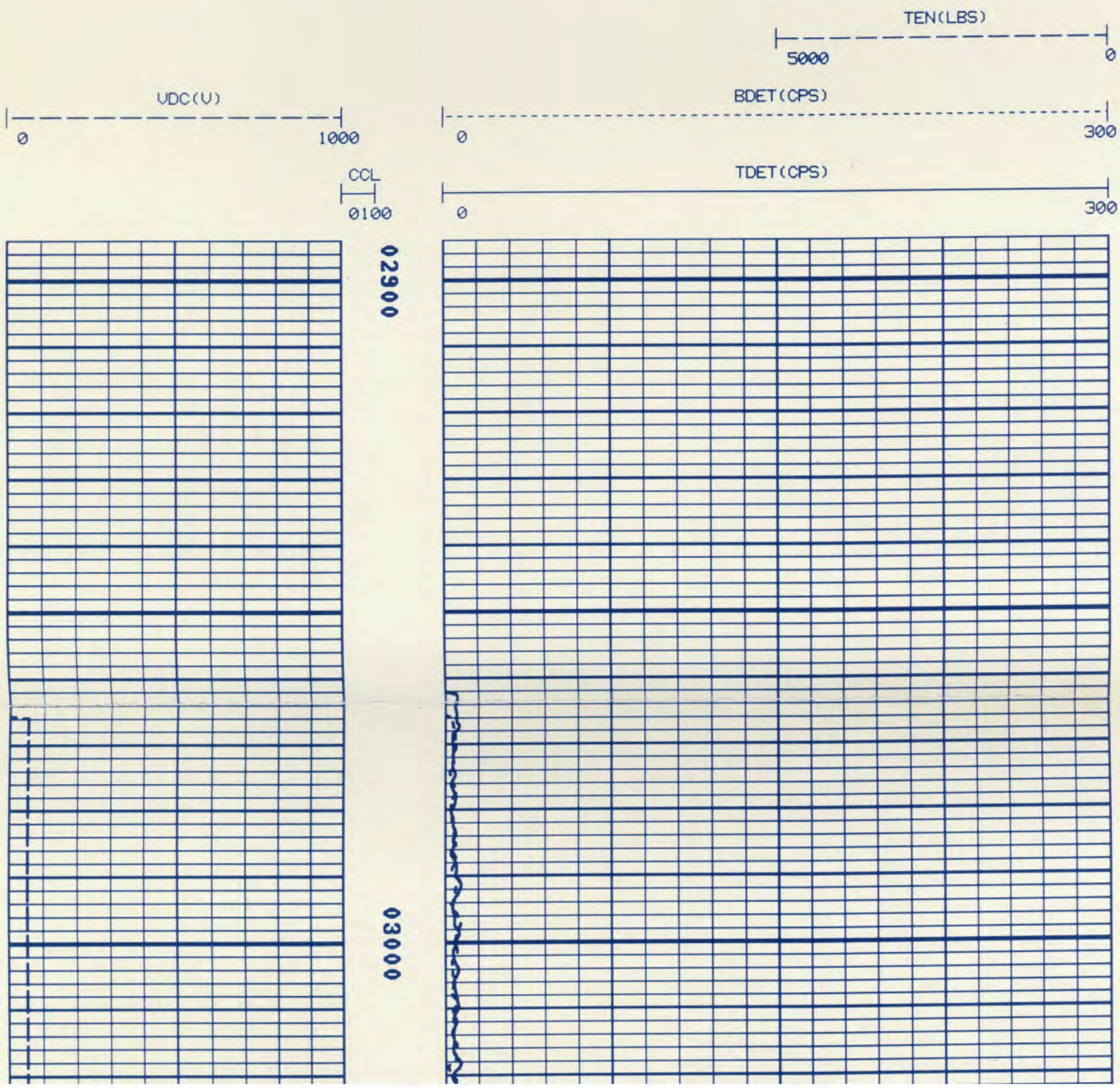
REVISION: FSYS256 REV:G002 VER:2.0

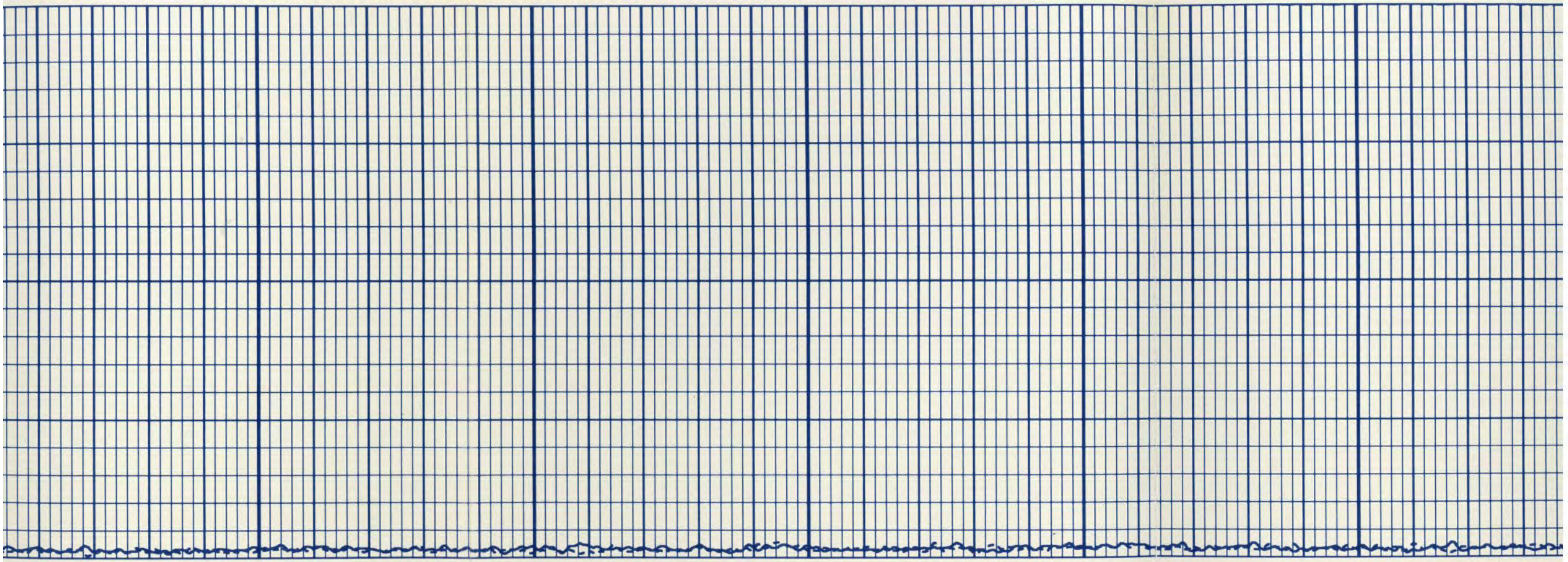
RUN: 1

TRIP: 1

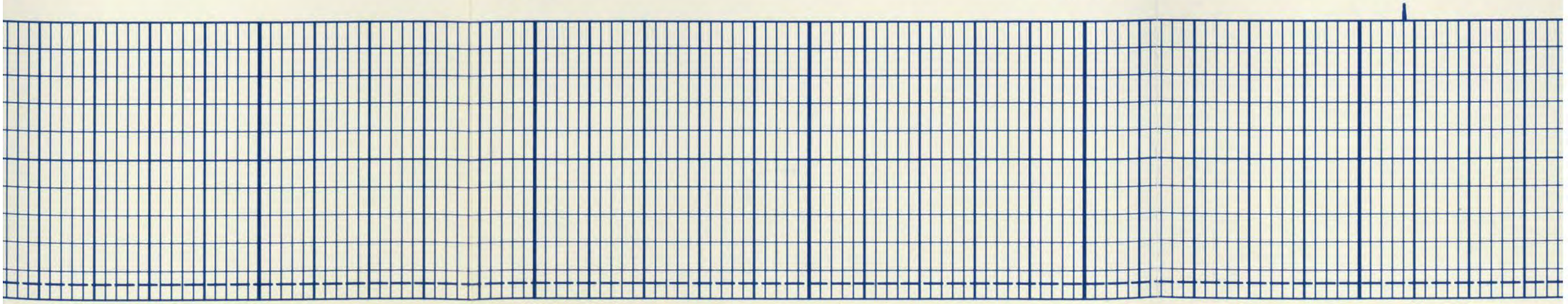
TIME: 10:58:10

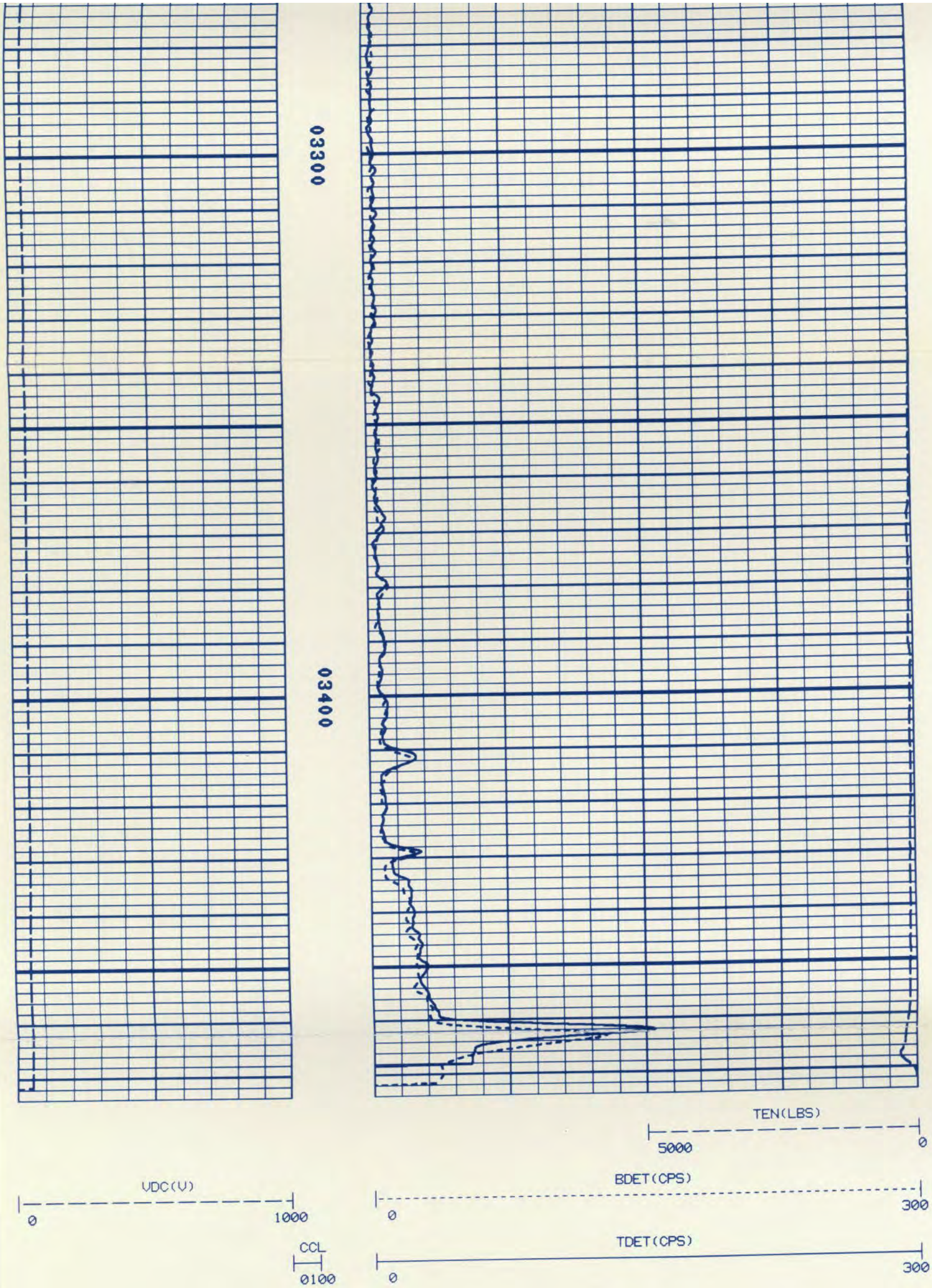
MODE: PLAYBACK





0 03100 03200





FILE: 18

****

SHOT SLUG AT 3348′ AT 100 GPM
LOG 3 MIN. BACKGROUND BEFORE INJECTING
LOG 15 MIN. AFTER INJECTING

LOG 3 MIN. BACKGROUND BEFORE INJECTING
LOG 15 MIN. AFTER INJECTING

****

FILE: 17

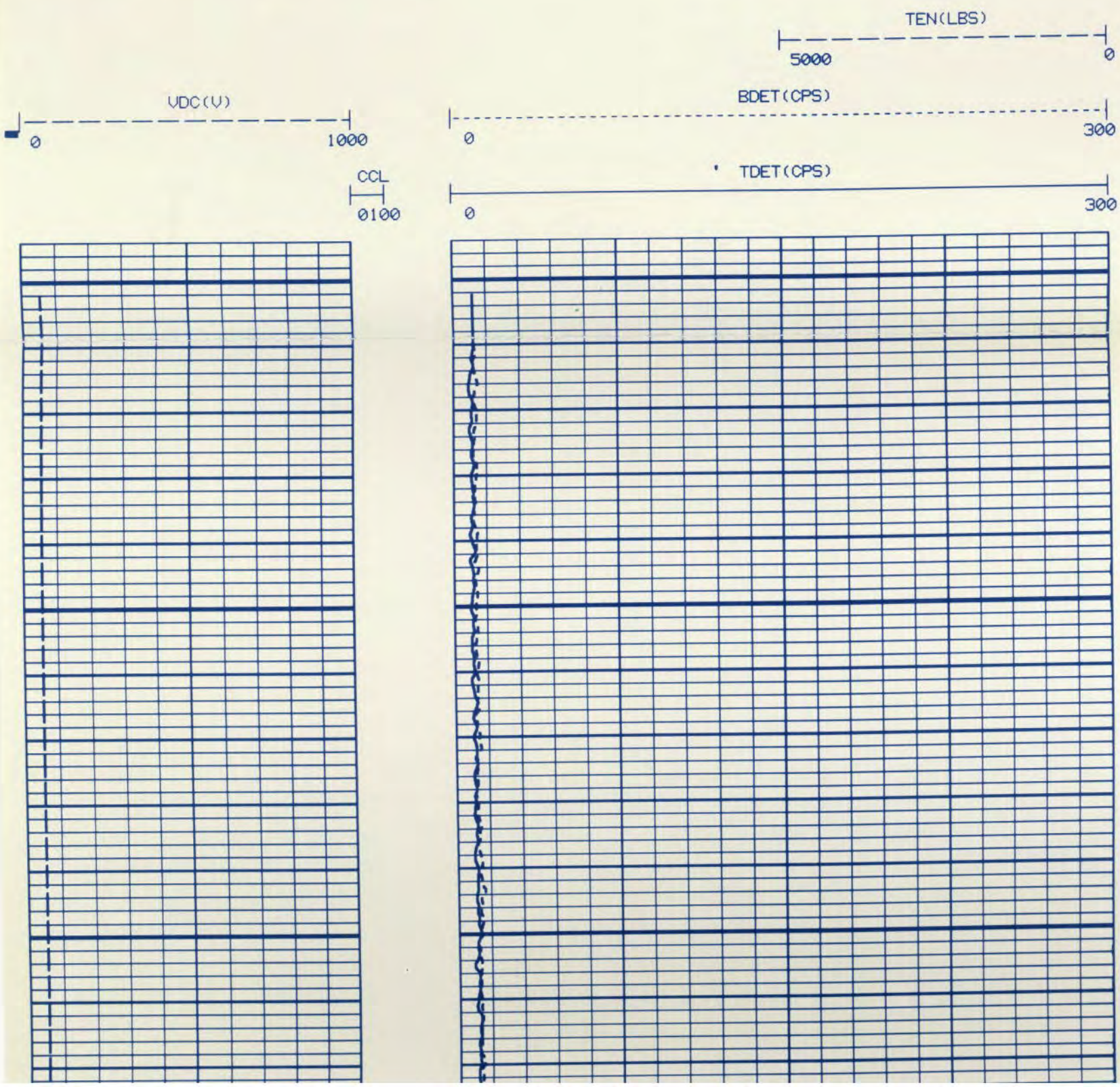
PARAMETERS

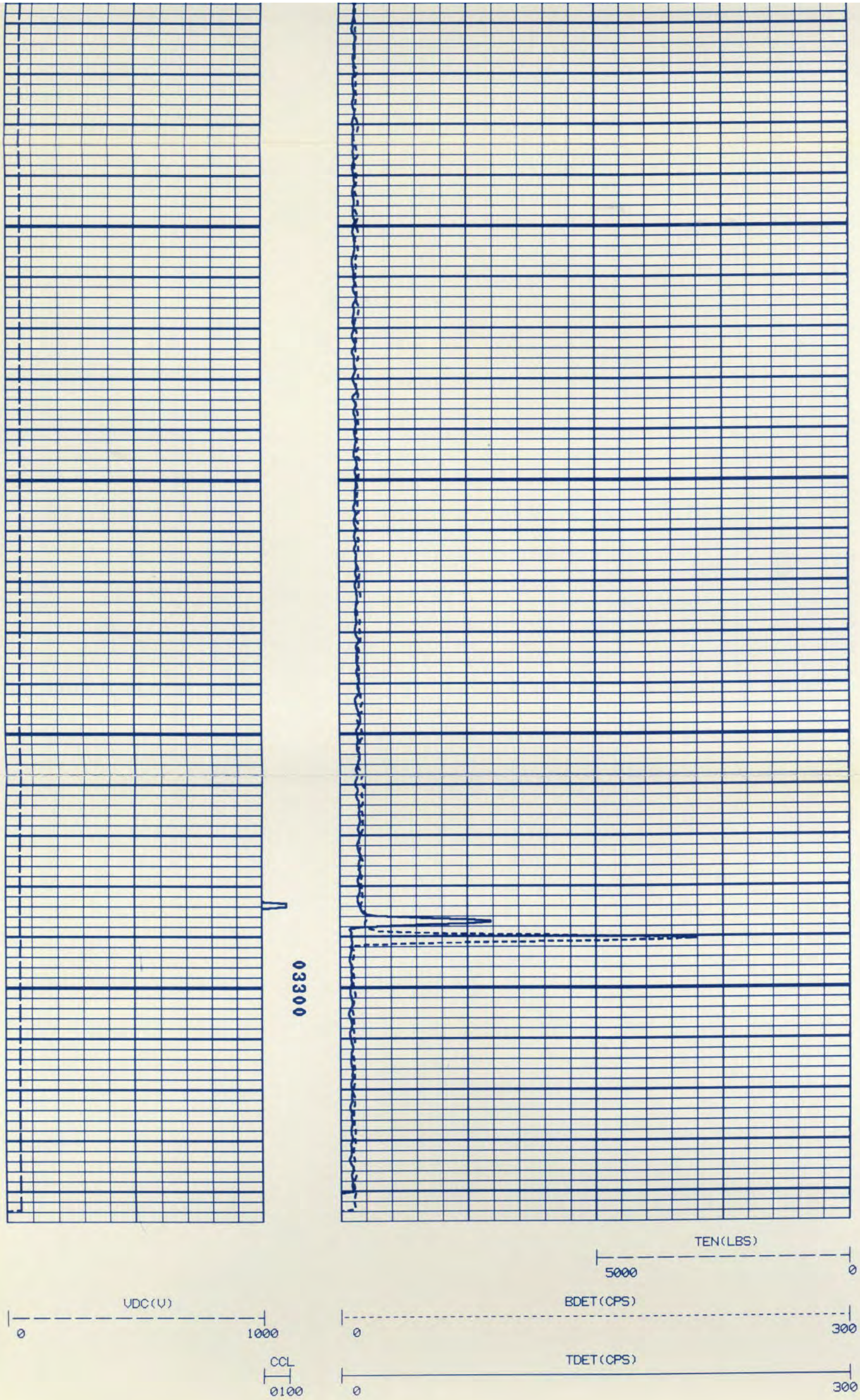
*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 4			TRIP:	1
SERVICE:	F 150C	FILE: 17	DATE: 11/01/91	TIME:	10:36:56
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK




03300
TEN(LBS)
5000
0
VDC(V)
0
1000
BDET(CPS)
0
300
CCL
0100
TDET(CPS)
0
300

FILE: 17

CCL 0100 | TDET(CPS) 0 – 300

FILE: 17

****

SHOT SLUG AT 3350′ AT 100 GPM
LOG 3 MIN. BACKGROUND BEFORE INJECTING
LOG 15 MIN. AFTER INJECTING

****

FILE: 16

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 4			TRIP:	1
SERVICE:	F 150C	FILE: 16	DATE: 11/01/91	TIME:	10:13:27
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK

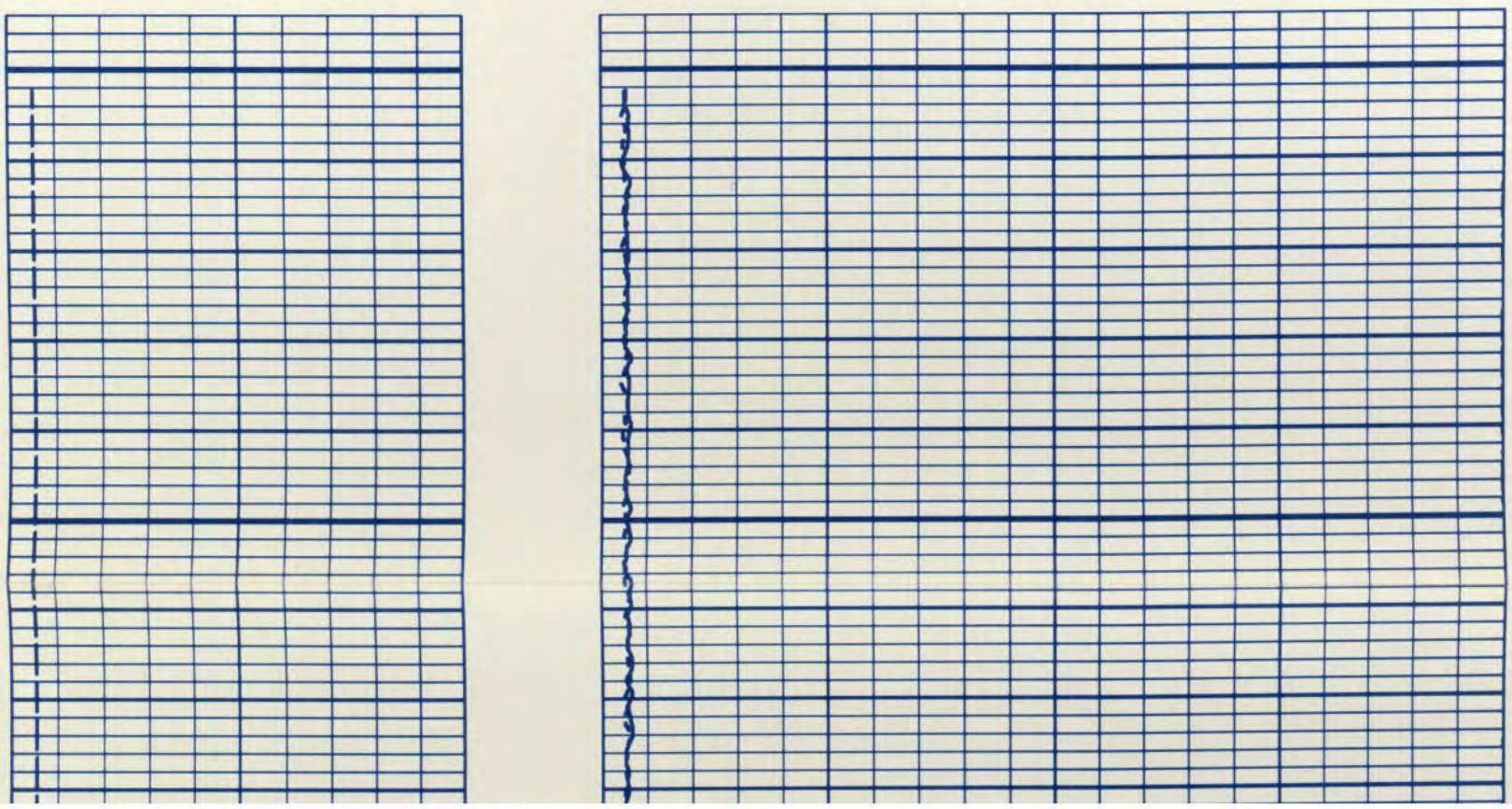
TEN(LBS) 5000 – 0

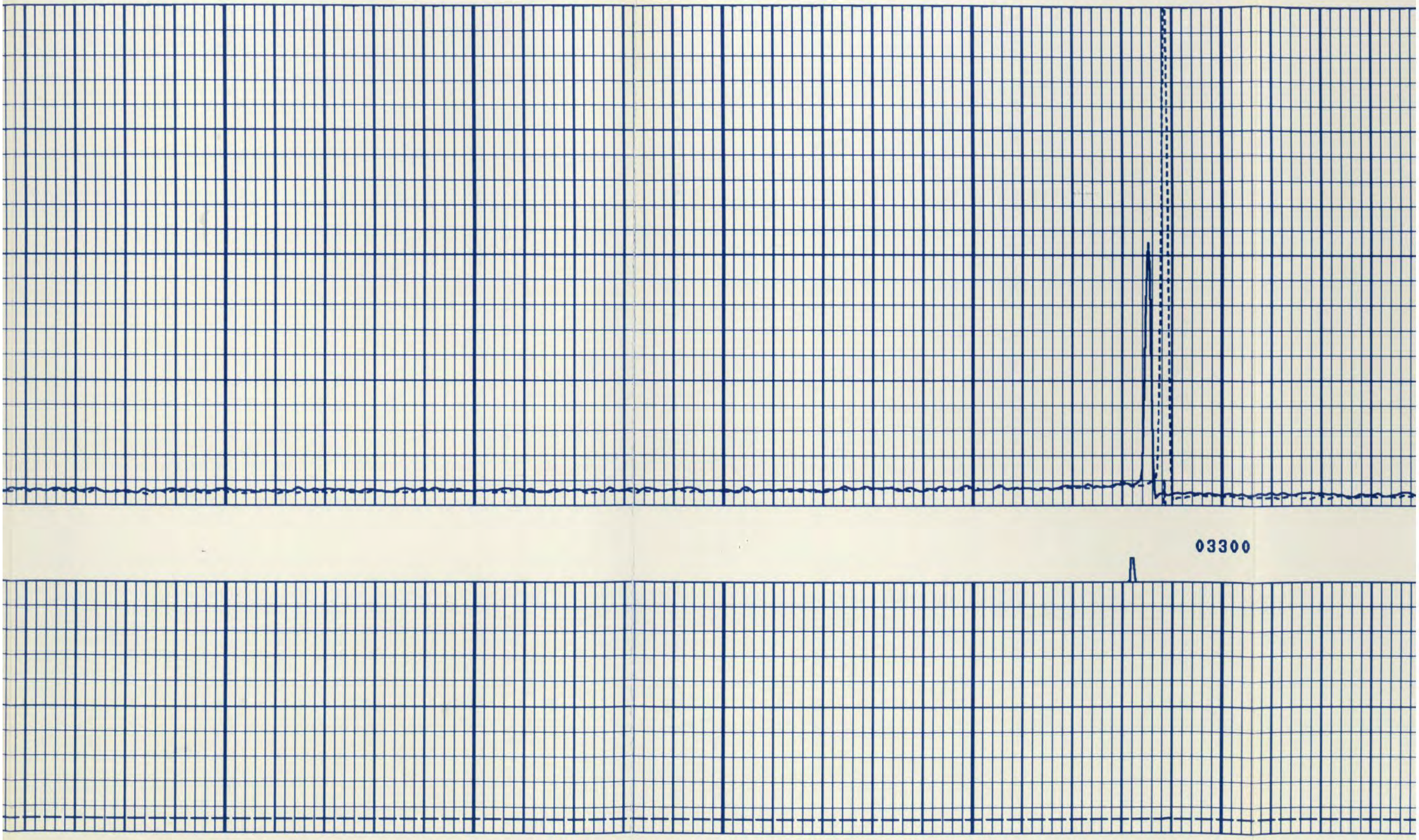
VDC(V) 0 – 1000

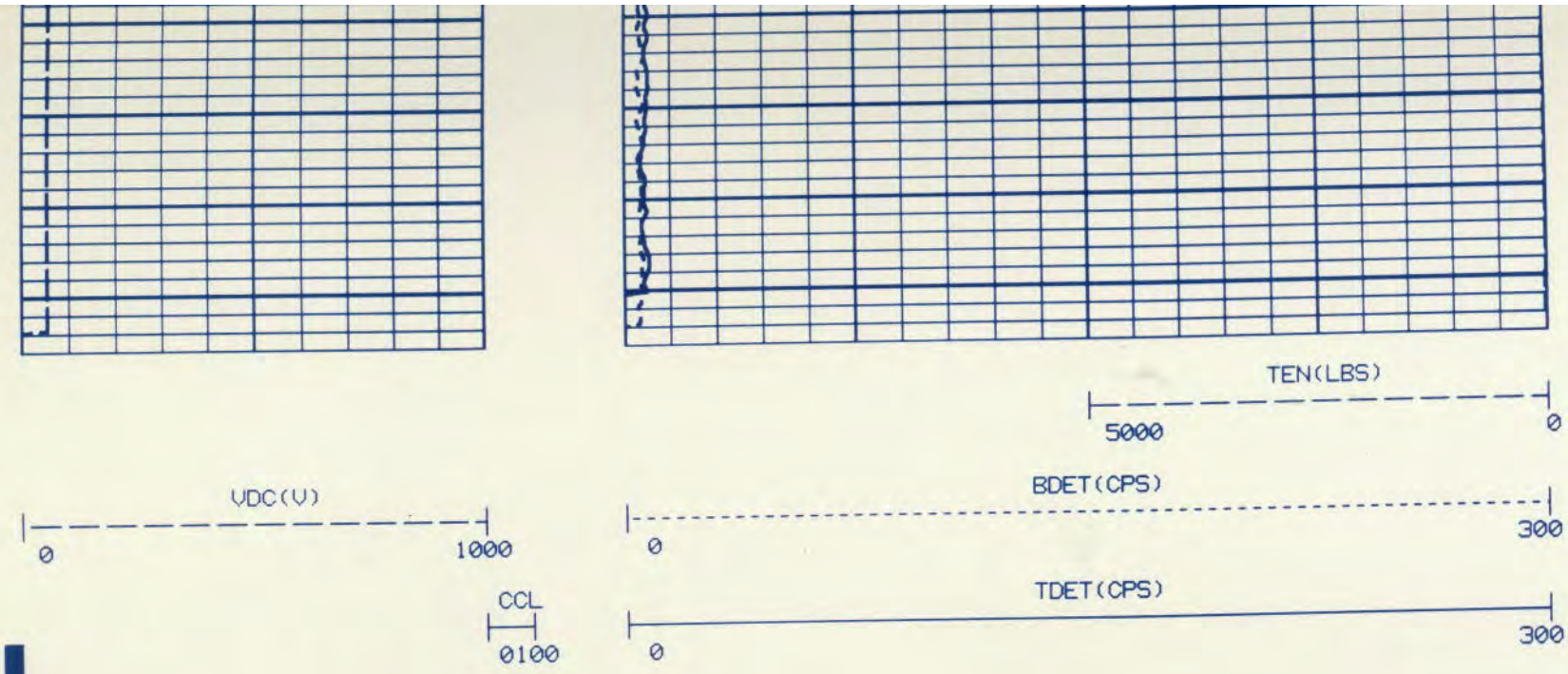
BDET(CPS) 0 – 300

CCL 0100

TDET(CPS) 0 – 300




03300



FILE: 16

****

SHOT SLUG AT 3150′ AT 20 GPM
CHASED SLUG DOWNHOLE
FILES 10 - 15

****

FILE: 15

PARAMETERS

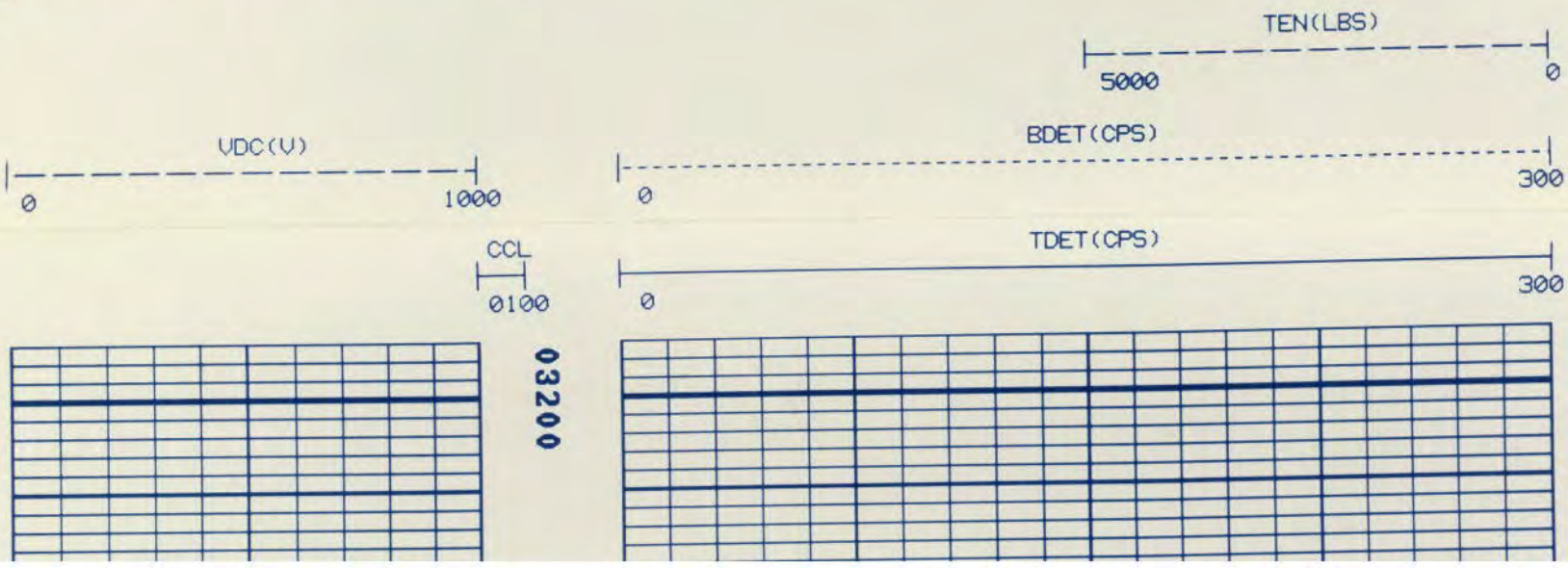
*** NONE ***

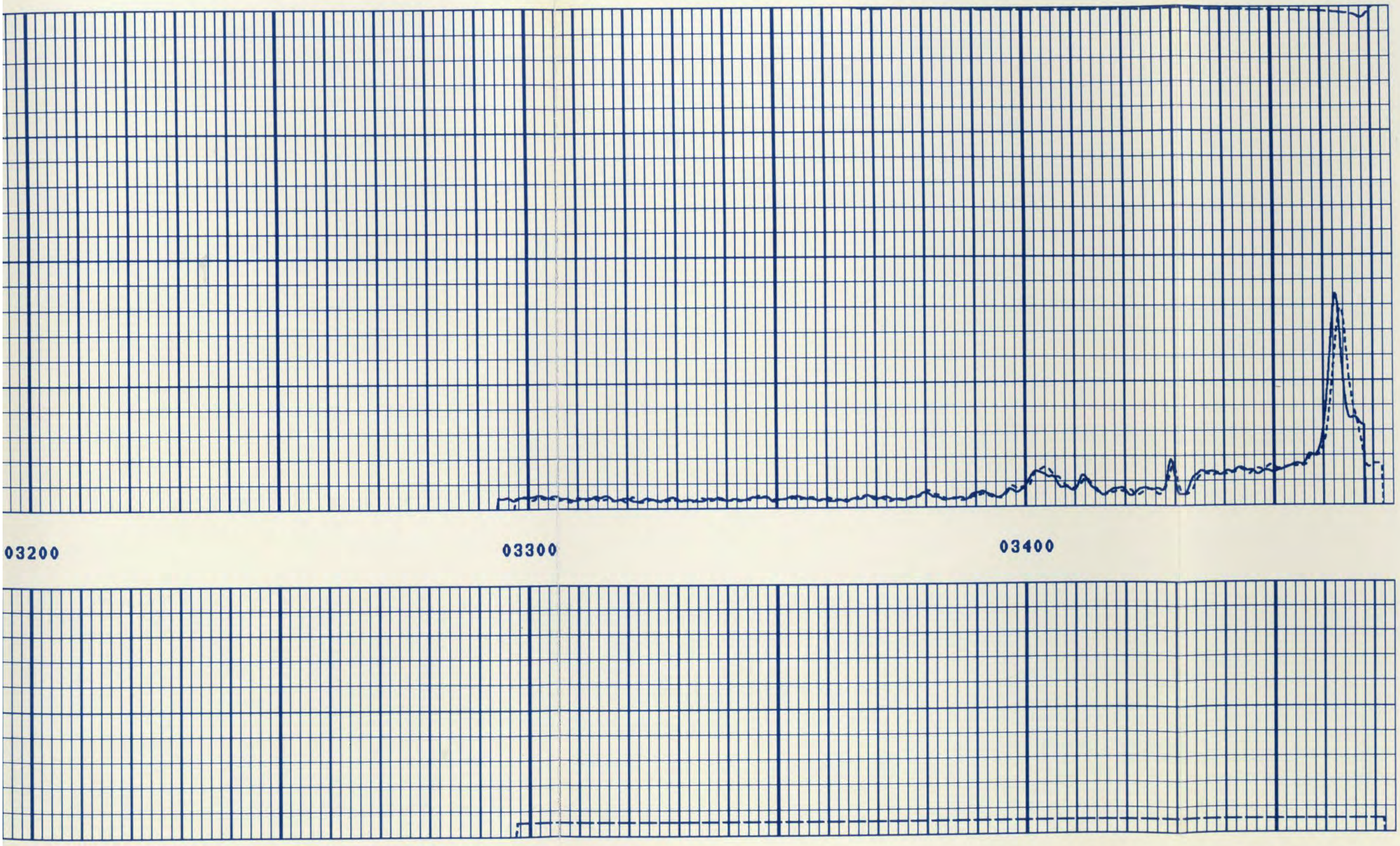
DISPLAY SCALE CHANGES

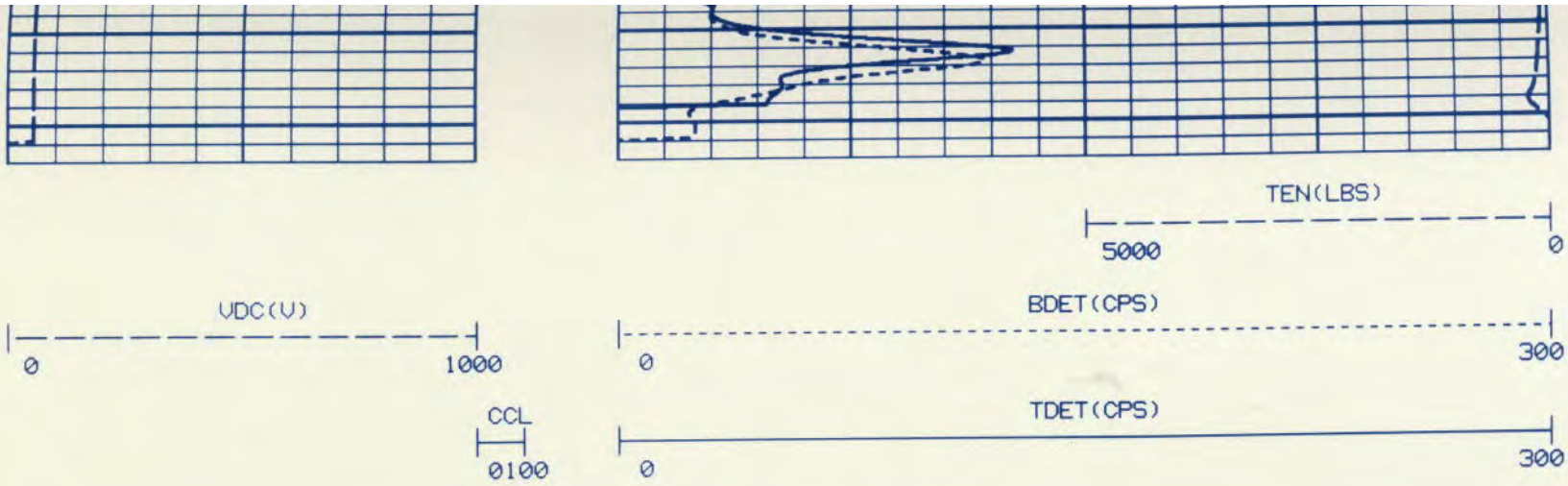
*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION
WELL NAME: EFFLUENT DISPOSAL WELL NO. 4
SERVICE: F 150C FILE: 15 DATE: 11/01/91
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1
TRIP: 1
TIME: 10:00:15
MODE: PLAYBACK




TFN(LBS)
03200
03300
03400



FILE: 15

****
****

FILE: 14

PARAMETERS

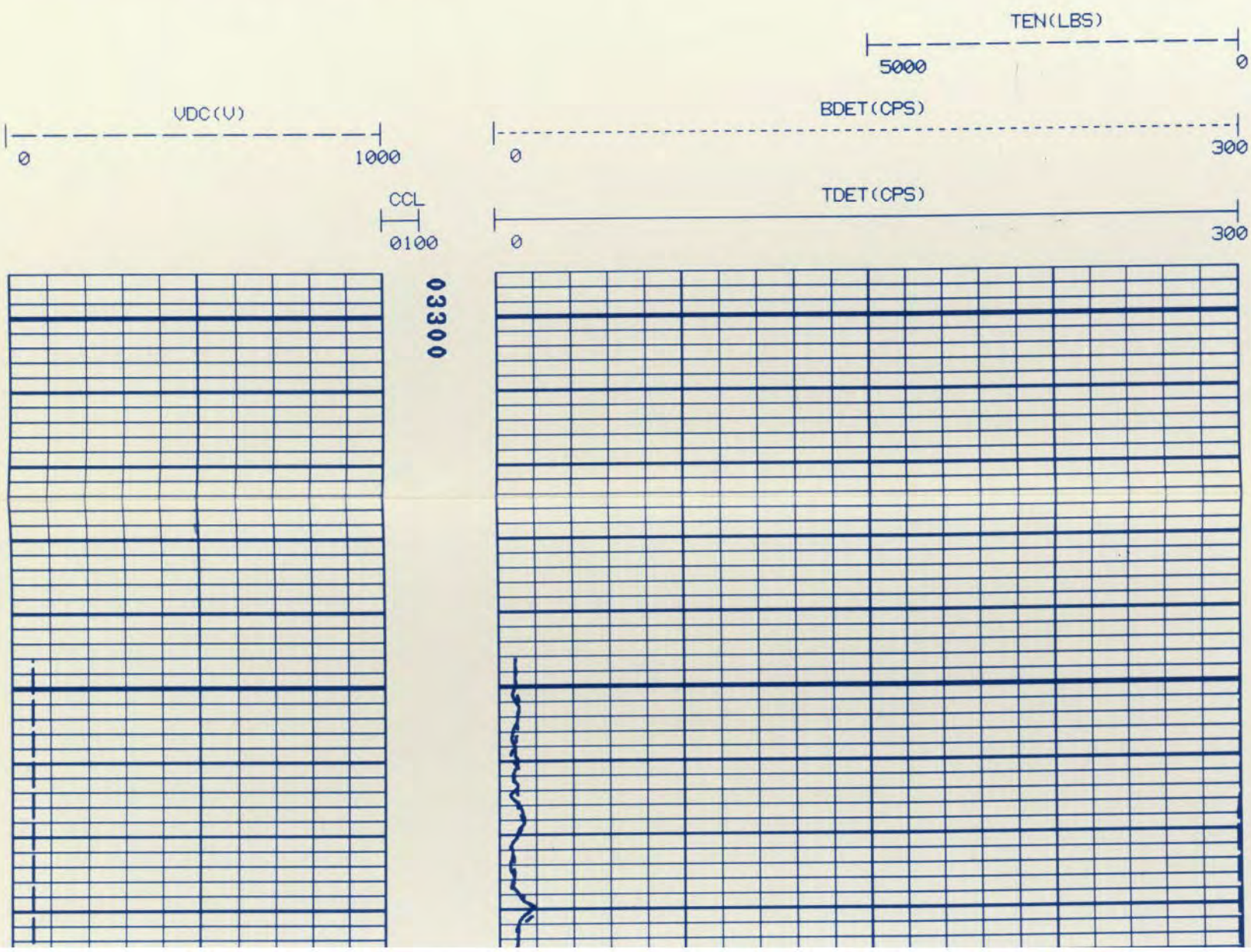
*** NONE ***

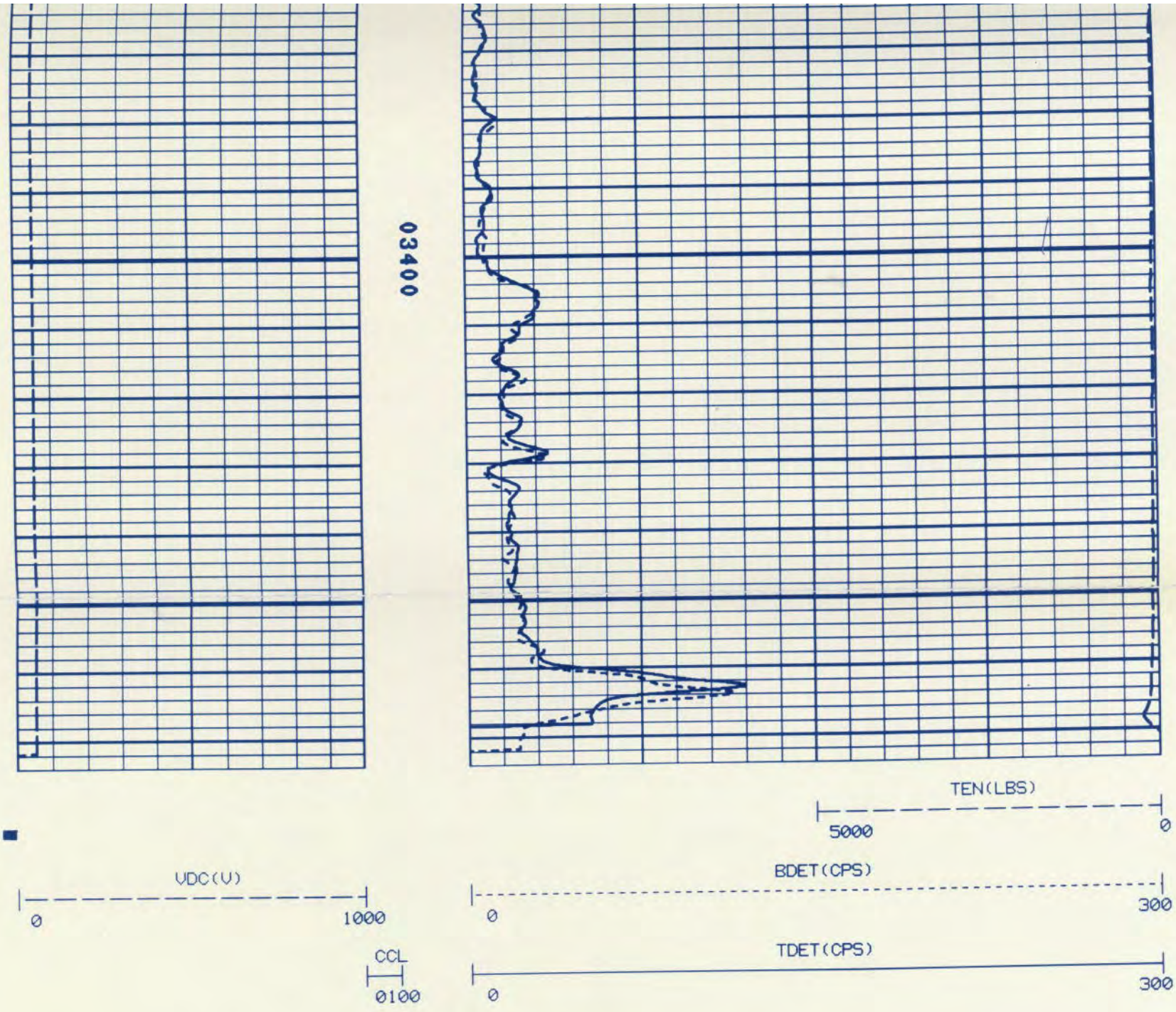
DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION
WELL NAME: EFFLUENT DISPOSAL WELL NO. 4
SERVICE: F 150C FILE: 14 DATE: 11/01/91
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1
TRIP: 1
TIME: 09:55:35
MODE: PLAYBACK





FILE: 14

****
****

FILE: 13

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 13 DATE: 11/01/91

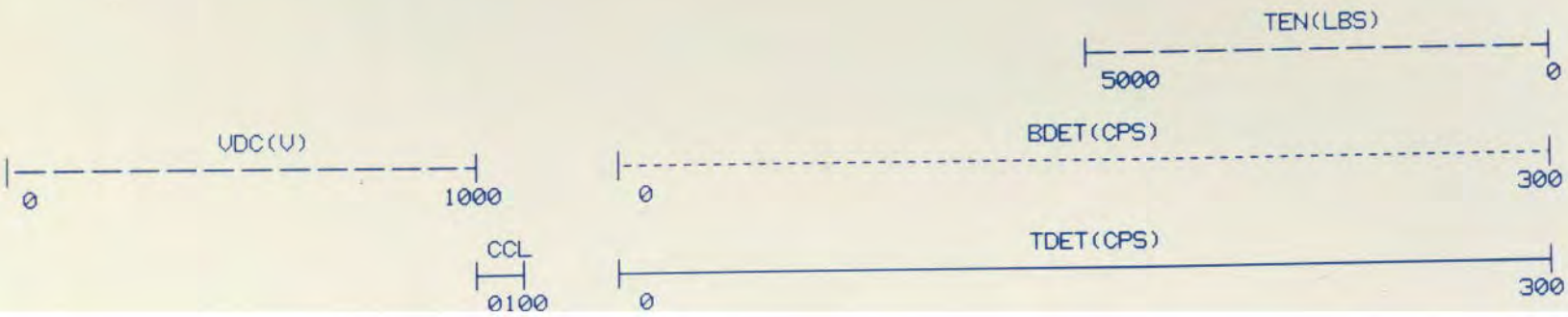
REVISION: FSYS256 REV:G002 VER:2.0

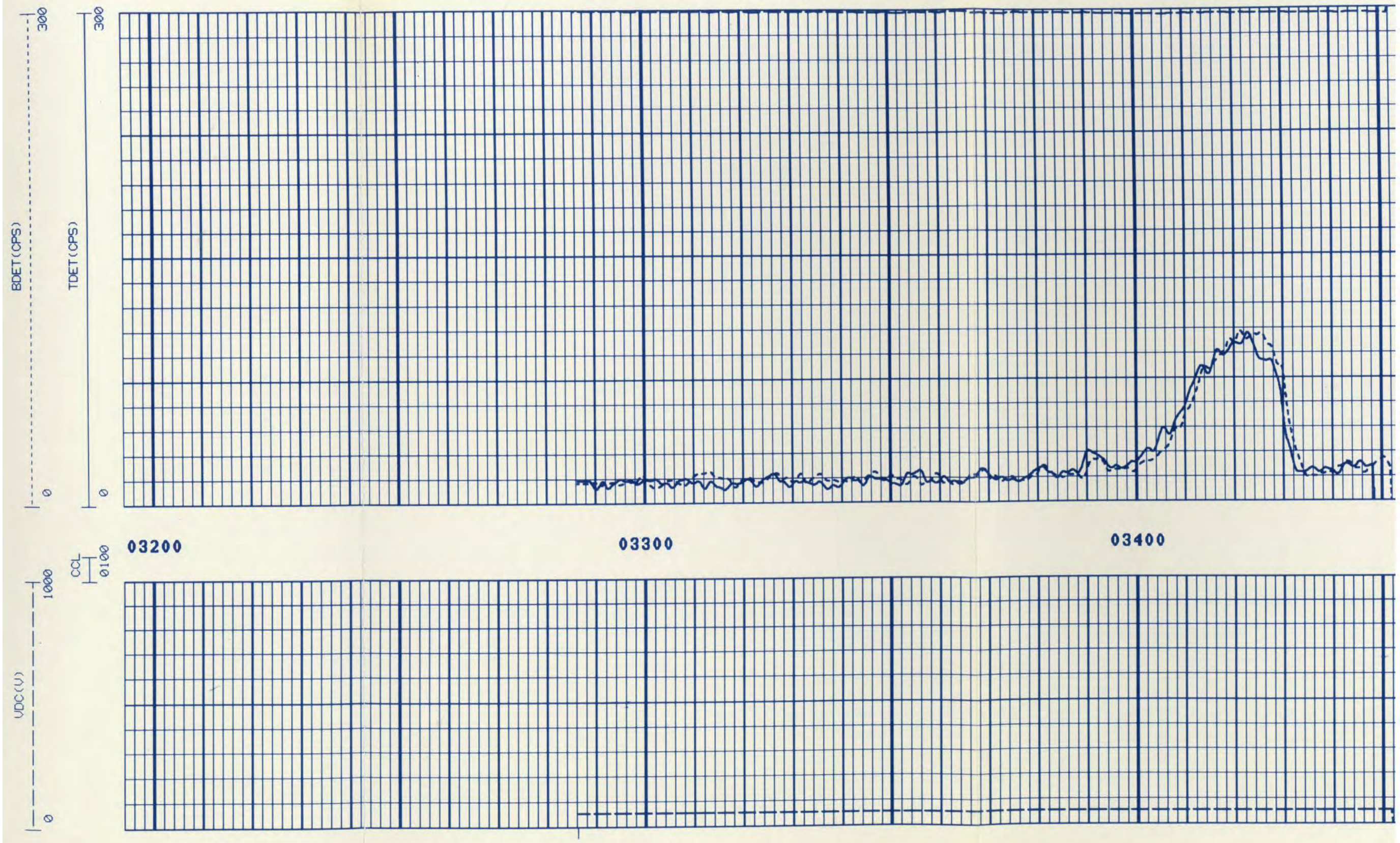
RUN: 1

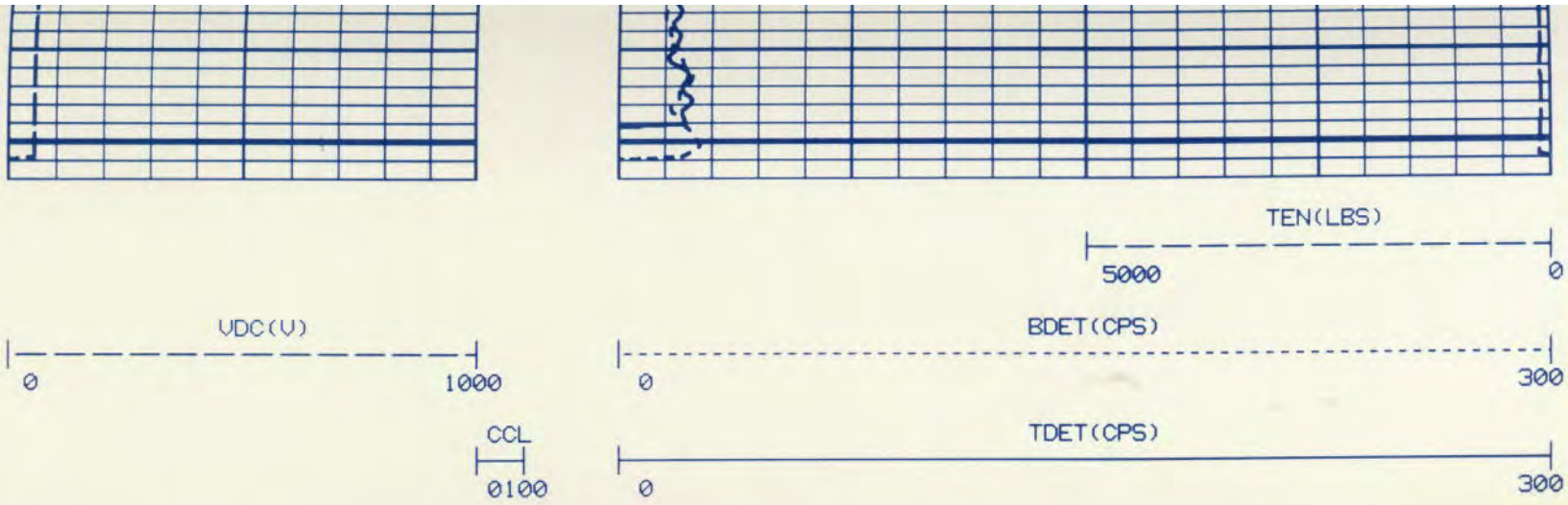
TRIP: 1

TIME: 09:52:10

MODE: PLAYBACK




BDET(CPS)
300
0
TDET(CPS)
300
0
03200
03300
03400
CCL
0100
VDC(V)
1000
0



FILE: 13

****
****

FILE: 12

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

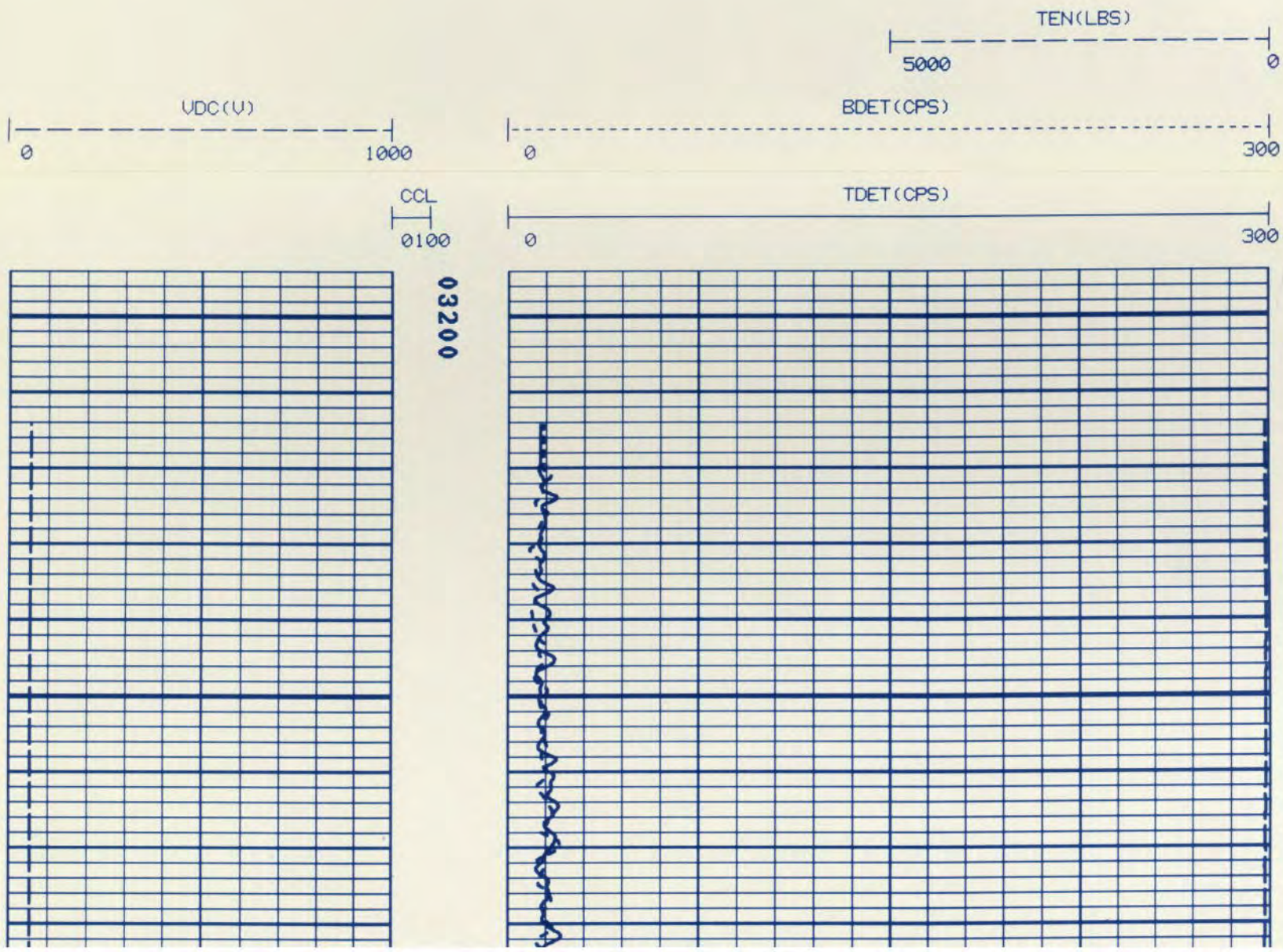
*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

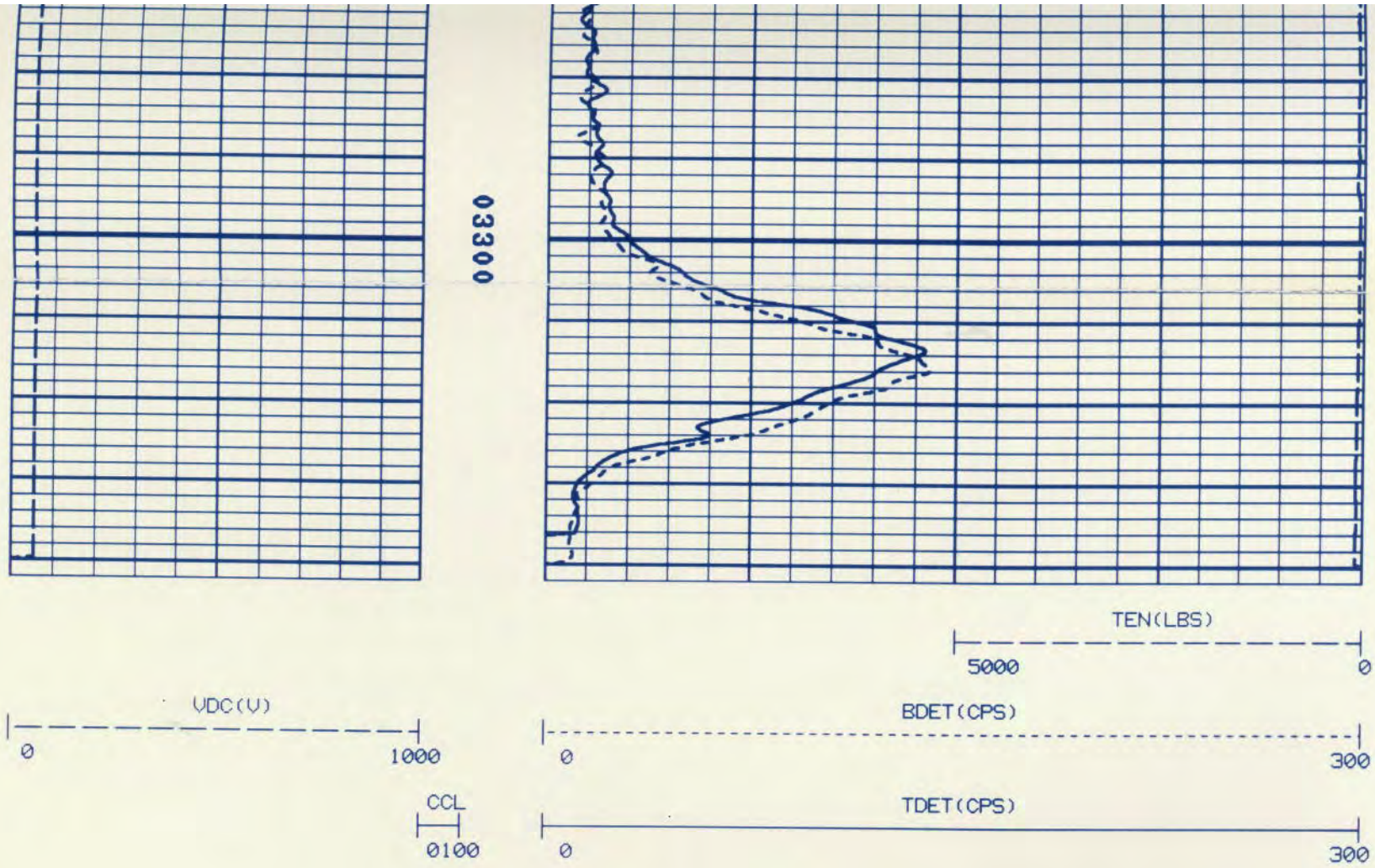
WELL NAME: EFFLUENT DISPOSAL WELL NO. 4 TRIP: 1

SERVICE: F 150C FILE: 12 DATE: 11/01/91 TIME: 09:49:27

REVISION: FSYS256 REV:G002 VER:2.0 MODE: PLAYBACK



03200



FILE: 12

****
****

FILE: 11

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 11 DATE: 11/01/91

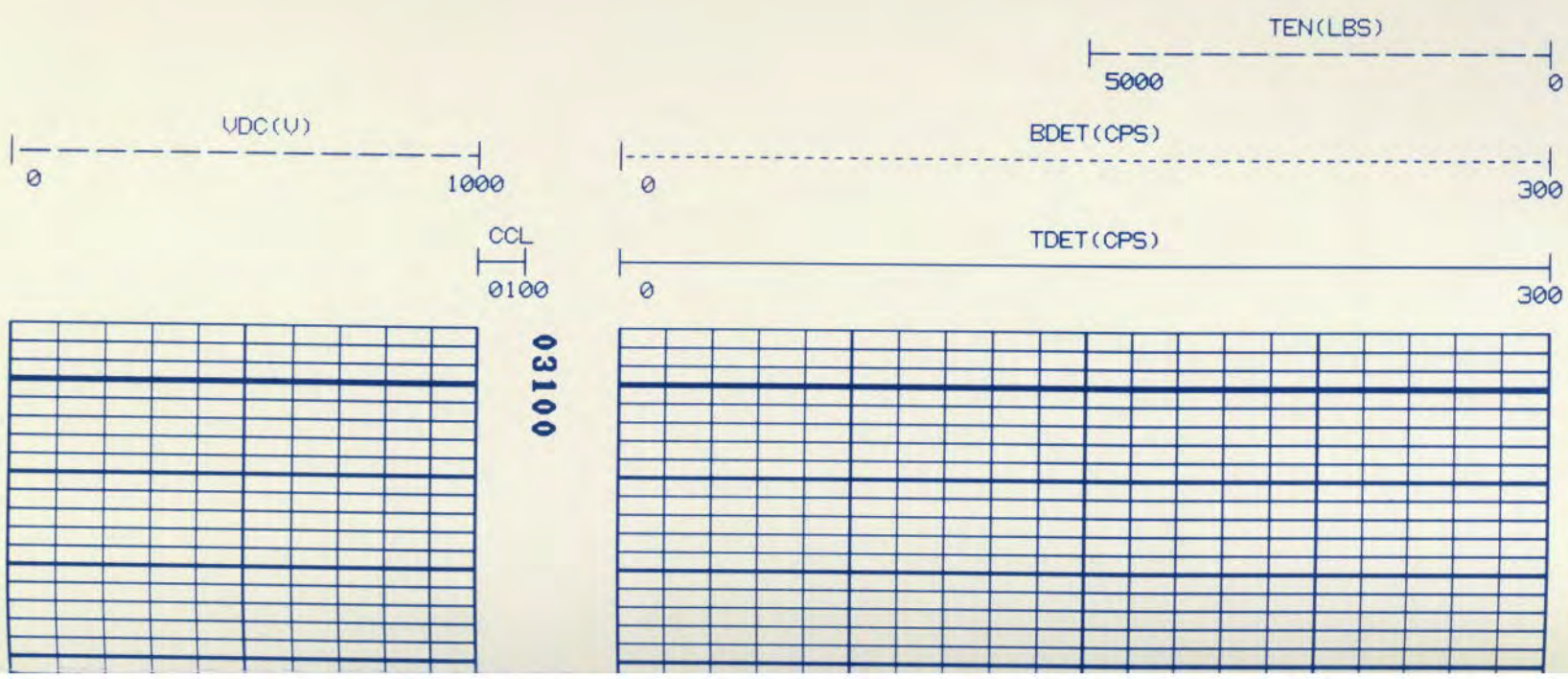
REVISION: FSYS256 REV:G002 VER:2.0

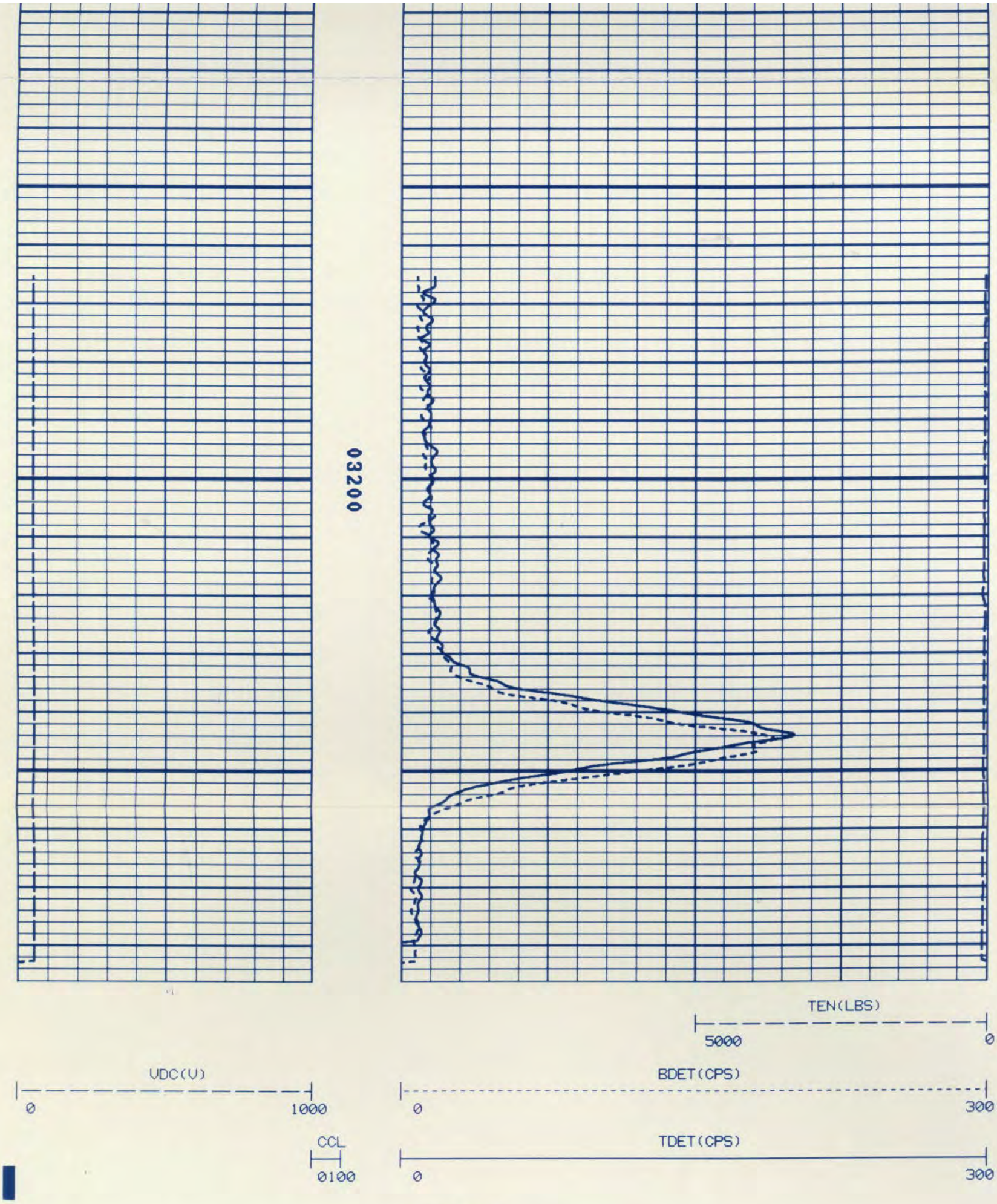
RUN: 1

TRIP: 1

TIME: 09:46:56

MODE: PLAYBACK





FILE: 11

****
****

FILE: 10

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 10 DATE: 11/01/91

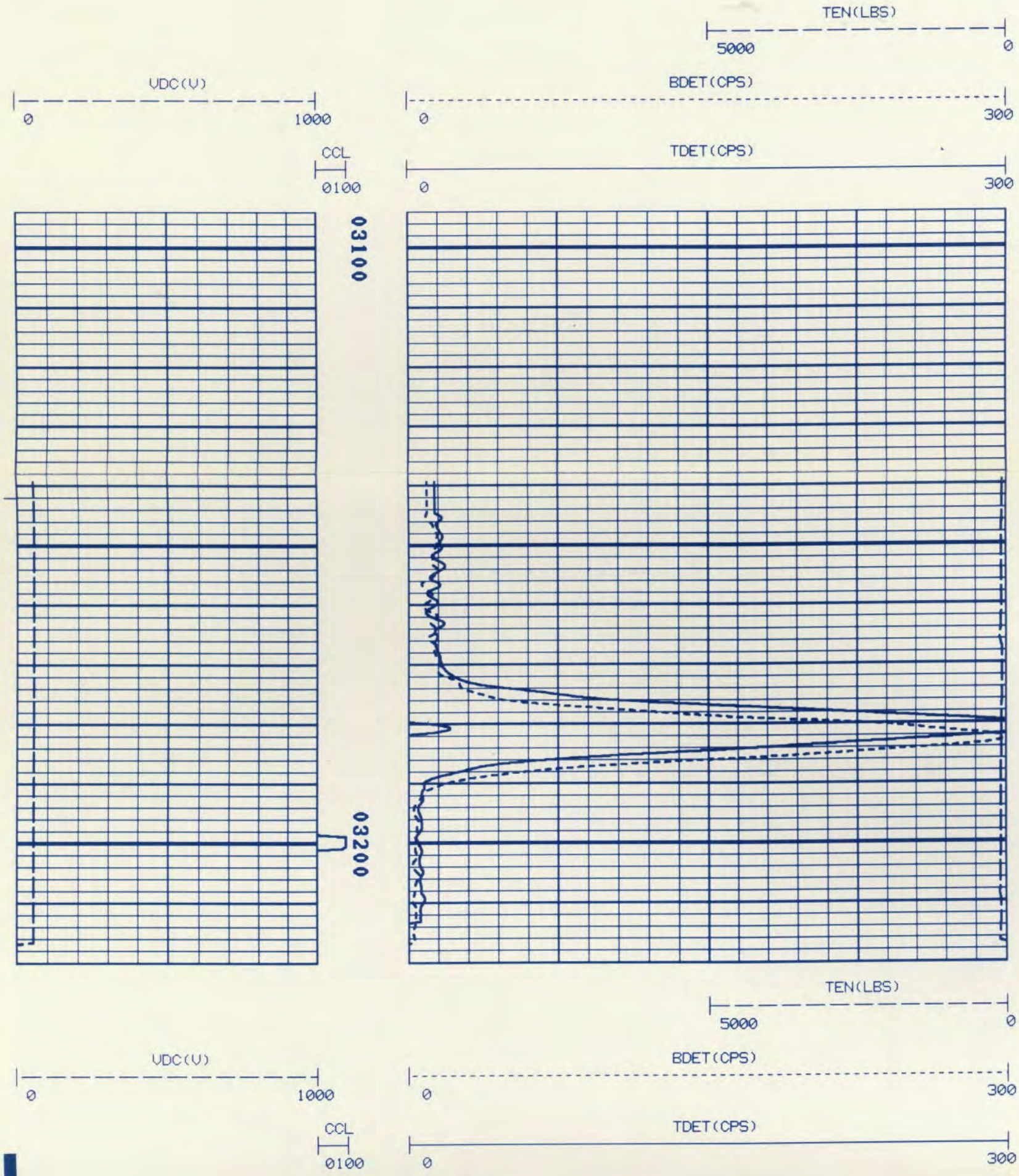
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 09:45:05

MODE: PLAYBACK



FILE: 10

****

SHOT SLUG AT 3000′ AT 20 GPM
CHASED SLUG DOWNHOLE
FILES 1 - 6 & 9

CHASED SLUG DOWNHOLE
FILES 1 - 6 & 9

****

FILE: 9

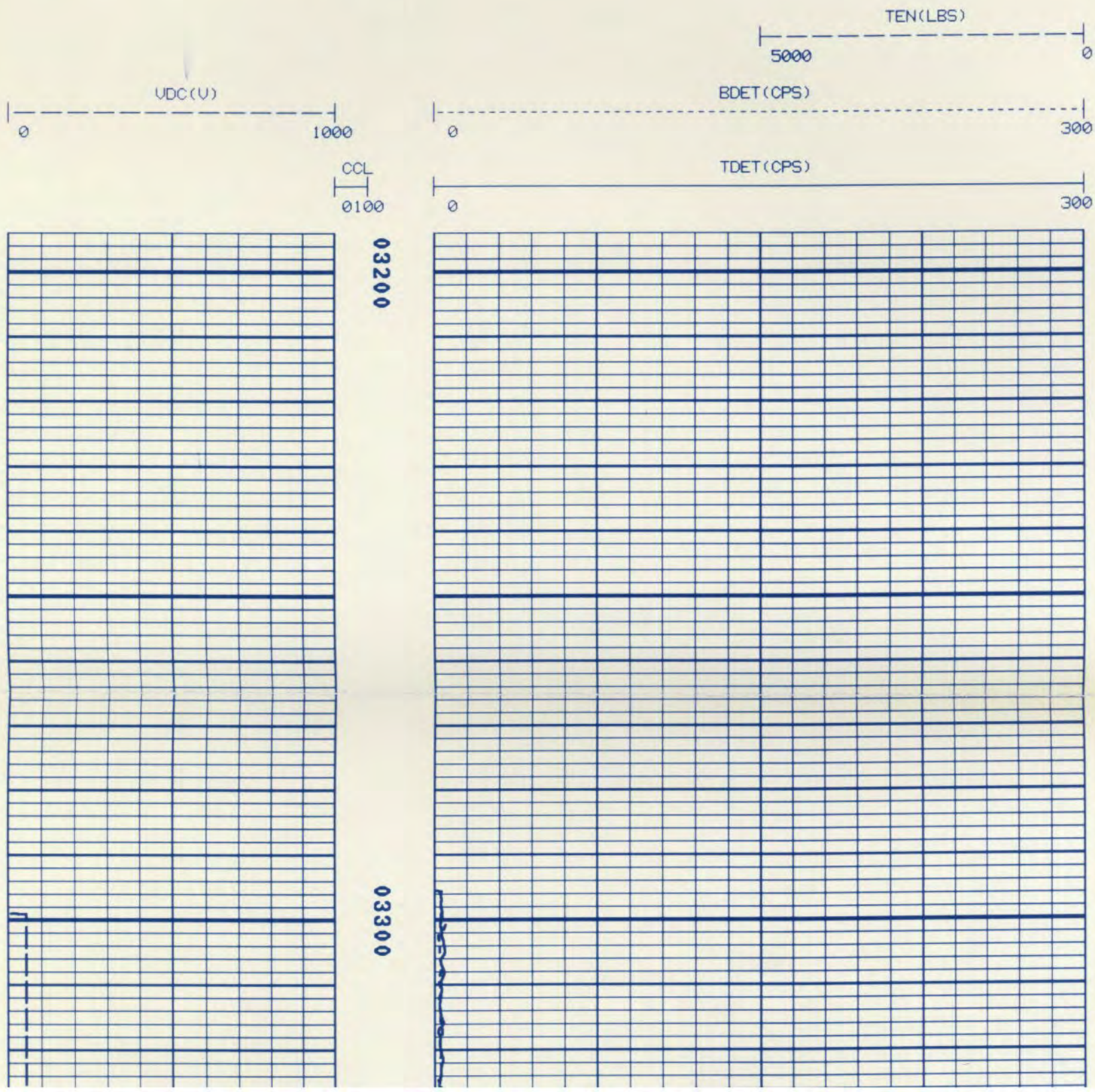
PARAMETERS

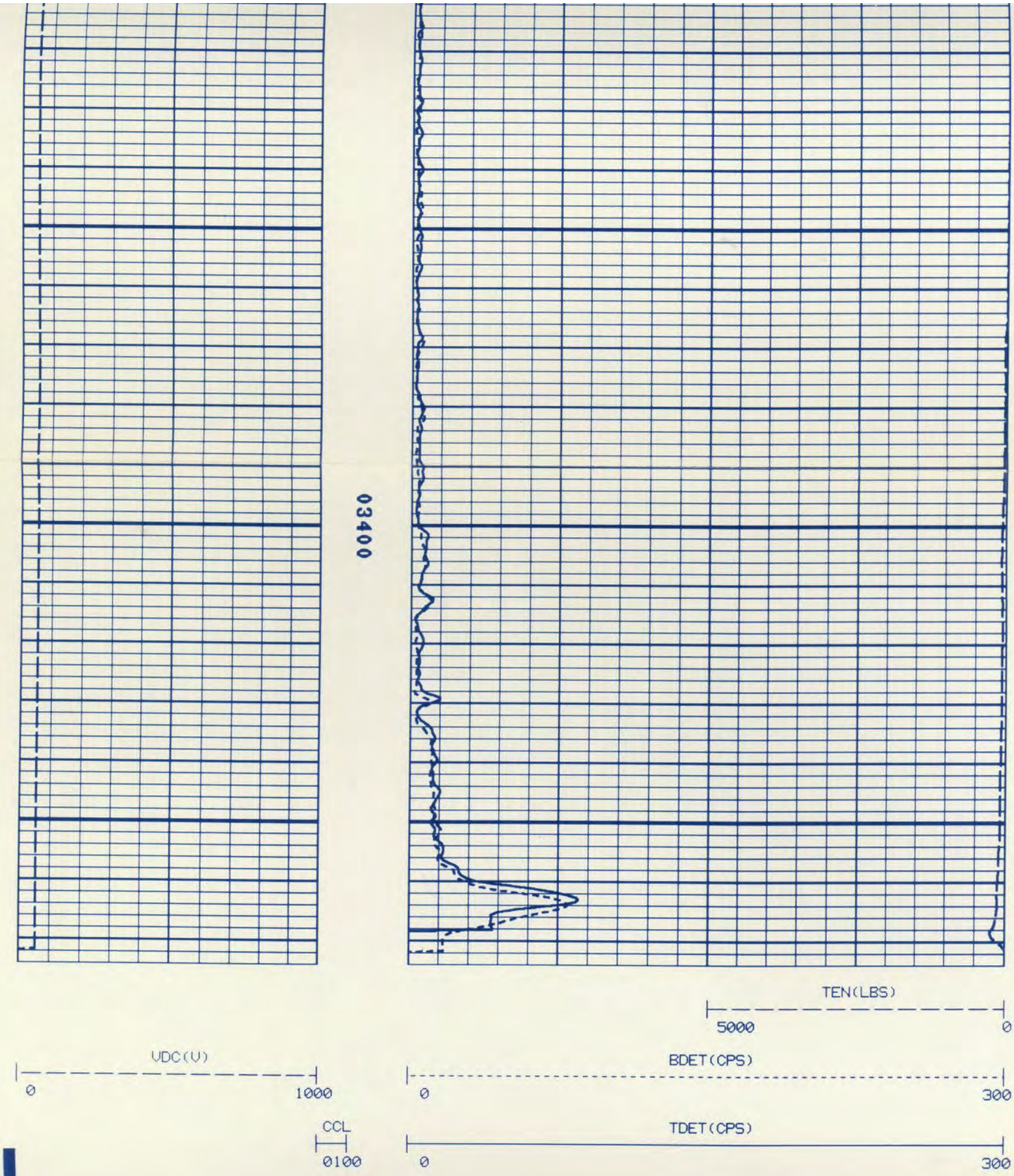
*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 4			TRIP:	1
SERVICE:	F 150C	FILE: 9	DATE: 11/01/91	TIME:	09:37:04
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK





FILE: 9

****
****

FILE: 6

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4 TRIP: 1

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 6 DATE: 11/01/91

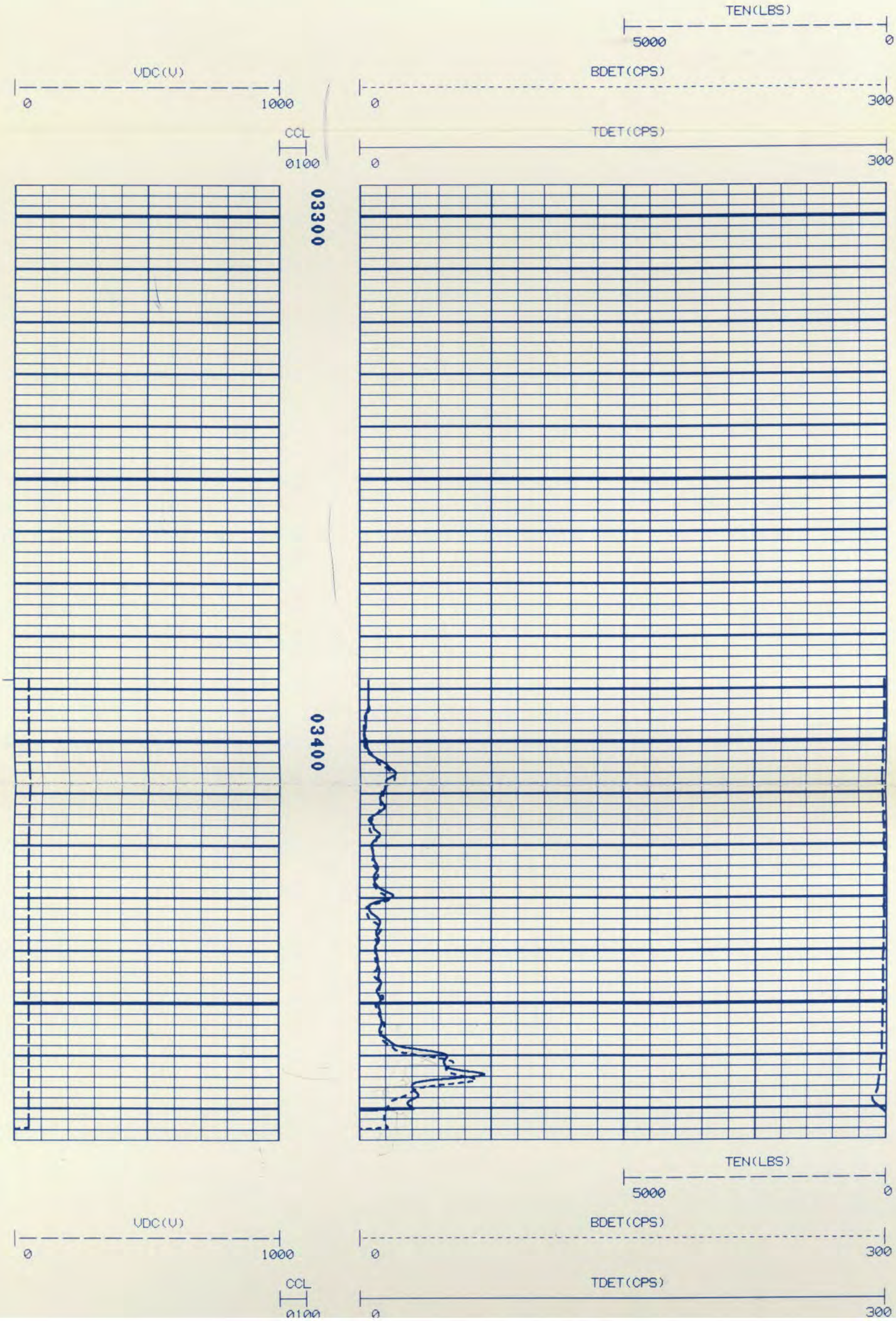
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 09:23:25

MODE: PLAYBACK



0 1000 | 0 300

CCL 0100 | TDET(CPS) 0 300

FILE: 6

****
****

FILE: 5

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 5 DATE: 11/01/91

REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

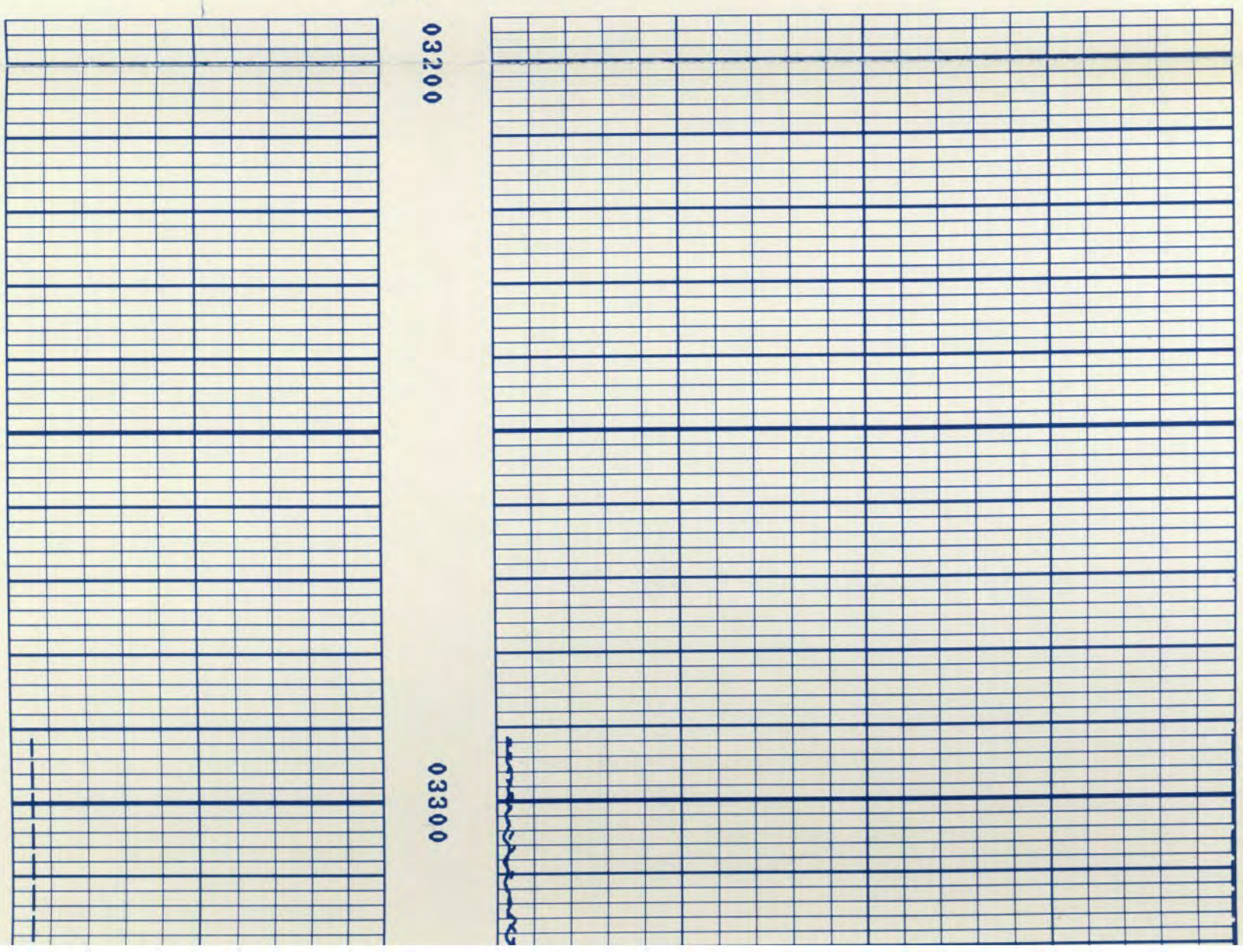
TIME: 09:19:59

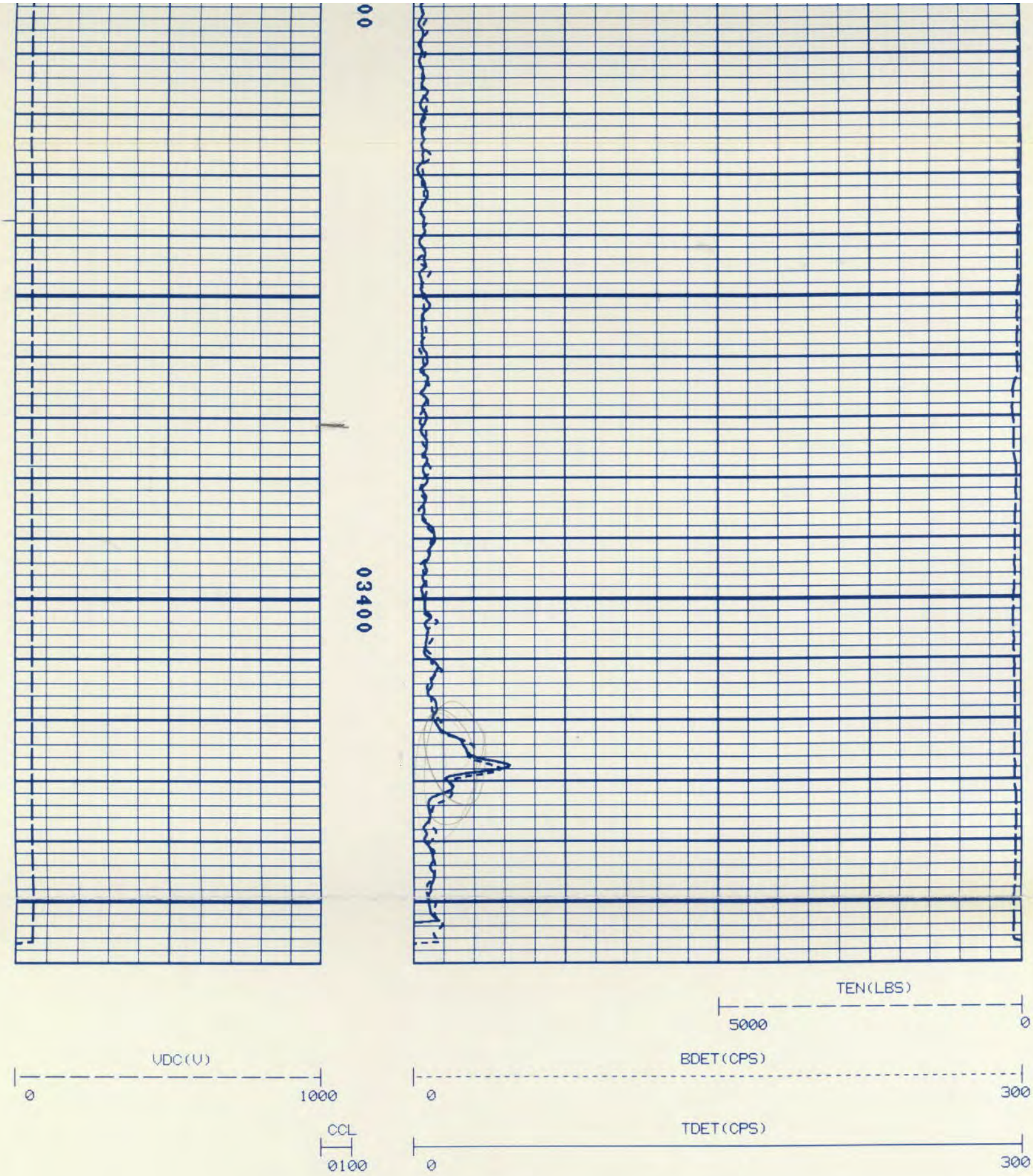
MODE: PLAYBACK

TEN(LBS) 5000 0

VDC(V) 0 1000 | BDET(CPS) 0 300

CCL 0100 | TDET(CPS) 0 300





FILE: 5

****
****

FILE: 4

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4 TRIP: 1

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 4 DATE: 11/01/91

REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 09:16:26

MODE: PLAYBACK

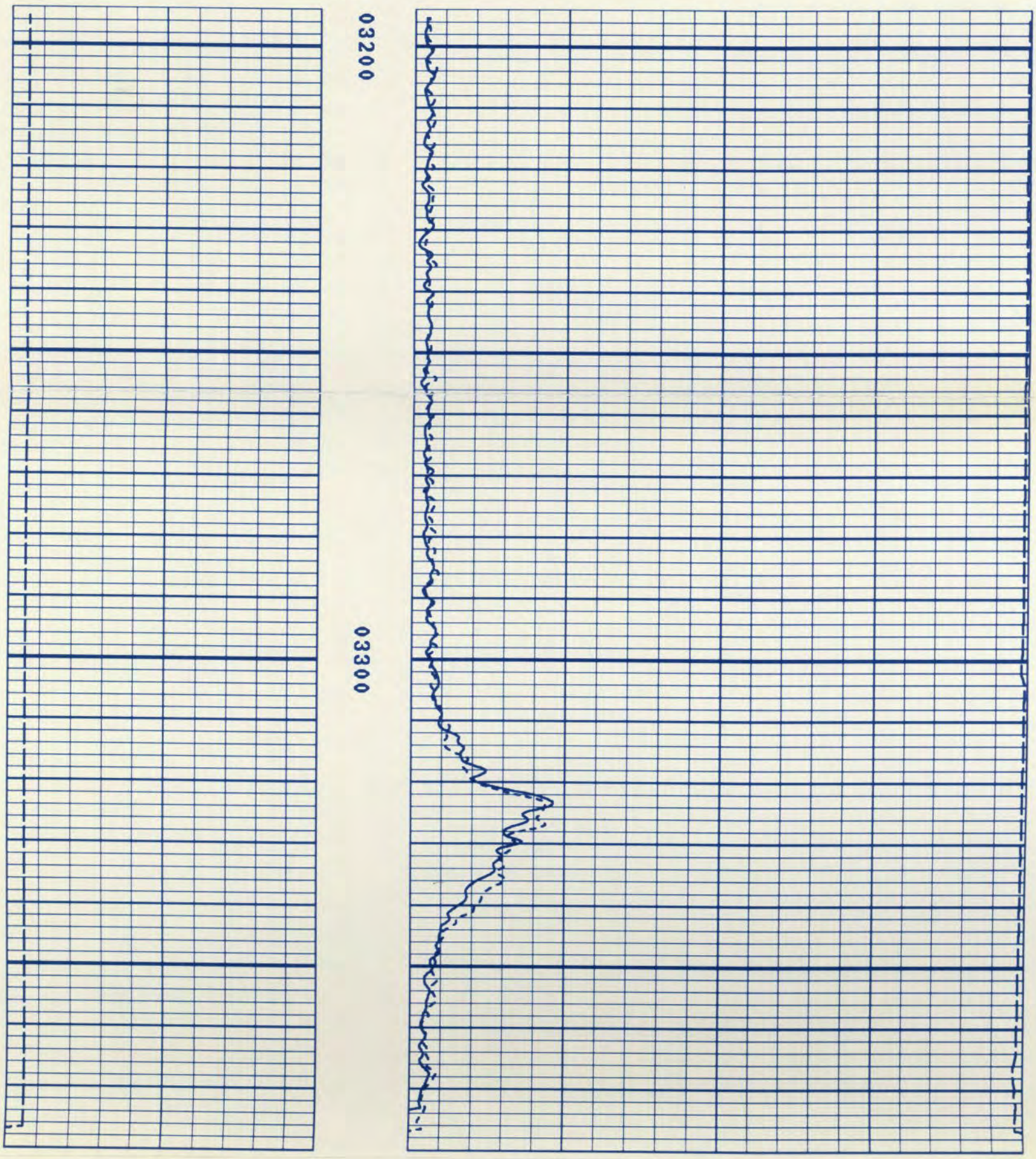
TEN(LBS)
5000 — 0

VDC(V)
0 — 1000

BDET(CPS)
0 — 300

CCL
0100

TDET(CPS)
0 — 300



TEN(LBS)
5000 — 0

VDC(V)
0 — 1000

BDET(CPS)
0 — 300

TEN(LBS)
5000 0

VDC(V)
0 1000

BDET(CPS)
0 300

CCL
0100

TDET(CPS)
0 300

FILE: 4

****
****

FILE: 3

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 4			TRIP:	1
SERVICE:	F 150C	FILE: 3	DATE: 11/01/91	TIME:	09:13:03
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK

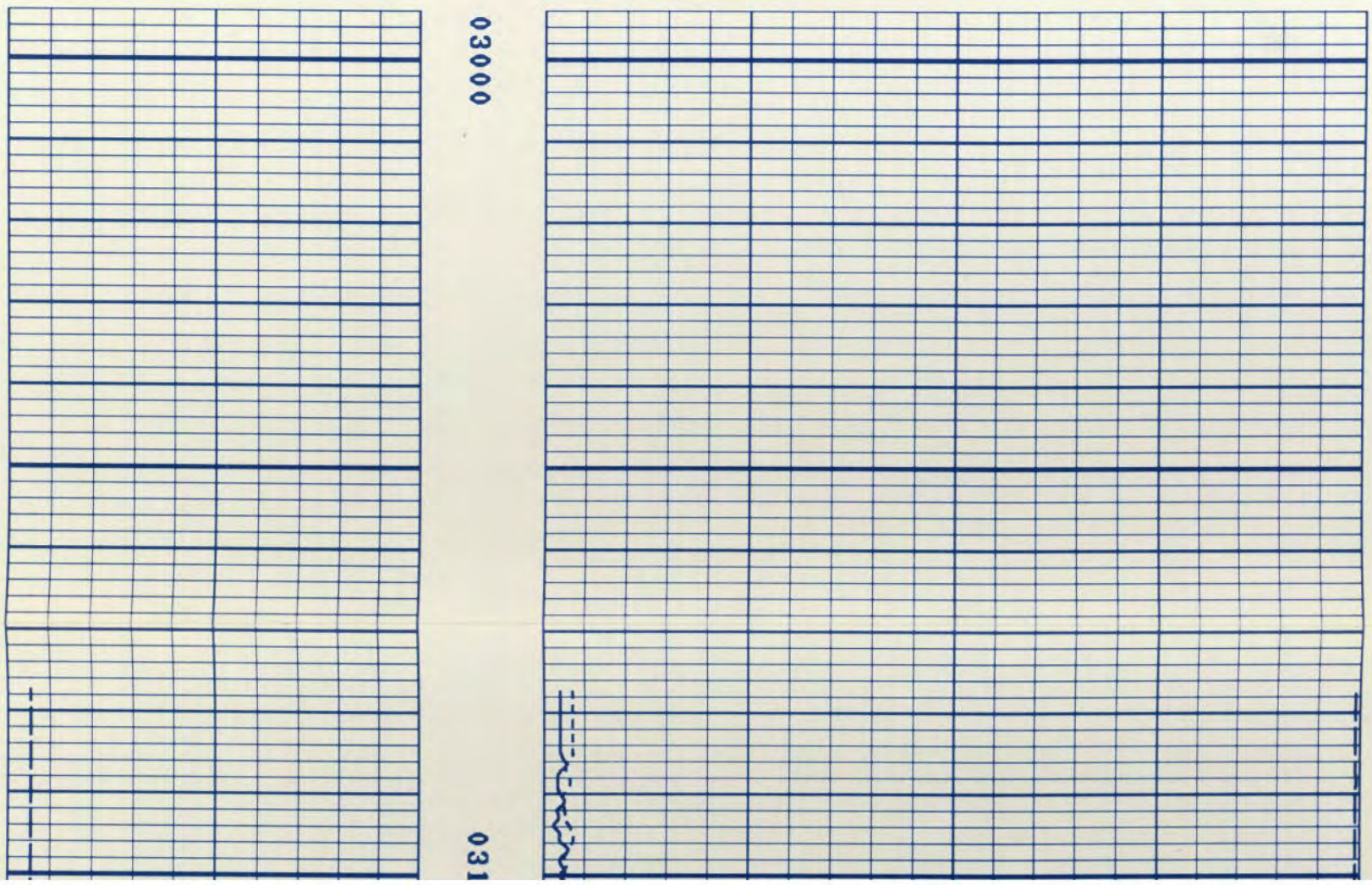
TEN(LBS)
5000 0

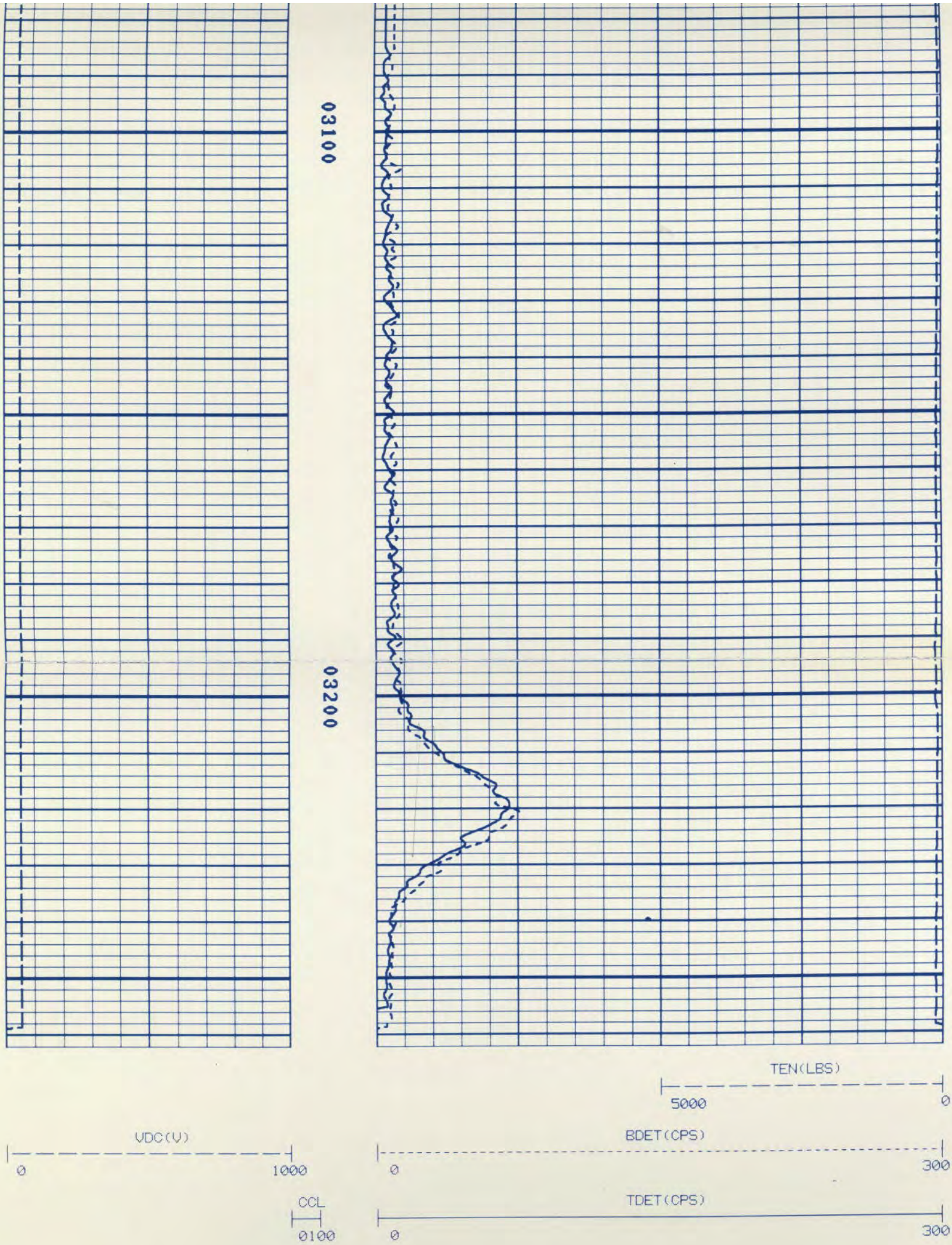
VDC(V)
0 1000

BDET(CPS)
0 300

CCL
0100

TDET(CPS)
0 300





FILE: 3

****
****

FILE: 2

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 2 DATE: 11/01/91

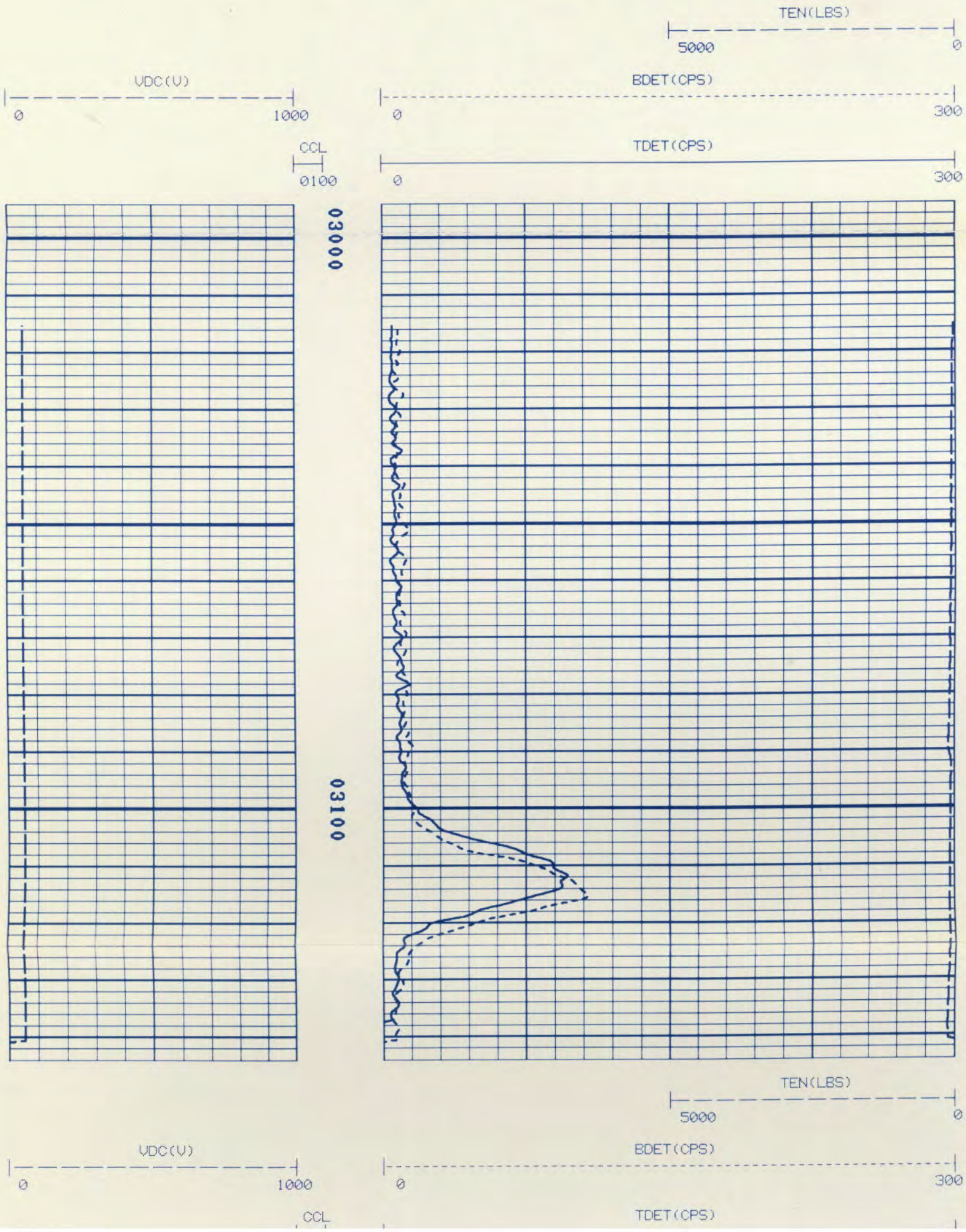
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 09:09:48

MODE: PLAYBACK



5000 0

VDC(V) 0 1000

BDET(CPS) 0 300

CCL 0100

TDET(CPS) 0 300

FILE: 2

****
****

FILE: 1

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4

SERVICE: F 150C FILE: 1 DATE: 11/01/91

REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 09:07:20

MODE: PLAYBACK

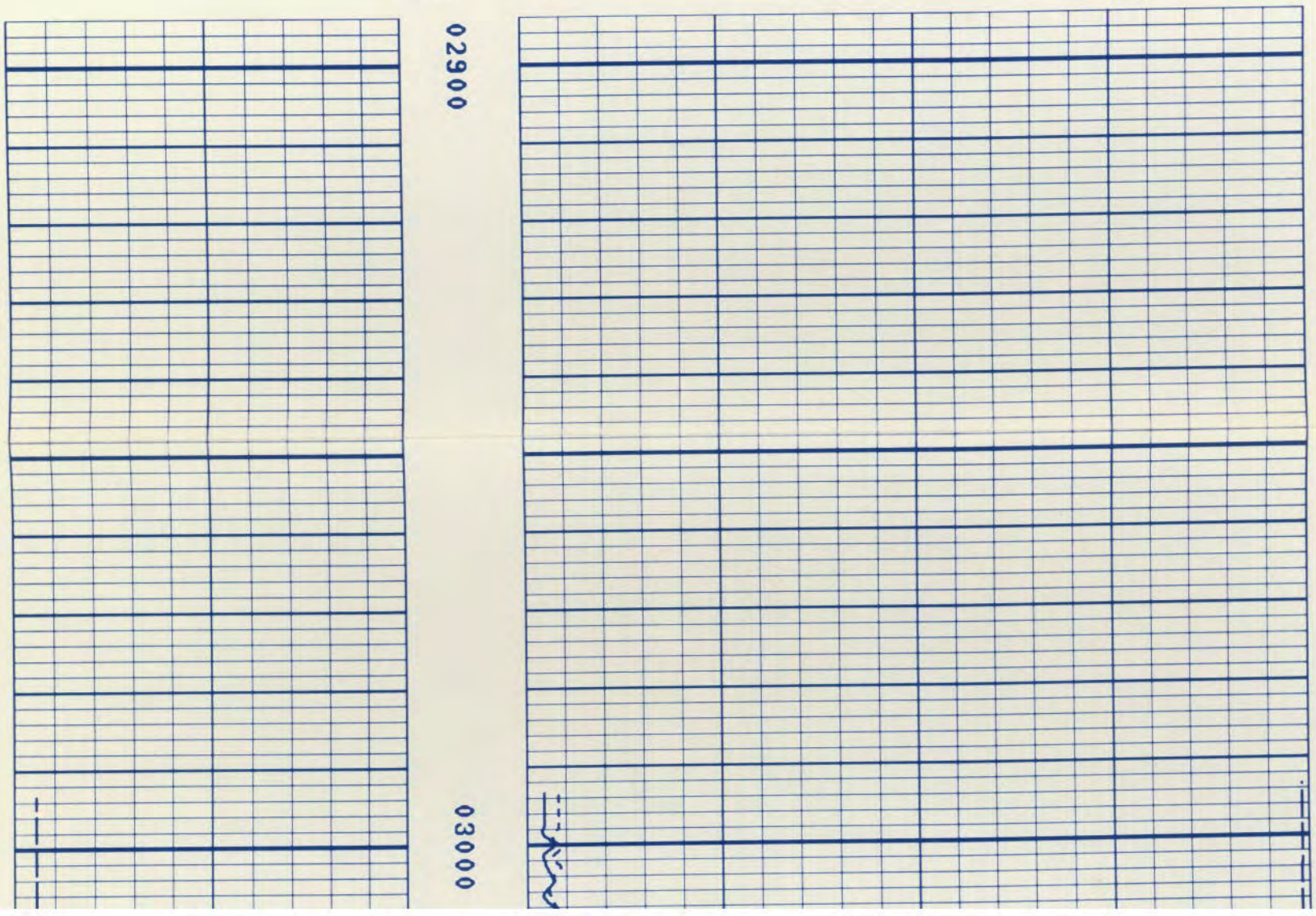
TEN(LBS) 5000 0

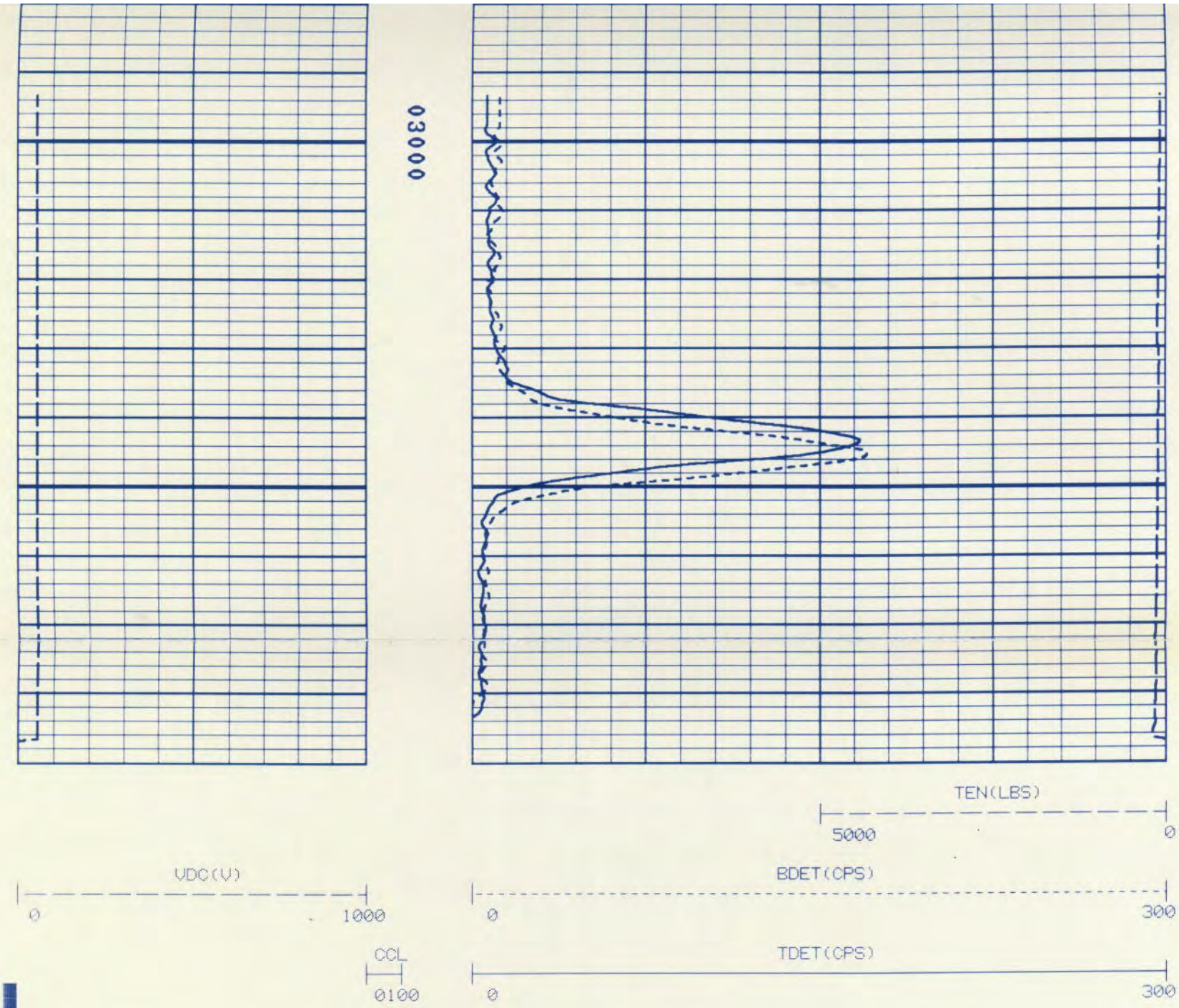
VDC(V) 0 1000

BDET(CPS) 0 300

CCL 0100

TDET(CPS) 0 300





FILE: 1

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****

FILE: 3

GR BASE Log Before Survey

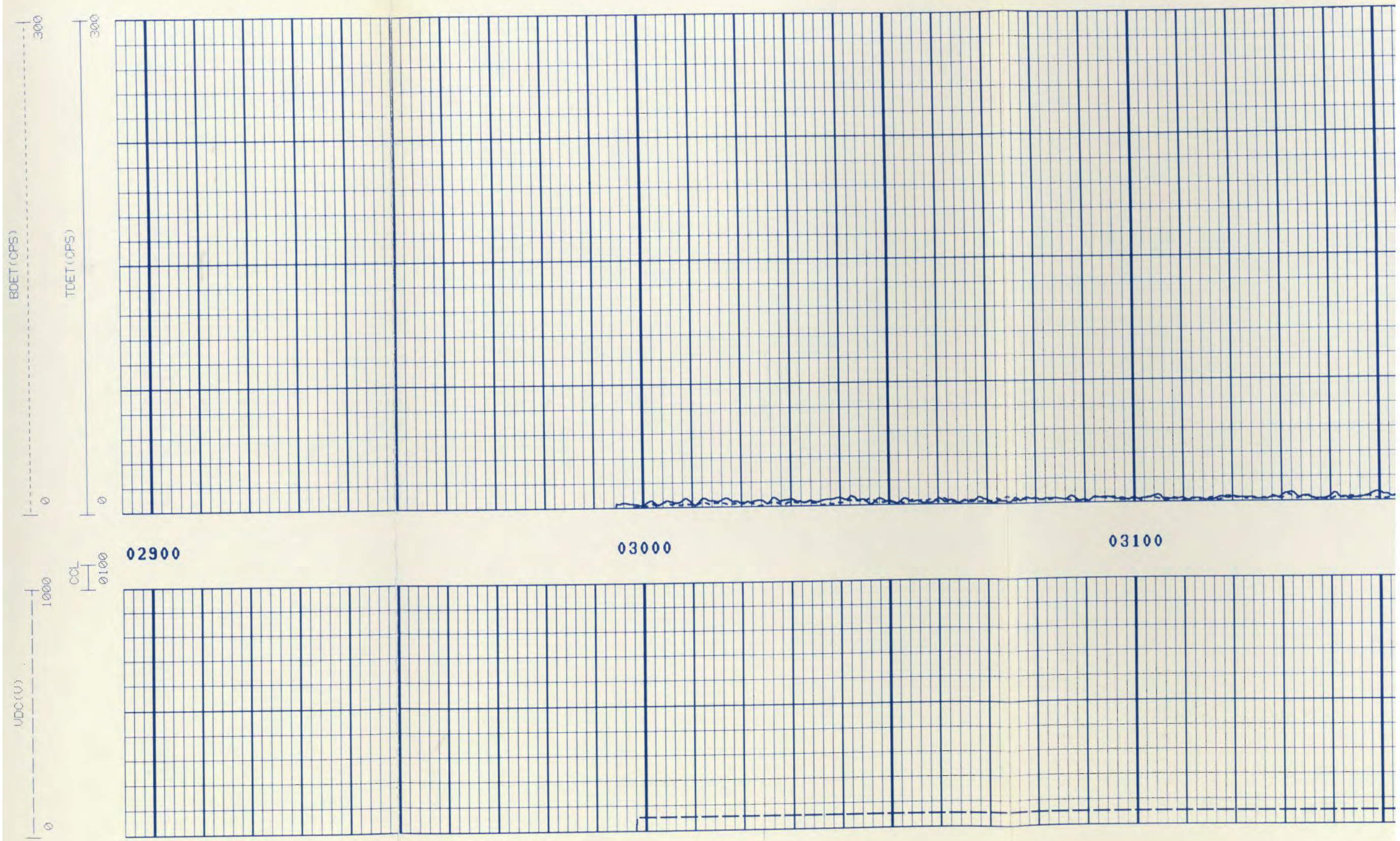
PARAMETERS

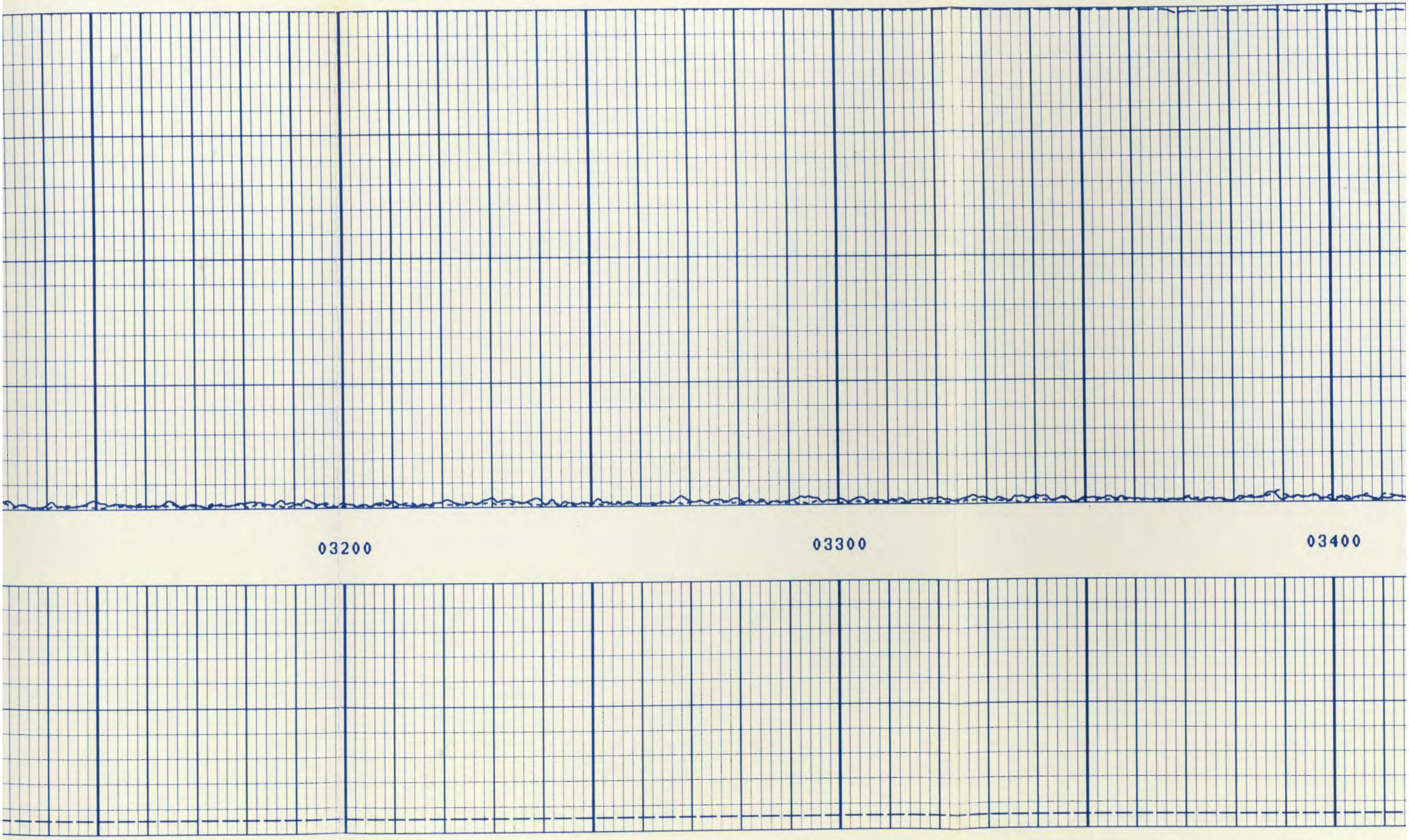
*** NONE ***

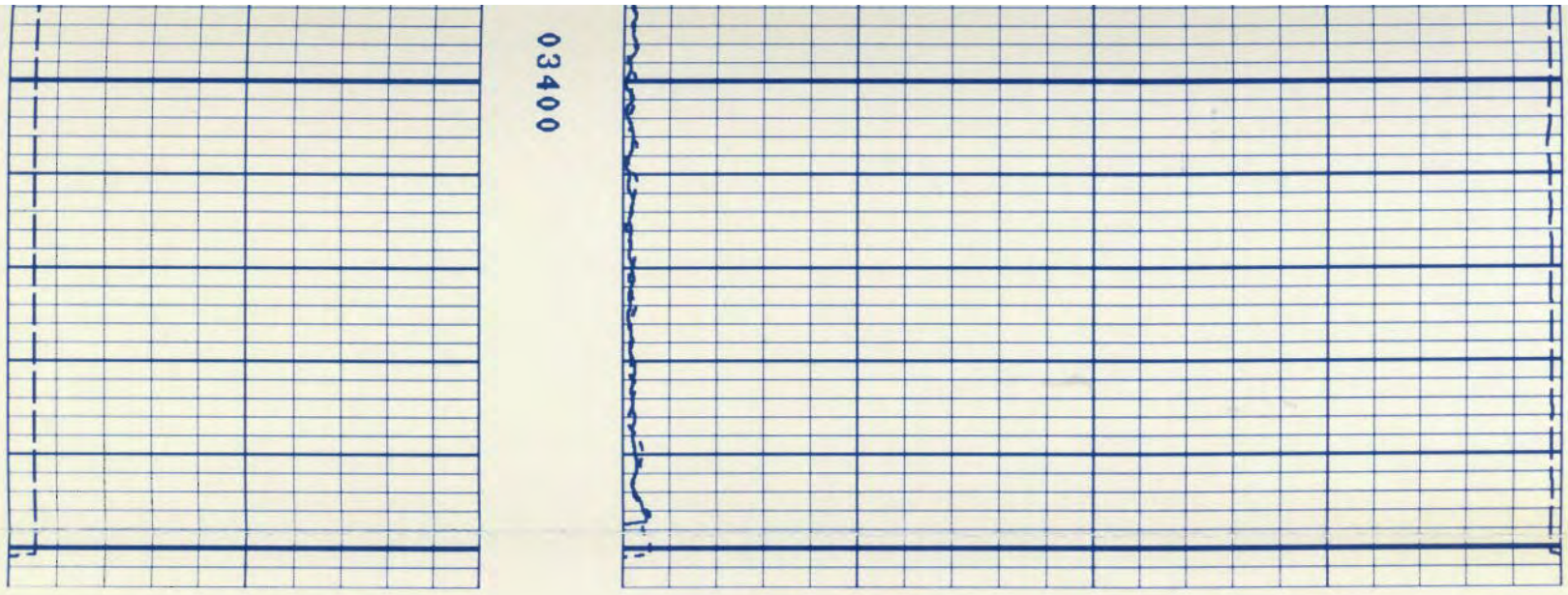
DISPLAY SCALE CHANGES

*** NONE ***

COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 4			TRIP:	1
SERVICE:	F 150C	FILE: 3	DATE: 10/31/91	TIME:	17:18:40
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK


BDET(CPS)
300
0
TDET(CPS)
300
0
02900
03000
03100
CCL
0100
UDC(V)
1000
0


03200
03300
03400



03400

TEN(LBS)
5000 0

UDC(V)
0 1000

BDET(CPS)
0 300

CCL
0100

TDET(CPS)
0 300

FILE: 3

****
****

FILE: 2

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORPORATION RUN: 1

WELL NAME: EFFLUENT DISPOSAL WELL NO. 4 TRIP: 1

SERVICE: F 150C FILE: 2 DATE: 10/31/91 TIME: 17:09:24

REVISION: FSYS256 REV:G002 VER:2.0 MODE: PLAYBACK

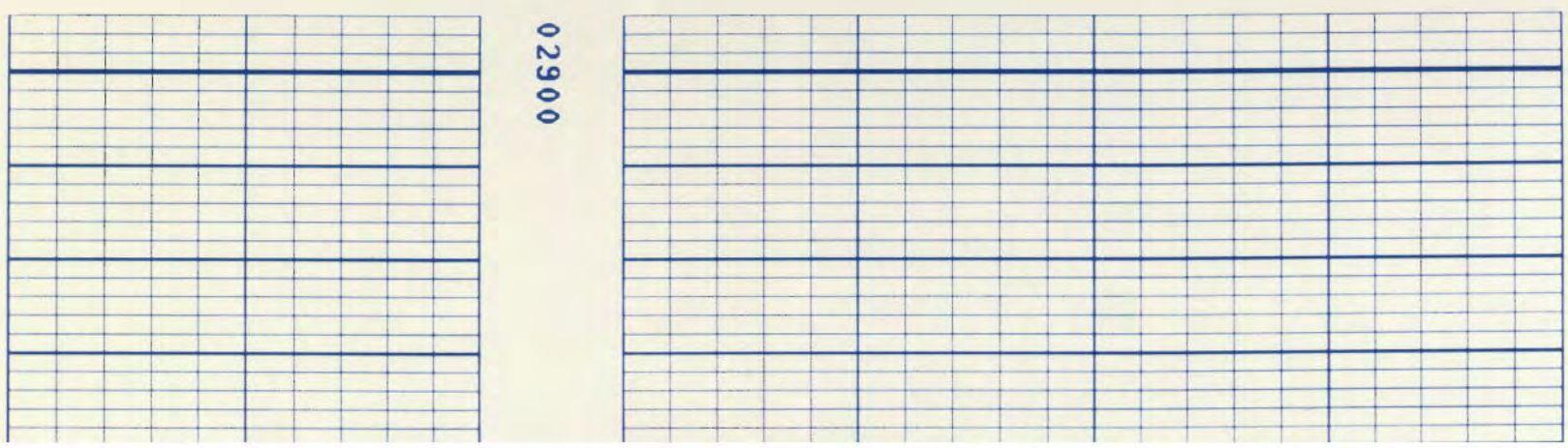
TEN(LBS)
5000 0

UDC(V)
0 1000

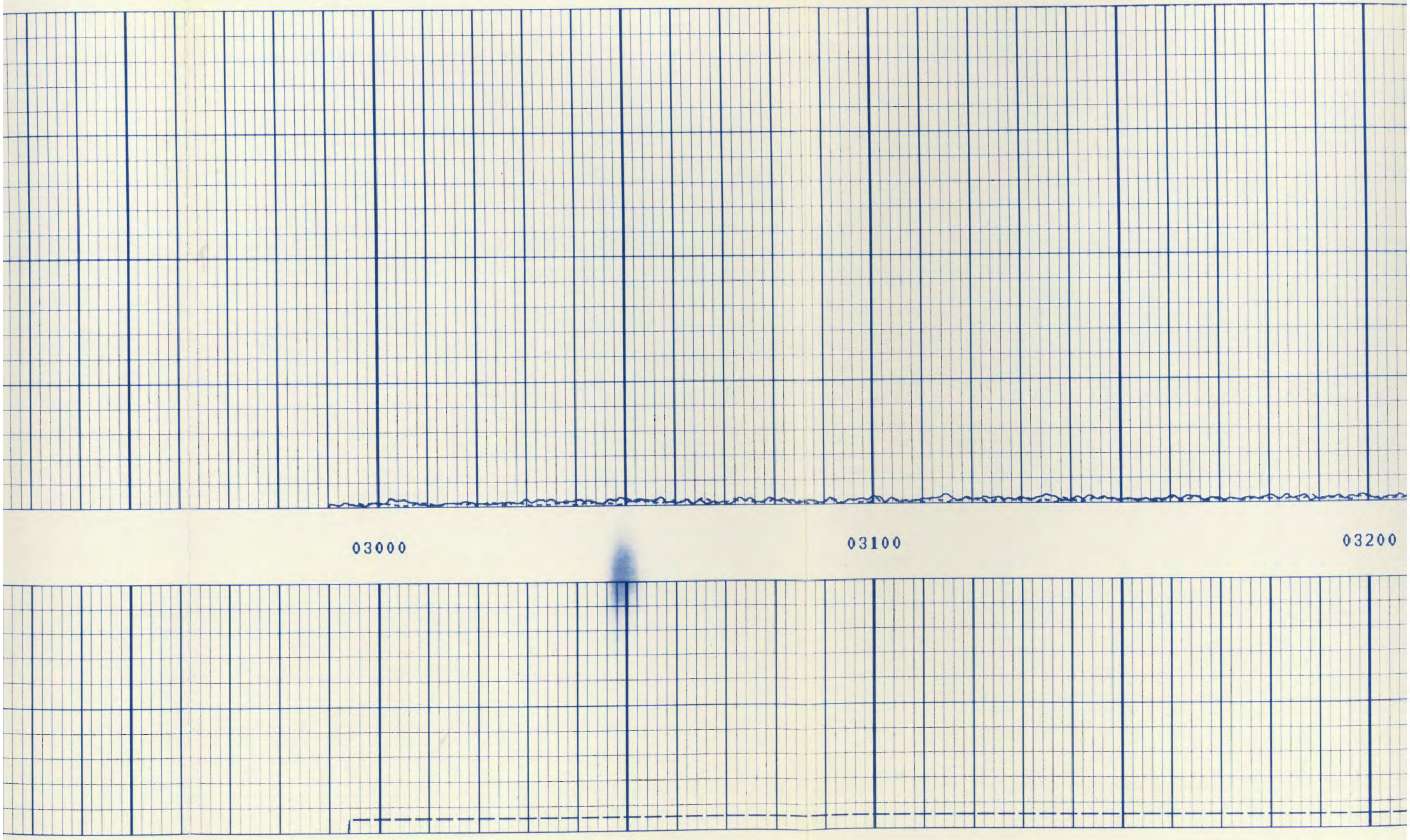
BDET(CPS)
0 300

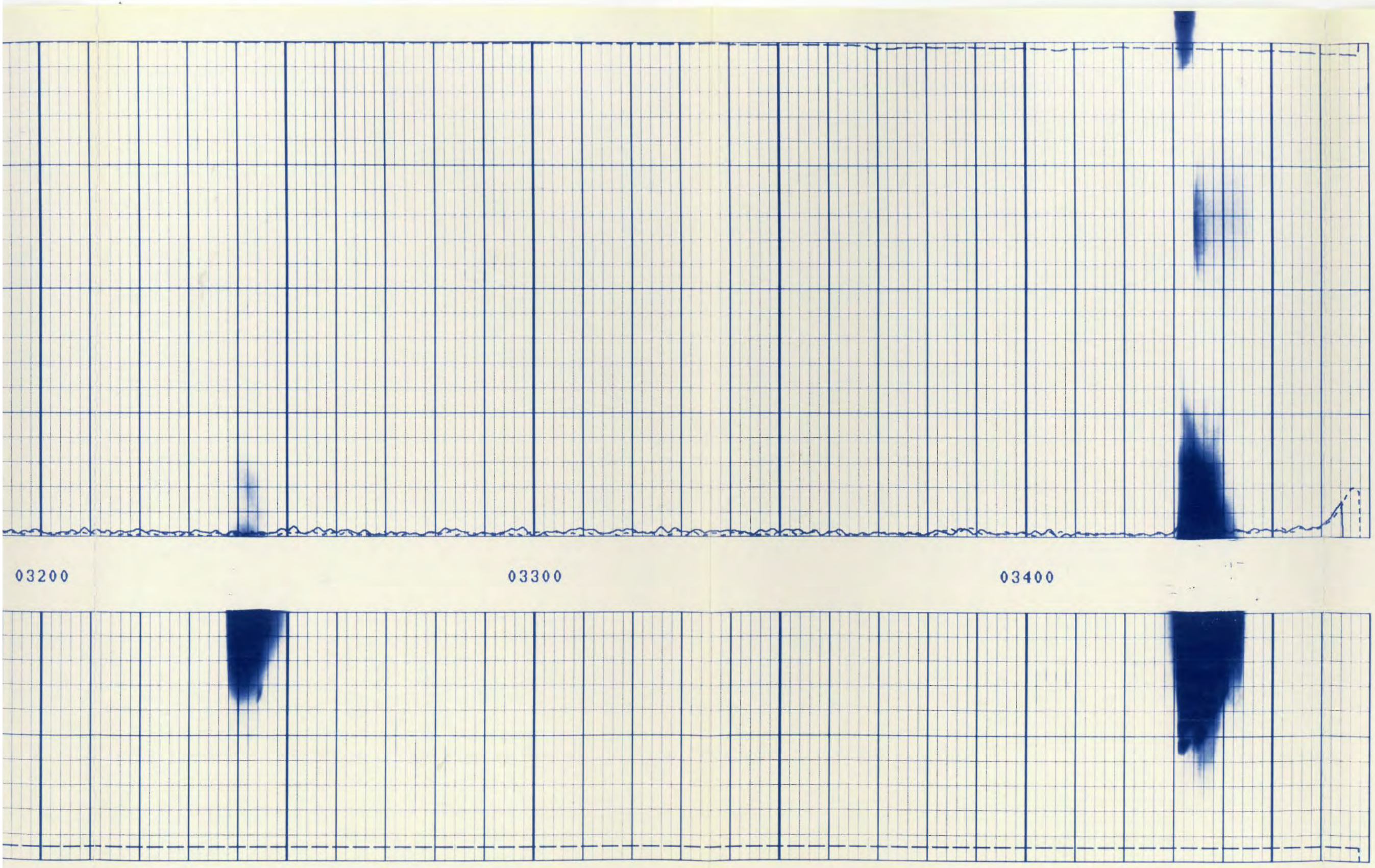
CCL
0100

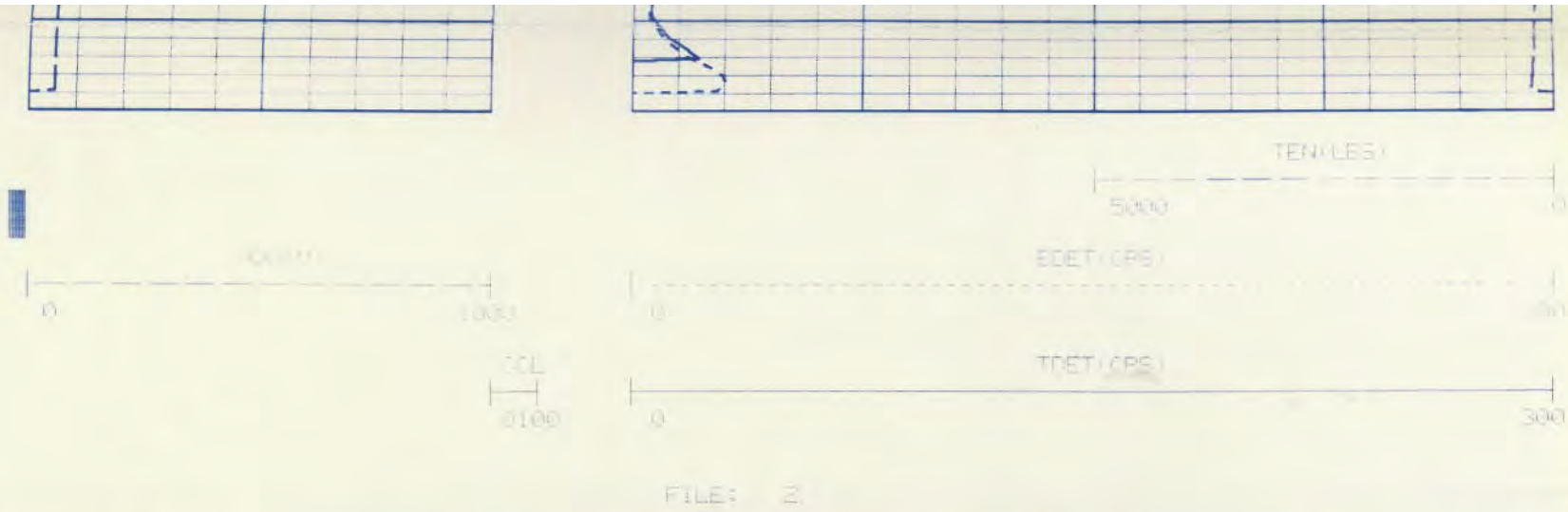
TDET(CPS)
0 300



02900


03000
03100
03200


03200
03300
03400



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CORRELATION MAIN LOG

****

FILE: 2

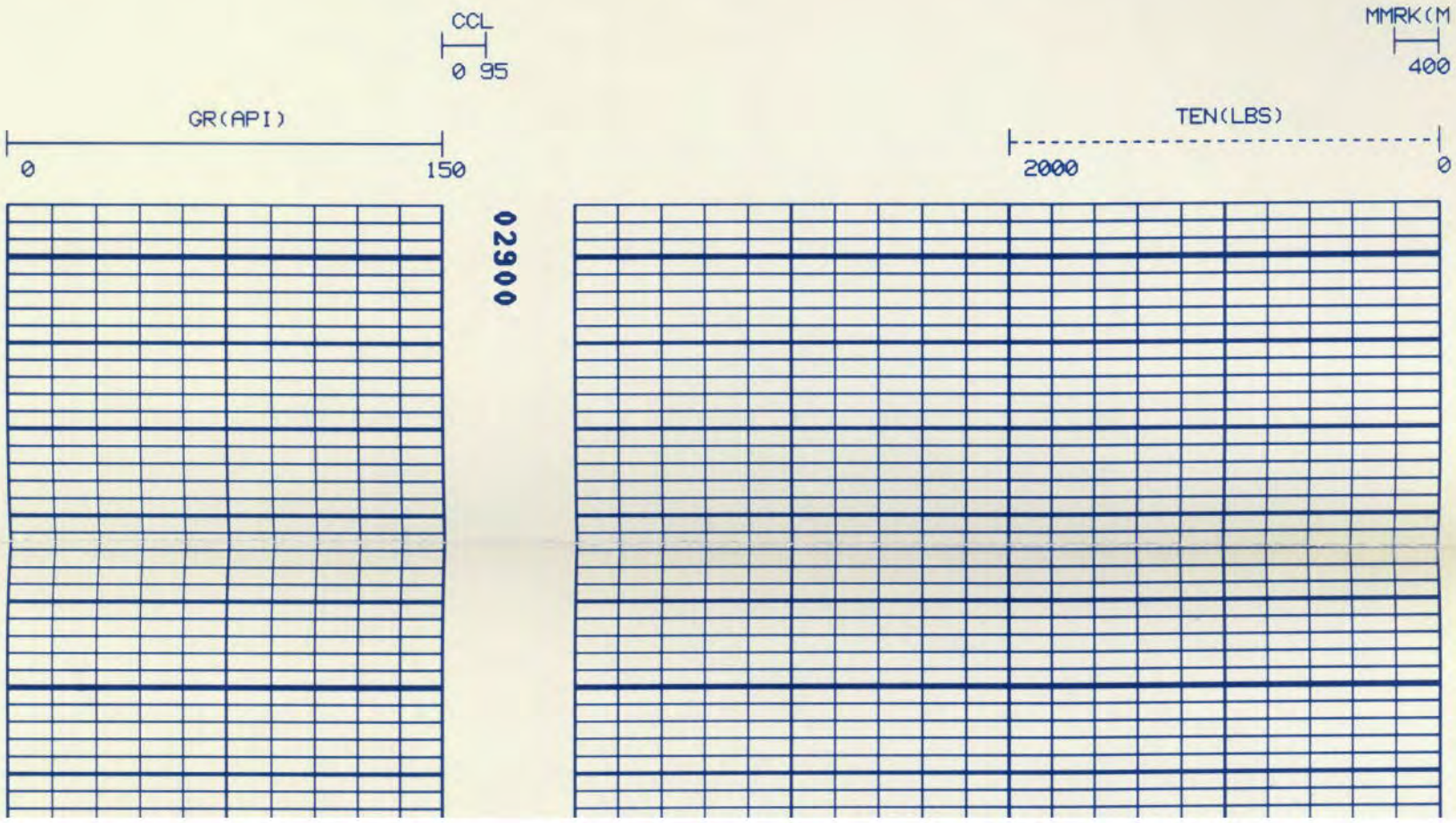
PARAMETERS

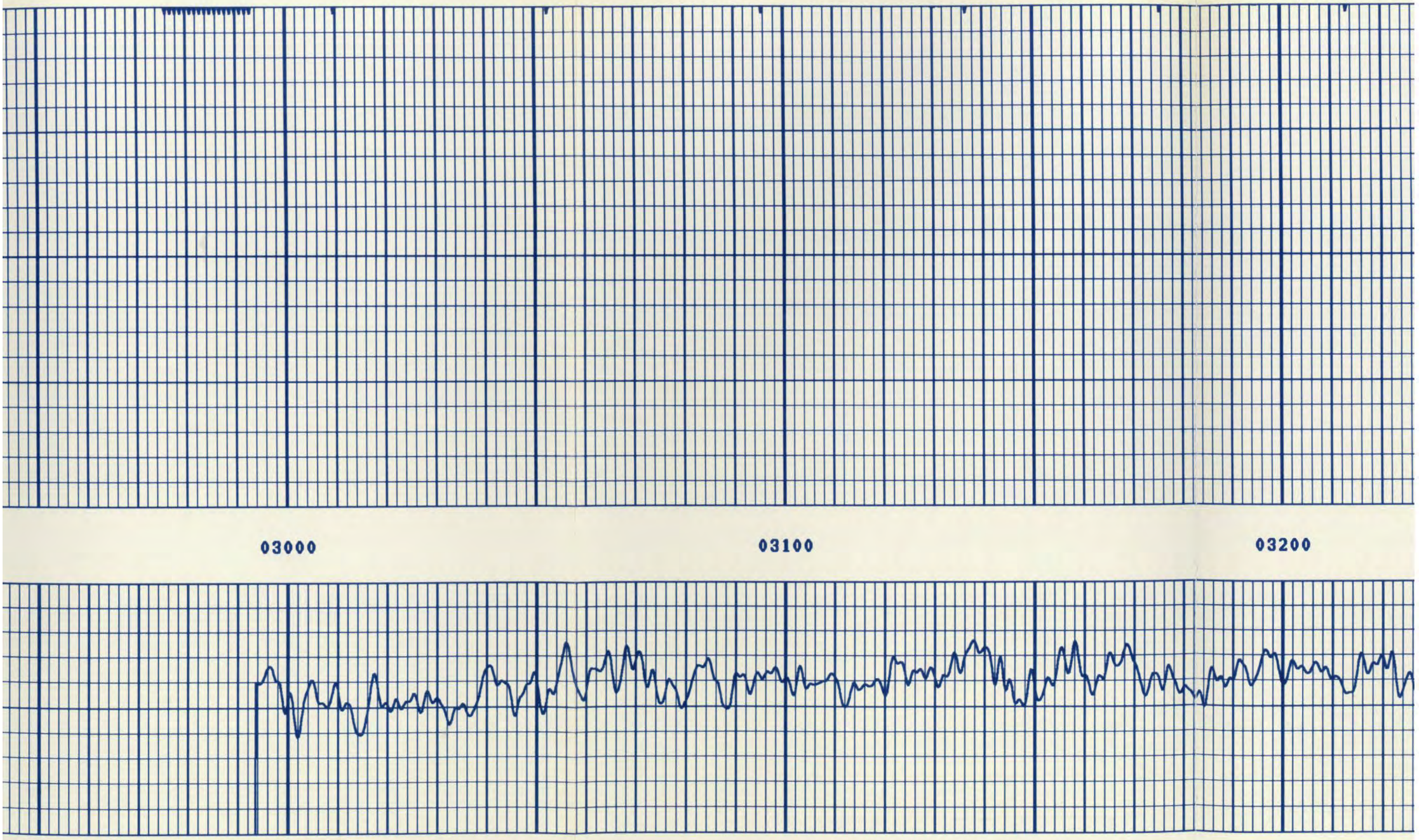
*** NONE ***

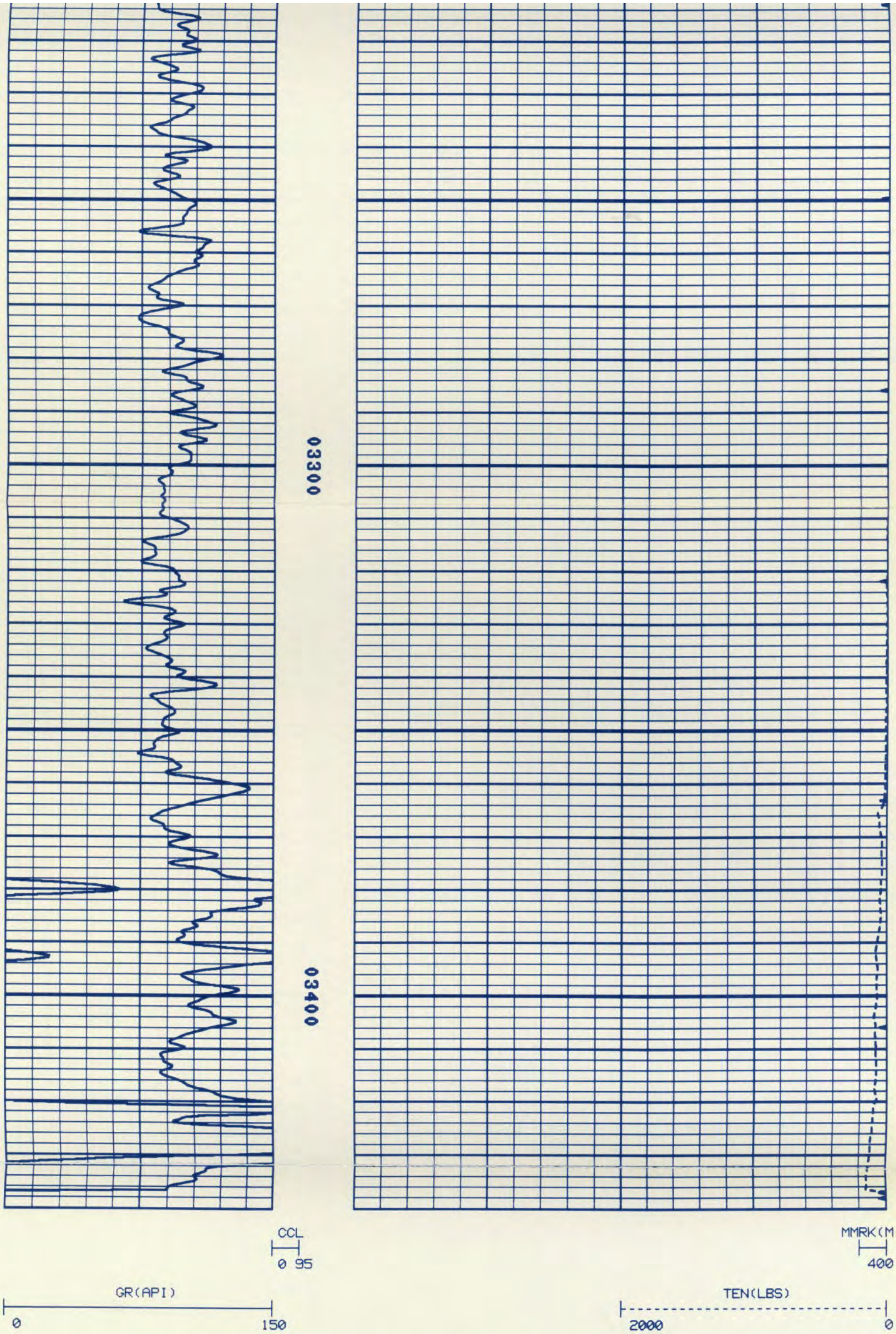
DISPLAY SCALE CHANGES

*** NONE ***

COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 4			TRIP:	1
SERVICE:	F 372B	FILE: 2	DATE: 10/31/91	TIME:	16:45:37
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK




03000
03100
03200



FILE: 2

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CORRELATION REPEAT SECTION

CORRELATION REPEAT SECTION

****

FILE: 1

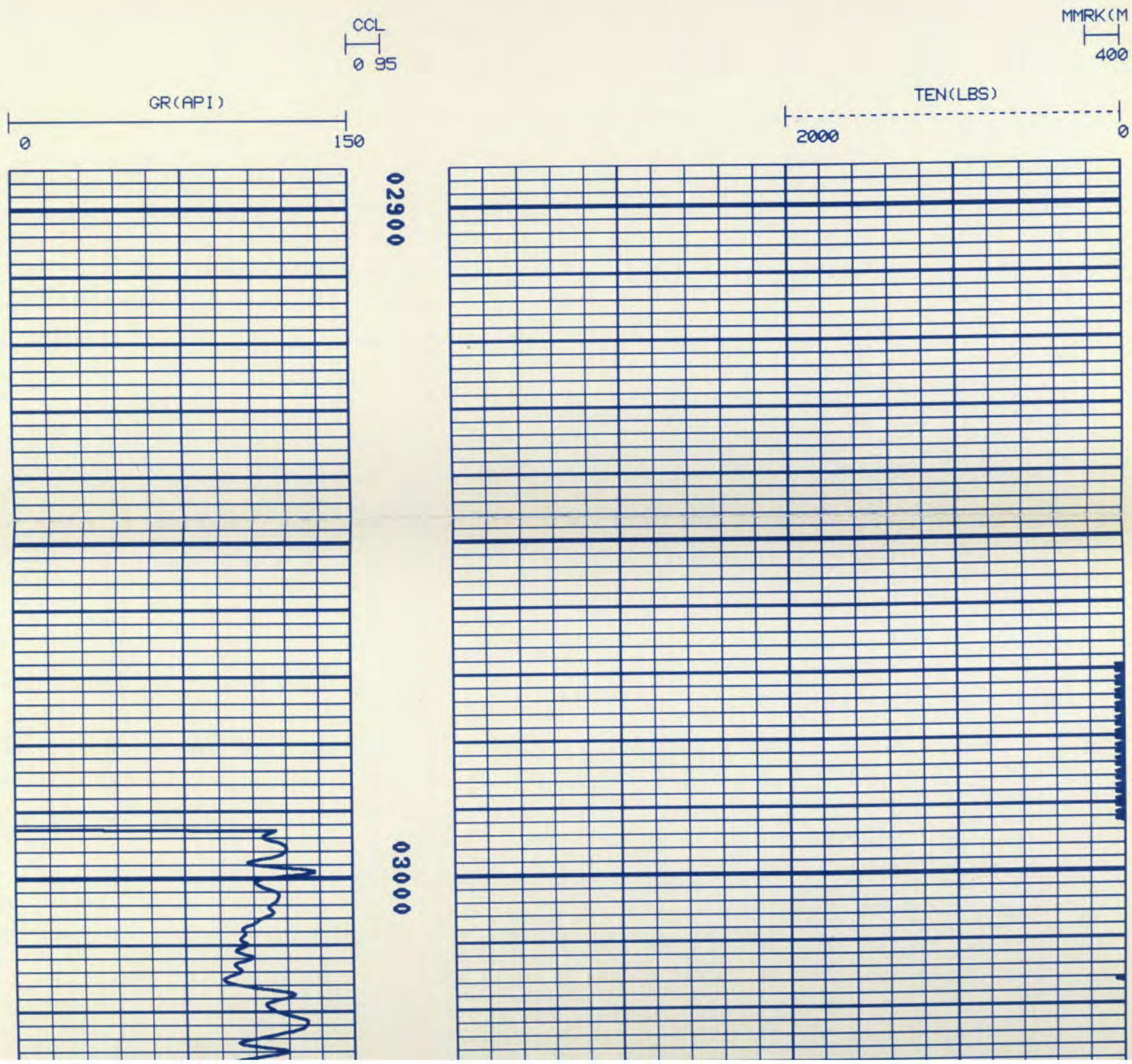
PARAMETERS

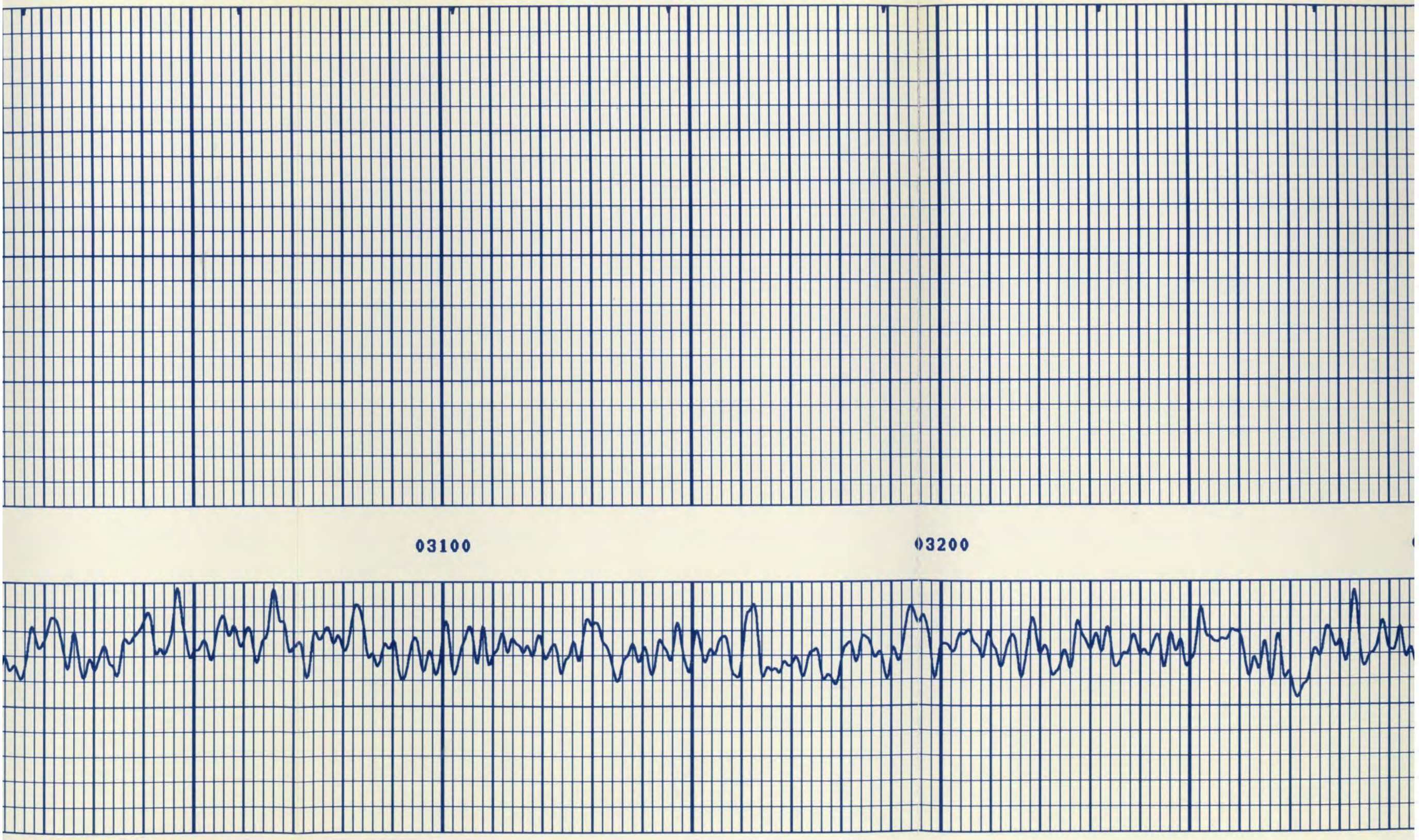
*** NONE ***

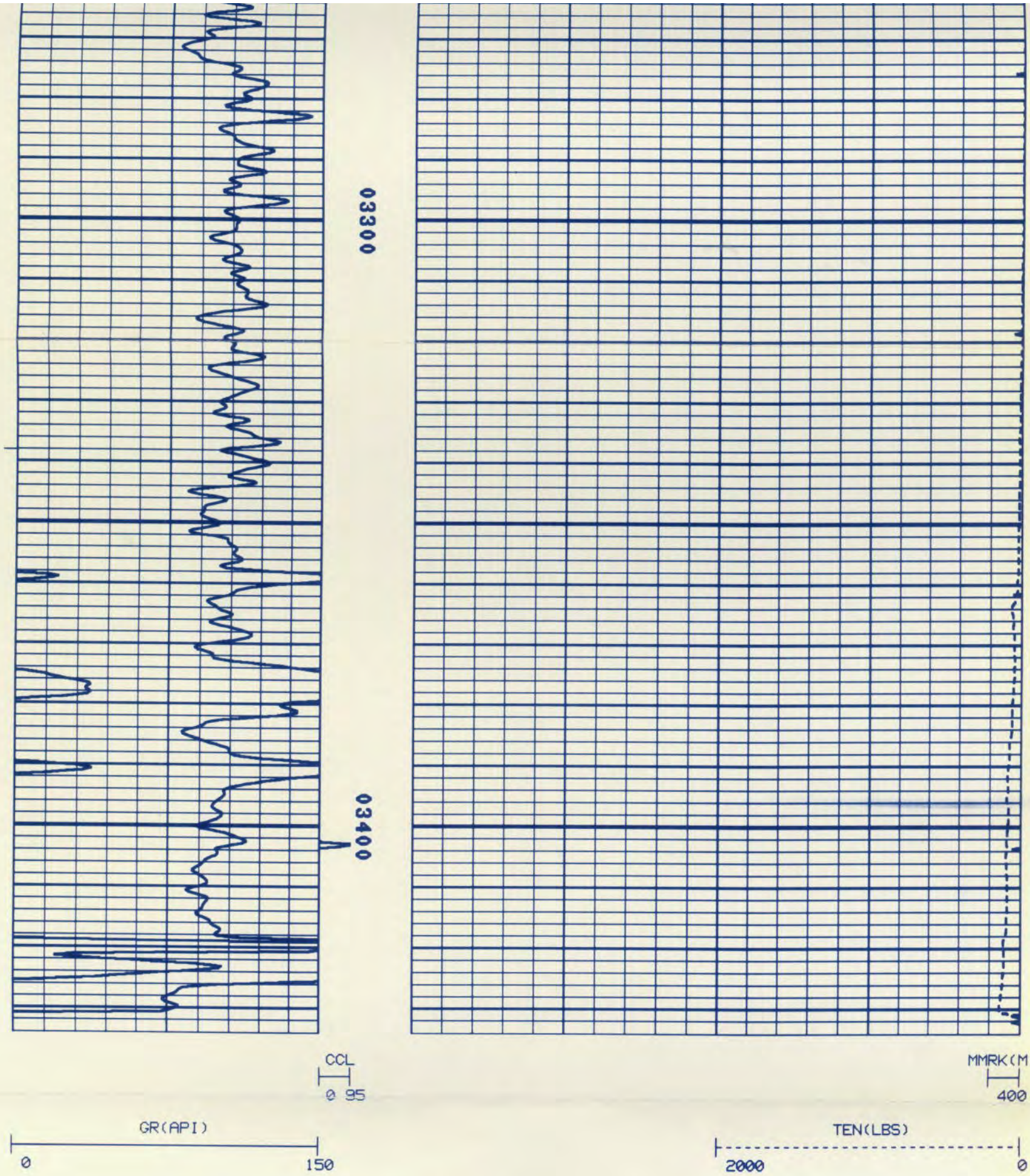
DISPLAY SCALE CHANGES

*** NONE ***

COMPANY:	HOECHST CELANESE CORPORATION			RUN:	1
WELL NAME:	EFFLUENT DISPOSAL WELL NO. 4			TRIP:	1
SERVICE:	F 372B	FILE: 1	DATE: 10/31/91	TIME:	16:31:06
REVISION:	FSYS256 REV:G002 VER:2.0			MODE:	PLAYBACK




03100
03200



FILE: 1

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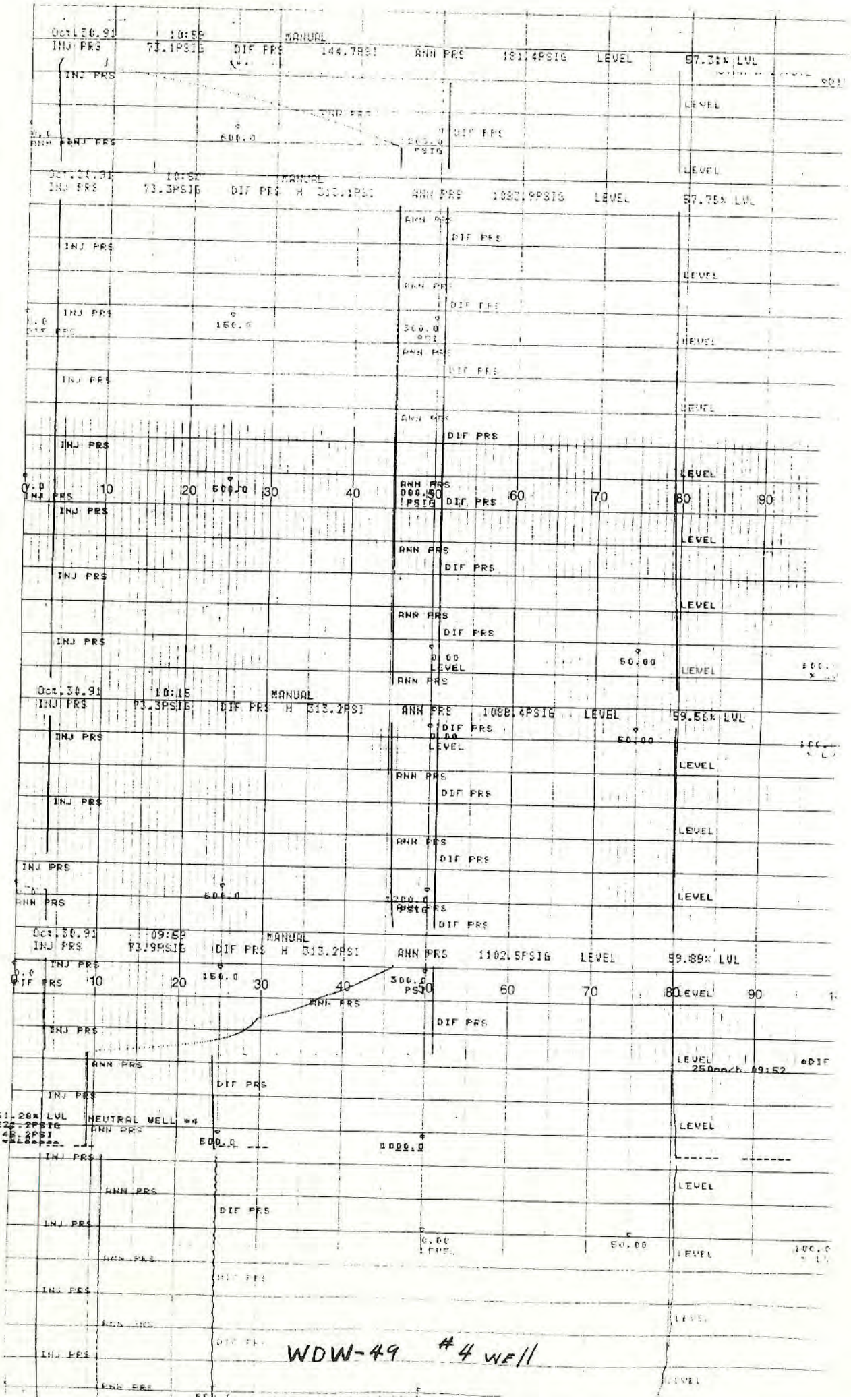
APPENDIX F
ANNULUS PRESSURE TEST WDW-49 (WELL #4)


Oct.30.91 10:59 MANUAL
INJ PRS 73.1PSIG DIF PRS 144.7PSI ANN PRS 1811.4PSIG LEVEL 57.31% LVL
Oct.30.91 10:58 MANUAL
INJ PRS 73.3PSIG DIF PRS H 313.1PSI ANN PRS 1082.9PSIG LEVEL 57.75% LVL
Oct.30.91 10:15 MANUAL
INJ PRS 73.3PSIG DIF PRS H 313.2PSI ANN PRS 1088.4PSIG LEVEL 59.56% LVL
Oct.30.91 09:59 MANUAL
INJ PRS 73.9PSIG DIF PRS H 313.2PSI ANN PRS 1102.5PSIG LEVEL 59.89% LVL
LEVEL 61.20% LVL
ANN PRS 228.2PSIG
DIF PRS 148.2PSI
NEUTRAL WELL #4
WDW-49 #4 well

APPENDIX G
AMBIENT MONITORING WDW-49 (WELL #4)

DRC

Data Retrieval Corporation

TEST DATA SUMMARY

COMPANY : HOECHST CELANESE

WELL NAME : WDW-49 #4

ENGINEER : BOB HALL

FIELD NAME:

TEST TYPE: INJECTION FALL-OFF

TEST DATES: OCT 29-30, 1991

LOCATION : BAY CITY PLANT - MATAGORDA COUNTY, TEXAS

WELL DATA

TUBING SIZE	: N/A IN.	WELL-HEAD TEMP.	: 75°F
TUBING I.D.	: N/A IN.	BOTTOM-HOLE TEMP.	: 125°F
TUBING LENGTH	: 3,440 FT.		
TRUE VERT. DEPTH	: 3,440 FT.		

FLUIDS DATA

GAS GRAVITY (SEP.)	: N/A	MOL % CO2	: N/A
OIL/GAS RATIO	: N/A	MOL % N2	: N/A
OIL API GRAVITY	: N/A	MOL % H2S	: N/A
H2O/GAS RATIO	: N/A		
H2O GRAVITY	: 1.0		

TEST SUMMARY

WHP AT SHUT-IN	: 600 PSIA	SAMPLE RATE	:15 SECONDS
BHP AT SHUT-IN	: 2,090 PSIA	SAMPLE WINDOW	: 1 PSI
		SPIDR S/N 1007	
MIN FALL-OFF WHP	: 91 PSIA		
MIN FALL-OFF BHP	: 1,581 PSIA		

BOTTOM-HOLE PRESSURE IS CALCULATED FROM A MODIFIED CULLENDER AND SMITH CORRELATION THAT ACCOUNTS FOR THE QUANTITY AND COMPOSITION OF PRODUCED FLUIDS.

5625 FM 1960 W Suite 502 Houston, Texas 77069 (713) 444-5398 FAX #(713) 444-5397

D A T A R E T R I E V A L W E L L T E S T

Company : HOECHST CELANESE
Well Name : WDW-49 4
Lease :
Location : BAY CITY PLANT
SPIDR s.n.: 1007

Active Channels : 1

Start Time : Tuesday, 10/29/91 10:50:10
End Time : Wednesday, 10/30/91 09:04:40
Readings : 132
Sample Window : 1 psi
Sample Rate : 00:00:15 240 samples/hr.

CHANNEL 1
Label: WHP
Min. : 598.0 Psia
Max. : 600.0 Psia

Report Columns :

Column #	Label			
1	WHP	Min.:	91.00	Tuesday, 10/29/91 20:01:10
		Max.:	598.00	Tuesday, 10/29/91 10:50:10
2	ELAPSED T	Min.:	10.84	Tuesday, 10/29/91 10:50:10
		Max.:	33.08	Wednesday, 10/30/91 09:04:40
3	BHP	Min.:	1580.52	Tuesday, 10/29/91 20:01:10
		Max.:	2087.52	Tuesday, 10/29/91 10:50:10
4	DELTA T	Min.:	0.00	Tuesday, 10/29/91 10:50:10
		Max.:	1166.25	Wednesday, 10/30/91 09:04:40
5	DELTA P	Min.:	0.00	Tuesday, 10/29/91 10:50:10
		Max.:	508.00	Tuesday, 10/29/91 20:01:10

HOECHST CELANESE

WDW-49 4

Location : BAY CITY PLANT

Lease :

Record	Date	Time	WHP PSIA	ELAPSED T HOURS	BHP PSIA	DELTA T MINUTES	DELTA P PSI
0001	10/29/91	10:50:10	598.00	10.84	2087.52	0.00	0.00
0129	Tuesday	13:35:55	599.00	13.60	2088.52	0.00	0.00
0130		13:38:40	592.00	13.64	2081.52	0.25	7.00
0131		13:39:25	590.00	13.66	2079.52	1.00	9.00
0133		13:39:55	588.00	13.67	2077.52	1.50	11.00
0134		13:40:25	587.00	13.67	2076.52	2.00	12.00
0135		13:40:40	585.00	13.68	2074.52	2.25	14.00
0136		13:40:55	580.00	13.68	2069.52	2.50	19.00
0137		13:41:10	576.00	13.69	2065.52	2.75	23.00
0138		13:41:25	572.00	13.69	2061.52	3.00	27.00
0140		13:42:10	570.00	13.70	2059.52	3.75	29.00
0141		13:42:25	569.00	13.71	2058.52	4.00	30.00
0142		13:43:25	568.00	13.72	2057.52	5.00	31.00
0143		13:44:10	566.00	13.74	2055.52	5.75	33.00
0144		13:44:25	563.00	13.74	2052.52	6.00	36.00
0145		13:44:40	558.00	13.74	2047.52	6.25	41.00
0146		13:44:55	552.00	13.75	2041.52	6.50	47.00
0147		13:45:10	549.00	13.75	2038.52	6.75	50.00
0148		13:45:25	547.00	13.76	2036.52	7.00	52.00
0149		13:45:40	545.00	13.76	2034.52	7.25	54.00
0150		13:45:55	538.00	13.77	2027.52	7.50	61.00
0151		13:46:10	534.00	13.77	2023.52	7.75	65.00
0152		13:46:25	517.00	13.77	2006.52	8.00	82.00
0153		13:46:40	513.00	13.78	2002.52	8.25	86.00
0154		13:46:55	509.00	13.78	1998.52	8.50	90.00
0156		13:47:25	507.00	13.79	1996.52	9.00	92.00
0157		13:47:55	493.00	13.80	1982.52	9.50	106.00
0158		13:48:10	484.00	13.80	1973.52	9.75	115.00
0159		13:48:25	469.00	13.81	1958.52	10.00	130.00
0160		13:48:40	467.00	13.81	1956.52	10.25	132.00
0161		13:48:55	465.00	13.82	1954.52	10.50	134.00
0162		13:49:10	463.00	13.82	1952.52	10.75	136.00
0163		13:49:25	461.00	13.82	1950.52	11.00	138.00
0165		13:49:55	459.00	13.83	1948.52	11.50	140.00
0166		13:50:10	447.00	13.84	1936.52	11.75	152.00
0167		13:50:25	438.00	13.84	1927.52	12.00	161.00
0168		13:50:40	434.00	13.84	1923.52	12.25	165.00
0169		13:50:55	430.00	13.85	1919.52	12.50	169.00
0170		13:51:10	398.00	13.85	1887.52	12.75	201.00
0171		13:51:25	383.00	13.86	1872.52	13.00	216.00
0172		13:51:40	363.00	13.86	1852.52	13.25	236.00
0173		13:51:55	341.00	13.87	1830.52	13.50	258.00
0174		13:52:10	317.00	13.87	1806.52	13.75	282.00
0175		13:52:25	294.00	13.87	1783.52	14.00	305.00
0176		13:52:40	273.00	13.88	1762.52	14.25	326.00
0177		13:52:55	256.00	13.88	1745.52	14.50	343.00
0178		13:53:10	243.00	13.89	1732.52	14.75	356.00
0179		13:53:25	233.00	13.89	1722.52	15.00	366.00
0180		13:53:40	225.00	13.89	1714.52	15.25	374.00
0181		13:53:55	219.00	13.90	1708.52	15.50	380.00

HOECHST CELANESE
WDW-49 4
Location : BAY CITY PLANT
Lease :

Record	Date	Time	WHP PSIA	ELAPSED T HOURS	BHP PSIA	DELTA T MINUTES	DELTA P PSI
0182	10/29/91	13:54:10	214.00	13.90	1703.52	15.75	385.00
0183	Tuesday	13:54:25	210.00	13.91	1699.52	16.00	389.00
0184		13:54:40	205.00	13.91	1694.52	16.25	394.00
0185		13:54:55	202.00	13.92	1691.52	16.50	397.00
0186		13:55:10	198.00	13.92	1687.52	16.75	401.00
0187		13:55:25	195.00	13.92	1684.52	17.00	404.00
0188		13:55:40	191.00	13.93	1680.52	17.25	408.00
0189		13:55:55	188.00	13.93	1677.52	17.50	411.00
0190		13:56:10	186.00	13.94	1675.52	17.75	413.00
0191		13:56:25	183.00	13.94	1672.52	18.00	416.00
0192		13:56:40	180.00	13.94	1669.52	18.25	419.00
0193		13:56:55	178.00	13.95	1667.52	18.50	421.00
0194		13:57:10	175.00	13.95	1664.52	18.75	424.00
0195		13:57:25	173.00	13.96	1662.52	19.00	426.00
0196		13:57:40	171.00	13.96	1660.52	19.25	428.00
0197		13:57:55	169.00	13.97	1658.52	19.50	430.00
0198		13:58:10	167.00	13.97	1656.52	19.75	432.00
0199		13:58:25	165.00	13.97	1654.52	20.00	434.00
0200		13:58:40	164.00	13.98	1653.52	20.25	435.00
0201		13:58:55	162.00	13.98	1651.52	20.50	437.00
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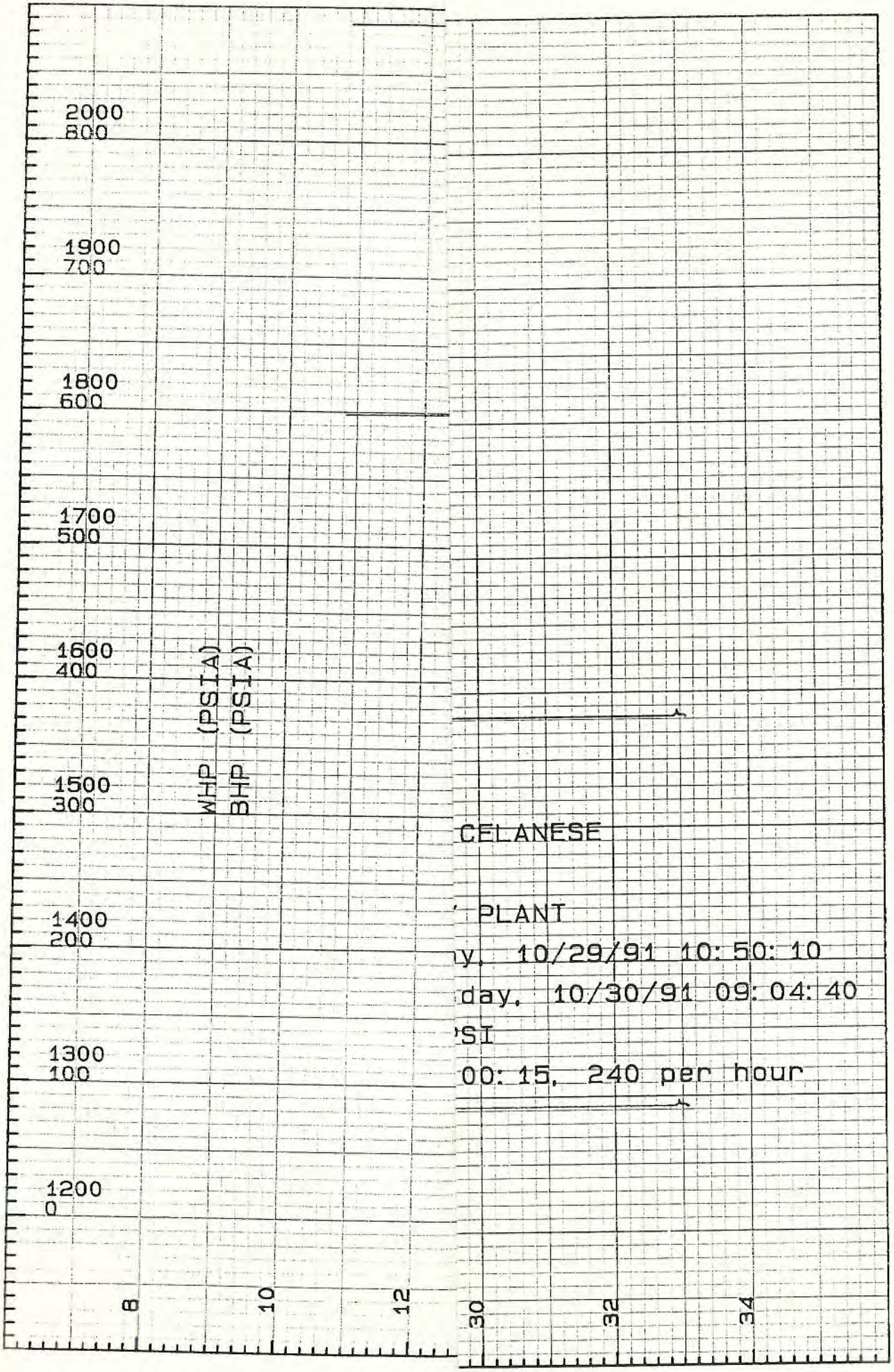
0203		13:59:25	159.00	13.99	1648.52	21.00	440.00
0204		13:59:40	157.00	13.99	1646.52	21.25	442.00
0206		14:00:10	155.00	14.00	1644.52	21.75	444.00
0207		14:00:25	154.00	14.01	1643.52	22.00	445.00
0208		14:00:40	152.00	14.01	1641.52	22.25	447.00
0210		14:01:10	150.00	14.02	1639.52	22.75	449.00
0211		14:01:25	149.00	14.02	1638.52	23.00	450.00
0213		14:01:55	147.00	14.03	1636.52	23.50	452.00
0214		14:02:10	146.00	14.04	1635.52	23.75	453.00
0216		14:02:40	144.00	14.04	1633.52	24.25	455.00
0217		14:02:55	143.00	14.05	1632.52	24.50	456.00
0219		14:03:40	141.00	14.06	1630.52	25.25	458.00
0220		14:03:55	140.00	14.07	1629.52	25.50	459.00
0222		14:04:40	138.00	14.08	1627.52	26.25	461.00
0223		14:04:55	137.00	14.08	1626.52	26.50	462.00
0225		14:05:40	135.00	14.09	1624.52	27.25	464.00
0226		14:06:10	134.00	14.10	1623.52	27.75	465.00
0228		14:06:55	132.00	14.12	1621.52	28.50	467.00
0229		14:07:25	131.00	14.12	1620.52	29.00	468.00
0231		14:08:10	129.00	14.14	1618.52	29.75	470.00
0232		14:08:40	128.00	14.14	1617.52	30.25	471.00
0234		14:09:55	126.00	14.17	1615.52	31.50	473.00
0235		14:10:25	125.00	14.17	1614.52	32.00	474.00
0237		14:11:40	123.00	14.19	1612.52	33.25	476.00
0238		14:12:25	122.00	14.21	1611.52	34.00	477.00
0240		14:13:55	120.00	14.23	1609.52	35.50	479.00
0241		14:14:40	119.00	14.24	1608.52	36.25	480.00
0243		14:16:25	117.00	14.27	1606.52	38.00	482.00
0244		14:17:25	116.00	14.29	1605.52	39.00	483.00

WDW-49 4

Location : BAY CITY PLANT

Lease :

Record	Date	Time	WHP PSIA	ELAPSED T HOURS	BHP PSIA	DELTA T MINUTES	DELTA P PSI
0246	10/29/91	14:19:40	114.00	14.33	1603.52	41.25	485.00
0247	Tuesday	14:20:25	113.00	14.34	1602.52	42.00	486.00
0249		14:23:40	111.00	14.39	1600.52	45.25	488.00
0250		14:24:40	110.00	14.41	1599.52	46.25	489.00
0252		14:27:55	108.00	14.47	1597.52	49.50	491.00
0253		14:29:25	107.00	14.49	1596.52	51.00	492.00
0255		14:33:25	105.00	14.56	1594.52	55.00	494.00
0256		14:35:55	104.00	14.60	1593.52	57.50	495.00
0258		14:40:55	102.00	14.68	1591.52	62.50	497.00
0259		14:44:10	101.00	14.74	1590.52	65.75	498.00
0262		14:51:55	100.00	14.87	1589.52	73.50	499.00
0263		14:52:25	99.00	14.87	1588.52	74.00	500.00
0266		15:01:40	98.00	15.03	1587.52	83.25	501.00
0267		15:03:25	97.00	15.06	1586.52	85.00	502.00
0271		15:18:10	96.00	15.30	1585.52	99.75	503.00
0272		15:18:55	95.00	15.32	1584.52	100.50	504.00
0278		15:28:10	95.00	15.47	1584.52	109.75	504.00
0279		15:31:55	94.00	15.53	1583.52	113.50	505.00
0291		15:49:40	94.00	15.83	1583.52	131.25	505.00
0292		15:52:55	93.00	15.88	1582.52	134.50	506.00
0322		16:53:40	93.00	16.89	1582.52	195.25	506.00
0323		16:56:55	92.00	16.95	1581.52	198.50	507.00
0406		20:00:10	92.00	20.00	1581.52	381.75	507.00
0407		20:01:10	91.00	20.02	1580.52	382.75	508.00
1006	10/30/91	08:53:40	92.00	32.89	1581.52	1155.25	507.00
1007	Wednesday	08:56:10	94.00	32.94	1583.52	1157.75	505.00
1008		08:56:25	96.00	32.94	1585.52	1158.00	503.00
1010		08:57:25	94.00	32.96	1583.52	1159.00	505.00
1011		08:58:25	93.00	32.97	1582.52	1160.00	506.00
1014		09:02:55	93.00	33.05	1582.52	1164.50	506.00
1015		09:04:10	92.00	33.07	1581.52	1165.75	507.00
1017		09:04:40	92.00	33.08	1581.52	1166.25	507.00

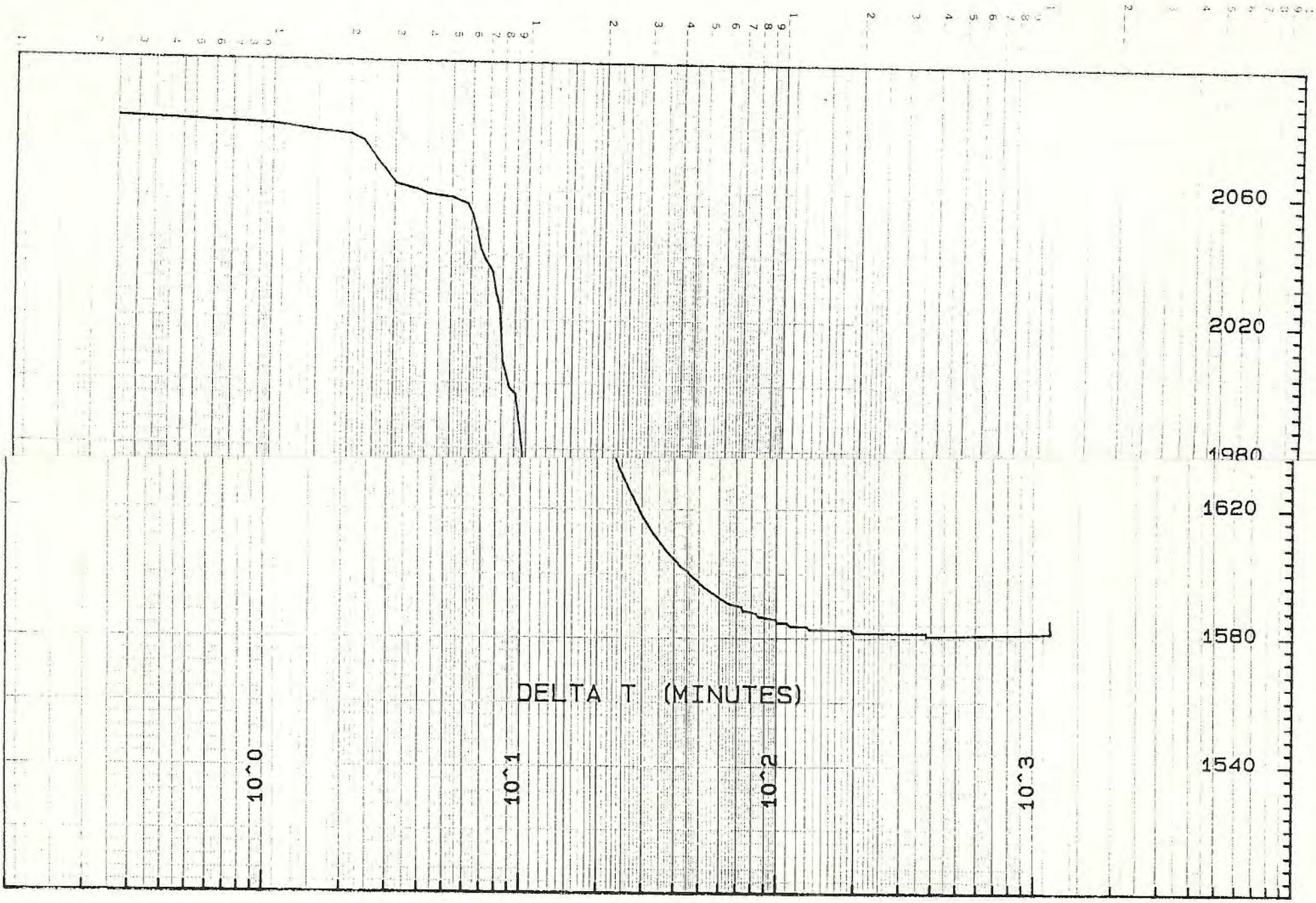


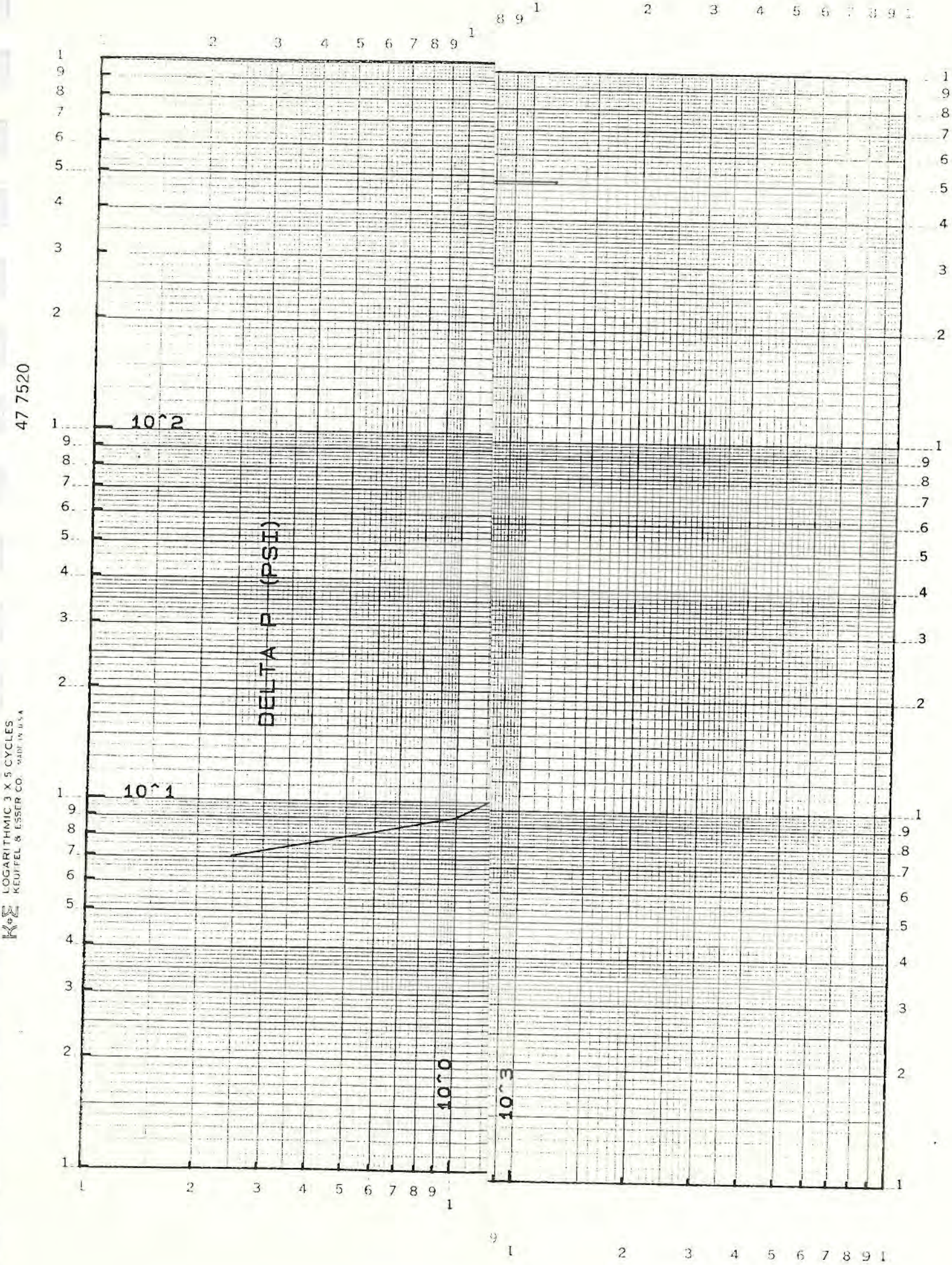
47 0780

10 X 10 TO THE INCH • 10 X 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

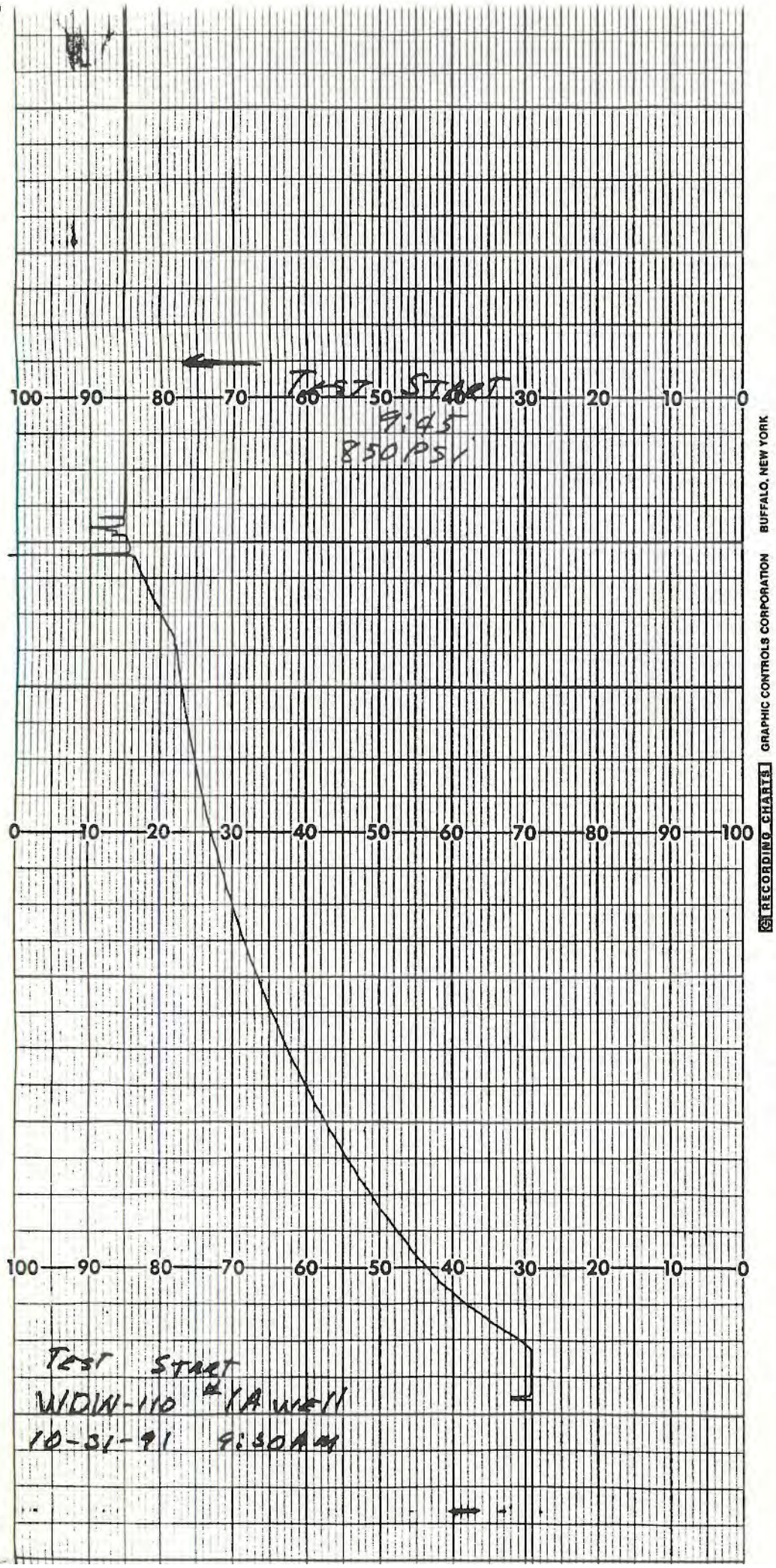
K&E SEMI-LOGARITHMIC 5 CYCLES X 150 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

47 6210




47 7520
10^2
10^1
10^0
10^3
DELTA P (PSI)
K+E LOGARITHMIC 3 X 5 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

APPENDIX H
ANNULUS PRESSURE WDW-110 (WELL #1-A)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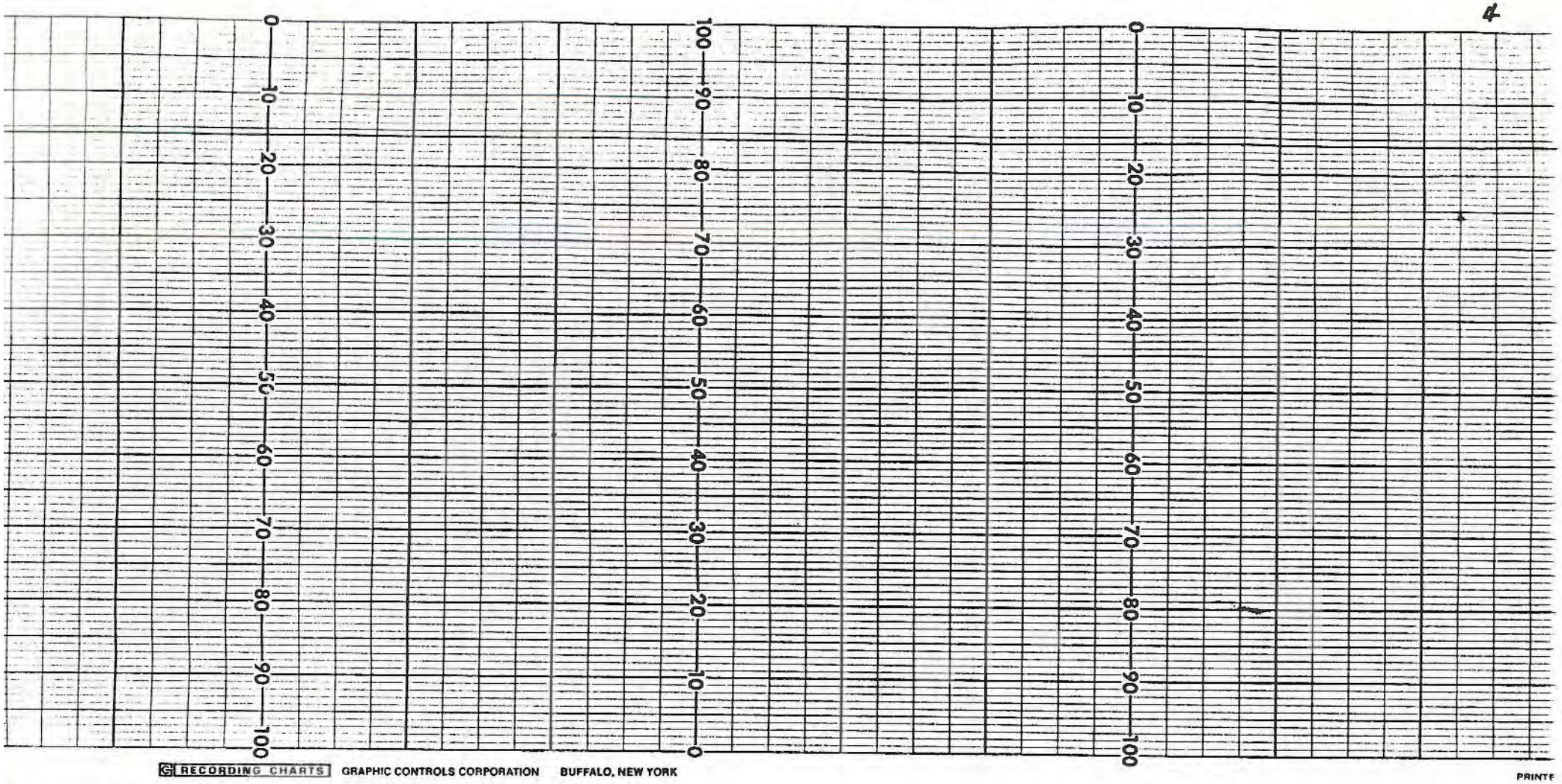
Test Start
9:45
850 PSI
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
Test Start
WIDW-110 #1A well
10-31-91 9:30AM
RECORDING CHARTS GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

4



RECORDING CHARTS GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK

PRINTE

Hoechst Celanese

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

January 28, 1993
KW-017-93

Mr. Richard Merritt,
Underground Injection Control
Texas Water Commission
P.O. Box 13087, Capitol Station
Austin, Texas 78711-3087

Re: Submittal of the 1992 Injection Zone Annual Report
Hoechst Celanese Chemical Group, Inc.
Bay City, Texas EPA ID No. TXD026040709

Dear Mr. Merritt:

Enclosed are two copies of the 1992 Injection Zone Annual Report for the Hoechst Celanese Chemical Group, Inc., Bay City Plant. The report was prepared by our contractor, DuPont Environmental Remediation Services.

If you have questions concerning the report, please contact me at (409) 241-4123 or Mr. I.O. Coleman, Jr. at (409) 241-4197.

Sincerely Yours,

Kaymartha Williams

Kaymartha Williams
Environmental Engineer

Attachments

Hoechst

cc: w/o Attached Report

Mr. Hesus Garza
Executive Director
Texas Water Commission
P.O. Box 13087, Capitol Station
Austin, Texas 78711

Mr. Anne Dobbs, Chief
Hazardous and Solid Waste Enforcement Section
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Austin, Texas 78711

Mr. Mac Weaver, Chief
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue Suite #1200
Dallas, Texas 75202-2733

1992 INJECTION ZONE ANNUAL REPORT
CLASS I INJECTION WELLS
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT

Prepared for:

Hoechst Celanese Chemical Group, Inc.
Bay City Plant
Bay City, Texas

Prepared by:

By Du Pont Environmental Remediation Services Inc.
140 Cypress Station Drive
Suite 140
Houston, Texas 77090

DERS Project Number 402263
January 1992

1992 INJECTION ZONE ANNUAL REPORT
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TABLE OF CONTENTS

LIST OF TABLES iii

LIST OF FIGURES iii

LIST OF APPENDICES iii

1.0 INTRODUCTION 1

1.1 Effect of 1992 Injection Operations on the Injection Sands 2

1.2 Artificial Penetration Update 2

1.3 Injected Fluid Analyses 2

2.0 EFFECT OF 1992 INJECTION OPERATIONS ON THE INJECTION SANDS 3

2.1 Waste and Pressure Distribution at the End of 1992 3

2.2 Waste and Pressure Distribution at the End of 2000 4

2.3 Comparison of Measured and Modeled Pressures 4

2.4 Summary 5

3.0 ARTIFICIAL PENETRATION UPDATE 6

3.1 Freshwater Wells 6

3.2 Non-Freshwater Wells 6

4.0 1992 INJECTED FLUID ANALYSIS 7

5.0 SUMMARY 8

LIST OF TABLES

Table 1 Geologic Input Parameters

Table 2 1992 Injection History by Well

Table 3 Shut-in Formation Pressures

Table 4 Representative Chemical Analyses of Acid and Neutral Waste - Analyses Performed October 12, 1992

LIST OF FIGURES

Figure 1 Pressure Contour Plot in Upper Miocene Injection Interval at the End of 1992

Figure 2 Pressure Contour Plot in Lower Miocene Injection Interval at the End of 1992

Figure 3 Composite Waste Plume in Upper Miocene Injection Interval at the End of 1992

Figure 4 Waste Plume in Lower Miocene Injection Interval at the End of 1992

Figure 5 Pressure Contour Plot in Upper Miocene Injection Interval at the End of 2000

Figure 6 Pressure Contour Plot in Lower Miocene Injection Interval at the End of 2000

Figure 7 Waste Plume in Lower Miocene Injection Interval at the End of 2000

Figure 8 Composite Waste Plume in Upper Miocene Injection Interval at the End of 2000

LIST OF APPENDICES

Appendix A Letters From AIC -Regarding Freshwater and Non-Freshwater Artificial Penetrations

Appendix B Modeling Results

Appendix C Quarterly Reports

1.0 INTRODUCTION

The Hoechst Celanese Chemical Group, Inc., Bay City Plant, operates four Class I injection wells at the Bay City, Texas, site. Three of these wells, WDW-14 (Well 2), WDW-32 (Well 3), and WDW-49 (Well 4), are known as the "neutral" wells. Although these wells usually inject the non-hazardous "neutral" waste into a subsurface interval known as the upper Miocene injection interval at approximately 3300 feet below ground level, they also are allowed (due to an approved No-Migration Petition) to inject restricted (RCRA Hazardous) waste. The fourth well, WDW-110 (Well 1-A), injected the hazardous "acid" waste into a deeper subsurface interval, at approximately 5700 feet, known as the lower Miocene injection interval.

As required by the Injection Well Permits, issued by the Texas Water Commission, and the Reporting Requirements in Subchapter D of 31 Texas Administrative Code (TAC) 331.65(b)(3), the following Injection Zone Annual Report is being submitted to summarize the injection operations at the Bay City Plant for 1992. Also included in this report are copies of representative waste analyses of the injected fluids for both the "acid" and the "neutral" wastewater.

Mechanical integrity testing, as required by TWC regulations, was performed on the injection wells in late 1992. WDW-14 (Well No. 2) was tested in December, and wells WDW-32 (Well No. 3) and WDW-49 (Well No. 4) were tested in September of 1992. The results of the testing indicate that three of the four wells are mechanically sound, are operating in an environmentally safe manner, and are delivering the injection fluids to the injection interval in a manner prescribed by the injection well permit.

Injection Well WDW-110 (Well No. 1-A) was not tested for mechanical integrity due to an ongoing workover procedure. Well No. 1-A was shut in during November, 1991, due to the well's inability to accept injection fluid. Work was started on Well No. 1-A during early 1992 and is still in progress. Upon completion of the well repair, a complete mechanical integrity test procedure will be completed on Well No. 1-A.

The following report will show that there were no significant changes in the injection operations at the Bay City Plant during 1992 that could adversely affect the injection zone or the injection wells themselves. Also, based on a review of the 1992 injection data and plume and pressure computer modeling for the plant, no unexpected effects due to injection operations were

Report.

1.1 Effect of 1992 Injection Operations on the Injection Sands

It has been demonstrated through the analysis of recent bottom hole pressure measurements and flow modeling, that injection at the Bay City Plant (1964 - 1992) has increased formation pressures in the injection sands slightly. In addition, the modeling indicates continued injection at current rates for the next twenty years (through 2000) will have no significant impact on formation pressures.

1.2 Artificial Penetration Update

No new or previously undiscovered fresh-water or non-fresh-water wells were found after a search of the Texas Water Commission and Texas Railroad Commission files. This was determined based on research by Agency Information Consultants, and is referenced in letters contained in Appendix A of this report.

1.3 Injected Fluid Analyses

The composition of the injected fluid has not varied in a manner that could substantially affect the injection zone. Analyses of the injected fluids for 1992 are included in this report and are representative of the 1992 injected fluid characteristics.

2.0 EFFECT OF 1992 INJECTION OPERATIONS ON THE INJECTION SANDS

In order to evaluate the effects of 1992 injection operations, the waste injection system was modeled using the Flow and Containment modeling package utilized in the Bay City Plant Class I Injection Well Petition. This package consists of the Multilayer Pressure, Basic Plume, and Vertical Permeation Models. These models predict formation pressure buildup in the injection sands, the lateral extent of the injected waste, and the vertical permeation caused by the injection operations, respectively. Vertical permeation was not evaluated for 1992 and is not required for this Annual Report. For a more detailed description of these models, please refer to the Bay City Plant Class I Injection Well Petition (Petition Section 2).

The geologic inputs to the models (see Table 1), and the model calibrations (see Sections 2.1.4.1 and 2.1.4.2 of the Bay City Plant Petition) remain unchanged from the petition. The only variations from the petition models were the addition of yearly injection data through the end of 1992 (see Table 2 for 1992 data) and modification of the time frames modeled. Injection operations were modeled for two time frames: 1) historical yearly injection through the end of 1992; and 2) projected yearly injection through the end of 2000.

2.1 Waste and Pressure Distribution at the End of 1992

The formation pressure distribution at the end of 1992, in the upper Miocene injection interval, is displayed in Figure 1. The maximum formation pressure increase in the upper Miocene injection interval was approximately 52 psi at WDW-14, while the pressure increase at the 2.5-mile Area of Review boundary was less than 14 psi. Figure 2 shows the formation pressure distribution in the lower Miocene injection interval at the end of 1992. No injection occurred in the lower Miocene injection interval during 1992. Therefore, formation pressure has returned to nearly the original pressure. The formation pressure increase due to injection is approximately two psi at WDW-110, as well as at the 2.5-mile Area of Review boundary.

The maximum horizontal extent of the waste in the upper Miocene injection sand, at the end of 1992, is shown in Figure 3. The shape of the composite waste plume is roughly circular, with an approximate diameter of 1.5 miles. At the end of 1992, the waste plume in the lower Miocene injection interval is also roughly circular, with an approximate diameter of 0.91 miles from WDW-110 (see Figure 4).

2.2 Waste and Pressure Distribution at the End of 2000

The modeling results at the end of 2000 are based on the following projected injection rates for the years 1993 through 2000: 1) 156.0 gallons per minute (gpm) in WDW-14, 2) 80.8 gpm in WDW-32, 3) 86.3 gpm in WDW-49, and 4) 145.0 gpm in WDW-110. The projected rates for WDW-32 and WDW-49 are based on the average rate for each well for 1991 and 1992. The projected rate for WDW-110, in the lower Miocene injection interval, is based on the 1991 injection rate and the conservative modeling assumption that injection will be re-established in this well and interval in 1993 and will continue through the end of the year 2000. If injection in WDW-110 is established in the upper Miocene injection interval, the volume of waste injected into this interval should not differ greatly from the projected volume (combined rates for WDW-14, WDW-32, and WDW-49).

The formation pressure distribution for the upper Miocene injection interval at the end of 2000 is shown in Figure 5. The pressure increase due to injection operations at the Area of Review boundary in the upper Miocene injection interval will be less than 14 psi at the end of 2000, while the maximum pressure increase will be approximately 44 psi at WDW-14. The maximum formation pressure increase in the lower Miocene injection interval would be approximately 21 psi. A pressure increase of less than 4 psi would be experienced at the Area of Review boundary in the lower Miocene injection sand (see Figure 6).

The maximum horizontal extent of waste in the lower Miocene injection interval at the end of 2000 is displayed in Figure 7. The waste plume would be centered around WDW-110 with a diameter of approximately 1.0 miles. The composite waste plume in the upper Miocene injection interval would be contained within a diameter of approximately 1.60 miles (see Figure 8).

2.3 Comparison of Measured and Modeled Pressures

Ambient pressure monitoring consisting of a pressure fall-off survey was conducted on Plant Well No. 3 (WDW-32) and Plant Well No. 4 (WDW-49) in September, 1992, in conjunction with mechanical integrity testing. The surveys were performed utilizing surface pressure gauges and the shut-in formation pressure results are displayed in Table 3. Both of these wells are completed in the upper Miocene injection interval. A pressure fall-off survey was not conducted in the lower Miocene injection interval because of completion problems in Plant Well No. 1-A (WDW-110), which is the only well completed in this interval.

In order to compare measured and modeled formation shut-in pressures, the measured pressures in WDW-32 and WDW-49 were corrected to the modeled mid-point of the upper Miocene injection interval (3440 feet below ground level). Since the measured pressures were recorded in psia and the model predicts pressures in psi, 15 psi was removed from each measured pressure during the correction process. The model only predicts the formation pressure increase over original formation pressure. The estimated original formation pressure for the upper Miocene injection interval is 1555 psi.

The measured shut-in formation pressures for WDW-32 and WDW-49 in the upper Miocene injection interval were 1580 psi and 1574 psi (see Table 3). The modeled shut-in formation pressure increases for the same time period (September 1992) in WDW-32 and WDW-49 were approximately 23 psi and 22 psi. These pressure increases equate to modeled shut-in pressures of 1578 psi in WDW-32 and 1577 psi in WDW-49.

The measured and modeled shut-in formation pressures in the upper Miocene injection interval compare very favorably with a maximum difference of only three psi. This confirms that the model is accurately predicting the impact of injection on formation pressures in the upper Miocene injection interval. Although no pressure measurements were obtained in lower Miocene injection interval, it is expected that the formation pressure increase from injection will have diminished to nearly zero due to the lack of injection during the year.

2.4 Summary

It has been demonstrated through the analysis of recent formation shut-in pressure measurements and flow and containment modeling, that injection at the Bay City Plant (1964 - 1992) has only slightly increased pressures in the injection intervals. In addition, continued injection, at projected rates through the end of the year 2000 will have no significant impact on formation pressures.

3.0 ARTIFICIAL PENETRATION UPDATE

Agency Information Consultants, Inc. (AIC), Austin, Texas, was contracted to conduct an Area of Review update for both newly constructed and/or previously undiscovered fresh-water and non-fresh-water artificial penetrations within a 2.5-mile radius of WDW-14, 32, 49, and 110 during 1992. Records were examined at both the Texas Railroad Commission and the Texas Water Commission.

3.1 Freshwater Wells

No new or previously undiscovered freshwater well artificial penetrations were found during a search of the Texas Water Commission files.

3.2 Non-Freshwater Wells

No new or previously undiscovered non-freshwater wells were found during a search of the Texas Railroad Commission files.

4.0 1992 INJECTED FLUID ANALYSIS

The fluid injected during 1992 was very similar to previous years. Table 4 shows representative 1992 bi-annual waste analyses for both the "acid" waste and the "neutral" waste.

5.0 SUMMARY

In summary, an evaluation of the injection operations at the Bay City Plant for 1992 indicates that there have been no substantial variations in operations from recent years that could adversely affect the injection zone or the operation of the injection wells.

No new or previously undiscovered freshwater or non-freshwater wells were discovered during searches of the State files.

Yearly mechanical integrity testing (MIT) confirmed the mechanical soundness of three of the four injection wells (workover strategy on Well No. 1-A (WDW-110) is underway). A wellhead pressure fall off survey conducted during the MIT testing was used to provide formation pressure information that was utilized in computer modeling of the injection zone. The resulting injection zone plume and pressure plots indicate that no adverse effects on the injection zone are likely as a result of 1992 injection operations, and generally, the behavior of the injection zone was as predicted.

Based on an analysis of the 1992 data, and the many previous years of safe injection operations at the Bay City Plant, future injection operations at the plant will be conducted in an environmentally safe manner.

TABLES

Table 1
Geologic Input Parameters
Hoechst Celanese Chemical Group, Inc., Bay City Plant

Level	Thickness (feet)	Por.	Perm. (darcy)	Visc. (Cp)	Comp. (1/Psi)
Overlying Shale Layer 1	908	0.145	1.5 E-5	0.74	5.00 E-5
Overlying Sand 1	365	0.34	1.00	0.73	5.00 E-6
Overlying Shale Layer 2	264	0.125	5.5 E-6	0.72	5.00 E-5
Overlying Sand 2	67	0.33	0.37	0.72	5.00 E-6
Confining Shale 2	450	0.12	8.0 E-7	0.71	5.00 E-5
Upper Miocene Injection Sand	165	0.33	1.35	0.71	5.00 E-6
Confining Shale 2	113	0.12	8.0 E-7	0.71	5.00 E-5
Arresting Sand 1	107	0.31	0.40	0.70	5.00 E-6
Arresting Shale 1	856	0.11	2.0 E-7	0.68	5.00 E-5
Arresting Sand 2	84	0.28	0.40	0.67	5.00 E-6
Arresting Shale 2	738	0.105	1.6 E-7	0.65	5.00 E-5
Arresting Sand 3	129	0.28	0.40	0.65	5.00 E-6
Confining Shale 3	150	0.10	1.3 E-8	0.64	5.00 E-5
Lower Miocene Injection Sand	203	0.32	1.30	0.64	5.00 E-6
Confining Shale 4	21	0.125	5.5 E-6	0.64	5.00 E-5
Arresting Sand 4	92	0.28	0.90	0.64	5.00 E-6

Table 2
1992 Injection History by Well
Hoechst Celanese Chemical Group
Bay City Plant

Month	Well 1-A (WDW-110) Volume (gal)	Well 2 (WDW-14) Volume (gal)	Well 3 (WDW-32) Volume (gal)	Well 4 (WDW-49) Volume (gal)
January	0	8,964,000	5,496,000	4,920,000
February	0	8,904,000	5,187,000	4,388,000
March	0	8,605,000	4,513,000	3,187,000
April	0	9,222,000	4,416,000	4,488,000
May	0	9,395,000	5,014,000	6,234,000
June	0	8,367,000	4,340,000	4,419,000
July	0	9,087,000	3,768,000	4,859,000
August	0	8,816,000	3,630,000	5,069,000
September	0	6,795,000	3,355,000	3,512,000
October	0	8,771,000	3,550,000	5,098,000
November	0	7,962,000	4,029,000	5,675,000
December	0	8,490,000	3,878,000	4,078,000
Total Volume	0	103,378,000	51,126,000	55,317,000
Yearly Rate (GPM)	0	196.6	97.2	105.2

Table 3
Shut-in Formation Pressures - September 1992*
Hoechst Celanese Chemical Group, Inc., Bay City Plant

UPPER MIOCENE INJECTION INTERVAL

Well	Shut-In Surface Pressure (psia)	Corrected Shut-In Formation Pressure @ 3440 Feet (psi)
WDW-32	105	1580
WDW-49	99	1574

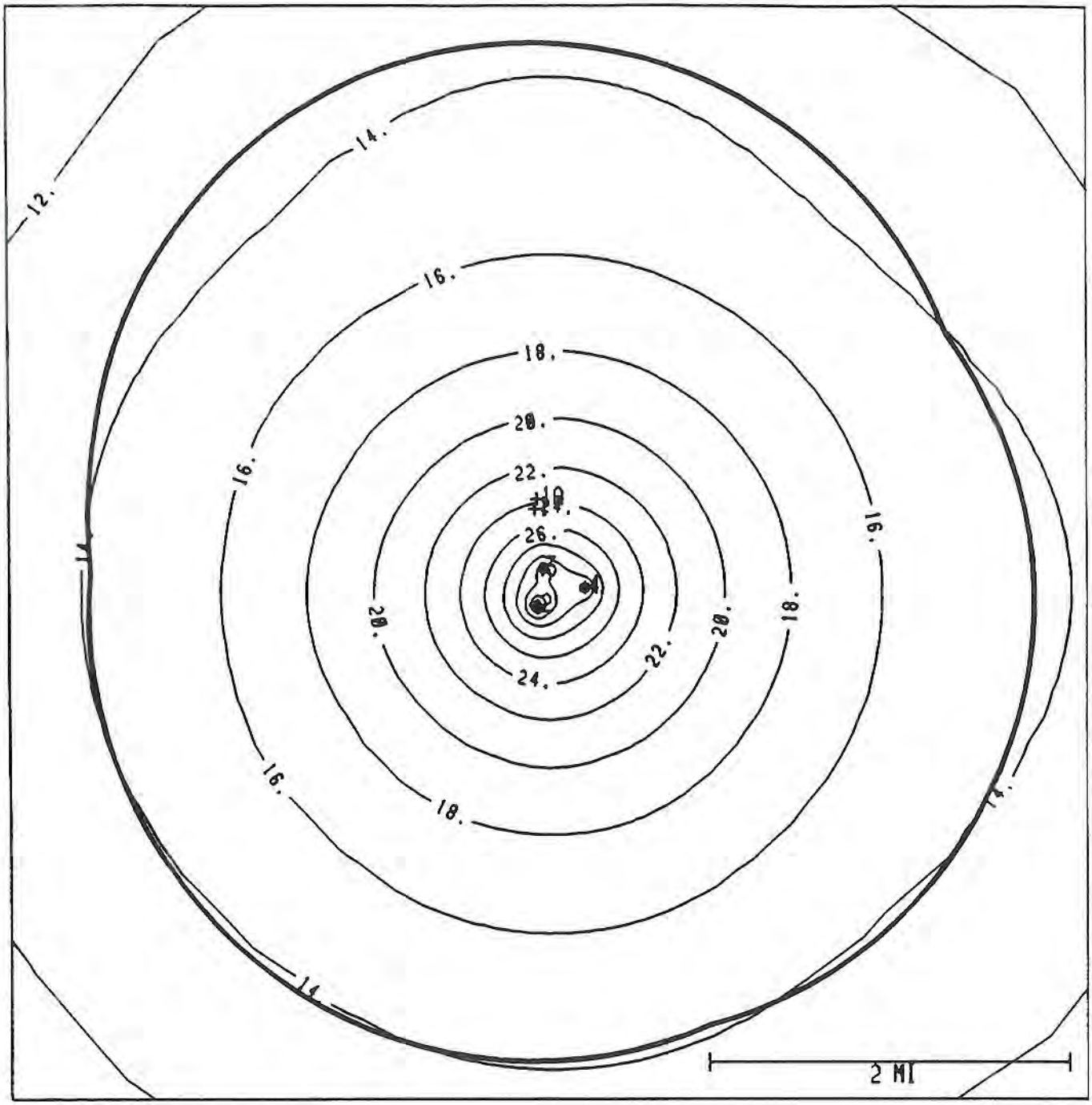
* The pressure in the lower Miocene injection interval (WDW-110) was not determined due to well problems.

Table 4
Chemical Analyses of Acid Waste and Neutral Waste *
Analyses Done October 12, 1992
Hoechst Celanese Chemical Group, Inc., Bay City Plant

Analysis	"Acid" Well**	"Neutral" Well(s)
Specific Conductance (µmhos)	10400	4840
Chlorinated Organics (ppm)	0.31	2427
Alkalinity (ppm)	3300	1860
Phosphorous - Ortho (ppm)	0.133	0.81
Phosphorous - Total (ppm)	<1	<1
Oil and Grease (ppm)	<5.0	53
Ash (ppm)	49	3024
Water (%)	63	10
Nitrate (ppm)	17.2	8.4
Total Organic Carbon (ppm)	4300	2680
Total Suspended Solids (ppm)	2	15
Total Dissolved Solids (ppm)	1656	6239
pH	6.3	6.5
Chemical Oxygen Demand (ppm)	12825	14500
Specific Gravity	1.0055	1.0027
Total Cyanides (ppm)	<0.005	<0.005
Total Phenols (ppm)	0.83	0.67
Antimony (ppm)	<0.010	<0.010
Arsenic (ppm)	<0.010	<0.010
Barium (ppm)	0.096	0.120
Cadmium (ppm)	<0.010	<0.010
Calcium (ppm)	170	212
Chromium (ppm)	<0.010	0.044
Copper (ppm)	0.331	3.24
Lead (ppm)	0.010	<0.010
Manganese (ppm)	0.019	0.379
Mercury (ppm)	<0.002	<0.002
Nickel (ppm)	0.097	0.505
Sulfate (ppm)	39	1356
Selenium (ppm)	<0.010	<0.010
Silver (ppm)	<0.010	<0.010
Thallium (ppm)	<0.010	<0.010
Vanadium (ppm)	0.010	0.241
Zinc (ppm)	0.030	0.332
Total Organic Halogen (ppm)	0.31	2427

* Taken from regular bi-annual waste analyses performed at the Bay City Plant.
** Acid well data is really No. 2 neutral well. (Well No. 1-A inoperable.)

FIGURES



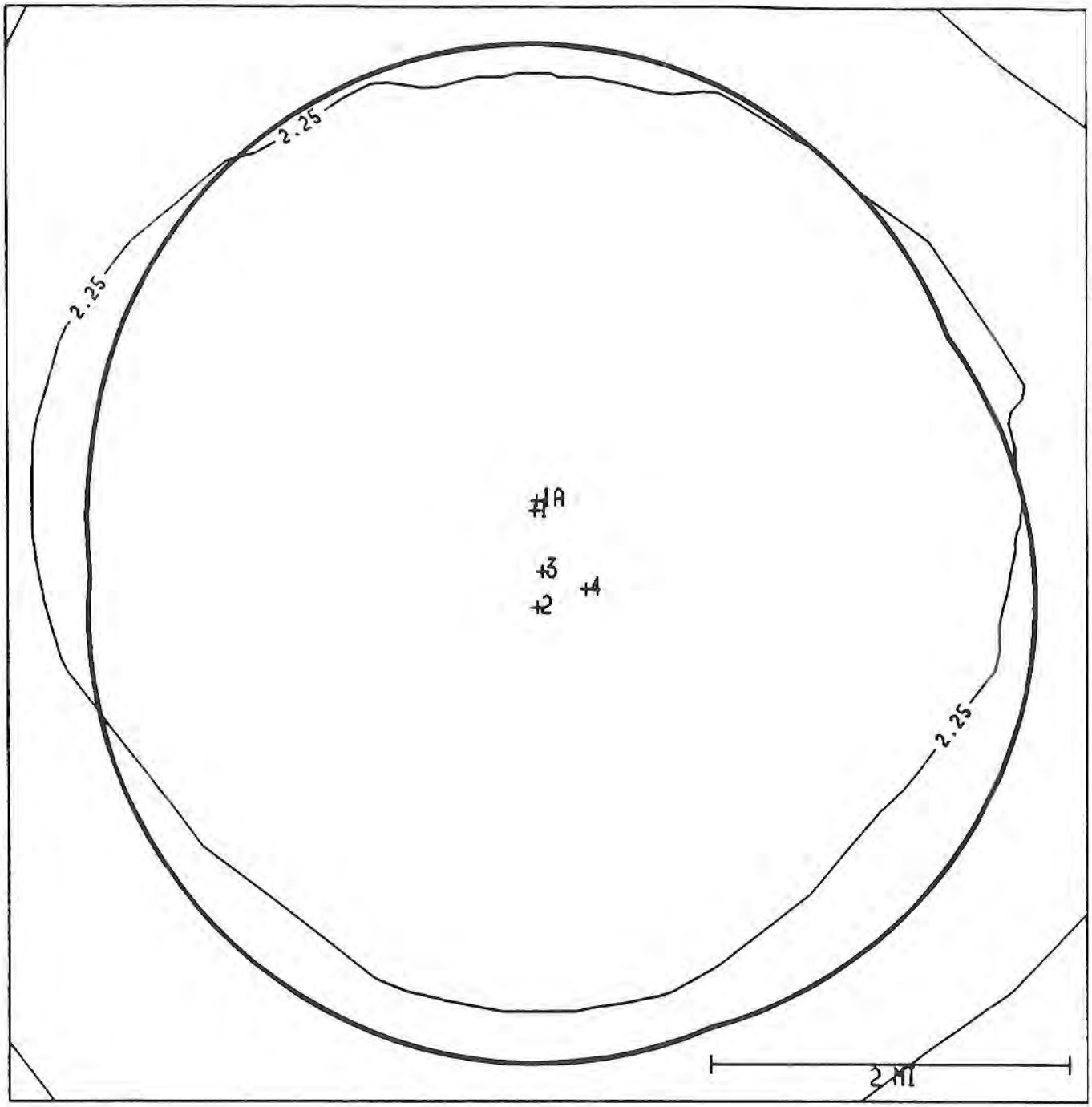
+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110
CI	=	2.0 PSI

Figure 1

Pressure Contour Plot in Upper Miocene Injection Interval

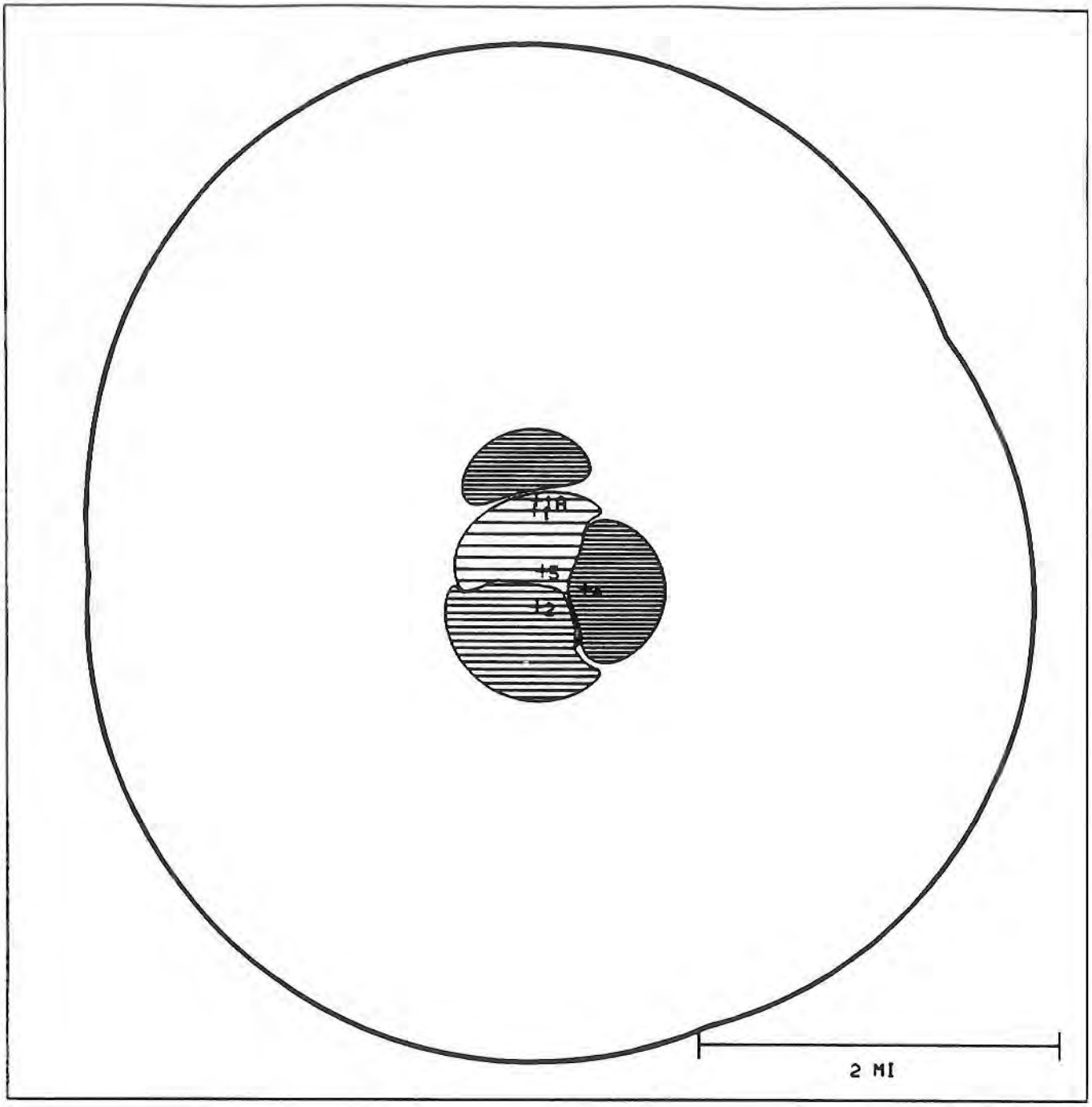
at the End of 1992

Hoechst Celanese Chemical Group, Inc., Bay City Plant



+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110

Figure 2
Pressure Contour Plot in Lower Miocene Injection Interval
at the End of 1992
Hoechst Celanese Chemical Group, Inc., Bay City Plant



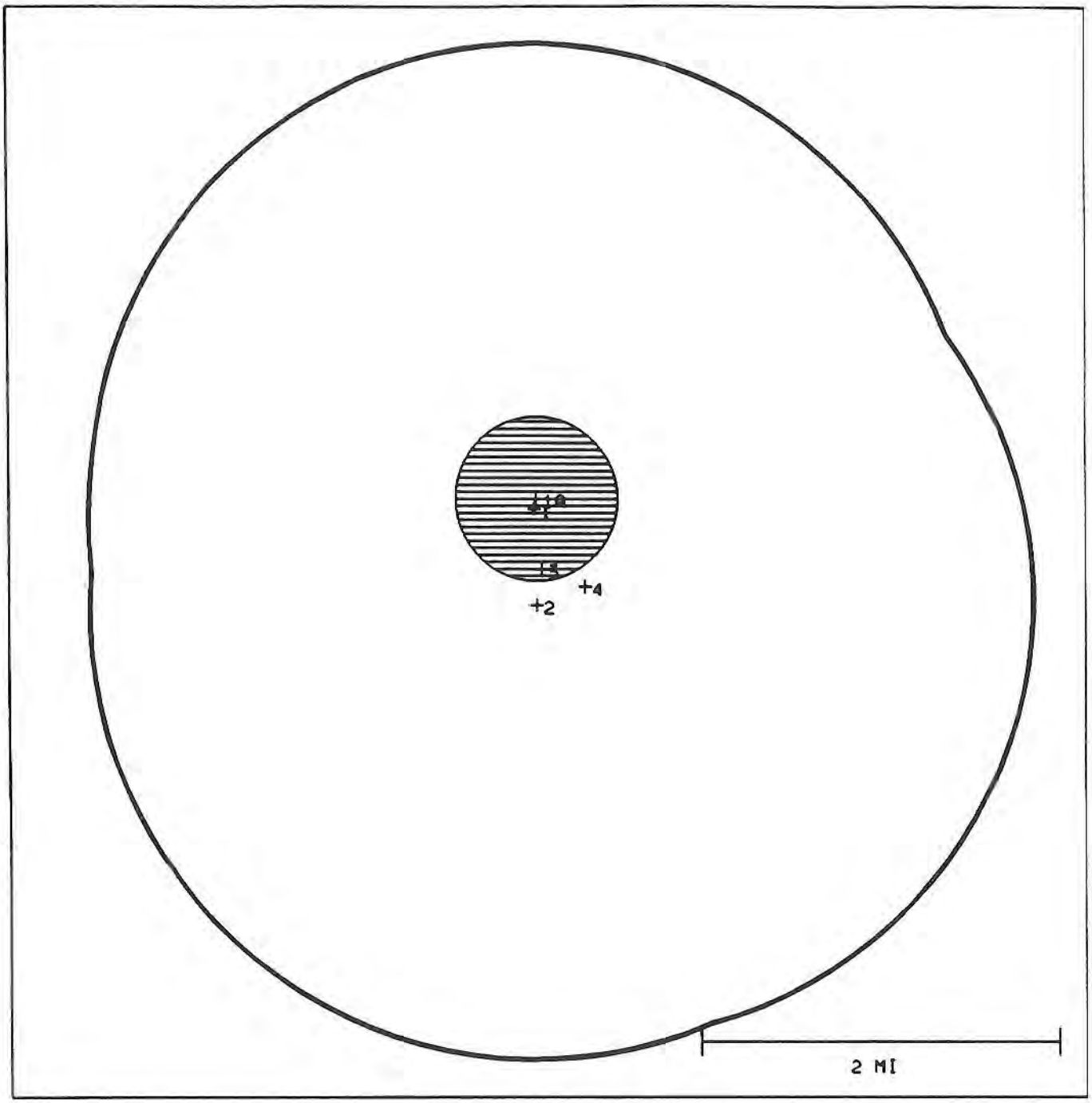
+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110

Figure 3

Composite Waste Plume in Upper Miocene Injection Interval

at the End Of 1992

Hoechst Celanese Chemical Group, Inc., Bay City Plant



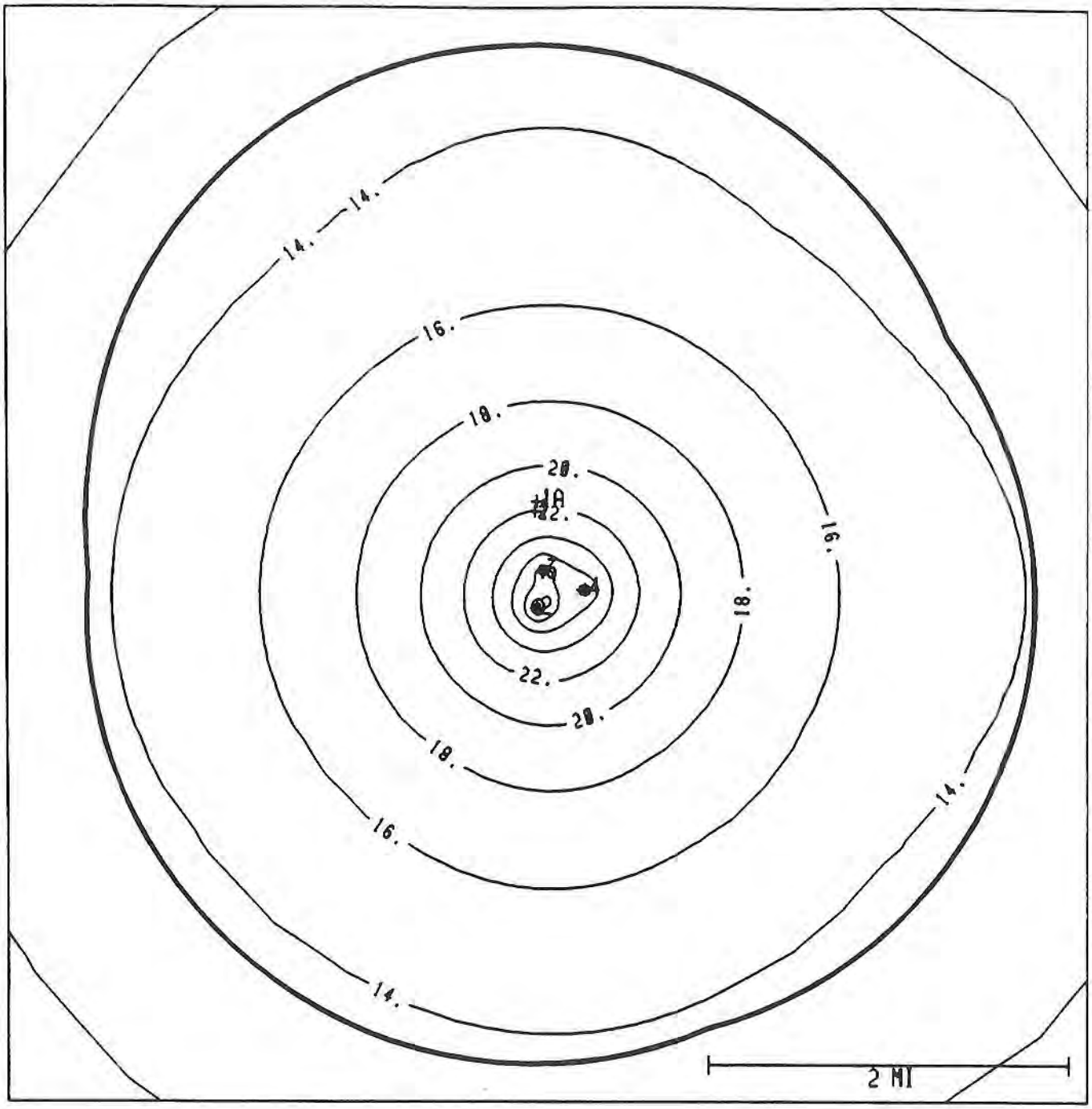
+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110

Figure 4

Waste Plume in Lower Miocene Injection Interval

at the End of 1992

Hoechst Celanese Chemical Group, Inc., Bay City Plant



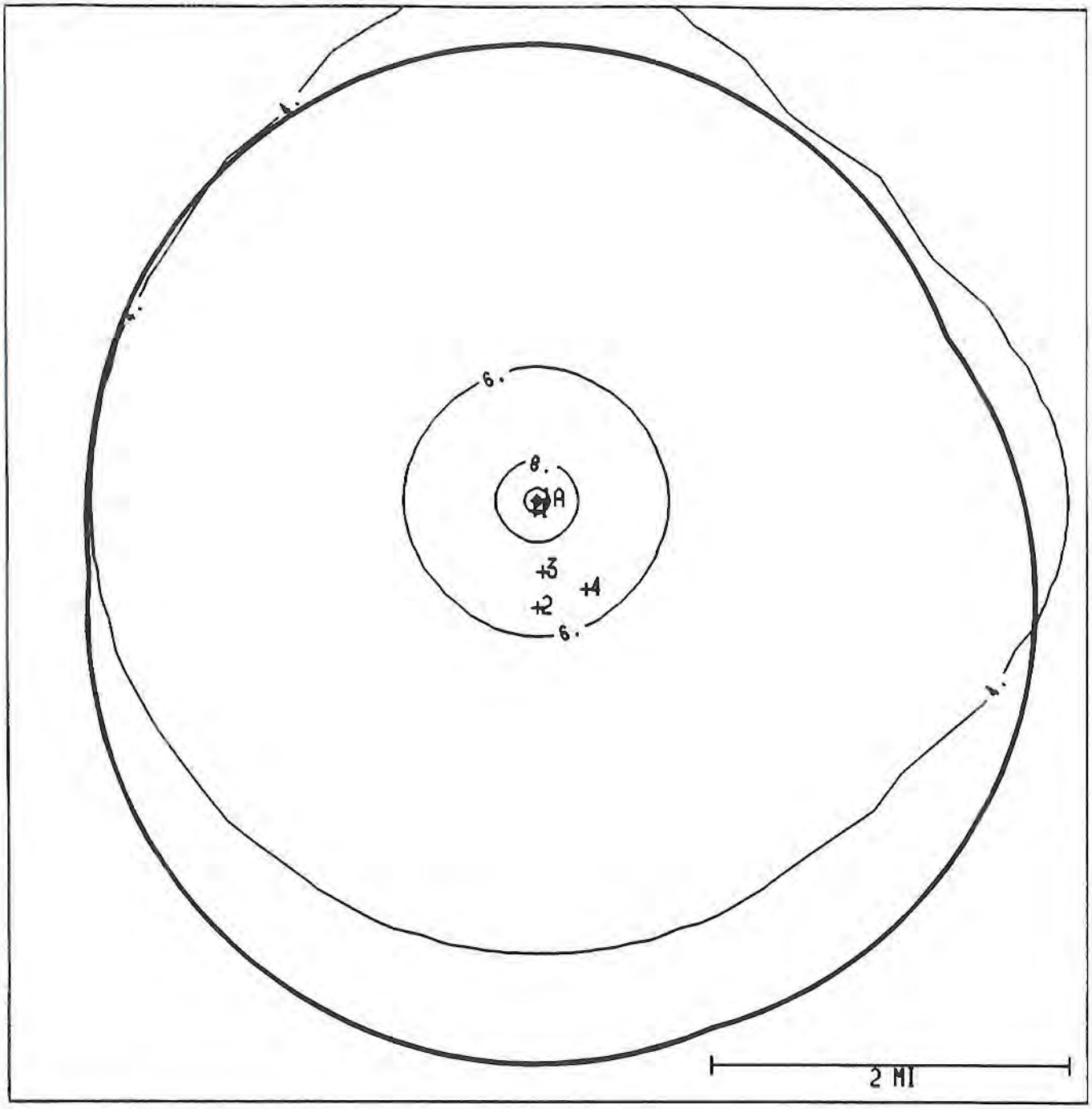
+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110
CI	=	2.0 PSI

Figure 5

Pressure Contour Plot in Upper Miocene Injection Interval

at the End of 2000

Hoechst Celanese Chemical Group, Inc., Bay City Plant



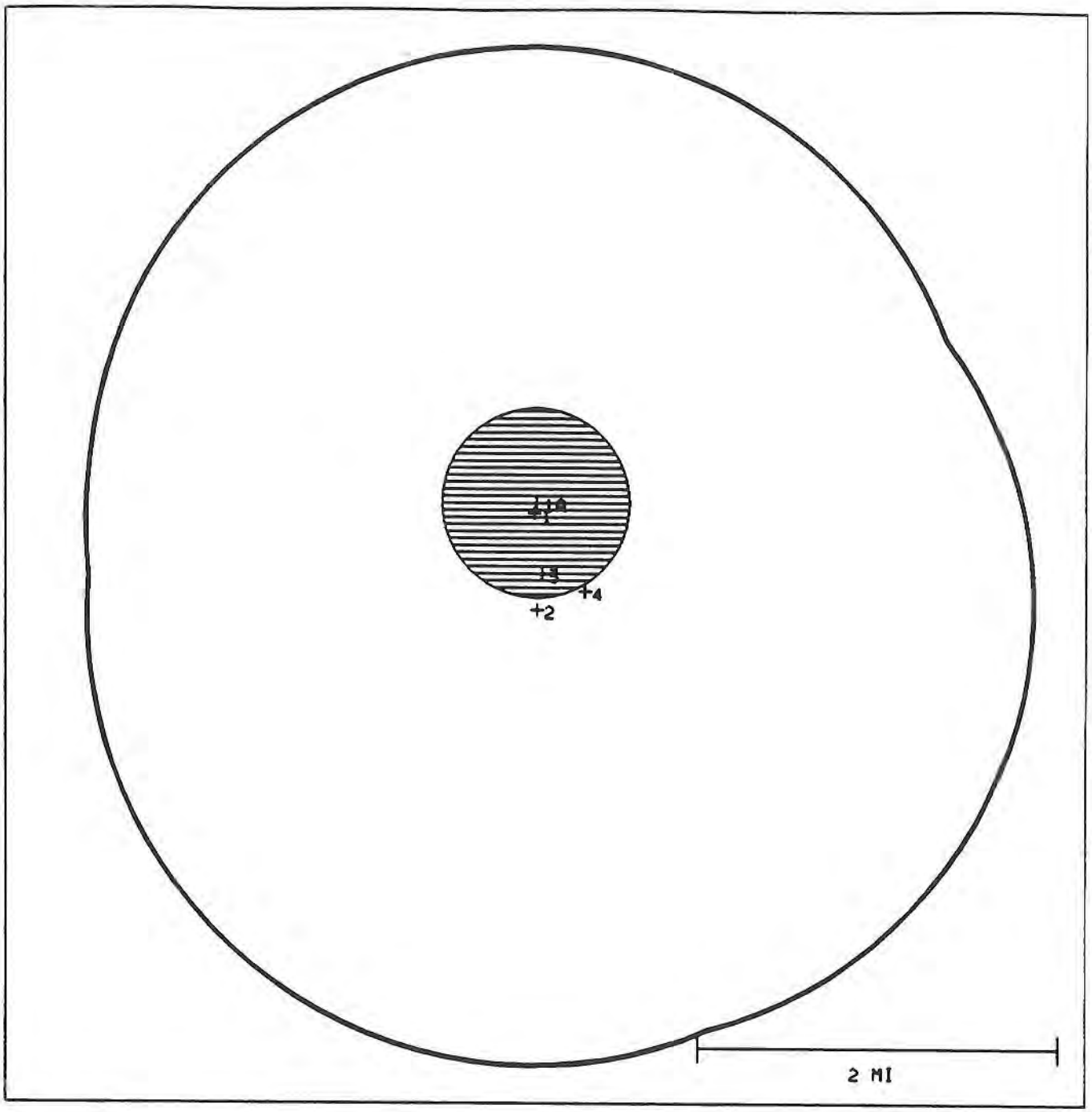
+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110
CI	=	2.0 PSI

Figure 6

Pressure Contour Plot in Lower Miocene Injection Interval

at the End of 2000

Hoechst Celanese Chemical Group, Inc., Bay City Plant



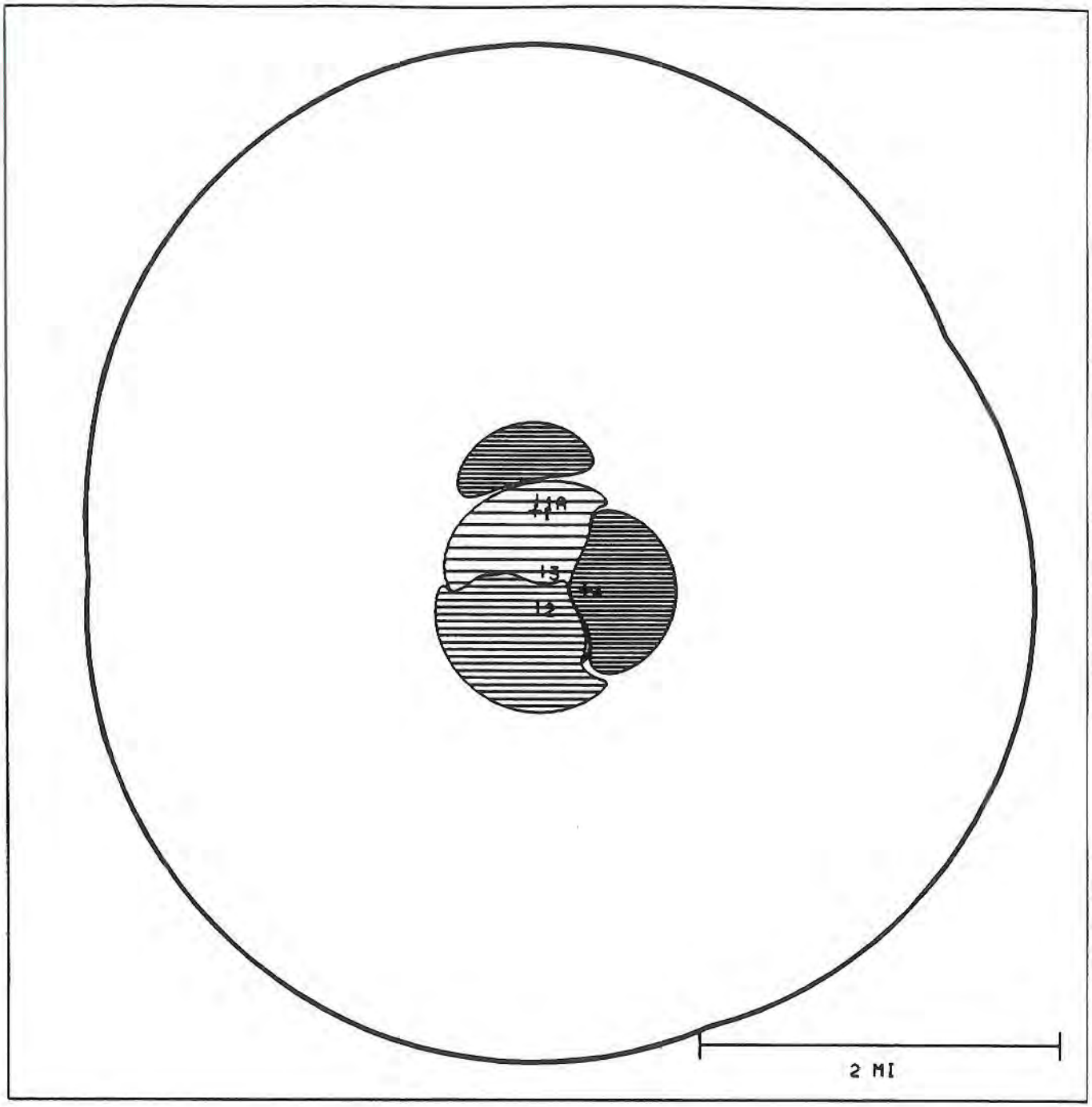
+ 1	=	WDW-8
+ 2	=	WDW-14
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110

Figure 7

Waste Plume in Lower Miocene Injection Interval

at the End of 2000

Hoechst Celanese Chemical Group, Inc., Bay City Plant



+ 1	=	WDW-8
+ 2	=	WDW-14.
+ 3	=	WDW-32
+ 4	=	WDW-49
+ 1A	=	WDW-110

Figure 8

Composite Waste Plume in Upper Miocene Injection Interval

at the End of 2000

Hoechst Celanese Chemical Group, Inc., Bay City Plant

APPENDICES

Appendix A

Letters From AIC -Regarding Freshwater and Non-Freshwater Artificial Penetrations

Digital maps reference an API number, which is used to extract well information from a computerized file system.

The Texas Railroad Commission maps showed no new non-freshwater artificial penetrations and no changes of existing non-freshwater artificial penetrations within the AOR.

Thank you for using AIC for this research project. If you have any questions regarding this project or any future projects please call me at 512-478-8991.

Sincerely,

Alan Brawley

Alan Brawley
Research Consultant

Agency Information Consultants, Inc.
P.O. Box 2181 Austin, Texas 78768-2181 Tel. (512) 478-8991 Fax. (512) 478-5215

January 4, 1993

Vickie Betts
Dupont
140 Cypress Station Drive, Ste.140
Houston, TX 77090

Re: AIC #02-0010157
Annual Review
Hoechst-Celanese
Bay City, Texas

Ms. Betts:

Agency Information Consultants, Inc. has searched the unnumbered log file for Matagorda County, Texas to determine if any new water wells were drilled in the area of review. For the period from December 31, 1991 to December 31, 1992, 2 water wells were spotted. A location map and the well logs have been provided for your review.

The monitor well file for Matagorda County, Texas was also reviewed to spot new monitor wells drilled from December 31, 1991 to December 31, 1992 at the Hoechst-Celanese site. The search showed 17 new monitor wells at the plant site.

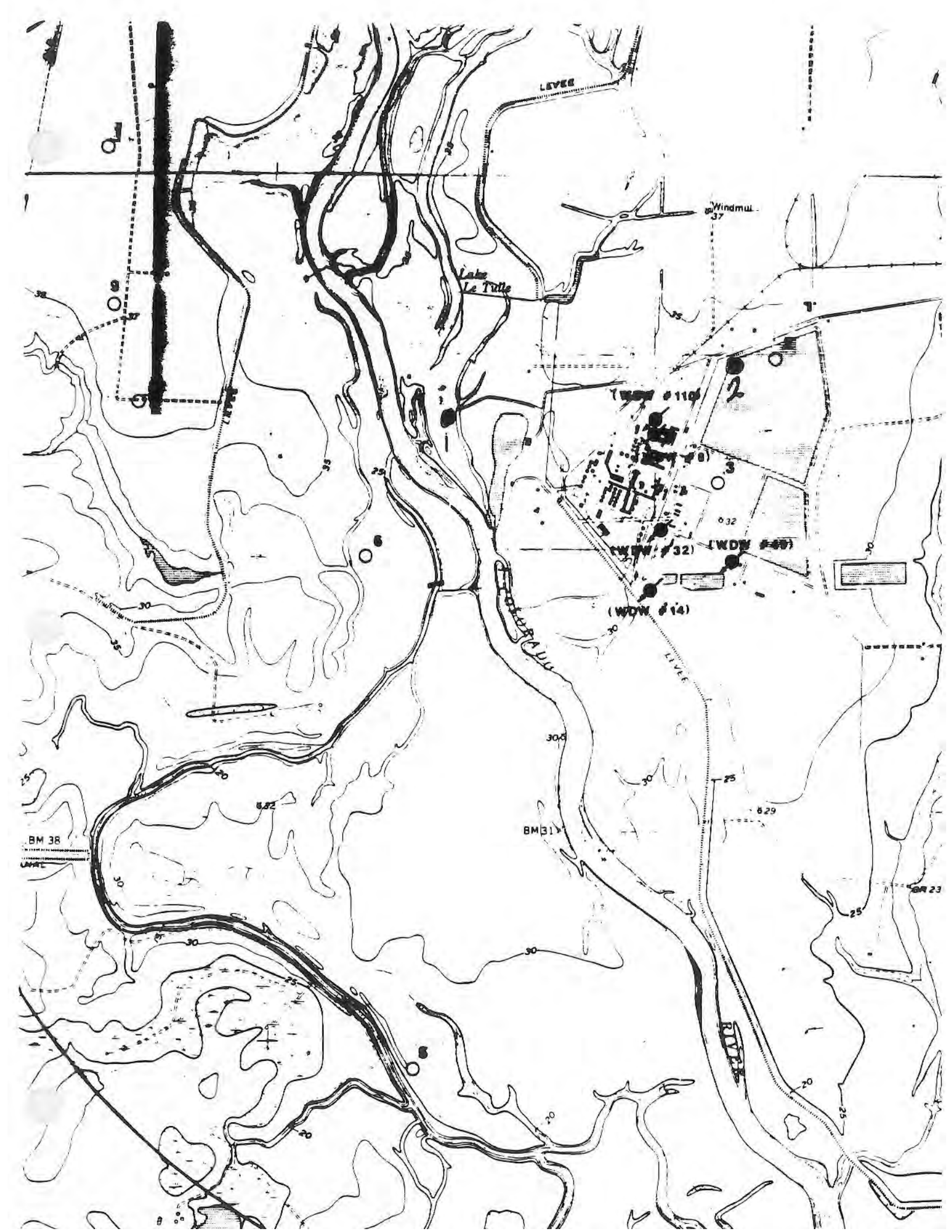
If you have any questions concerning this project or should need any additional information, please contact us at 1-512-478-8991. Thank you for using Agency Information Consultants, Inc. for this annual review.

Sincerely,

Dale L. Emrich

Dale L. Emrich

Enclosures


LEVEE
Windmill
Lake
Le Tulle
(WDW #110)
(WDW #32)
(WDW #14)
LEVEE
BM 38
BM 31
RIVER

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Port Of Bay City Authority (Name) ADDRESS P.O. Box 1426 (Street or RFD) Bay City (City) Tex. (State) 77414 (Zip)

2) LOCATION OF WELL: County Matagorda, 11.1 miles in SW (NE, SW, etc.) direction from Bay City, Tex. (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☒ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☒ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Driver ☐ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:

Date Drilling:
Started 12-11-90
Completed 12-11-90

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	-450

7) BOREHOLE COMPLETION: ☐ Open Hole ☒ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	2	Surface clay
2	9	Sand fine brown
9	25	Clay brown
25	37	Sand medium brown
37	111	Clay brown and grey
111	173	Clay brown and grey
173	185	Sand brown
185	433	Clay brown and blue
433	450	Sand coarse grey

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
4	N	PVC Screen	-450	-430	.01
4	N	PVC Casing	-430	+2	40

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from -10 ft. to 0 ft. No. of Sacks Used 4
-190 ft. to -140 ft. No. of Sacks Used 8

Method used Pressure tremmie

Cemented by Critendon Drilling Service Inc.

10) SURFACE COMPLETION
☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:
Static level 69 ft. below land surface Date 12-11-90
Artesian flow _____ gpm. Date _____

12) PACKERS:

Type	Depth
Rubber	-425 -420 -415 -190 -1

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 100 gpm with air ft. drawdown after 2 hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? Fresh Depth of strata 17'
Was a chemical analysis made? ☐ Yes ☒ No

RECEIVED AUG 29 1991 TEXAS WATER WELL DRILLERS BOARD

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Critendon Drilling Service Inc. (Type or print) WELL DRILLER'S LICENSE NO. 1785

ADDRESS Rt. 3 Box 153-A (Street or RFD) Port Lavaca (City) Texas (State) 77979 (Zip)

(Signed) [signature] (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Love

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

D.I.M.

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS FM 3057 (Street or RFD) Bay City (City) Tx (State) 77404-0509 (Zip)

2) LOCATION OF WELL: County Matagorda, 5 miles in S (NE, SW, etc.) direction from Bay City (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

D.I.M.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Drive ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:

Date Drilling: Started 15 Nov 19 91 Completed 15 Nov 19 91

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
2	Surface	35.5

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 20 ft. to 35.5 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	5	Tan & grey silty clay
5	24	Reddish brown silty clay
24	32	Reddish brown sandy silt
32	35	Lt grey sandy silt

RECEIVED APR 0 2 1992 TEXAS WATER COMMISSION

CBC - 30

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2	N	PVC	+3	23	
2	N	PVC slot	23	33	0.010
2	N	PVC	33	35.5	
		NWSC			

9) CEMENTING DATA (Rule 287.44(1)) Cemented from 0 ft. to 18 ft. No. of Sacks Used 6

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Pump down

Cemented by Law Engs

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL: Static level 16 ft. below land surface Date 4 Dec'91

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

Bentonite seal 18' - 20'

13) TYPE PUMP: N/A ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: N/A

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Law Engineering Inc (Type or print) WELL DRILLER'S LICENSE NO. 2698 M

ADDRESS 5500 Guhn Rd (Street or RFD) Houston (City) Tx (State) 77040 (Zip)

(Signed) _____ (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentially Privilege Notice on Reverse Side*

State of Texas WELL REPORT

D.I.M.

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS FM 3057 (Street or RFD) Bay City (City) Tx (State) 77404-050 (Zip)

2) LOCATION OF WELL: County Matagorda, 5 miles in S (NE, SW, etc.) direction from Bay City (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:

Date Drilling: Started 14 Nov 19 91 Completed 14 Nov 19 91

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
2	Surface	36

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 21 ft. to 36 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	4	Tan & grey silty clay
4	26	Red & tan silty clay
26	32.5	Reddish brown sandy silt
32.5	36	Lt grey sandy silt

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2	N	PVC	+3	23.5	
2	N	PVC slot	23.5	33.5	0.010
2	N	PVC	33.5	36	
		NWSC			

RECEIVED APR 0 2 1992 TEXAS WATER COMMISSION

CBC-31

(Use reverse side if necessary)

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 0 ft. to 19 ft. No. of Sacks Used 6

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Pump down

Cemented by Law Engineering

10) SURFACE COMPLETION

☒ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level 16 ft. below land surface Date 4 Dec '91

Artesian flow _____ gpm. Date _____

12) PACKERS

Type	Depth
Bentonite seal 19' - 21'	

13) TYPE PUMP: N/A ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: N/A

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☒ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Law Engineering Inc (Type or print) WELL DRILLER'S LICENSE NO. 2698 M

DDRESS 5700 Guhn Road (Street or RFD) Houston (City) Tx (State) 77040 (Zip)

(Signed) [signature] (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

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Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

MW 1

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS (Street or RFD) Bay City, Texas (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, miles in (NE, SW, etc.) direction from Bay City (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☒ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:

Date Drilling: Started 11-13 19 91 Completed 11-13 19 91

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
6"	Surface	14'

From (ft.)	To (ft.)	Description and color of formation material
0	2'	Black clay
2	13'	Course gray silty sand
13'	14'	Red clay

(Use reverse side if necessary)

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2	N	PVC Blank	0	5	sch
2	N	PVC Screen	5	14	.01

RECEIVED

TEXAS WATER WELL DRILLERS BOARD

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from _____ ft. to _____ ft. No. of Sacks Used _____

_____ ft. to _____ ft. No. of Sacks Used _____

Method used _____

Cemented by _____

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME EnviroDrill Services, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 3026M

ADDRESS 10405 Town & Country Way, Suite 310 (Street or RFD) Houston, Texas 77024 (City) (State) (Zip)

(Signed) _____ (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

MW 2

State of Texas WELL REPORT

D.I.M.

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS (Street or RFD) Bay City (City), Texas (State) (Zip)

2) LOCATION OF WELL: County Matagroda, miles in (NE, SW, etc.) direction from Bay City (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

X☐ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☒ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:

Date Drilling: Started 11-14 19 91 Completed _____ 19 __

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6	Surface	14

D.I.M.

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	2.5'	Brown sandy clay
2.5'	14'	Gray wet sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2	N	PVC Screen	0	9	.010

RECEIVED

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from _____ ft. to _____ ft. No. of Sacks Used _____

_____ ft. to _____ ft. No. of Sacks Used _____

Method used _____

Cemented by _____

TEXAS WATER WELL DRILLERS BOARD

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME EnviroDrill Services, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 3026M

ADDRESS 10405 Town & Country Way, Suite 310 (Street or RFD) Houston (City), Texas (State) 77024 (Zip)

(Signed) _____ (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

MW 3

D.I.M.

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

OWNER Hoechst Celanese (Name) ADDRESS (Street or RFD) Bay City, Texas (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, miles in (NE, SW, etc.) direction from Bay City (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Driven ☒ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:

Date Drilling: Started 11-14 19 91 Completed 11-14 19 91

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
6	Surface	14

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	2'	Brownish clay
2'	8'	Brownish gray sand clay
8'	16'	Gray sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2	N	PVC Screen	0	14	.010

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from _____ ft. to _____ ft. No. of Sacks Used _____

_____ ft. to _____ ft. No. of Sacks Used _____

Method used _____

Cemented by _____

RECEIVED MAR 4 1992 TEXAS WATER WELL DRILLERS BOARD

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

12) PACKERS: Type Depth

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME EnviroDrill Services, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 3026M

ADDRESS 10405 Town & Country Way, Suite 310 (Street or RFD) Houston (City) Texas (State) 77024 (Zip)

(Signed) [signature] (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentially Privilege Notice on Reverse Side*

MW 4

State of Texas WELL REPORT

D.I.M.

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoeschst Celanese (Name) ADDRESS (Street or RFD) Bay City, Texas (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, miles in (NE, SW, etc.) direction from Bay City (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Driven ☒ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:

Date Drilling: Started 11-14 19 91 Completed 11-14 19 91

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6	Surface	14

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	2'	Brown clay
2'	9'	Brownish gray clay
9'	14'	Silty gray sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2	N	PVC Screen	0	14	.010

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from _____ ft. to _____ ft. No. of Sacks Used _____

_____ ft. to _____ ft. No. of Sacks Used _____

Method used _____

Cemented by _____

RECEIVED MAR 4 1992 TEXAS WATER WELL DRILLERS BOARD

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME EnviroDrill Services, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 3026M

DDRESS 10405 Town & Country Way, Suite 310 (Street or RFD) Houston (City) Texas (State) 77024 (Zip)

(Signed) [signature] (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

MW 5

State of Texas WELL REPORT

D.I.M.

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS ~~Bay City, Texas~~ (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda _____ miles in _____ (NE, SW, etc.) direction from Bay City (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

D.I.M.

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☒ Bored ☐ Air Rotary ☐ Cable Tool ☐ Other _____

6) WELL LOG:

Date Drilling: Started 11-14 1991 Completed 11-14 1991

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
6	Surface	14

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☐ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from _____ ft. to _____ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	2.5'	Clay brown
2.5'	8'	Brownish gray clay
8'	14'	Silty gray sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2	N	PVC Screen	0	9	.010

RECEIVED MAR 4 1992 TEXAS WATER WELL DRILLERS BOARD

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from _____ ft. to _____ ft. No. of Sacks Used _____

_____ ft. to _____ ft. No. of Sacks Used _____

Method used _____

Cemented by _____

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

12) PACKERS: Type Depth

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME EnviroDrill Services, Inc. (Type or print) WELL DRILLER'S LICENSE NO. 3026M

ADDRESS 10405 Town & Country Way, Suite 310 (Street or RFD) Houston (City) Texas (State) 77024 (Zip)

(Signed) _____ (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

WWD-012 (Rev. 05-18-90)

TEXAS WATER COMMISSION COPY

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

D.I.M.

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

CBC#32

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, Texas (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda . _____ miles in 9 (NE, SW, etc.) direction from Bay City, Texas (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:

Date Drilling: Started 4-24 1992 Completed 4-24 1992

Elevation: 26.64'

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10 ¼	Surface	26'

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 19' ft. to 10' ft.

Pellet 26' TO 19'

From (ft.)	To (ft.)	Description and color of formation material
0'	TO 4'	Dark Gray Clay
4'	TO 11'	Red Clay
11'	TO 20'	Red si sand
20'	TO 26'	Red & Brown Clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	NEW	PVC Sch.80 Sump	19'	18'	
2"	NEW	PVC Sch.80 Screen	18'	12'	OK
2"	NEW	PVC Sch.80 Riser	12'	+2'	

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9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 8' ft. to 0' ft. No. of Sacks Used 2

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Slurry

Cemented by John Loden

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

12) PACKERS:

Type	Depth
Bentonite Pellets	10' TO 8'

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Scot Environmental Services International Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East S-240 (Street or RFD) Humble, (City) Texas (State) 77346 (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

D.I.M.

CBC#33

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, TX (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda . 9 miles in SW (NE, SW, etc.) direction from Bay City, TX (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:
Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☐ Municipal ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:
Date Drilling:
Started 4/23 1992
Completed 4/23 1992
Elevation: 22.89'

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10 1/4"	Surface	23

From (ft.)	To (ft.)	Description and color of formation material
0	4	Dark Gray Clay
4	15	Red Clay w/si layers
15	21	Red si sand
21	23	Red & Brown Clay

(Use reverse side if necessary)

RECEIVED
JUL 1 8 1992
TEXAS WATER COMMISSION

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from 23 ft. to 13 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	New	PVC Sch. 80 Sump	22	21	
2"	New	PVC Sch. 80 Screen	21	15	10K
2"	New	PVC Sch. 80 Riser	15	+2	

9) CEMENTING DATA [Rule 287.44(1)]
Cemented from 11 ft. to 0 ft. No. of Sacks Used 3
_____ ft. to _____ ft. No. of Sacks Used _____
Method used Slurry
Cemented by John Loden

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☐ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth
Bentonite Pellets 13 to 11

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

PANY NAME Scot Environmental Services International Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East, Suite 240 (Street or RFD) Humble, TX (City) (State) 77346 (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

D.I.M.

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

CBC#34

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, TX (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda . 9 miles in SW (NE, SW, etc.) direction from Bay City, TX (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:

Date Drilling: Started 4-24 1992 Completed 4-24 1992

Elevation: 28.01

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10 1/4"	Surface	29

From (ft.)	To (ft.)	Description and color of formation material
0	4	Dark Gray Clay
4	20	Red Clay w/si clay layers
20	27	Red si/sand
27	29	Red & Brown Clay

(Use reverse side if necessary)

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7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 29 ft. to 18 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2	New	PVC Sch. 80 Sump	27	26	
2	New	PVC Sch. 80 Screen	26	20	10K
2	New	PVC Sch. 80 Riser	20	+2	

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from +6 ft. to 0 ft. No. of Sacks Used 4

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Slurry

Cemented by John Loden

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

Bentonite Pellets 18 to 16

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Scot Environemental Services International, Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East, Suite 240 (Street or RFD) Humble, TX (City) 77346 (State) (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

D.I.M. CBC#35

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, TX (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, 9 miles in SW (NE, SW, etc.) direction from Bay City, TX (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

XX SEE ATTACHED MAP

3) TYPE OF WORK (Check): XX New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial XX Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool XX Other HSA

6) WELL LOG:

Date Drilling: Started 4-23 19 92 Completed 4-23 19 92

Elevation: 26.57'

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10 1/4"	Surface	34'

From (ft.)	To (ft.)	Description and color of formation material
0	4	Dark Gray Clay
4	21	Red Clay w/si clay layers
21	32	Red si/sand
32	34	Red & Brown Clay

(Use reverse side if necessary)

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 34 ft. to 20 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2	New	PVC Sch. 80 Sump	33	32	
2	New	PVC Sch. 80 Screen	32	22	10K
2	New	PVC Sch. 80 Riser	22	+2	

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9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 18 ft. to 0 ft. No. of Sacks Used 5

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Slurry

Cemented by John Loden

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type: Bentonite Pellets Depth: 20 to 18

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Scot Environmental Services ~~International Inc.~~ (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East, Suite 240 (Street or RFD) Humble, TX 77346 (City) (State) (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

D.I.M.

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

CBC#36

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, TX (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, 9 miles in SW (NE, SW, etc.) direction from Bay City, TX (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:

Date Drilling: Started 4-16- 19 92 Completed 4-16- 19 92

Elevation: 35.35'

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10 1/4"	Surface	35

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 35 ft. to 24 ft.

From (ft.)	To (ft.)	Description and color of formation material
0	4	Dark Gray Clay
4	25	Red Clay w/ si clay layers
5	33	Red si sand.
33	35	Red & Brown Clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	New	PVC Sch. 80 Sump	35	32	
2"	New	PVC Sch. 80 Screen	32	22	10K
2"	New	PVC Sch. 80 Riser	22	+2	

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9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 21 ft. to 0 ft. No. of Sacks Used 6

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Slurry

Cemented by John Loden

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

Bentonite Pellets 23 to 21

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Scot Environmental Services International, Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East, Suite 240 (Street or RFD) Humble, TX (City) 77346 (State) (Zip)

(Signed) John D. Lock (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentially Privilege Notice on Reverse Side*

State of Texas WELL REPORT

CBC#37 D.I.M.

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, TX (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, 9 miles in SW (NE, SW, etc.) direction from Bay City, Tx (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

D.I.M.

5) DRILLING METHOD (Check): ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Driven ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:

Date Drilling: Started 4-22- 19 92 Completed 4-22 19 92

Elevation: 33.17

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10 1/4'	Surface	34

From (ft.)	To (ft.)	Description and color of formation material
0	4	Drk Gray Clay
4	21	Red clay w/si clay layers
21	32	Red si/sand
32	34	Red & Brown Clay

(Use reverse side if necessary)

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7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 34 ft. to 20 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
2	New	PVC Sch. 80 Sump	33	32	
2	New	PVC Sch. 80 Screen	32	25	10K
2	New	PVC Sch. 80 Riser	25	+2	

9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 18 ft. to 0 ft. No. of Sacks Used 5

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Slurry

Cemented by John Loden

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) PACKERS: Type Depth

Bentonite Pellets 20 to 18

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

PANY NAME Scot Environmental Services International Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East, Suite 240 (Street or RFD) Humble, TX 77346 (City) (State) (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

CBC#38

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, Texas (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, 9 miles in SW (NE, SW, etc.) direction from Bay City, Texas (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:

Date Drilling: Started 4-22 1992 Completed 4-22 1992

Elevation; 32.73'

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10¼"	Surface	36'

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 35' ft. to 23' ft.

From (ft.)	To (ft.)	Description and color of formation material
0'	4'	Dark Gray Clay
4'	25'	Red Clay w/si clay lay
25'	34'	Red Silty Sand
34'	36'	Red & Brown Clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	NEW	PVC Sch.80 Sump	35'	34'	
2"	NEW	PVC Sch.80 Screen	34'	25'	10R
2"	NEW	PVC Sch.80 Riser	25'	+2'	

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9) CEMENTING DATA [Rule 287.44(1)]

Cemented from 2' ft. to 0' ft. No. of Sacks Used 6

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Slurry

Cemented by John Loden

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

10) SURFACE COMPLETION

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

14) WELL TESTS:

Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

11) WATER LEVEL:

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

15) WATER QUALITY:

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

12) PACKERS:

Type	Depth
Bentonite Pellets	21-19'

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Scot Environmental Services International, Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East S-240 (Street or RFD) Humble, (City) Texas (State) 77346 (Zip)

(Signed) _____ (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

D.I.M.

Please use black ink.

ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side

State of Texas WELL REPORT

CBC#39

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, TX (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, 9 miles in SW (NE, SW, etc.) direction from Bay City, TX (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:
Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): D.I.M. ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:
Date Drilling: Started 4/20/ 1992 Completed 4/ 20 1992
Elvation: 33.38'

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10 1/4"	Surface	30'

7) BOREHOLE COMPLETION: ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from 30' ft. to 10' ft.

From (ft.)	To (ft.)	Description and color of formation material
0	4	Dark Gray Clay
4	11	Red Clay
11	28	Red si Sand
28	30	Red & Brown Clay

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	New	PVC Nat.Well Supply	0	11	Sch.40
2"	New	PVC Slotted Screen	11	27	10K
2"	New	Sump	27	29	Sch.40

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JUL 16 1992
TEXAS WATER COMMISSION

9) CEMENTING DATA [Rule 287.44(1)]
Cemented from 8 ft. to 0 ft. No. of Sacks Used 3
_____ ft. to _____ ft. No. of Sacks Used _____
Method used Slurry
Cemented by John Loden

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

12) PACKERS: Type: Bentonite Pellets Depth: 10 to 8

13) TYPE PUMP: ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS: Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

PANY NAME Scot Environmental Services International Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 East Suite 240 (Street or RFD) Humble, TX 77346 (City) (State) (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available

For TWC use only: Well No. _____ Located on map _____

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711 D.I.M. Please use black ink.

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

CBC#40

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) OWNER Hoechst Celanese (Name) ADDRESS Bay City, Texas (Street or RFD) (City) (State) (Zip)

2) LOCATION OF WELL: County Matagorda, 9 miles in SW (NE, SW, etc.) direction from Bay City, Texas (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ LEGAL DESCRIPTION:
Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____
Distance and direction from two intersecting section or survey lines _____

☒ SEE ATTACHED MAP

3) TYPE OF WORK (Check): ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check): D.I.M. ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) DRILLING METHOD (Check): ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) WELL LOG:
Date Drilling:
Started 4-21 1992
Completed 4-21 1992
Elevation: 34.57'

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
10 ¼"	Surface	33'

7) BOREHOLE COMPLETION:
☐ Open Hole ☐ Straight Wall ☐ Underreamed
☒ Gravel Packed ☐ Other _____
If Gravel Packed give interval . . . from 33' ft. to 20' ft.

From (ft.)	To (ft.)	Description and color of formation material
0'	4'	Dark Gray Clay
4'	23'	Red Clay w/sicLay Lay
23'	31'	Red Silty Clay
31'	33'	Red & Brown Clay

RECEIVED JUL 16 1992 TEXAS WATER COMMISSION

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2"	New	PVC Sch.80 Sump	33'	32'	
2"	New	PVC Sch.80 Screen	32'	22'	10K
2"	New	PVC Sch.80 Riser	22'	+2'	

9) CEMENTING DATA [Rule 287.44(1)]
Cemented from 18' ft. to 0 ft. No. of Sacks Used 6
_____ ft. to _____ ft. No. of Sacks Used _____
Method used Slurry
Cemented by John Loden

10) SURFACE COMPLETION
☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]
☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]
☐ Pitless Adapter Used [Rule 287.44(3)(B)]
☐ Approved Alternative Procedure Used [Rule 287.71]

11) WATER LEVEL:
Static level _____ ft. below land surface Date _____
Artesian flow _____ gpm. Date _____

12) PACKERS:

	Type	Depth
Bentonite	Pellets	20' To 18

13) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other _____
Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) WELL TESTS:
Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated
Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable constituents?
☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? _____ Depth of strata _____
Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Scot Environmental Services International, Inc. (Type or print) WELL DRILLER'S LICENSE NO. TX 3213 DM

ADDRESS 5616 FM 1960 Bypass (Street or RFD) Humble, (City) Texas (State) 77346 (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

Send original copy by certified mail to: Texas Water Commission, P.O. Box 13087, Austin, Texas 78711

Please use black ink.

D.I.M. CBC#41

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

State of Texas WELL REPORT

Texas Water Well Drillers Board
P.O. Box 13087
Austin, Texas 78711

1) **OWNER** Hoechst Celanese (Name) **ADDRESS** Bay City, TX (Street or RFD) (City) (State) (Zip)

2) **LOCATION OF WELL:** County Matagorda . 9 miles in SW (NE, SW, etc.) direction from Bay City, TX (Town)

Driller must complete the legal description below with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ **LEGAL DESCRIPTION:**

Section No. _____ Block No. _____ Township _____ Abstract No. _____ Survey Name _____

Distance and direction from two intersecting section or survey lines _____

☒ **SEE ATTACHED MAP**

3) **TYPE OF WORK (Check):** ☒ New Well ☐ Deepening ☐ Reconditioning ☐ Plugging

4) **PROPOSED USE (Check):** D.I.M. ☐ Domestic ☐ Industrial ☒ Monitor ☐ Public Supply ☐ Irrigation ☐ Test Well ☐ Injection ☐ De-Watering

5) **DRILLING METHOD (Check):** ☐ Driven ☐ Mud Rotary ☐ Air Hammer ☐ Jetted ☐ Bored ☐ Air Rotary ☐ Cable Tool ☒ Other HSA

6) **WELL LOG:**

Date Drilling: Started 4-16- 1992 Completed 4-16- 1992

Elevation: 38.03'

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
10 1/4"	Surface	30

From (ft.)	To (ft.)	Description and color of formation material
0	4	Dark Gray Clay
4	23	Red Clay w/ si clay layers
3	31	Red si/sand
31	33	Red & ~~Brown~~ Clay

RECEIVED JUL 16 1992 TEXAS WATER COMMISSION

(Use reverse side if necessary)

7) **BOREHOLE COMPLETION:** ☐ Open Hole ☐ Straight Wall ☐ Underreamed ☒ Gravel Packed ☐ Other _____

If Gravel Packed give interval . . . from 30 ft. to 10 ft.

8) **CASING, BLANK PIPE, AND WELL SCREEN DATA:**

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casting Screen
2	New	PVC Sch. 40 Screen	32	22	10K
2	New	PVC Sch. 40 Riser	22	+2	Riser

9) **CEMENTING DATA** [Rule 287.44(1)]

Cemented from 18 ft. to 0 ft. No. of Sacks Used 6

_____ ft. to _____ ft. No. of Sacks Used _____

Method used Slurry

Cemented by John Loden

10) **SURFACE COMPLETION**

☐ Specified Surface Slab Installed [Rule 287.44(2)(A)]

☒ Specified Steel Sleeve Installed [Rule 287.44(3)(A)]

☐ Pitless Adapter Used [Rule 287.44(3)(B)]

☐ Approved Alternative Procedure Used [Rule 287.71]

11) **WATER LEVEL:**

Static level _____ ft. below land surface Date _____

Artesian flow _____ gpm. Date _____

12) **PACKERS:** Type: Bentonite Pellets Depth: 20 to 18

13) **TYPE PUMP:** ☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder ☐ Other _____

Depth to pump bowls, cylinder, jet, etc., _____ ft.

14) **WELL TESTS:** Type Test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: _____ gpm with _____ ft. drawdown after _____ hrs.

15) **WATER QUALITY:**

Did you knowingly penetrate any strata which contained undesirable constituents?

☐ Yes ☐ No If yes, submit "REPORT OF UNDESIRABLE WATER"

Type of water? _____ Depth of strata _____

Was a chemical analysis made? ☐ Yes ☐ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME Scot Environmental Services International, Inc. (Type or print) **WELL DRILLER'S LICENSE NO.** TX 3213 DM

ADDRESS 5616 FM 1960 East, Suite 240 (Street or RFD) Humble, TX (City) 77346 (State) (Zip)

(Signed) John D. Loden (Licensed Well Driller) (Signed) _____ (Registered Driller Trainee)

For TWC use only: Well No. _____ Located on map _____

Appendix B
Modeling Results

* * * Celanese Annual Report 1992 (ym92.job) * * *
WELL ID 1 - WDW-8
WELL ID 2 - WDW-14
WELL ID 3 - WDW-32
WELL ID 4 - WDW-49
WELL ID 5 - WDW-110

YEAR 1 (1964)

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL	WELL ID (1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.01	0.01	0.01	0.01	0.01
6	UPPER MIOCENE INJECTION SAND	4.97*	1.17	1.37	1.18	2.16
8	ARRESTING SAND 1	0.01	0.01	0.01	0.01	0.01
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	INJECTION LEVEL	WELL ID (1)	(2)	(3)	(4)	(5)
6	UPPER MIOCENE INJECTION SAND	28.40	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	14.9	0.0	0.0	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	FORMATION LEVEL	MONITOR ID (1)	(2)	(3)	(4)
6	UPPER MIOCENE INJECTION SAND	0.49	0.45	0.42	0.49
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

YEAR 2 (1965)

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL	WELL ID (1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.05	0.05	0.05	0.05	0.05
6	UPPER MIOCENE INJECTION SAND	31.38*	23.75*	13.19	11.62	15.85
8	ARRESTING SAND 1	0.13	0.13	0.13	0.13	0.13
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	INJECTION LEVEL	WELL ID (1)	(2)	(3)	(4)	(5)
6	UPPER MIOCENE INJECTION SAND	155.30	98.30	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	96.6	51.7	0.0	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	4.27	4.21	4.19	4.57
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

YEAR 3 (1966)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.11	0.11	0.11	0.11	0.11
6	UPPER MIOCENE INJECTION SAND	40.62*	40.62*	20.38	18.17	22.38
8	ARRESTING SAND 1	0.30	0.30	0.30	0.30	0.30
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	181.40	181.40	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	192.0	147.1	0.0	0.0	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	7.13	7.15	7.22	7.69
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

YEAR 4 (1967)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.00	0.00	0.00	0.00	0.00
4	OVERLYING SAND 2	0.20	0.20	0.20	0.20	0.20
6	UPPER MIOCENE INJECTION SAND	58.87*	57.13*	39.04*	28.20	33.74
8	ARRESTING SAND 1	0.54	0.54	0.54	0.54	0.54
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	248.70	231.80	64.50	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	322.8	269.0	33.9	0.0	0.0

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	11.27	11.33	11.42	12.12
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

----------YEAR 5 (1968)----------

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.01	0.01	0.01	0.01	0.01
4	OVERLYING SAND 2	0.34	0.34	0.34	0.33	0.33
6	UPPER MIOCENE INJECTION SAND	77.59*	87.88*	71.71*	44.06	48.65
8	ARRESTING SAND 1	0.91	0.91	0.91	0.91	0.91
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	282.50	347.60	194.50	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
CUMULATIVE INJECTION TO DATE (MMGAL)		471.4	451.9	136.2	0.0	0.0

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	17.28	17.57	17.82	18.72
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

----------YEAR 6 (1969)----------

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.01	0.01	0.01	0.01	0.01
4	OVERLYING SAND 2	0.47	0.47	0.47	0.47	0.47
6	UPPER MIOCENE INJECTION SAND	87.58*	94.19*	75.03*	63.03*	55.76
8	ARRESTING SAND 1	1.31	1.31	1.31	1.31	1.31
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	311.20	344.10	162.80	97.30	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00

CUMULATI NJECTION TO DATE (MMGAL)	635.1	632.8	221.8	51.2	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	21.17	21.65	21.81	22.69
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

----------YEAR 7 (1970)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.02	0.02	0.02	0.02	0.02
4	OVERLYING SAND 2	0.63	0.63	0.63	0.63	0.63
6	UPPER MIOCENE INJECTION SAND	99.49*	97.51*	102.16*	100.58*	67.44
8	ARRESTING SAND 1	1.80	1.80	1.80	1.80	1.80
10	ARRESTING SAND 2	0.00	0.00	0.00	0.00	0.00
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	310.00	258.60	275.50	291.10	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	798.1	768.8	366.8	204.3	0.0

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	26.65	27.58	27.52	28.35
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

----------YEAR 8 (1971)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.03	0.03	0.03	0.03	0.03
4	OVERLYING SAND 2	0.74	0.74	0.74	0.74	0.73
6	UPPER MIOCENE INJECTION SAND	93.48*	78.77*	81.47*	79.18*	60.52
8	ARRESTING SAND 1	2.16	2.17	2.17	2.16	2.16

10	ARRE 'G SAND 2	0.01	0.01	0.01	0.01	0.01
12	ARRE .G SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	323.30	188.50	189.40	196.70	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
CUMULATIVE INJECTION TO DATE (MMGAL)		968.2	868.0	466.4	307.7	0.0

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	25.62	26.16	26.02	26.88
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

* * * Celanese Annual Report 1992 (ym92.job) * * *

YEAR 9 (1972)

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.03	0.03	0.03	0.03	0.03
4	OVERLYING SAND 2	0.81	0.81	0.81	0.81	0.81
6	UPPER MIOCENE INJECTION SAND	86.26*	69.84*	72.99*	71.60*	55.78
8	ARRESTING SAND 1	2.47	2.47	2.47	2.47	2.47
10	ARRESTING SAND 2	0.01	0.01	0.01	0.01	0.01
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
16	ARRESTING SAND 4	0.00	0.00	0.00	0.00	0.00

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	299.70	155.30	161.70	173.60	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	0.00
CUMULATIVE INJECTION TO DATE (MMGAL)		1125.8	949.7	551.4	399.0	0.0

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	24.57	25.00	24.83	25.64
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00

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YEAR 10 (1973)

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.04	0.04	0.04	0.04	0.04
4	OVERLYING SAND 2	0.84	0.85	0.85	0.84	0.84

6	UPPE[illegible]OCENE INJECTION SAND	43.77*	63.91*	72.00*	3.92*	40.00
8	ARRE[illegible]G SAND 1	2.68	2.69	2.69	2.69	2.68
10	ARRESTING SAND 2	0.01	0.01	0.01	0.01	0.01
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	4.40	2.23	2.60	2.28	10.36*
16	ARRESTING SAND 4	0.58	0.56	0.57	0.56	0.58

* PERFORATED INJECTION ZONE

	INJECTION RATES (GPM)				
WELL ID	(1)	(2)	(3)	(4)	(5)
INJECTION LEVEL					
6 UPPER MIOCENE INJECTION SAND	28.20	149.60	213.00	237.00	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	79.00
CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1028.4	663.4	523.7	41.6

	PRESSURES AT MONITOR COORD (PSI)			
MONITOR ID	(1)	(2)	(3)	(4)
FORMATION LEVEL				
6 UPPER MIOCENE INJECTION SAND	21.72	22.69	22.77	22.90
14 LOWER MIOCENE INJECTION SAND	0.94	0.85	0.78	0.92

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----------YEAR 11 (1974)----------

	PRESSURES AT INJECTION WELL COORD (PSI)				
WELL ID	(1)	(2)	(3)	(4)	(5)
FORMATION LEVEL					
2 OVERLYING SAND 1	0.05	0.05	0.05	0.05	0.05
4 OVERLYING SAND 2	0.84	0.85	0.85	0.84	0.84
6 UPPER MIOCENE INJECTION SAND	31.53	50.02*	54.44*	56.91*	30.81
8 ARRESTING SAND 1	2.81	2.81	2.81	2.81	2.81
10 ARRESTING SAND 2	0.01	0.01	0.01	0.01	0.01
12 ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14 LOWER MIOCENE INJECTION SAND	15.96	8.19	9.54	8.37	37.22*
16 ARRESTING SAND 4	2.31	2.25	2.28	2.26	2.31

* PERFORATED INJECTION ZONE

	INJECTION RATES (GPM)				
WELL ID	(1)	(2)	(3)	(4)	(5)
INJECTION LEVEL					
6 UPPER MIOCENE INJECTION SAND	0.00	116.80	151.80	177.20	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	282.10
CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1089.8	743.3	616.9	189.9

	PRESSURES AT MONITOR COORD (PSI)			
MONITOR ID	(1)	(2)	(3)	(4)
FORMATION LEVEL				
6 UPPER MIOCENE INJECTION SAND	18.42	19.21	19.31	19.33
14 LOWER MIOCENE INJECTION SAND	3.57	3.25	3.00	3.50

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----------YEAR 12 (1975)----------

	PRESSURES AT INJECTION WELL COORD (PSI)				
WELL ID	(1)	(2)	(3)	(4)	(5)
FORMATION LEVEL					

2	OVER G SAND 1	0.06	0.06	0.06	0.06	0.06
4	OVER G SAND 2	0.84	0.84	0.84	0.84	0.84
6	UPPER MIOCENE INJECTION SAND	28.82	46.65*	48.06*	53.45*	28.17
8	ARRESTING SAND 1	2.91	2.91	2.91	2.91	2.91
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	13.14	7.13	8.18	7.27	29.57*
16	ARRESTING SAND 4	2.62	2.57	2.60	2.58	2.62

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	113.90	123.60	172.70	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	218.00
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1149.7	808.3	707.7	304.6

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	16.88	17.64	17.73	17.72
14	LOWER MIOCENE INJECTION SAND	3.54	3.28	3.08	3.49

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----------YEAR 13 (1976)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.07	0.07	0.07	0.07	0.07
4	OVERLYING SAND 2	0.85	0.85	0.86	0.85	0.85
6	UPPER MIOCENE INJECTION SAND	32.43	50.50*	58.68*	63.52*	31.61
8	ARRESTING SAND 1	3.05	3.06	3.06	3.06	3.05
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	14.17	7.79	8.89	7.93	31.62*
16	ARRESTING SAND 4	3.00	2.95	2.98	2.96	3.00

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	109.40	175.50	219.90	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	231.60
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1207.2	900.6	823.4	426.4

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	17.68	18.59	18.66	18.64
14	LOWER MIOCENE INJECTION SAND	3.97	3.69	3.47	3.91

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----------YEAR 14 (1977)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL	WELL ID (1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.07	0.07	0.07	0.07	0.07
4	OVERLYING SAND 2	0.88	0.88	0.88	0.88	0.88
6	UPPER MIOCENE INJECTION SAND	34.48	58.80*	61.84*	65.57*	33.59
8	ARRESTING SAND 1	3.22	3.22	3.22	3.22	3.21
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	15.40	8.54	9.73	8.70	34.18*
16	ARRESTING SAND 4	3.40	3.35	3.37	3.35	3.40

* PERFORATED INJECTION ZONE

	INJECTION LEVEL	WELL ID (1)	(2)	(3)	INJECTION RATES (GPM) (4)	(5)
6	UPPER MIOCENE INJECTION SAND	0.00	156.10	178.90	216.40	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	249.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1289.3	994.7	937.2	557.4

	FORMATION LEVEL	MONITOR ID (1)	(2)	(3)	PRESSURES AT MONITOR COORD (PSI) (4)
6	UPPER MIOCENE INJECTION SAND	18.47	19.45	19.58	19.57
14	LOWER MIOCENE INJECTION SAND	4.44	4.14	3.90	4.37

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YEAR 15 (1978)

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL	WELL ID (1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.08	0.08	0.08	0.08	0.08
4	OVERLYING SAND 2	0.90	0.90	0.90	0.90	0.90
6	UPPER MIOCENE INJECTION SAND	35.19	59.08*	59.79*	71.94*	34.32
8	ARRESTING SAND 1	3.38	3.39	3.39	3.39	3.38
10	ARRESTING SAND 2	0.02	0.02	0.02	0.02	0.02
12	ARRESTING SAND 3	0.00	0.00	0.00	0.00	0.00
14	LOWER MIOCENE INJECTION SAND	15.79	8.86	10.06	9.02	34.72*
16	ARRESTING SAND 4	3.68	3.63	3.66	3.64	3.68

* PERFORATED INJECTION ZONE

	INJECTION LEVEL	WELL ID (1)	(2)	(3)	INJECTION RATES (GPM) (4)	(5)
6	UPPER MIOCENE INJECTION SAND	0.00	151.40	154.00	259.90	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	251.30
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1369.0	1075.7	1073.9	689.6

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	4)
	FORM N LEVEL				
6	UPPER MIOCENE INJECTION SAND	18.94	20.01	20.11	20.04
14	LOWER MIOCENE INJECTION SAND	4.72	4.42	4.18	4.65

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YEAR 16 (1979)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.09	0.09	0.09	0.09	0.09
4	OVERLYING SAND 2	0.93	0.93	0.93	0.93	0.93
6	UPPER MIOCENE INJECTION SAND	35.89	57.18*	66.45*	68.70*	34.96
8	ARRESTING SAND 1	3.54	3.55	3.55	3.55	3.54
10	ARRESTING SAND 2	0.03	0.03	0.03	0.03	0.03
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	20.38	11.29	12.87	11.49	45.24*
16	ARRESTING SAND 4	4.47	4.40	4.44	4.41	4.47

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	130.90	206.00	230.30	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	329.90
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1437.8	1184.0	1195.0	863.1

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	19.26	20.27	20.37	20.36
14	LOWER MIOCENE INJECTION SAND	5.86	5.47	5.15	5.77

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YEAR 17 (1980)

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.10	0.10	0.10	0.10	0.10
4	OVERLYING SAND 2	0.94	0.95	0.95	0.95	0.94
6	UPPER MIOCENE INJECTION SAND	34.55	69.48*	56.24*	60.76*	33.70
8	ARRESTING SAND 1	3.69	3.69	3.69	3.69	3.68
10	ARRESTING SAND 2	0.03	0.03	0.03	0.03	0.03
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	17.68	10.12	11.44	10.30	38.33*
16	ARRESTING SAND 4	4.49	4.43	4.46	4.44	4.49

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	241.30	127.40	175.20	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	274.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1564.7	1251.0	1287.2	1007.3

ESSURES AT MONITOR COORD (PSI)

	FORMATION LEVEL / MONITOR ID	(1)	(2)	(3)	(4)
6	UPPER MIOCENE INJECTION SAND	19.02	20.01	20.28	20.25
14	LOWER MIOCENE INJECTION SAND	5.60	5.26	5.00	5.52

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YEAR 18 (1981)

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.10	0.10	0.10	0.10	0.10
4	OVERLYING SAND 2	0.94	0.95	0.95	0.95	0.94
6	UPPER MIOCENE INJECTION SAND	30.25	56.38*	51.64*	48.74*	29.53
8	ARRESTING SAND 1	3.78	3.78	3.78	3.78	3.78
10	ARRESTING SAND 2	0.03	0.03	0.03	0.03	0.03
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	12.56	7.59	8.46	7.71	26.13*
16	ARRESTING SAND 4	3.93	3.89	3.91	3.89	3.93

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	INJECTION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
6	UPPER MIOCENE INJECTION SAND	0.00	178.60	137.10	121.50	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	180.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1658.7	1323.2	1351.1	1102.0

PRESSURES AT MONITOR COORD (PSI)

	FORMATION LEVEL / MONITOR ID	(1)	(2)	(3)	(4)
6	UPPER MIOCENE INJECTION SAND	17.50	18.26	18.48	18.51
14	LOWER MIOCENE INJECTION SAND	4.61	4.38	4.20	4.56

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YEAR 19 (1982)

PRESSURES AT INJECTION WELL COORD (PSI)

	FORMATION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
2	OVERLYING SAND 1	0.11	0.11	0.11	0.11	0.11
4	OVERLYING SAND 2	0.93	0.93	0.93	0.93	0.93
6	UPPER MIOCENE INJECTION SAND	25.84	43.60*	44.07*	41.57*	25.27
8	ARRESTING SAND 1	3.82	3.83	3.83	3.83	3.82
10	ARRESTING SAND 2	0.04	0.04	0.04	0.04	0.04
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	10.68	6.57	7.29	6.67	21.93*
16	ARRESTING SAND 4	3.54	3.51	3.52	3.51	3.54

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	INJECTION LEVEL / WELL ID	(1)	(2)	(3)	(4)	(5)
6	UPPER MIOCENE INJECTION SAND	0.00	118.10	120.70	105.70	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	149.20
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1720.8	1386.6	1406.7	1180.5

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	15.69	16.29	16.44	16.46
14	LOWER MIOCENE INJECTION SAND	4.10	3.91	3.76	4.06

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YEAR 20 (1983)

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.11	0.11	0.11	0.11	0.11
4	OVERLYING SAND 2	0.90	0.91	0.91	0.91	0.90
6	UPPER MIOCENE INJECTION SAND	23.39	39.89*	38.39*	38.03*	22.90
8	ARRESTING SAND 1	3.85	3.85	3.85	3.85	3.85
10	ARRESTING SAND 2	0.04	0.04	0.04	0.04	0.04
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	10.86	6.59	7.33	6.69	22.51*
16	ARRESTING SAND 4	3.43	3.40	3.42	3.40	3.43

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	110.60	96.70	98.80	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	154.70
CUMULATIVE INJECTION TO DATE (MMGAL)		1140.6	1779.0	1437.5	1458.6	1261.8

		PRESSURES AT MONITOR COORD (PSI)			
	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	14.44	14.99	15.12	15.13
14	LOWER MIOCENE INJECTION SAND	4.03	3.84	3.69	3.99

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YEAR 21 (1984)

		PRESSURES AT INJECTION WELL COORD (PSI)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.12	0.12	0.12	0.12	0.12
4	OVERLYING SAND 2	0.89	0.89	0.89	0.89	0.89
6	UPPER MIOCENE INJECTION SAND	22.67	39.07*	37.64*	36.92*	22.17
8	ARRESTING SAND 1	3.88	3.88	3.88	3.88	3.87
10	ARRESTING SAND 2	0.04	0.04	0.04	0.04	0.04
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	9.47	5.87	6.50	5.95	19.32*
16	ARRESTING SAND 4	3.21	3.18	3.19	3.18	3.21

* PERFORATED INJECTION ZONE

		INJECTION RATES (GPM)				
	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	110.10	96.80	95.90	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	130.70

CUMULATI NJECTION TO DATE (MMGAL) 1140.6 1836.9 1488.4 09.1 1330.6

	MONITOR ID	(1)	(2)	(3)	(4)
					PRESSURES AT MONITOR COORD (PSI)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	13.83	14.36	14.49	14.50
14	LOWER MIOCENE INJECTION SAND	3.71	3.54	3.41	3.67

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----------YEAR 22 (1985)----------

	WELL ID	(1)	(2)	(3)	(4)	(5)
				PRESSURES AT INJECTION WELL COORD (PSI)		
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.12	0.12	0.12	0.12	0.12
4	OVERLYING SAND 2	0.87	0.87	0.87	0.87	0.87
6	UPPER MIOCENE INJECTION SAND	22.87	39.36*	38.45*	38.38*	22.35
8	ARRESTING SAND 1	3.91	3.91	3.91	3.91	3.91
10	ARRESTING SAND 2	0.05	0.05	0.05	0.05	0.05
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	8.12	5.14	5.66	5.21	16.26*
16	ARRESTING SAND 4	2.95	2.92	2.94	2.93	2.95

* PERFORATED INJECTION ZONE

	WELL ID	(1)	(2)	(3)	(4)	(5)
					INJECTION RATES (GPM)	
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	109.90	100.90	105.30	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	108.00

CUMULATIVE INJECTION TO DATE (MMGAL) 1140.6 1894.7 1541.5 1564.5 1387.4

	MONITOR ID	(1)	(2)	(3)	(4)
					PRESSURES AT MONITOR COORD (PSI)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	13.66	14.22	14.34	14.35
14	LOWER MIOCENE INJECTION SAND	3.35	3.22	3.11	3.32

* * * Celanese Annual Report 1992 (ym92.job) * * *

----------YEAR 23 (1986)----------

	WELL ID	(1)	(2)	(3)	(4)	(5)
				PRESSURES AT INJECTION WELL COORD (PSI)		
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.13	0.13	0.13	0.13	0.13
4	OVERLYING SAND 2	0.85	0.85	0.85	0.85	0.85
6	UPPER MIOCENE INJECTION SAND	20.42	38.50*	32.58*	30.61*	19.99
8	ARRESTING SAND 1	3.91	3.92	3.92	3.92	3.91

10	ARR' NG SAND 2	0.05	0.05	0.05	0.05	0.05
12	ARR. NG SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	11.52	6.81	7.63	6.92	24.42*
16	ARRESTING SAND 4	3.29	3.25	3.27	3.26	3.29

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	126.10	75.30	65.00	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	171.10
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	1961.0	1581.1	1598.7	1477.4

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	12.70	13.16	13.32	13.34
14	LOWER MIOCENE INJECTION SAND	3.99	3.78	3.62	3.94

* * * Celanese Annual Report 1992 (ym92.job) * * *

----------YEAR 24 (1987)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.13	0.13	0.13	0.13	0.13
4	OVERLYING SAND 2	0.83	0.83	0.83	0.83	0.83
6	UPPER MIOCENE INJECTION SAND	18.77	30.57*	30.82*	30.30*	18.38
8	ARRESTING SAND 1	3.91	3.91	3.91	3.91	3.91
10	ARRESTING SAND 2	0.05	0.05	0.05	0.05	0.05
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	13.77	8.01	9.01	8.14	29.54*
16	ARRESTING SAND 4	3.70	3.65	3.68	3.66	3.70

* PERFORATED INJECTION ZONE

INJECTION RATES (GPM)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	INJECTION LEVEL					
6	UPPER MIOCENE INJECTION SAND	0.00	78.00	79.10	78.40	0.00
14	LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	209.20
	CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2002.0	1622.7	1639.9	1587.4

PRESSURES AT MONITOR COORD (PSI)

	MONITOR ID	(1)	(2)	(3)	(4)
	FORMATION LEVEL				
6	UPPER MIOCENE INJECTION SAND	11.86	12.28	12.37	12.38
14	LOWER MIOCENE INJECTION SAND	4.56	4.31	4.11	4.51

* * * Celanese Annual Report 1992 (ym92.job) * * *

----------YEAR 25 (1988)----------

PRESSURES AT INJECTION WELL COORD (PSI)

	WELL ID	(1)	(2)	(3)	(4)	(5)
	FORMATION LEVEL					
2	OVERLYING SAND 1	0.14	0.14	0.14	0.14	0.14
4	OVERLYING SAND 2	0.81	0.81	0.81	0.81	0.81

6	UPPE[illegible]OCENE INJECTION SAND	18.11	30.97*	29.55*	[illegible]8.57*	17.73
8	ARRE[illegible]G SAND 1	3.90	3.90	3.90	3.90	3.90
10	ARRES[illegible]NG SAND 2	0.06	0.06	0.06	0.06	0.06
12	ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14	LOWER MIOCENE INJECTION SAND	13.13	7.78	8.70	7.90	27.77*
16	ARRESTING SAND 4	3.78	3.74	3.76	3.75	3.78

* PERFORATED INJECTION ZONE

	INJECTION RATES (GPM)				
WELL ID	(1)	(2)	(3)	(4)	(5)
INJECTION LEVEL					
6 UPPER MIOCENE INJECTION SAND	0.00	86.80	74.00	69.90	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	194.30
CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2047.7	1661.6	1676.7	1689.6

	PRESSURES AT MONITOR COORD (PSI)			
MONITOR ID	(1)	(2)	(3)	(4)
FORMATION LEVEL				
6 UPPER MIOCENE INJECTION SAND	11.37	11.77	11.88	11.89
14 LOWER MIOCENE INJECTION SAND	4.57	4.33	4.14	4.51

* * * Celanese Annual Report 1992 (ym92.job) * * *

YEAR 26 (1989)

	PRESSURES AT INJECTION WELL COORD (PSI)				
WELL ID	(1)	(2)	(3)	(4)	(5)
FORMATION LEVEL					
2 OVERLYING SAND 1	0.14	0.14	0.14	0.14	0.14
4 OVERLYING SAND 2	0.79	0.79	0.79	0.79	0.79
6 UPPER MIOCENE INJECTION SAND	16.39	26.90*	26.49*	25.54*	16.06
8 ARRESTING SAND 1	3.88	3.88	3.88	3.88	3.88
10 ARRESTING SAND 2	0.06	0.06	0.06	0.06	0.06
12 ARRESTING SAND 3	0.01	0.01	0.01	0.01	0.01
14 LOWER MIOCENE INJECTION SAND	10.47	6.47	7.16	6.56	21.41*
16 ARRESTING SAND 4	3.50	3.47	3.49	3.47	3.50

* PERFORATED INJECTION ZONE

	INJECTION RATES (GPM)				
WELL ID	(1)	(2)	(3)	(4)	(5)
INJECTION LEVEL					
6 UPPER MIOCENE INJECTION SAND	0.00	70.30	66.10	61.50	0.00
14 LOWER MIOCENE INJECTION SAND	0.00	0.00	0.00	0.00	145.20
CUMULATIVE INJECTION TO DATE (MMGAL)	1140.6	2084.6	1696.4	1709.0	1766.0

	PRESSURES AT MONITOR COORD (PSI)			
MONITOR ID	(1)	(2)	(3)	(4)
FORMATION LEVEL				
6 UPPER MIOCENE INJECTION SAND	10.58	10.93	11.01	11.02
14 LOWER MIOCENE INJECTION SAND	4.06	3.88	3.73	4.02

* * * Celanese Annual Report 1992 (ym92.job) * * *

YEAR 27 (1990)

	PRESSURES AT INJECTION WELL COORD (PSI)				
WELL ID	(1)	(2)	(3)	(4)	(5)
FORMATION LEVEL					

Appendix C
Quarterly Reports

77414

40A	WW0000110	00105	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 1-A BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR REC

PARAMETER	MONTH	01 VALUE	NO. EX.	02 VALUE	NO. EX.	03 VALUE	NO. EX.	UNITS
000036242	REPORTED							
HOURS MONTH	PERMITTED							
000507026	REPORTED							OPERAT
FLOW AVERAGE	PERMITTED	600.00		600.00		600.00		GAL/MI
000507080	REPORTED							
INJ RATE MAXIMUM	PERMITTED	800.00		800.00		800.00		GAL/M
000507239	REPORTED							
VOLUME TOTAL	PERMITTED	26.784000		26.784000		26.784000		MGM
000562580	REPORTED							
INJ PRES MAXIMUM	PERMITTED	900.00		900.00		900.00		PSI
000566080	REPORTED							
SPECIFIC MAXIMUM	PERMITTED	1.0051	0	1.0044	0	1.0052	0	
000566081	REPORTED	1.100		1.100		1.100		GRAVITY
SPECIFIC MINIMUM	PERMITTED	1.0005	0	1.0027	0	1.0001	0	
000572581	REPORTED	1.000		1.000		1.000		GRAVITY
ANNULUS MINIMUM	PERMITTED	0(1)	0	105	0	0(2)	0	
000582561	REPORTED							PRESSUR
ANNULUS 100 PSI	PERMITTED	97.5	0	96	0	0(3)	0	
	REPORTED							PRESSUR
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE
ORMATION CONTAINED

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. If the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR

Explanation of Intermittent Well Shutdowns, First Quarter, 1992

Footnote	Date	Explanation
1	1/14/92	Process Upset; approximately 70 minutes.
	1/15/92	Freeze Protection; approximately 30 mins.
	1/17/92	Process Upset; approximately 50 minutes.
	1/31/92	Process Upset; approximately 10 minutes.
2	3/23/92	Process Upset; approximately 160 minutes.
	3/24/92	Process Upset; approximately 1 hour.
	3/27/92	Process Upset; approximately 40 minutes.
	3/28/92	Process Upset; approximately 30 minutes.
3	3/29/92	Well isolated for plugging of Lower Injection Interval.

77414

40A	WW0000014	00103	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 2 BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR REC

PARAMETER	MONTH	OPERATIONAL DATA 01 VALUE	NO. EX.	02 VALUE	NO. EX.	03 VALUE	NO. EX.	UNITS
000036242	REPORTED	744	0	696	0	744	0	
HOURS MONTH	PERMITTED							
500507080	REPORTED	230	0	225	0	225	0	OPERAT
IND RATE MAXIMUM	PERMITTED	750.00		750.00		750.00		GAL/M
500507239	REPORTED	10.2672	0	9.3960	0	10.0440	0	
VOLUME TOTAL	PERMITTED	33.480000		33.480000		33.480000		MGM
500507343	REPORTED	10.2672	0	19.6632	0	29.7072	0	
VOLUME TOTAL	PERMITTED	394.200		394.200		394.200		(MG)
500562580	REPORTED	520	0	530	0	530	0	
IND PRES MAXIMUM	PERMITTED	775.00		775.00		775.00		PSI
500566080	REPORTED	1.0007	0	1.0006	0	1.0010	0	
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		GRAVITY
500566081	REPORTED	1.0007	0	1.0006	0	1.0010	0	
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		GRAVITY
500572581	REPORTED	525	0	300	0	0(1)	0	
NNULUS MINIMUM	PERMITTED							
500582561	REPORTED	147	0	171	0	0(2)	0	PRESSUR
NNULUS 100 PSI	PERMITTED							
	REPORTED							PRESSUR
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE
FORMATION CONTAINED

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR [illegible]

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. If the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR [illegible]

Explanation of Intermittent Well Shutdowns, First Quarter, 1992

Footnote	Date	Explanation
1	3/16/92	Zero Pressure; Well shutdown to tie in new instruments, down till 3/18/92.
2	3/16/92	Zero Pressure; Well shutdown to tie in new instruments, down till 3/18/92.
	3/18/92	Pressure <100 for 30 minutes while working on Annulus pressure instrument. Well was not shutdown.
	3/23/92	Pressure <100 for approximately 50 minutes and down to zero approximately 1 hour. Well was shutdown to repair pump.
	3/23/92	Zero Pressure for 30 minutes due to pump vapor-locked.

77414

40A	WW0000032	00103	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 3 BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR REC

PARAMETER	MONTH	01 VALUE	NO. EX.	02 VALUE	NO. EX.	03 VALUE	NO. EX.	UNITS
		OPERATIONAL DATA						
000035242	REPORTED	744	0	696	0	744	0	
HOURS MONTH	PERMITTED							
500537060	REPORTED	187	0	186	0	174	0	OPERAT
INJ RATE MAXIMUM	PERMITTED	750.00		750.00		750.00		
500507239	REPORTED	5.4907	0	5.1782	0	4.5086	0	GAL/M
VOLUME TOTAL	PERMITTED	33.480000		33.480000		33.480000		
500507343	REPORTED	5.4907	0	10.6689	0	15.1775	0	MGM
VOLUME TOTAL	PERMITTED	394.200		394.200		394.200		
500562580	REPORTED	592	0	594	0	591	0	(MG)
INJ PRES MAXIMUM	PERMITTED	775.00		775.00		775.00		
500566080	REPORTED	1.0007	0	1.0006	0	1.0010	0	PSI
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		
500566081	REPORTED	1.0007	0	1.0006	0	1.0010	0	GRAVITY
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		
500572581	REPORTED	463	0	479	0	460	0	GRAVITY
ANNULUS MINIMUM	PERMITTED							
500582561	REPORTED	118	0	48 (1)	0	66 (2)	0	PRESSUR
ANNULUS 100 PSI	PERMITTED							
	REPORTED							PRESSUR
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE
ORMATION CONTAINED

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? NO
   B. Have any workovers been performed during this report period? NO
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? NO
   D. If the answer to any of the above is yes, then briefly describe.

CERTIFY THAT

77414

40A	WW0000349	00103	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 4 BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR RECO

PARAMETER	MONTH	01 VALUE	NO. EX.	02 VALUE	NO. EX.	03 VALUE	NO. EX.	UNITS
		OPERATIONAL DATA						
000035242	REPORTED							
HOURS MONTH	PERMITTED	744	0	696	0	744	0	
500507080	REPORTED							OPERAT
INJ RATE MAXIMUM	PERMITTED	255	0	255	0	168	0	
500507239	REPORTED	750.00		750.00		750.00		GAL/M
VOLUME TOTAL	PERMITTED	4.2854	0	4.3848	0	3.1694	0	
500507343	REPORTED	33.480000		33.480000		33.480000		MGM
VOLUME TOTAL	PERMITTED	4.2854	0	8.6702	0	11.8396	0	
500562580	REPORTED	394.200		394.200		394.200		(MG)
INJ PRES MAXIMUM	PERMITTED	594	0	597	0	517	0	
500566080	REPORTED	775.00		775.00		775.00		PSI
SPECIFIC MAXIMUM	PERMITTED	1.0007	0	1.0006	0	1.0010	0	
500566281	REPORTED	1.100		1.100		1.100		GRAVITY
SPECIFIC MINIMUM	PERMITTED	1.0007	0	1.0006	0	1.0010	0	
500572581	REPORTED	1.000		1.000		1.000		GRAVITY
ANNULUS MINIMUM	PERMITTED	220	0	245	0	233	0	
500302581	REPORTED							PRESSUR
ANNULUS 100 PSI	PERMITTED	<100 (1)	0	54 (2)	0	<100 (3)	0	
	REPORTED							PRESSUR
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE

SYS	PERMIT NUMBER		YEAR

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No significant change!

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   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. If the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR WITH THE

1	2/03/92	Pressure <100 for 17 minutes.
	2/13/92	Pressure <100 for 15 minutes.
	2/24/92	Pressure <100 for 15 minutes.
2	3/14/92	Pressure <100 for 1 hour and 15 minutes.
	3/28/92	Pressure <100 for 14 minutes.

77414

40A	WWC000014	10001	92
SYS	PERMIT NUMBER		YEAR

THE STATE OF TEXAS

THIS REPORT TO BE USED FOR COMBINED WELLS 14,32,49,110

COMPANY COPY

RETAIN THIS COPY FOR YOUR REC

PARAMETER	MONTH	OPERATIONAL DATA 01 VALUE	NO. EX.	02 VALUE	NO. EX.	03 VALUE	NO. EX.	UNITS
000035242	REPORTED							
HOURS MONTH	PERMITTED	744	0	696	0	744	0	
500507030	REPORTED							OPERAT
INJ RATE MAXIMUM	PERMITTED	255	0	255	0	225	0	
500507239	REPORTED							GAL/M
VOLUME TOTAL	PERMITTED	20.0433	0	18.9590	0	17.7220	0	
500507343	REPORTED	33.480000		33.480000		33.480000		MGM
VOLUME TOTAL	PERMITTED	20.0433	0	39.0023	0	56.7243	0	
	REPORTED	394.200		394.200		394.200		(MG)
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
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	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE
ORMATION CONTAINED

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR

TWC COPY

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No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. If the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR

Footnote	Date	Explanation
1	1/15/92	Pressure <100 for approximately 15 minutes.
	1/28/92	Pressure <100 for approximately 20 minutes.
2	2/06/92	Pressure <100 for approximately 20 minutes.
	2/07/92	Pressure <100 for approximately 50 minutes.
3	3/02/92	Pressure <100 for approximately 35 minutes.
	3/10/92	Pressure <100 for approximately 39 minutes.
	3/14/92	Pressure <100 for approximately 27 minutes.

77414

SYS	PERMIT NUMBER		YEAR
40A	WW0000110	00105	92

THIS REPORT TO BE USED FOR WELL 1-A BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR RECO

PARAMETER	MONTH	OPERATIONAL DATA 04 VALUE	NO. EX.	05 VALUE	NO. EX.	06 VALUE	NO. EX.	UNITS
000033242	REPORTED							
HOURS MONTH	PERMITTED							
500507026	REPORTED							OPERAT
FLOW AVERAGE	PERMITTED	600.00		600.00		600.00		GAL/MI
500507080	REPORTED							
INJ RATE MAXIMUM	PERMITTED	800.00		800.00		800.00		GAL/M
500507239	REPORTED							
VOLUME TOTAL	PERMITTED	26.784000		26.784000		26.784000		MGM
500507343	REPORTED							
VOLUME TOTAL	PERMITTED	315.360		315.360		315.360		(MG)
500562500	REPORTED	15 (1)	0	144	0	146	0	
INJ PRES MAXIMUM	PERMITTED	900.00		900.00		900.00		PSI
500566080	REPORTED							
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		GRAVITY
500566031	REPORTED							
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		GRAVITY
500572581	REPORTED							
ANNULUS MINIMUM	PERMITTED							
500572581	REPORTED							PRESSUR
ANNULUS 100 PSI	PERMITTED							
	REPORTED							PRESSUR
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH

Summary of Intermittent Well Shutdowns, Second Quarter, 1992

Footnote	Date	Explanation
1	4/01/92	Well shutdown to start plugging lower injection well interval.

SYS	PERMIT NUMBER		YEAR
	[illegible]	[illegible]	[illegible]

THIS REPORT TO BE USED FOR [illegible]

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? Yes
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

Well No. 1-A was shut in during November, 1991, due to the well's inability to accept injection fluid. Work was started on Well No. 1-A during early 1992.

77414

SYS	PERMIT NUMBER		YEAR
4CA	WR0000014	00103	92

THIS REPORT TO BE USED FOR WELL 2 BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR REC

PARAMETER	MONTH	04 VALUE	NO. EX.	05 VALUE	NO. EX.	06 VALUE	NO. EX.	UNITS
		OPERATIONAL DATA						
000035242	REPORTED							
HOURS MONTH	PERMITTED	720	0	744	0	720	0	
500507000	REPORTED							OPERAT
INJ RATE MAXIMUM	PERMITTED	225	0	230	0	215	0	
500507239	REPORTED	750.00		750.00		750.00		GAL/M
VOLUME TOTAL	PERMITTED	9.2448	0	9.4190	0	8.3808	0	
500507343	REPORTED	33.480000		33.480000		33.480000		MGM
VOLUME TOTAL	PERMITTED	38.9520	0	48.3710	0	56.7518	0	
500362550	REPORTED	394.200		394.200		394.200		(MG)
INJ PRES MAXIMUM	PERMITTED	514	0	518	0	508	0	
500566000	REPORTED	775.00		775.00		775.00		PSI
SPECIFIC MAXIMUM	PERMITTED	1.0158	0	1.0071	0	1.0065	0	
500565031	REPORTED	1.100		1.100		1.100		GRAVITY
SPECIFIC MINIMUM	PERMITTED	1.0002	0	1.0028	0	1.0019	0	
500725981	REPORTED	1.000		1.000		1.000		GRAVITY
ANNULUS MINIMUM	PERMITTED	340	0	<100 (2)	0	239	0	
500562561	REPORTED							PRESSUR
ANNULUS 100 PSI	PERMITTED	63 (1)	0	0 (3)	0	85 (4)	0	
	REPORTED							PRESSUR
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE
ORMATION CONTAINED

Explanation of Intermittent Well Shutdowns, Second Quarter, 1992

Footnote	Date	Explanation
1	4/05/92	Process Upset; approximately 25 minutes.
	4/14/92	Well Shutdown; approximately 1 hour.
	4/17/92	Process Upset; approximately 1 hour.
	4/30/92	Process Upset; approximately 20 minutes.
2	5/24/92	Process Upset; approximately 30 minutes.
3	5/18/92	Process Upset; approximately 15 minutes.
	5/24/92	Process Upset; approximately 28 minutes.
	5/27/92	Process Upset; approximately 43 minutes.
4	6/06/92	Process Upset; approximately 26 minutes.

SYS	PERMIT NUMBER		YEAR
	[illegible]	[illegible]	92

THIS REPORT TO BE USED FOR [illegible] CITY PLANT

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change !

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

CERTIFY THAT

77414

SYS	PERMIT NUMBER		YEAR
4CA	WQ0000032	00103	92

THIS REPORT TO BE USED FOR WELL 3 BAY CITY PLANT

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PARAMETER	MONTH	OPERATIONAL DATA 04 VALUE	NO. EX.	05 VALUE	NO. EX.	06 VALUE	NO. EX.	UNITS
00003242	REPORTED	720	0	744	0	720	0	
HOURS MONTH	PERMITTED							
50050708C	REPORTED	177	0	170	0	165	0	OPERAT
INJ RATE MAXIMUM	PERMITTED	750.00		750.00		750.00		
50050723P	REPORTED	4.4064	0	4.9997	0	4.3632	0	GAL/M
VOLUME TOTAL	PERMITTED	33.480000		33.480000		33.480000		
50050724P	REPORTED	19.5839	0	24.5836	0	28.9468	0	MGM
VOLUME TOTAL	PERMITTED	394.200		394.200		394.200		
50056258C	REPORTED	597	0	603	0	598	0	(MG)
INJ PRES MAXIMUM	PERMITTED	775.00		775.00		775.00		
50056600C	REPORTED	1.0020	0	1.0015	0	1.0018	0	PSI
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		
50056608I	REPORTED	1.0010	0	1.0002	0	1.0005	0	GRAVITY
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		
50057255I	REPORTED	486	0	473	0	270	0	GRAVITY
ANNULUS MINIMUM	PERMITTED							
50058256I	REPORTED	0(1)	0	140	0	<100(2)	0	PRESSUR
ANNULUS 100 PSI	PERMITTED							
	REPORTED							PRESSUR
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE
ORMATION CONTAINED

Footnote	Date	Explanation
1	4/17/92	Process Upset; approximately 41 minutes.
	4/19/92	Process Upset; approximately 1 hour and 8 minutes.
2	6/13/92	Process Upset; approximately 43 minutes.

77414

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR [illegible]

TWC COPY

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No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

77414

SYS	PERMIT NUMBER		YEAR
40A	WW0000049	00103	92

THIS REPORT TO BE USED FOR WELL 4 BAY CITY PLANT

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PARAMETER	MONTH	04 VALUE	NO. EX.	05 VALUE	NO. EX.	06 VALUE	NO. EX.	UNITS
		OPERATIONAL DATA						
00000324C	REPORTED							
HOURS MONTH	PERMITTED	720	0	744	0	720	0	
500507060	REPORTED							OPERAT
INJ RATE MAXIMUM	PERMITTED	207	0	240	0	204	0	
500507230	REPORTED	750.00		750.00		750.00		GAL/M
VOLUME TOTAL	PERMITTED	4.4928	0	6.3389	0	4.4064	0	
500507343	REPORTED	33.480000		33.480000		33.480000		MGM
VOLUME TOTAL	PERMITTED	16.3324	0	22.6713	0	27.0777	0	
500562500	REPORTED	394.200		394.200		394.200		(MG)
INJ PRES MAXIMUM	PERMITTED	600	0	605	0	565	0	
500566020	REPORTED	775.00		775.00		775.00		PSI
SPECIFIC MAXIMUM	PERMITTED	1.0020	0	1.0015	0	1.0018	0	
500566081	REPORTED	1.100		1.100		1.100		GRAVITY
SPECIFIC MINIMUM	PERMITTED	1.0010	0	1.0002	0	1.0005	0	
500572581	REPORTED	1.000		1.000		1.000		GRAVITY
ANNULUS MINIMUM	PERMITTED	544	0	575	0	350	0	
500582561	REPORTED							PRESSUR
ANNULUS 100 PSI	PERMITTED	145	0	147	0	110	0	
	REPORTED							PRESSURE
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

CERTIFY THAT I AM FAMILIAR WITH THE
ORMATION CONTAINED

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL # GAY CITY PLANT

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

CERTIFY THAT

77414

40A	WWC0C0014	10001	92
SYS	PERMIT NUMBER		YEAR

THE STATE OF TEXAS

THIS REPORT TO BE USED FOR COMBINED WELLS 14,32,49,110

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PARAMETER	MONTH	04 VALUE	NO. EX.	05 VALUE	NO. EX.	06 VALUE	NO. EX.	UNITS
		OPERATIONAL DATA						
00035242	REPORTED							
HOURS MONTH	PERMITTED	720	0	744	0	720	0	
50050700	REPORTED							OPERAT
INJ RATE MAXIMUM	PERMITTED	225	0	240	0	215	0	
50050723	REPORTED							GAL/M
VOLUME TOTAL	PERMITTED	18.1440	0	20.7576	0	17.1504	0	
50050734	REPORTED	33.480000		33.480000		33.480000		MGM
VOLUME TOTAL	PERMITTED	74.8683	0	95.6259	0	112.7763	0	
	REPORTED	394.200		394.200		394.200		(MG)
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
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	REPORTED							
	PERMITTED							
	REPORTED							

CERTIFY THAT I AM FAMILIAR WITH THE
ORMATION CONTAINED

77414

SYS	PERMIT NUMBER		YEAR
	[illegible]	[illegible]	92

THIS REPORT TO BE USED FOR [illegible] 14,37,40,110

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No Significant change

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? Yes
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

See the quarterly injection report for WDW-110.

P.O. BOX 509
BAY CITY, TEXAS
77414

SYS	PERMIT NUMBER		YEAR
40A	WW0000110	00105	92

THIS REPORT TO BE USED FOR WELL 1-A BAY CITY PLANT

COMPANY COPY

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PARAMETER	OPERATIONAL DATA							
	MONTH	07 VALUE	NO. EX.	08 VALUE	NO. EX.	09 VALUE	NO. EX.	UNITS
000035242	REPORTED							
HOURS MONTH	PERMITTED							OPERATE
500507026	REPORTED							
FLOW AVERAGE	PERMITTED	600.00		600.00		600.00		GAL/MIN
500507030	REPORTED							
INJ RATE MAXIMUM	PERMITTED	800.00		800.00		800.00		GAL/MI
500507239	REPORTED							
VOLUME TOTAL	PERMITTED	26.784000		26.784000		26.784000		MGM
500507343	REPORTED							
VOLUME TOTAL	PERMITTED	315.360		315.360		315.360		(MG)
500562530	REPORTED	148	0	146	0	140	0	
INJ PRES MAXIMUM	PERMITTED	900.00		900.00		900.00		PSI
500566030	REPORTED	1.0092	0	1.0064	0	1.0063	0	
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		GRAVITY
500566031	REPORTED	1.0029	0	1.0020	0	1.0006	0	
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		GRAVITY
500572531	REPORTED							
ANNULUS MINIMUM	PERMITTED							PRESSUR
500572561	REPORTED							
ANNULUS 100 PSI	PERMITTED							PRESSUR
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR

TWC COPY

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No Significant Change.

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR WITH THE

SEE BACK FOR INSTRUCTIONS AND DEFINITIONS

P.O. BOX 509
BAY CITY, TEXAS
77414

SYS	PERMIT NUMBER		YEAR
40A	WW0000014	00103	92

THIS REPORT TO BE USED FOR WELL 2 BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR RECORD

PARAMETER	MONTH	OPERATIONAL DATA 07 VALUE	NO. EX.	08 VALUE	NO. EX.	09 VALUE	NO. EX.	UNITS
000035242 HOURS MONTH	REPORTED	744	0	744	0	720	0	OPERATE
	PERMITTED							
500507080 INJ RATE MAXIMUM	REPORTED	213	0	212	0	212	0	GAL/MI
	PERMITTED	750.00		750.00		750.00		
500507239 VOLUME TOTAL	REPORTED	9.1066	0	8.8387	0	6.7824	0	MGM
	PERMITTED	33.480000		33.480000		33.480000		
500507343 VOLUME TOTAL	REPORTED	65.8584	0	74.6971	0	81.4795	0	(MG)
	PERMITTED	394.200		394.200		394.200		
500562580 INJ PRES MAXIMUM	REPORTED	514	0	516	0	585	0	PSI
	PERMITTED	775.00		775.00		775.00		
500566080 SPECIFIC MAXIMUM	REPORTED	1.0020	0	1.0031	0	1.0034	0	GRAVITY
	PERMITTED	1.100		1.100		1.100		
500566081 SPECIFIC MINIMUM	REPORTED	1.0005	0	1.0010	0	1.0011	0	GRAVITY
	PERMITTED	1.000		1.000		1.000		
500572581 ANNULUS MINIMUM	REPORTED	340	0	510	0	234	0	PRESSURE
	PERMITTED							
500582561 ANNULUS 100 PSI	REPORTED	145	0	112	0	<100(1)	0	PRESSURE
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT

[illegible] CITY, TEXAS

[illegible] 77414

SYS	PERMIT NUMBER		YEAR
[illegible]	[illegible]	[illegible]	[illegible]

THIS REPORT TO BE USED FOR [illegible] CITY PLANT

TWC COPY

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No Significant Change.

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR WITH THE

SEE BACK FOR INSTRUCTIONS AND DEFINITIONS

Explanation of Intermittent Well Shutdowns, Third Quarter, 1992

Footnote	Date	Explanation
1	9/19/92	Preparation for well shutdown; approximately 19 minutes.
	9/22/92	Well Capacity Test, increased flow and annulus differential pressure pump did not respond fast enough.
	9/29/92	Well Shutdown; approximately 17 minutes.

P.O. BOX 509
BAY CITY, TEXAS
77414

40A	WW0000032	00103	92
SYS	PERMIT NUMBER		YEAR

THE STATE OF TEXAS

THIS REPORT TO BE USED FOR WELL 3 BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR RECORD

PARAMETER	MONTH	OPERATIONAL DATA 07 VALUE	NO. EX.	08 VALUE	NO. EX.	09 VALUE	NO. EX.	UNITS
000035242	REPORTED	744	0	744	0	720	0	
HOURS MONTH	PERMITTED							OPERATED
500507080	REPORTED	135	0	171	0	159	0	
INJ RATE MAXIMUM	PERMITTED	750.00		750.00		750.00		GAL/MIN
500507239	REPORTED	3.7498	0	3.6158	0	3.4560	0	
VOLUME TOTAL	PERMITTED	33.480000		33.480000		33.480000		MGM
500507343	REPORTED	32.6966	0	36.3124	0	39.7684	0	
VOLUME TOTAL	PERMITTED	394.200		394.200		394.200		(MG)
500562580	REPORTED	541	0	594	0	650	0	
INJ PRES MAXIMUM	PERMITTED	775.00		775.00		775.00		PSI
500566080	REPORTED	1.0020	0	1.0031	0	1.0034	0	
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		GRAVITY
500566081	REPORTED	1.0005	0	1.0010	0	1.0011	0	
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		GRAVITY
500572581	REPORTED	466	0	0 (2)	0	0 (4)	0	
ANNULUS MINIMUM	PERMITTED							PRESSURE
500582561	REPORTED	<100 (1)	0	0 (3)	0	0 (5)	0	
ANNULUS 100 PSI	PERMITTED							PRESSURE
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT

77414

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR [illegible]

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No Significant Change.

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR WITH THE

SEE BACK FOR INSTRUCTIONS AND DEFINITIONS

Footnote	Date	Explanation
1	7/10/92	Process Upset; approximately 84 minutes.
	7/14/92	Process Upset; approximately 1 hour and 33 minutes.
	7/17/92	Process Upset; approximately 57 minutes.
	7/21/92	Process Upset; approximately 18 minutes.
2	8/05/92	Well Shutdown.
	8/12/92	Process Upset; approximately 1 hour and 7 minutes.
	8/26/92	Well Shutdown.
3	8/05/92	Well Shutdown.
	8/10/92	Process Upset; approximately 16 minutes.
	8/12/92	Process Upset; approximately 1 hour and 22 minutes.
	8/23/92	Process Upset; approximately 19 minutes.
	8/26/92	Process Upset; approximately 11 hours.
4	9/15/92	Process Upset; approximately 16 minutes.
	9/23/92	Well Shutdown.
5	9/02/92	Process Upset; approximately 43 minutes.
	9/14/92	Process Upset; approximately 19 minutes.
	9/15/92	Process Upset; approximately 16 minutes.
	9/22/92	Process Upset; approximately 17 minutes.
	9/23/92	Well Shutdown.
	9/24/92	Process Upset; approximately 32 minutes.

P.O. BOX 509
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77414

SYS	PERMIT NUMBER		YEAR
4CA	WW0000049	00103	92

THIS REPORT TO BE USED FOR WELL 4 BAY CITY PLANT

COMPANY COPY

RETAIN THIS COPY FOR YOUR RECORD

PARAMETER		OPERATIONAL DATA							
	MONTH	07 VALUE	NO. EX.	08 VALUE	NO. EX.	09 VALUE	NO. EX.	UNITS
000035242 HOURS MONTH	REPORTED	744	0	744	0	720	0	OPERATED
	PERMITTED							
500507080 INJ RATE MAXIMUM	REPORTED	180	0	186	0	229	0	GAL/MIN
	PERMITTED	750.00		750.00		750.00		
500507239 VOLUME TOTAL	REPORTED	4.8658	0	5.0890	0	3.7584	0	MGM
	PERMITTED	33.480000		33.480000		33.480000		
500507343 VOLUME TOTAL	REPORTED	31.9435	0	37.0325	0	40.7909	0	(MG)
	PERMITTED	394.200		394.200		394.200		
500562580 INJ PRES MAXIMUM	REPORTED	548	0	602	0	609	0	PSI
	PERMITTED	775.00		775.00		775.00		
500566080 SPECIFIC MAXIMUM	REPORTED	1.0020	0	1.0031	0	1.0034	0	GRAVITY
	PERMITTED	1.100		1.100		1.100		
500566081 SPECIFIC MINIMUM	REPORTED	1.0005	0	1.0010	0	1.0011	0	GRAVITY
	PERMITTED	1.000		1.000		1.000		
500572581 ANNULUS MINIMUM	REPORTED	461	0	151	0	0 (3)	0	PRESSURE
	PERMITTED							
500582561 ANNULUS 100 PSI	REPORTED	<100 (1)	0	0 (2)	0	0 (4)	0	PRESSURE
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT

77414

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR [illegible]

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No Significant Changes.

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR WITH THE

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Footnote	Date	Explanation
1	7/04/92	Process Upset; approximately 39 minutes.
2	8/05/92	Well Shutdown; approximately 15 minutes.
	8/12/92	Well Shutdown.
3	9/17/92	Well Shutdown.
	9/20/92	Well Shutdown.
	9/22/92	Well Shutdown.
4	9/02/92	Well Shutdown.
	9/03/92	Annulus pump problems.
	9/04/92	Annulus pump problems for 20 minutes.
	9/17/92	Well Shutdown; approximately 28 minutes.
	9/20/92	Annulus Controller problems for 49 minutes.

P.O. BOX 509
BAY CITY, TEXAS
77414

SYS	PERMIT NUMBER		YEAR
4CA	WW0000014	10001	92

THIS REPORT TO BE USED FOR COMBINED WELLS 14,32,49,110

COMPANY COPY

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PARAMETER	OPERATIONAL DATA							
	MONTH	07 VALUE	NO. EX.	08 VALUE	NO. EX.	09 VALUE	NO. EX.	UNITS
000035242 HOURS MONTH	REPORTED	744	0	744	0	720	0	OPERATED
	PERMITTED							
500507080 INJ RATE MAXIMUM	REPORTED	213	0	212	0	229	0	GAL/MIN
	PERMITTED							
500507239 VOLUME TOTAL	REPORTED	17.7222	0	17.5435	0	13.9968	0	MGY
	PERMITTED	33.480000		33.480000		33.480000		
500507343 VOLUME TOTAL	REPORTED	130.4985	0	148.0420	0	162.0388	0	(MG)
	PERMITTED	394.200		394.200		394.200		
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
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	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS

SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No Significant Changes.

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

CERTIFY THAT I AM FAMILIAR WITH THE

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P.O. BOX 509
BAY CITY, TEXAS
77414

40A	WW0000110	00105	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 1-A BAY CITY PLANT

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PARAMETER	MONTH	OPERATIONAL DATA 10 VALUE	NO. EX.	11 VALUE	NO. EX.	12 VALUE	NO. EX.	UNITS
000035242	REPORTED							
HOURS MONTH	PERMITTED							OPERATI
500507026	REPORTED							
FLOW AVERAGE	PERMITTED	600.00		600.00		600.00		GAL/MI
500507080	REPORTED							
INJ RATE MAXIMUM	PERMITTED	800.00		800.00		800.00		GAL/M
500507239	REPORTED							
VOLUME TOTAL	PERMITTED	26.784000		26.784000		26.784000		MGM
500507343	REPORTED							
VOLUME TOTAL	PERMITTED	315.360		315.360		315.360		(MG)
500562580	REPORTED	140	0	142	0	146	0	
INJ PRES MAXIMUM	PERMITTED	900.00		900.00		900.00		PSI
500566080	REPORTED							
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		GRAVITY
500566081	REPORTED							
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		GRAVITY
500572581	REPORTED							
ANNULUS MINIMUM	PERMITTED							PRESSUR
500582561	REPORTED							
ANNULUS 100 PSI	PERMITTED							PRESSUR
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

[illegible] CITY, TEXAS

[illegible]

SYS	PERMIT NUMBER	[illegible]	YEAR
	[illegible]	[illegible]	[illegible]

THIS REPORT TO BE USED FOR [illegible] CITY PLANT

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? Yes
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

Well No. 1-A was shut in during November, 1991, due to the well's inability to accept injection fluid. Work was started on Well No. 1-A during early 1992 and is still in progress.

P.O. BOX 509
BAY CITY, TEXAS
77414

40A	WW0000014	00103	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 2 BAY CITY PLANT

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PARAMETER	MONTH	OPERATIONAL DATA 10 VALUE	NO. EX.	11 VALUE	NO. EX.	12 VALUE	NO. EX.	UNITS
000035242	REPORTED	744	0	696	0	720	0	
HOURS MONTH	PERMITTED							OPERATE
500507080	REPORTED	205	0	205	0	200	0	
INJ RATE MAXIMUM	PERMITTED	750.00		750.00		750.00		GAL/MI
500507239	REPORTED	8.7941	0	7.6838	0	8.5104	0	
VOLUME TOTAL	PERMITTED	33.480000		33.480000		33.480000		MGM
500507343	REPORTED	74.6525	0	82.3363	0	90.8467	0	
VOLUME TOTAL	PERMITTED	394.200		394.200		394.200		(MG)
500562580	REPORTED	514	0	509	0	509	0	
INJ PRES MAXIMUM	PERMITTED	775.00		775.00		775.00		PSI
500566080	REPORTED	1.0075	0	1.0066	0	1.0034	0	
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		GRAVITY
500566081	REPORTED	1.0034	0	1.0006	0	1.0003	0	
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		GRAVITY
500572581	REPORTED	620	0	0 (1)	0	247	0	
ANNULUS MINIMUM	PERMITTED							PRESSURE
500582561	REPORTED	148	0	0 (2)	0	163	0	
ANNULUS 100 PSI	PERMITTED							PRESSURE
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE

Explanation of Intermittent Well Shutdowns, Fourth Quarter, 1992

Footnote	Date	Explanation
1	11/22/92	Well Shutdown; approximately 3 hours and 30 minutes.
2	11/22/92	Well Shutdown; approximately 3 hours and 30 minutes.

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77414

SYS	PERMIT NUMBER		YEAR
	[illegible]	[illegible]	90

THIS REPORT TO BE USED FOR WELL 2 BAY CITY PLANT

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

I CERTIFY THAT I AM FAMILIAR WITH THE

SEE BACK FOR INSTRUCTIONS

P.O. BOX 509
BAY CITY, TEXAS
77414

40A	WW0000032	00103	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 3 BAY CITY PLANT

TWC COPY

PARAMETER	MONTH	OPERATIONAL DATA 10 VALUE	NO. EX.	11 VALUE	NO. EX.	12 VALUE	NO. EX.	UNITS
000035242	REPORTED	744	0	720	0	744	0	
HOURS MONTH	PERMITTED							OPERATE
500507080	REPORTED	147	0	159	0	159	0	
INJ RATE MAXIMUM	PERMITTED	750.00		750.00		750.00		GAL/MI
500507239	REPORTED	3.5712	0	4.0176	0	3.8837	0	
VOLUME TOTAL	PERMITTED	33.480000		33.480000		33.480000		MGM
500507343	REPORTED	36.2678	0	40.2854	0	44.1691	0	
VOLUME TOTAL	PERMITTED	394.200		394.200		394.200		(MG)
500562580	REPORTED	549	0	554	0	666	0	
INJ PRES MAXIMUM	PERMITTED	775.00		775.00		775.00		PSI
500566080	REPORTED	1.0032	0	1.0028	0	1.0075	0	
SPECIFIC MAXIMUM	PERMITTED	1.100		1.100		1.100		GRAVITY
500566081	REPORTED	1.0019	0	1.0008	0	1.0008	0	
SPECIFIC MINIMUM	PERMITTED	1.000		1.000		1.000		GRAVITY
500572581	REPORTED	0 (1)	0	0 (3)	0	260	0	
ANNULUS MINIMUM	PERMITTED							PRESSURE
500582561	REPORTED	0 (2)	0	0 (4)	0	172	0	
ANNULUS 100 PSI	PERMITTED							PRESSURE
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE

Explanation of Intermittent Well Shutdowns, Fourth Quarter, 1992

Footnote	Date	Explanation
1	10/4/92	Well shutdown for maintenance work on the brine pump. Shutdown for approximately 6 hours.
	10/16/92	Well shutdown for pump repair. Shutdown for approximately 5 hours and 30 minutes.
	10/21/92	Well shutdown for approximately 5 hours.
	10/28/92	Well shutdown for approximately 9 hours.
2	10/03/92	Well Shutdown.
	10/13/92	Process Upset; approximately 42 minutes.
	10/14/92	Transmitter problems for approximately 18 minutes.
	10/16/92	Well Shutdown.
	10/20/92	Process Upset; approximately 28 minutes.
	10/21/92	Process Upset; approximately 27 minutes.
	10/21/92	Well Shutdown for approximately 5 hours.
	10/28/92	Well Shutdown for approximately 9 hours.
4	11/22/92	Well Shutdown.

[illegible]
[illegible] CITY, TEXAS

77414

SYS	PERMIT NUMBER		YEAR
[illegible]	[illegible]	[illegible]	[illegible]

THIS REPORT TO BE USED FOR WELL 7 BAY CITY PLANT

TWC COPY

1. Quality of injected fluid: Discuss any significant change in constituents or concentrations of the injected waste.

No significant change!

2. Operating Conditions
   A. Have any operational problems occurred during this report period? No
   B. Have any workovers been performed during this report period? No
   C. Has any significant change occurred in any of the monitored parameters which might indicate a leak or other failure of the well? No
   D. if the answer to any of the above is yes, then briefly describe.

I CERTIFY THAT I AM FAMILIAR WITH THE

SEE BACK FOR INSTR

P.O. BOX 509
BAY CITY, TEXAS
77414

40A	WW0000049	00103	92
SYS	PERMIT NUMBER		YEAR

THIS REPORT TO BE USED FOR WELL 4 BAY CITY PLANT

TWC COPY

PARAMETER	MONTH	OPERATIONAL DATA 10 VALUE	NO. EX.	11 VALUE	NO. EX.	12 VALUE	NO. EX.	UNITS
000035242 HOURS MONTH	REPORTED	744	0	720	0	744	0	OPERATE
	PERMITTED							
500507080 INJ RATE MAXIMUM	REPORTED	186	0	180	0	195	0	GAL/MI
	PERMITTED	750.00		750.00		750.00		
500507239 VOLUME TOTAL	REPORTED	5.0443	0	5.6592	0	4.0622	0	MGM
	PERMITTED	33.480000		33.480000		33.480000		
500507343 VOLUME TOTAL	REPORTED	36.9878	0	42.6470	0	46.7092	0	(MG)
	PERMITTED	394.200		394.200		394.200		
500562580 INJ PRES MAXIMUM	REPORTED	565	0	550	0	580	0	PSI
	PERMITTED	775.00		775.00		775.00		
500566080 SPECIFIC MAXIMUM	REPORTED	1.0032	0	1.0028	0	1.0075	0	GRAVITY
	PERMITTED	1.100		1.100		1.100		
500566081 SPECIFIC MINIMUM	REPORTED	1.0019	0	1.0008	0	1.0008	0	GRAVITY
	PERMITTED	1.000		1.000		1.000		
500572581 ANNULUS MINIMUM	REPORTED	240	0	270	0	265	0	PRESSURE
	PERMITTED							
500582561 ANNULUS 100 PSI	REPORTED	<100 (1)	0	131	0	120	0	PRESSURE
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							
	REPORTED							
	PERMITTED							

I CERTIFY THAT I AM FAMILIAR WITH THE

Explanation of Intermittent Well Shutdowns, Fourth Quarter, 1992

Footnote	Date	Explanation
1	10/17/92	Motor Valve Problems; approximately 32 minutes.