VCM Plant

Conoco Chemicals
Continental Oil Company
P.O. Box 605
Westlake, Louisiana 70669
(318) 882-0550

June 21 , 1974

United States Environmental Protection Agency
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Attention: Mr. Don R. Goodwin

Gentlemen:

In accordance with your request we are submitting the enclosed information with regard to vinyl chloride emissions. The following items are included per your letter dated May 30, 1974:

I. Process And Emission Data

A. Brief Process Description And Process Flow Sheet
B. Listing Of Continuous And Intermittent Emission Sources On A Simplified Process Flow Drawing.
C. Discussion Of Existing And Possible Control Devices.
D. Listing Of Fugitive Emissions.
E. Discussion Of Emission Control Procedures.

II. Control And Economic Data

A. Investment Cost Data For Present And Planned Emission Control Devices.
B. Operating And Maintenance Costs For Emission Control Devices.

III. Ambient Air Data

A. Results Of Ambient Air Sampling Of Vinyl Chloride And Discussion Of Analytical And Sampling Methods.
B. Source Emission Data And Discussion.

The CONOCO VCM Plant has previously submitted extensive data concerning hydrocarbon emissions. For your reference we have mailed on June 7, 1974

copies of our completed emission inventory questionnaire (EIQ) and hydrocarbon compliance plan as approved by the Louisiana Air Control Commission on May 2, 1974 and our EPA Air Pollutant Emission report dated January 18, 1974. These reports contain specific information concerning vinyl chloride emissions as well as data on other hydrocarbons.

There is an area of this submission which we consider to be a trade secret. Item 1-A is related to technology obtained under license and in confidence from Stauffer Chemical Company. This technology is incorporated in our commercial plant. It is our understanding that it is also licensed by Stauffer to other companies. We consider this technology to be quite valuable and proprietary to Continental and Stauffer and request that it be held in confidence.

Yours very truly,

R H Gerlach

R. H. Gerlach,
Acting Plant Manager

bw

BCC:
LNV-REL-RDG-RHG-JMc-RSM-CRH-DPC-
DEM-JCL-DVP-RTF-EMS

[redacted] pph Hours/YR

TANK CAR LOADING - 50

SHIP LOADING - 50

PUMP SEALS - 2.2 Ave.

RELIEF VALVES - 2.4 Ave.

SAMPLING - 6.3 Ave.

EQUIPMENT INSPECTION [redacted]

CAUSTIC BEDS 250 pph TANK FARM LOADING

T/A 413 pph

L.E. WASH FILTERS 197.5 pph

LEAKAGE 10 ?

IN-PROCESS WATER ? ~~(0.33)~~ 1 pph

TANK CAR HOSE CLEARING 33 pph

T-101 VENT 0.5

LIGHT ENDS VENT 144

WASH VENTS ?

Oxy Vent 28.7

		% VCM	SCFM	VCM PPH
TANK VENTS -	T-402	5.93	32.4	[redacted] 12.6
	T-405	0.39	36.2	1.4
	T-450	1.59	322.4	50.78
	T-451	0.1	506.7	5.0
	T-452	0.84	165.8	13.8
	T-453	0.05	286.7	1.4
	T-460	2.38	41.1	1.7
				86.6 pph

CCR 000035619

L.E Col. 12'ϕ x 75'

8482 ft^3

30 psig 100°F 5% VCT

$$8482 \times \frac{44.7}{14.7} \times \frac{520}{560} \times \frac{1}{379} \times .05 \times 67.5$$

= 197.5 pounds

Oxy — 0.02 lbs VCM / 100 lbs EDC

EDC MAKE = 0.99 x 1467 x 99 = 143,781 pph

VCM ALLOWABLE IN VENT = 28.76 pph (0.46 mole/hr.)

T-101 VENT —

LE Vent - 29019 SCFH 4% VCM ~3 pph

Samples - 1/4" tubing 3' x 27 samples/day

0.00072 x 3 x 27 = 0.06 ft³/day

= 0.45 gals/CM/day

or ~4 ppd

0.16 pph

CCR 000035621

BY _____ DATE 6-7-74 SUBJECT SIMPLIFIED PROCESS FLOW SHEET NO. _____ OF _____

CHKD. BY _____ DATE _____ CONOCO VCM PLANT JOB NO. _____

WESTLAKE, LOUISIANA DWG. NO. 1

PRODUCTION

STREAM NUMBER

DRY EDC TO/FROM STORAGE

WET EDC TO/FROM STORAGE

LIGHT ENDS TO STORAGE

ETHYLENE DICHLORIDE AND BY-PRODUCT STORAGE (8 TANKS)

VENT RECOVERY

VENT

1

2

VENT TO C-500

C_2H_4

Cl_2

DIRECT CHLORINATION

RECOVERED EDC

EDC WASHING

EDC PURIFICATION

PURE EDC TO STORAGE

1180MM lbs/YR

ACID WATER + SPENT CAUSTIC

RECOVERED EDC

TARS

TARS TO STORAGE

EDC STRIPPING

WATER TO SECONDARY TREATING SYSTEM

TARS

RECYCLE TREATING

EDC RECYCLE

VCM STORAGE SPHERES T-411 ABCD

VCM CHECK TANKS T-401 A/B

VCM

VCM PURIFICATION

EDC, VCM

HCl REMOVAL

EDC, VCM HCl

EDC CRACKING

EDC TO CRACKING

11,000 SCFM

ATM VENT 36" 148' ELEVATION

5

ATM 2" ϕ 20' ELV.

7

SEE DWG. NO. 2

VENT RECOVERY

RECOVERED VCM

730MM lbs/YR

6

VENT

VCM TANK CAR LOADING

C_2H_4 HCl

VENT

VENT RECOVERY

3

4

VENT TO C-500

AIR

OXY-CHLORINATION

RECOVERED EDC

OXY EDC TO WASH

C-500 SPRAY TOWER

MISC. RELEIFS AND MINOR VENTS

VENTURI

SCRUBBING WATER

WATER TO SECONDARY TREATING SYSTEM

ATM 2" ϕ 50' ELV

9

SEE DWG. NO. 3

VENT RECOVERY

RECOVERED VCM

8

VENT

VCM SHIP LOADING AT CONOCO DOCKS

CCR 000035622

	1	2 A	3	4 A	5 A	6 B	7 B	8 C	9 D
POUNDS VCM PER HOUR E	1.2	1.2	NA	65	122	1916 THEORETICAL MAX	1516 THEORETICAL MAX	5967 THEORETICAL MAX	2738 THEORETICAL MAX
CONCENTRATION MOLE PPM OR %	600 ppm	712 ppm	NA	600 ppm	1120 ppm	79.2% BALANCE N_2	79.2% BALANCE N_2	94.2% BALANCE N_2	87.3% BALANCE N_2
POUNDS VCM EMISSION PER POUND VCM PRODUCED	0.000013	0.000013	NA	0.00134	0.00137	NA	NA	NA	NA
TYPE OF VENT INTERMITTENT VENTS SHOW APPROXIMATE HOURS/YEAR	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	CONTINUOUS	INTERMITTENT 400 MAXIMUM	INTERMITTENT 400 MAXIMUM	INTERMITTENT 290	INTERMITTENT 290

A - WEEKLY LAB ANALYSIS

B - CALCULATED WORST CASE ZERO EFFICIENCY 240gpm LOADING RATE @ 80 PSIG, 95°F

C - CALCULATED 1300gpm LOADING RATE @ 45 PSIG, 75°F

D - CALCULATED 1300gpm LOADING RATE @ 90 PSIG, 100°F

E - BEST ESTIMATE

I - A

CONOCO VCM PLANT

BRIEF PROCESS DESCRIPTION

In the Direct Chlorination Unit, ethylene and chlorine are reacted in the liquid phase to form crude ethylene dichloride (EDC). The crude EDC is mixed with recycled EDC from the VCM purification unit and then processed in the EDC washing section. EDC produced in the oxychlorination unit is neutralized prior to being sent to the EDC purification section. Within the EDC purification section the neutralized EDC is fractionally distilled first to remove low boiling impurities (Light Ends) and water and then to remove high boiling impurities (Tars).

Purified anhydrous EDC is thermally cracked in the EDC cracking unit to form hydrogen chloride (HCl) and vinyl chloride monomer (VCM). The HCl is isolated by distillation in the HCl removal section and sent to the oxychlorination unit. The VCM purification unit then separates the vinyl chloride product and the uncracked EDC which is recycled to purification. The vinyl chloride product is sent to check tanks for analysis and then transferred to storage spheres. From storage, vinyl product is loaded into railroad tank cars or VCM cargo ships.

In the oxychlorination unit, HCl, oxygen, as air, and ethylene are combined to form EDC and water. The EDC produced in this unit is sent to the EDC washing section.

I - C

EXISTING EQUIPMENT

CONTROL AND ECONOMIC DATA

CONOCO VCM PLANT

Tank Car Vent Recovery Unit - Built 1970 (Retrofitted)

1. Engineering description - See DWG. No. 2.

Railroad tank cars which are not in dedicated vinyl chloride monomer service must be nitrogen purged to remove oxygen from these cars before loading vinyl. When initially loaded this nitrogen must be vented from the tank cars to prevent overpressure. The vented nitrogen which contains VCM vapors is piped from the rail cars to the tank car vent recovery condenser (H-485). Vinyl chloride is condensed from the nitrogen and is collected in the vent recovery receiver (T-490). The nitrogen is then vented through a pressure control valve to the atmosphere. The recovered VCM is batched to the VCM storage spheres.

This system will operate on approximately 100 railroad tank cars per year (4 hours per car or 400 hours maximum per year). Unit efficiency will vary depending on ambient weather conditions. Average concentration of this vent is unknown, however, the calculated maximum theoretical rate of vinyl chloride emission is 1516 pounds per hour.

Note: The tank car vent recovery unit was originally designed for dedicated VCM tank car loading. Unit efficiency while operating at the orignal design conditions is 100 % with no VCM emissions.

2. Investment cost - $69,000 installed. (1970 Dollars)

3. Operating cost - 400 hours operation per year. (1974 Dollars)

a.	Utilities	$ 30.00
b.	Labor	320.00
c.	Maintenance	4150.00
	Total	$4500.00

Dock Vent Recovery Unit - Built 1970 (Retrofitted)

1. Engineering description - See DWG. No. 3.

The dock VCM recovery unit operates only a few days per month and use rate varies greatly depending on shipping load and condition of the ship. Ships which are not in dedicated vinyl chloride service must be nitrogen purged to remove oxygen prior to loading. When initially loaded these purged ships must be vented to remove nitrogen to prevent overpressure. The vented nitrogen which contains VCM vapor is piped from the ships tanks to a 200 h.p. compressor (BL625).

The stream leaves the compressor at 90 psig and is piped to the ship vent condenser (H - 625). The condensed VCM is separated in a receiver (S-625) and returned to the ship. The nitrogen is vented through a pressure control valve to the atmosphere.

The dock VCM recovery vent will operate approximately 290 hours per year. The unit efficiency changes depending on ambient temperature and weather conditions. Average concentration of this vent is unknown, however, the calculated maximum theoretical instantaneous rate of vinyl chloride monomer emission is 2738 pounds per hour.

Note: The dock vent recovery unit was originally designed for dedicated VCM ship loading. Unit efficiency while operating at the original design conditions is 100% with no VCM emissions.

2. Investment cost - $75,000 installed. (1970 Dollars)

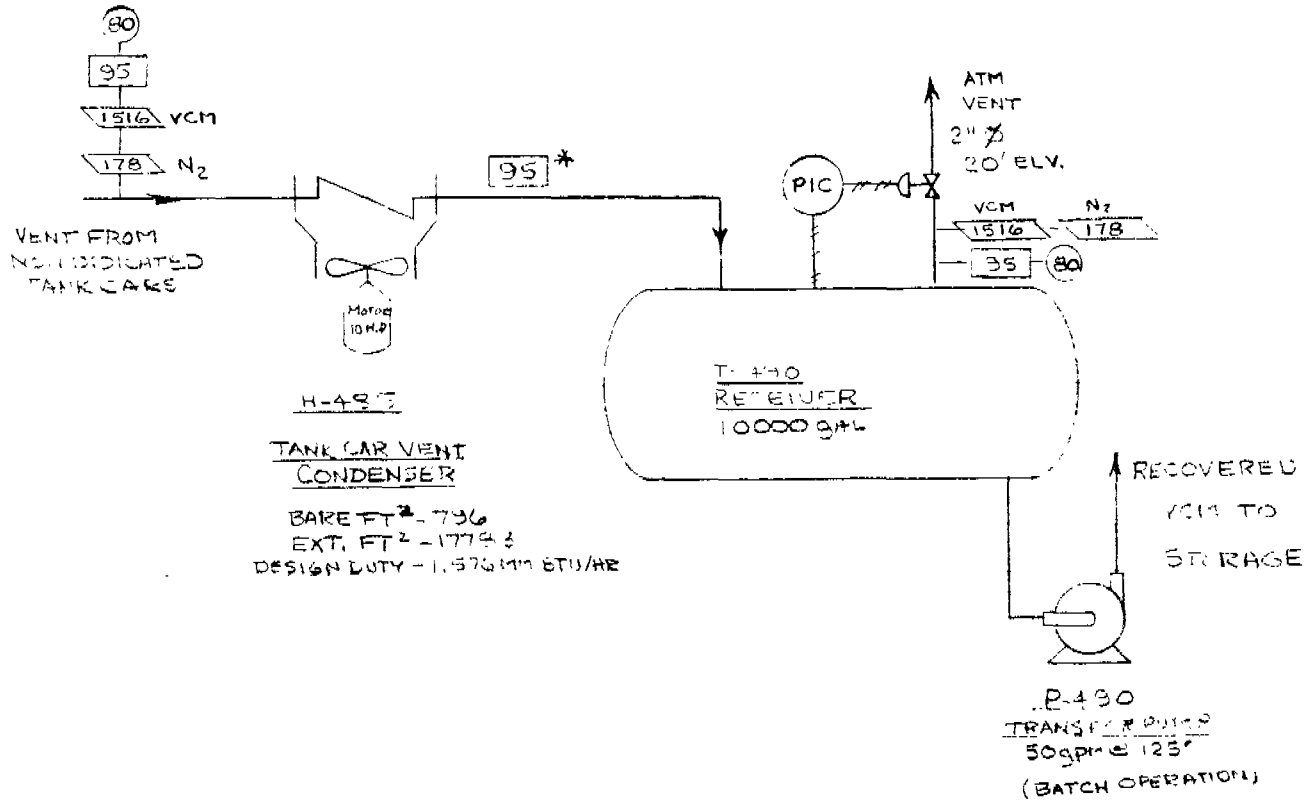
3. Operating cost - 290 hours operation per year. (1974 Dollars)

a.	Utilities	$ 380.00
b.	Labor	2,320.00
c.	Maintenance	4,500.00
	Total	$7,200.00

I - C

DRAWING NO. 2

EXISTING VCM TANK CAR
VENT RECOVERY UNIT



○ PRESSURE, PSIG

▭ TEMPERATURE, °F

▱ FLOW, lbs PER HOUR

* WORST CASE 95°+ AMBIENT TEMPERATURE

CCR 000035626

CONOCO VCM PLANT
WESTLAKE, LA.

6,
6-12-74

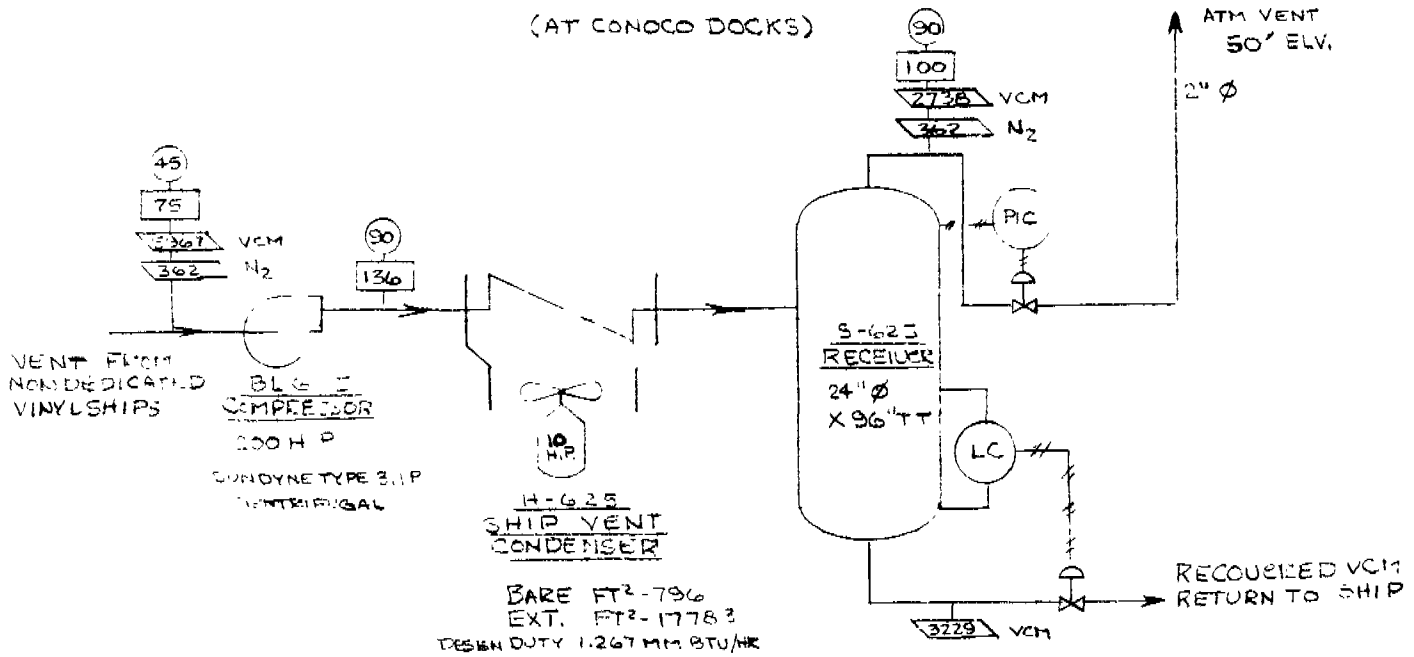
H-C

DRAWING NO. 3

EXISTING SHIP

VENT RECOVERY UNIT

(AT CONOCO DOCKS)



○ PRESSURE, PSIG

▭ TEMPERATURE, °F

▱ FLOW, lbs PER HOUR (REPRESENTS TYPICAL MAXIMUM)

CCR 000035627

CONOCO VCM PLANT
WESTLAKE, LA

6-12-74

I - C

POSSIBLE EMISSION CONTROL SYSTEM

FOR THE VCM TANK CAR LOADING VENT

AND THE SHIP LOADING VENT

The VCM plant is currently under an implementation schedule with the Louisiana Air Control Commission for installation of control devices on the VCM tank car and ship vents. The tank car unit will consist of a refrigerated condenser which will reduce the maximum VCM vent from 1516 pounds per hour to less than 50 pounds per hour. An associated 148 foot vent stack will lower expected ambient ground level concentrations to less than 0.1 ppm. The estimated installed cost of this unit is $350,000.

The proposed ship loading unit will consist of compression and refrigeration equipment. The unit is expected to lower the maximum VCM emission rate to approximately 50 pounds per hour at an estimated cost of $1,000,000. An associated 148 foot vent stack will lower expected ambient ground level concentration to less than 0.1 ppm.

I - D

ESTIMATED

FUGITIVE EMISSIONS

CONOCO VCM PLANT

1. Vinyl Chloride Sampling

   a. Basis of estimate - 4 times sample volume as purge and sample loss.
   b. Number of VCM samples per day - 27 typical.
   c. Estimated daily vinyl loss - 214 pounds per day.
   d. Location - 9 samples within processing battery limits.
      Balance in tank farm and loading area.
   e. Possible control system - VCM recycle sample systems are now being installed where applicable. (SEE DWG. No. 4).

2. Vinyl Chloride Pump Seal Leaks

   a. Basis of estimate - AP - 40 Air Pollution Engineering Manual, U.S. EPA, second. edition 1973, page 685.

      Volatile organic service with mechanical seals.

-Average continuous pump loss	7.9 lbs/day
-Average standby pump loss	4.4 lbs/day

   b. Estimated daily VCM loss (factored for vinyl content and percent operating time).

3 1/2 continuous pump	27.6 lbs/day
5 1/2 standby pumps	24.2 lbs/day
Total	51.8 lbs/day

   c. Location - 3 continuous pumps and 3 standby pumps in process battery limits.
      Balance in tank farm area.
   d. Possible control system - unknown.

3. Vinyl Chloride Relief Valve Leaks

   a. Basis of estimate - AP - 40, page 291
      Relief valves in operational serviae - 2.9 lbs/day (average)
   b. Estimated daily loss,
      20 Valves - 58 lbs/day.
   c. Location - throughout plant.
   d. Possible control system - unknown.

4. Other Fugitive Emissions

Emissions from other potential fugitive sources such as valve stem leaks and wash system vacuum breaker vents have no basis for rate estimation at present.

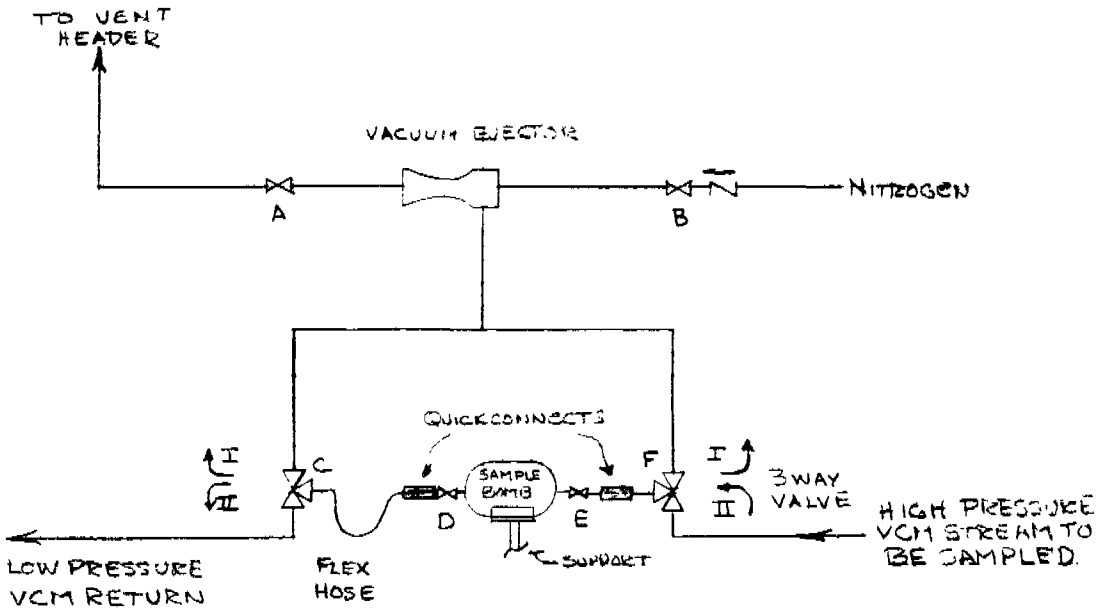
Fugitive emission of vinyl chloride vapor results from venting of the dip-tube on rail car tank cars during vinyl loading. The dip-tubes are used to determine the tank car liquid level. These dip-tubes were previously open to the atmosphere resulting in an undetermined vinyl emission. A system is now being installed to contain this emission and ultimate recovery is being considered. This system is shown on drawing No. 4 A.

I-D

DRAWING NO. 4

CONOCO VCM PLANT

VCM SAMPLE SYSTEM



Sample Procedure

1. Hook up sample bomb, valves C and F in position I.
2. Open valve A, open valve B.
3. Set valves C and F to position II.
4. Open valve E, open valve D.
5. Circulate 1 minute, close valve E, close valve D.
6. Set valves C and F to position I.
7. Close valve A, close valve B.
8. Remove sample bomb.

Discussion:

System will recycle sample bomb purges back to the process. Only vinyl loss will be VCM vacuum purged from between valves C - D and E - F plus sample loss in laboratory.

Estimated installed cost: $500.00 each.

CCR 000035631

Conoco VCM Plant
Westlake, La.

6-13-74

I-D

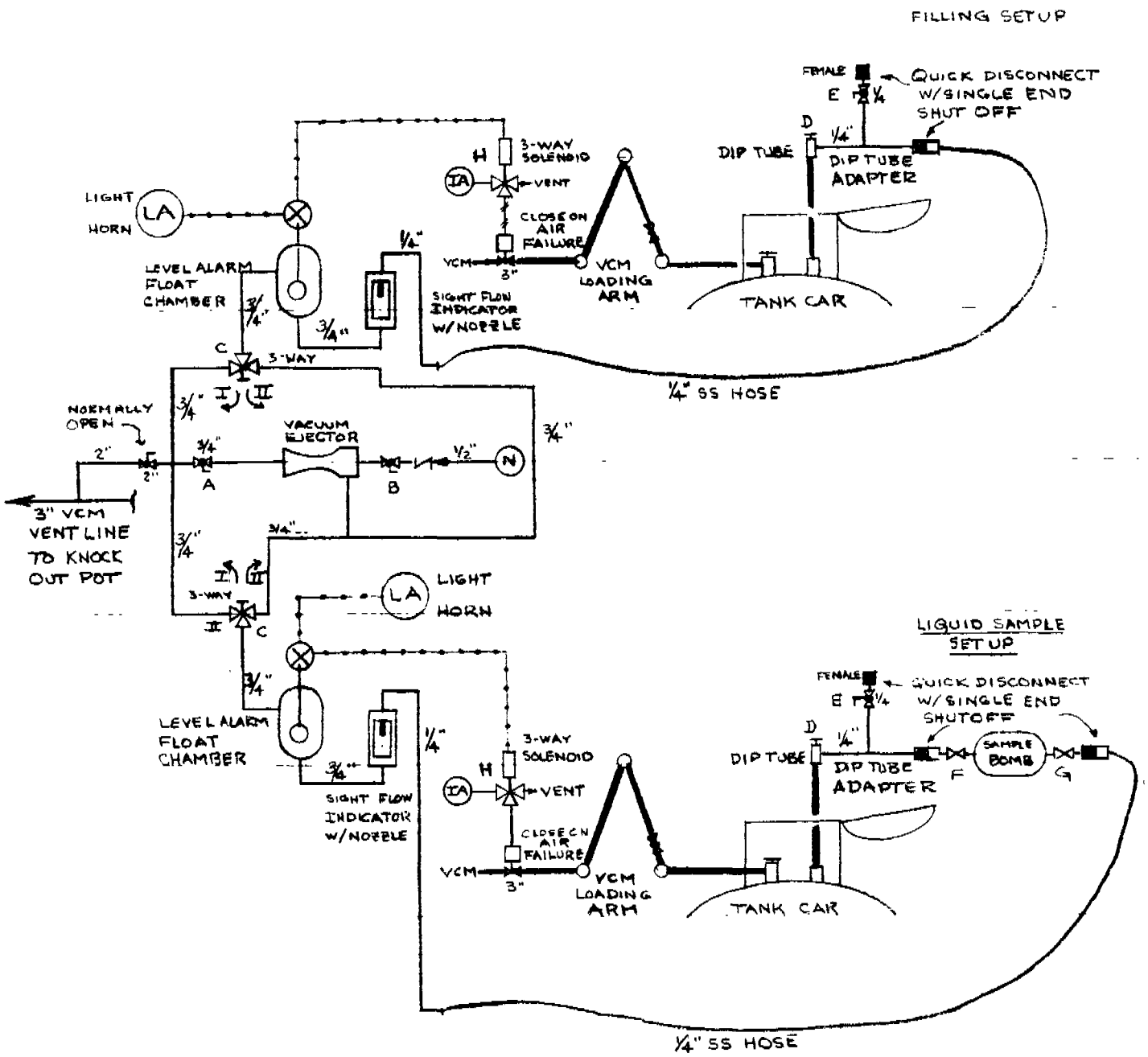
DRAWING NO. 4A

CONOCO VCM PLANT

DIP TUBE EMISSION REDUCTION

TYPICAL SETUP

(5 REQUIRED AS DRAWN)



EXISTING

NEW

(N) NITROGEN

(IA) INSTRUMENT AIR

BALLVALVE

NOTE: NEW 3" VENT LINE TO MANIFOLD ALL TEN LOADING SPOTS INTO THE NEW TEMPORARY KNOCKOUT POT AND VENT STACK.

CCR 000035632

4-19-74

1 OF 7

I - D

VESSEL BLOWDOWN EMISSION

ESTIMATES

1. Filter Changeouts

   a. Basis of estimate - Contained vinyl vapors at 100 psig and 60° F.
   b. Estimated loss per changeout - 10 lbs.
   c. Frequency of changeout - 2 Filters changed out once per month.
   d. Location - Tank farm area.
   e. Possible emission control -
      Nitrogen purge of filters to proposed tank car recovery vent refrigeration system.

2. In Plant Caustic Drying Vessels

   a. Basis of estimate - Contained vinyl vapors at 100 psig and 60° F.
   b. Estimated changeout - 1000 lbs/changeout.
   c. Frequency of changeout - Once per week.
   d. Location - Process battery limits.
   e. Possible control system - Unknown.
      Vessel currently is purged into the 148 foot C - 500 vent stack.

3. Tank Farm Loading Vessels

   a. Basis of estimate - Contained vinyl vapors at 0 psig and 60° F plus
      VCM adsorbed on treating bed contents.
   b. Estimated changeout loss - 3400 lbs. per vessel or 6800 lbs. total per changeout.
   c. Frequency of changeout - 3 to 4 times per year.
   d. Location - Tank farm area.
   e. Possible control system -
      Nitrogen purge to proposed VCM tank car vent refrigeration system.

4. Battery Limits Maintenance

   All vessels within the process battery limits are nitrogen pressure purged of liquid vinyl and then nitrogen pressure purged of contained VCM vapors to the existing 148 foot C - 500 main process vent stack. This will occur approximately once every 9 months. Estimated vinyl loss from the vapor purges is approximately 9900 pounds maximum per system clearing if the process system contained only vinyl vapors. However, the process units are not pure VCM and contain other materials.

I - D

SUMMARY OF FUGITIVE AND BLOWDOWN EMISSIONS ESTIMATES

	Fugitive Sources	Pounds Per Day	Pounds Per Year	Pounds VCM Emission Per Pound VCM Produced
1.	Vinyl Sampling	214	73,000	0.0001
2.	Pump Seal Leaks	51.8	17,700	0.00002
3.	Relief Valve Leaks	58	19,800	0.000027
4.	Other Fugitive	No Estimate		
		Subtotal		0.000147

	Blowdown Sources	Pounds per Blowdown	Pounds Per Year	Pounds Yearly VCM Emission Per Pound VCM Produced
1.	Filter Changeouts	10	240	0.0000003
2.	Caustic Drying Vessel Changeouts	1000	52000	0.00007
3.	Tank Farm Vessel Changeouts	6800	27200	0.000037
4.	Battery Limits Maintenance	9900	19800	0.000027
		Subtotal		0.0001343

Note:
The above represents our best estimate and is approximate and not inclusive. Other sources of emission may exist but cannot be determined.

I-E

SPECIAL MAINTENANCE PROCEDURES

FOR VCM EMISSION CONTROL

CONOCO VCM PLANT

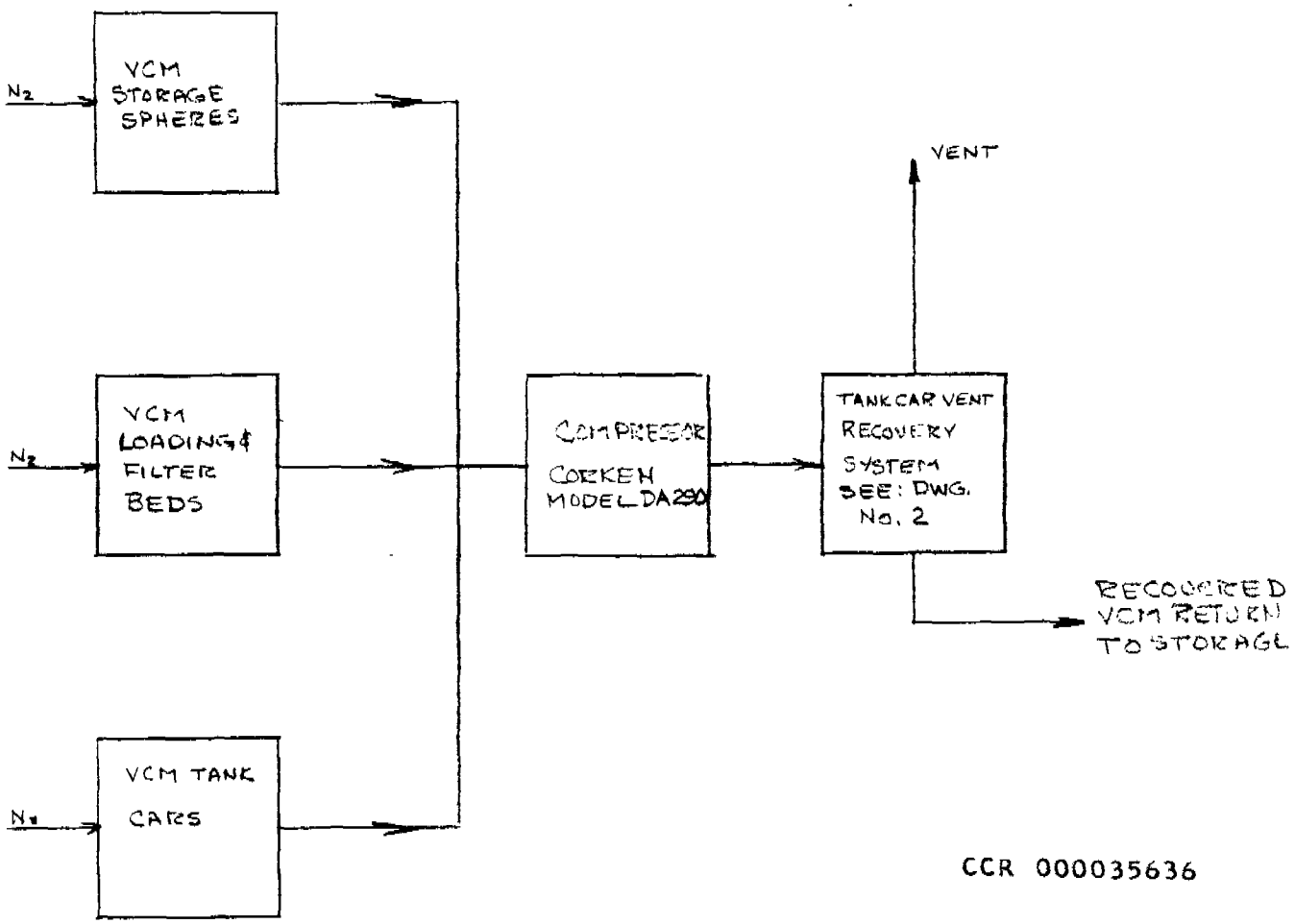
1. Tank Farm and Tank Car Maintenance

Required vessel and tank car maintenance in the tank farm area utilizes a small positive displacement compressor to pull down VCM vapors from the vessels. The compressor discharge is then piped to the existing tank car vent recovery unit (DWG. No. 2) to recover vinyl chloride. (See block diagram - DWG. No. 5)

DRAWING NO. 5

CONOCO VCM PLANT

SPECIAL TANK FARM AND VCM RAIL CAR MAINTENANCE VCM CLEARING SYSTEM



CCR 000035636

BRIEF DESCRIPTION

LIQUID VCM IS PRESSURED WITH NITROGEN FROM THE VESSEL REQUIRING MAINTENANCE. THE VESSEL IS THEN PULLED DOWN TO ATMOSPHERIC PRESSURE WITH A POSITIVE DISPLACEMENT COMPRESSOR. THE COMPRESSOR DISCHARGES TO THE EXISTING TANK CAR VENT RECOVERY UNIT WHERE SOME VCM IS RECOVERED. THE VESSELS ARE THEN PRESSURE PURGED WITH NITROGEN.

6-13-74

II
SUMMARY OF CONTROL SYSTEMS AND ECONOMIC DATA

A. Existing Units (Discussed in Section I)

1. Tankcar Vent Recovery Unit

Installed Cost	$ 69,000
Operating Labor	320 per year
Utilities	30 per year
Maintenance	4,150 per year
Pounds Recovered*	300,000 per year

2. Ship Vent Recovery Unit

Installed Cost	$ 75,000
Operating Labor	2,320 per year
Utilities	380 per year
Maintenance	4,500 per year
Pounds Recovered*	930,000 per year

B. Control Systems (Discussed in Section I)

1. Tankcar Vent Refrigeration

Estimated Installed Cost	$350,000
Pounds Recovered*	300,000 per year

2. Ship Vent Compression and Refrigeration

Estimated Installed Cost	**$1,000,000**
Pounds Recovered*	780,000 per year

3. **VCM Recycle Sample Systems**

Estimated Installed Cost (5 Systems now Installed)	$500 each

C. Other Possible Control Systems

1. Carbon Adsorption

Basic process is undefined and no estimated installed cost numbers are available. Technical and economic problems which must be resolved are poor carbon loading and bed regeneration with VCM recovery.

2. Absorption with another Compound

Process is undefined.

3. Vent Gas Incineration

Incineration will require investment in high energy consuming equipment costing nearly two million dollars. To incinerate the primary process vent, which is greater than 90% nitrogen, would require 1,319,500 gallons of distillate fuel per year or 170,280,000 SCF per year of natural gas to be consumed at a time when both of these energy commodities are in short supply.

Also, one product of combustion from such an incinerator, hydrogen chloride gas, must be removed from the air effluent. This would require additional investment in recovery or neutralization equipment. Estimated yearly neutralization cost are over $500,000.00.

Complexities in the control of such an incinerator during emergency shut-downs of various process units of the VCM Plant presents severe safety problems which must be resolved.

Excessive energy costs and other factors indicate this approach is environmentally unsound.

*Pure vinyl chloride monomer has an estimated market value of 7¢/lb. (Marketing Reporter June 17, 1974). Monomer recovered as above may not be suitable for marketing without further process treating.

A

Interoffice Communication

VISTA

To: Tom Grumbles

From: D. Penney
Date: November 15, 1993

Subject: LCVCM and Aberdeen Q & A

Here are the draft Q & As for Aberdeen and LCVCM. I've also included my comments on the draft answers that you prepared and sent over.

Let's discuss after you have had a chance to review.

5. Is the VCM skin disease, acroosteolysis, reversible?

I can't find any thing on this. Perhaps Dr. Ham can help here.

6. What's the difference between "known human" and "probable human" carcinogens?

A "known human" carcinogen is one for which there is strong evidence from human studies that exposure to the material can cause cancer. A "probable human" carcinogen is one for which there is some, but not conclusive, evidence that the material can cause cancer in humans.

7. Can you get VCM exposure through the skin? What about at concentrations where breathing air is required?

Absorption through the skin of very small amounts of VCM from the air is possible. Experiments with animals have estimated that only 0.023% of the VCM available in the air is absorbed through the skin at a concentration of 7,000 ppm. Humans wearing protective clothing would probably absorb an even smaller amount.

8. What does short-term exposure mean in the VCM "exposure history" slide?

The term "Short-term exposure" was used to contrast exposures which last anywhere from a minute or even as long as a few months with those lasting for years.

11. Who decides what causes certain kinds of cancers? How is this determination made?

This decision can be made by an individual, but usually groups of individuals with specialized knowledge (e.g. medicine, toxicology, epidemiology) are better at surveying the the different types of relevant scientific information available to make such a determination. These evaluations most often include information from human and animal studies as well as other organisms, including bacteria.

12. Who is Sir Richard Doll and what makes him an expert?

Sir Richard Doll was trained as a mathematician. He has achieved wide recognition in the scientific community for his contributions to the mathematical interpretation of human cancer studies. He holds an academic position at the University of Oxford in England and serves on numerous health effects advisory boards. He is widely published in peer-reviewed journals.

14. Can't equal "experts" come up with different opinions when looking at the same data?

Certainly, when it comes to making judgements on incomplete data about complex issues such as when a chemical causes cancer in humans, experts can disagree.
Sometimes these issues cannot be resolved until additional scientific information is available.

15. Why isn't the almost two-fold increase in brain cancer in the Wong study considered significant?

From the standpoint of the overall brain cancer rate in the U.S., this increase would be very small, approximately 0.004% greater than the already expected rate of about 0.005%. Of course, any increase is worthy of consideration and should be studied to confirm whether it is real and to understand the circumstances it may be related to.

17. What is the significance of EDC binding to DNA? Does VCM also bind to DNA?

For certain chemicals such as EDC it is thought that the process leading to the production of cancer is an initial binding to DNA. DNA is made of the genes which control the way a cell functions. By binding to DNA a chemical can cause changes in the genes which can alter the way cells grow, eventually leading to cancer. VCM is thought to work through a similar process and is known to bind to DNA as well.

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Aberdeen Q & A

1. What are the results of the last update to the angiosarcoma registry which was published in 1991? Are any Vista people in the registry? When will the next registry update be available?

The angiosarcoma registry is a world-wide registry of all cases of angiosarcoma of the liver which have been attributed to vinyl chloride exposure. As of the last review, 161 cases had been entered into the registry. 39 of these cases were from the U.S., but none of these cases were from Vista. Vista has not had any cases of angiosarcoma of the liver diagnosed in its workers at any site.

A more recent update of the registry has just been completed. Hopefully, we will have a copy of it available to us within the next few months.

2. Are there studies that show chemical workers have a higher risk of Cancer?

Some studies show that chemical workers that have been exposed to certain chemicals or chemical processes have a higher risk of some forms of cancer. Usually, the higher risks have been linked to chemical exposures which were higher than those encountered today.

3. Do we have data from each plant on the risk of cancer?

Vista maintains medical records on its employees. However, the Company does not they have not been studied to determine whether any particular plant is at an increased risk of cancer.

4. How is the information on cause of death collected?

The cause of death is obtained from the death certificate. A copy of the death certificate can be obtained from the local health authorities where the death occurred. Often, the most difficult part of the process is in finding the place of death of former employees, particularly if the employee only worked with the company for a short period of time. Sometimes this information can be obtained from company records, other employees or the National Death Registry, which is a registry of the location of all deaths in the U.S.

5. Why are studies typically conducted on deceased individuals? Why not conduct surveys of plant people and see what problems people have?

Most often the focus is on the causes of death because this information is easier to obtain and it provides data about the most serious diseases. Obviously, other diseases, though not life threatening, can have a major impact as well. Surveys can provide this information although the accuracy of the data can be a problem. Often, people do not know the specific disease that they or other individuals may have experienced.

6. Do the studies in the presentation that was given by D. Penney take into account exposure to other chemicals besides vinyl chloride?

Most studies of workers engaged in VCM or PVC manufacturing or processing have not taken potential exposure to other chemicals into account. This is a area worthy of further investigation.

7. What are the health effects of trichloroethylene (TCE)?

TCE can produce skin irritation probably due to its ability to dry the skin. Nervous system damage has been attributed to overexposure to TCE. Large doses of TCE produce liver and kidney disorders in animals, but these effects would not be anticipated in the accepted range of occupational TCE exposures. Individuals have died from the accumulation of fluid in the lungs produced by intentionally sniffing high concentrations of TCE.

TCE is considered a potential human carcinogen because it has caused the production of tumors in mice.

8. How are animal studies used to determine whether a chemical can cause cancer?

Animal studies are one of many sources of information used to help determine whether a chemical causes cancer. A chemical that has been shown to cause cancer in animals may, without data to the contrary, be presumed capable of causing cancer in humans.

10. Why does it take so long to get data from cancer studies?

It takes a long time to gather and analyze the data, particularly, when many thousands of individuals are involved. After the study is completed, it must it is reviewed by other scientists before it is published in the scientific literature. This review can take a long time, but is critical to establishing the validity of the study.

11. Do cancer studies include data on specific individuals?

Yes, in some studies information is gathered on all individuals who have had exposure to a particular chemical or group of chemicals. In other studies, individual information is only gathered on individuals who have the particular disease that is being investigated.

12. Have there been studies of how many people have cancer in the Aberdeen area? Have there been studies of the causes of these cancers?

Not to our knowledge.

14. Has CMA been accused of using bad information in its studies of workers exposed to Vinyl Chloride? Who pay for the studies? How do we know the studies are not biased based on who paid for the studies? Does anyone disagree with the conclusion of these studies?

CMA has not been accused of using bad information in its study. While it is true that it is the member companies of CMA that pay for these studies, CMA goes to great lengths to assure their scientific integrity. CMA chose to have the study of the vinyl chloride workers published so it would face the scrutiny of scientists who do not have any connection with industry. We do not know of anyone who disagrees with the conclusions of the CMA study.

15. What is the risk of breathing PVC dust?

High levels of PVC dust exposure have been associated with changes in the lungs. These changes, though detectable, are not considered serious. Obviously, prolonged high-level exposure to PVC dust should be avoided.

16. We used to have benzene in the plant. What are the health effects of benzen exposure?

Benzene exposure has been linked with the production of leukemia in humans. Exposure to benzene can also lead to dizziness, abnormal heart beat, fluid in the lungs and irritation of the lungs and the digestive tract. Long-term exposure can also hinder the formation of blood cells and damage the genetic information of cells.

17. What are the health effects of AMS (alpha- methyl styrene)?

In animals, AMS exposure has been shown to produce effects on both the liver and the kidneys. In humans, AMS has been shown to produce irritation of the eyes, skin and upper respiratory tract. Prolonged exposure of humans to AMS has also been shown to learn to sleepiness and other signs of depression of the central nervous system.

DRAFT 11/10.93

LCVCM Plant - Q & A Page 1

Q. What kind of cancer did Jim Debernardi die from?

A. Jim died from

Q. Were the early angiosarcoma deaths reported by the PVC industry from the Aberdeen plant?

A. No. There have been no reported cases of angiosarcoma at any Conoco chemical or Vista PVC plants. The reported angiosarcomas that resulted in the OSHA VCM standard were initially ~~reported in~~ from workers from a BF Goodrich PVC plant in Louisville, Kentucky.

Q. How many deaths have occurred at Vista/Conoco from VCM exposure?

A. There are no known or confirmed deaths that have been attributed to VCM exposure. Most of you are aware of current litigation that alleges an employee's death was a result of VCM exposure but this is not confirmed.

Q. When were LCVCM plant employees first told of brain cancer studies?

A. There are at least two times that plant employees were provided information in the 1970's. The first was a bulletin board posting of a letter from Jim Debernardi and the second time was a ChemNews article in _____ 1979. (Question - should we attach copies?). There were also employee meetings and information provided in 1989.

I don't think so, just have them available.

Q. What is the Odor Threshold for VCM and EDC?

A. Odor thresholds are difficult to specifically determine based on the wide range of individual sensitivities to odors. As a result there are few "official" odor thresholds determined, and most are reported in ranges. Based on a review of available studies the following is reported:

VCM

EDC

Q. Are any studies of VCM health effects going on now?

A. Vista is not aware of any active toxicity or epidemiological studies being done at this time.

Vista is discussing on update of the previous CMA Vinyl Chloride worker epidemiological studies with that organization. Vista is also reviewing the feasibility of studying the population of Vista workers. This may be difficult based on the small size of our worker population. This was pointed out by NIOSH in their response letter which to Vista's request for a Health Hazard Evaluation in 1990. That letter was provided to all employees.

A

Aberdeen Q & A

Q. Do we have records of exposure to employees early in the life of the Aberdeen plant?

A. Routine sampling to measure individual employee exposure and general area VCM levels was not started until late 1974. At that time data was developed to measure exposures in the low parts per million range.

Prior to that time VCM measurements were made to evaluate safe conditions based on flammability or explosivity of atmospheres. These measurements evaluated much higher air levels, typically in the thousands of parts per million.

Q. Is there any specific ppm exposure level where you will get cancer.

A. It is not possible in most cases to determine a specific exposure level that will result in cancer. Specifically the OSHA permissible exposure limit of 1.0 ppm is based on the OSHA policy of setting exposure limits for carcinogens at the "lowest feasible level". It is not specifically determined based on the animal and human data available.

What about something like this?

In fact, the American Conference of Governments ?????????????????????????????????? 5.0 ppm is a safe exposure limit for VCM. (Should we elaborate on TLV's?)

Q. Paul Hubbard died of liver cancer. Is this death included in the CMA studies and did he die of angiosarcoma?

A. ~~There~~ The risk of getting cancer at a given exposure level varies from person to person. ~~At the same~~ Some might get cancer while others wouldn't. Most Carcinogens are considered to be capable of causing in some people even at very low levels of exposure. However the risk at these low levels of exposure are usually at a lot lower than other risks which all workers are exposed to.

Q. Has the exposure to VCM been different in PVC plants?

A. ~~In general~~, it is believed that VCM exposures were higher in PVC plants in the 1950's, 1960's and early 1970's. This is a result of ~~several reasons specific to the~~ the different ~~processes~~ at the time used. The process used in the past was a batch process that required routine entry and cleaning of the PVC reactors. Also, the amount of removal vinyl chloride in the PVC product was higher. Significant process changes in the early 1970's resulted in significant decreases in exposure potential.

LCVCM Q&A

1. ***What's the difference between "known human" and "probable human" carcinogens?***

A "known human" carcinogen is one for which there is ~~strong~~ **sufficient** evidence from human studies that exposure to the material can cause cancer. A "probable human" carcinogen is one for which there is some, but not ~~conclusive~~ **sufficient**, evidence **from either human or animal studies** that the material can cause cancer in humans.

2. ***Can you get VCM exposure through the skin? What about at concentrations where breathing air is required?***

Exposure to VCM through the skin is not considered a significant route of worker exposure. Experiments with animals have shown a very small amount (about 0.023 %) can be absorbed through the skin at a high concentration (7,000 ppm). Clothing would reduce skin absorption of VCM even more.

3. ***What does short-term exposure mean in the VCM "exposure history" slide?***

The term "Short-term" exposure was used to contrast chemical exposures which last anywhere from a minute or even as long as a few months with those lasting for years.

4. ***Who decides what causes certain kinds of cancer? How is this determination made?***

This decision can be made by an individual, but usually groups of individuals with specialized knowledge (e.g., medicine, toxicology and epidemiology) are better at evaluating the different types of scientific information which can go into this decision. These evaluations most often include information from human and animal studies as well as **from studies on** other organisms, such as bacteria.

5. ***Who is Sir Richard Doll and what makes him an expert?***

Sir Richard Doll was trained as a mathematician. He has achieved wide recognition in the scientific community for his contributions to the mathematical interpretation of human cancer studies. He holds an academic position at the University of Oxford in England and serves on many health advisory boards. He is widely published in well known scientific journals.

6. ***Can't equal "experts" come up with different opinions when looking at the same data?***

When making judgements about complex issues such as whether a chemical causes cancer in humans, experts can disagree. The matter can be especially complicated because studies often conflict with another and vary in quality. Sometimes these issues cannot be resolved until more scientific information is available.

7. ***Is the almost two-fold increase in brain cancer in the Wong study considered significant?***

Probably not for any single individual. However, any reported increase of a disease is worthy of concern, ~~however~~ **but**, the size of the increase in risk should be kept in perspective. A doubling of a very small risk, such as the risk of contracting brain cancer. which has been measured as about 7 cases per 100,000 individuals, ~~does~~ **may** not represent a ~~major~~ **significant** increase in risk for any one individual. ~~Small increases such as these~~ **Increase of a risk such as this, which is already rather low** should be noted for further investigation. ~~to determine their cause or causes.~~

8. ***What is the significance of EDC binding to DNA? Does VCM also bind to DNA?***

For certain chemicals such as EDC it is thought that the process leading to the production of cancer ~~is~~ **may be** an initial binding to DNA in the cell. ~~DNA is a molecule that is made of the genes which control the way a cell functions.~~ **Genes which are made of DNA control the way a cell functions.** By binding to DNA a chemical can cause changes in the genes which alter the way cells grow, eventually leading to cancer. VCM is thought to work through a similar process and is known to bind to DNA as well.

9. ***What kind of cancer did Mr. Jim DeBernadri die from?***

According to his death certificate, Mr. DeBernadri ~~contracted~~ **died from** colon cancer which spread to his liver.

10. ***Were the early angiosarcoma deaths reported by the PVC industry from the Aberdeen Plant?***

No. There have been no reported cases of angiosarcoma at any Conoco or Vista PVC plants. The reported angiosarcomas that resulted in the OSHA VCM standard were initially from workers at a BF Goodrich PVC plant in Louisville, Kentucky.

11. ***How many deaths have occurred at Conoco/Vista from VCM exposure?***

Ther are no known ~~or confirmed~~ deaths that have been attributed to VCM exposure. Most of you are aware of current litigation that alleges an employee's death was a result of VCM exposure but this is not confirmed.

~~12. *When were LCVCM plant employees first told of brain cancer studies?*~~

~~There are at least two times that plant employees were provided information in the 1970's. The first was a bulletin board posting of a letter from Jim Debernardi and the second time was a ChemNews article in 1979. (Question - Should we attache copies?) There were also~~

~~employee meetings and information provided in 1989.~~

13. ***What is the odor threshold for VCM and for EDC?***

Odor thresholds are difficult to determine based on the wide range of individual sensitivities to odors. As a result, ~~there are~~ few "official" odor thresholds **have been** determined, and most are reported in ranges. With these qualifications in mind, the following values for VCM and EDC have been reported:

VCM 10 - 20 ppm (published studies of VCM odor thresholds are considered of limited quality)

EDC 6 - 185 ppm

14. ***Are any studies of VCM health effects going on now?***

Vista is not aware of any effects studies **on humans** ~~now~~ being conducted. However, Vista is discussing an update of the previous CMA Vinyl Chloride worker epidemiological studies with that organization. Vista is also reviewing the feasibility of studying the ~~population of~~ Vista's workers. This may be difficult based on the small size of our worker population. This was pointed out by NIOSH in their letter which responded to Vista's request for a Health Hazard Evaluation in 1990. That letter was provided to all employees. **(Attached.)**

15. **Has the exposure to VCM been different in PVC plants?**

It is believed that VCM exposures were higher in PVC plants in the 1950's, 1960's and early 1970's. This is a result of the different processes used at the time. The process used in the past was a batch process that required entry and cleaning of the PVC reactors. Also, the amount of residual vinyl chloride in the PVC product was higher. Significant process changes and environmental controls in the early 1970's resulted in significant decreases in exposure potential.

16. **Where can I get additional information about the health risks of chemical exposure?**

This document is an attempt to answer specific questions that have been raised about the health effects of vinyl chloride exposure. If you have other questions about the health effects of exposure to vinyl chloride or ~~other~~ any other, chemicals, you may call Mike Lunsford (ext. 5039) or Dave Penney (512/331-2468).

III - A

AMBIENT AIR DATA

A. Results of ambient air sampling of vinyl chloride and discussion of analytical and sampling methods.

The plant has sampled the ambient air in the vicinity of the plant on two occasions. These plant samples were taken simultaneously with Environmental Protection Agency Region VI personnel on April 24, 1974. In both instances no vinyl chloride was detected in the samples. Figure 1 attached shows the location of the VCM Plant process area, the C - 500 vent stack and the two sampling points. Table 1 shows the resulting data as well as the analysis of the C - 500 vent at the time the sample was obtained. The sample was collected using an evacuated glass bomb and analyzed via chromatographic separation and flame ionization.

The plant has collected data on the ambient air vinyl chloride concentration at the loading dock area during ship loading. Figure 2 shows the location of the sampling points and the present dock vent stack. A portable flame ionization device which is not specific to vinyl chloride was used to monitor the dock loading area. When the device recorded an abnormal reading indicating the suspected presence of vinyl chloride a glass bomb sample was obtained. This sample was then analyzed for VCM by chromatographic separation and flame ionization. During monitoring with the continuous device VCM ambient concentrations were suspected 5 times in 70 monitoring instances. The glass bomb samples were obtained in those 5 instances and analyzed. The results of the glass bomb samples have indicated concentrations of 3 to 26 ppm. We are in the process of obtaining further data. It should be noted that these values represent data of only 7% of the monitoring results at the dock and that VCM was not suspected in other instances. The vinyl chloride emission at the dock area occurs only during ship loading, approximately 290 hours per year.

TABLE I

AMBIENT AIR DATA

Date	April 24, 1974			April 24, 1974		
Time	11:30 am			2:30 pm		
Wind	NE 13 mph			NE 13 mph		
Temperature	77 ° F			77 ° F		
Condition	Clear			Clear		
Sample Point	C-500	A	B	C-500	A	B
Vinyl Chloride Conc.	1169 ppm (1)	(2)	(2)	1226 ppm (1)	(2)	(2)

(1) Represents concentration in gas leaving the stack.
(2) None Detected.

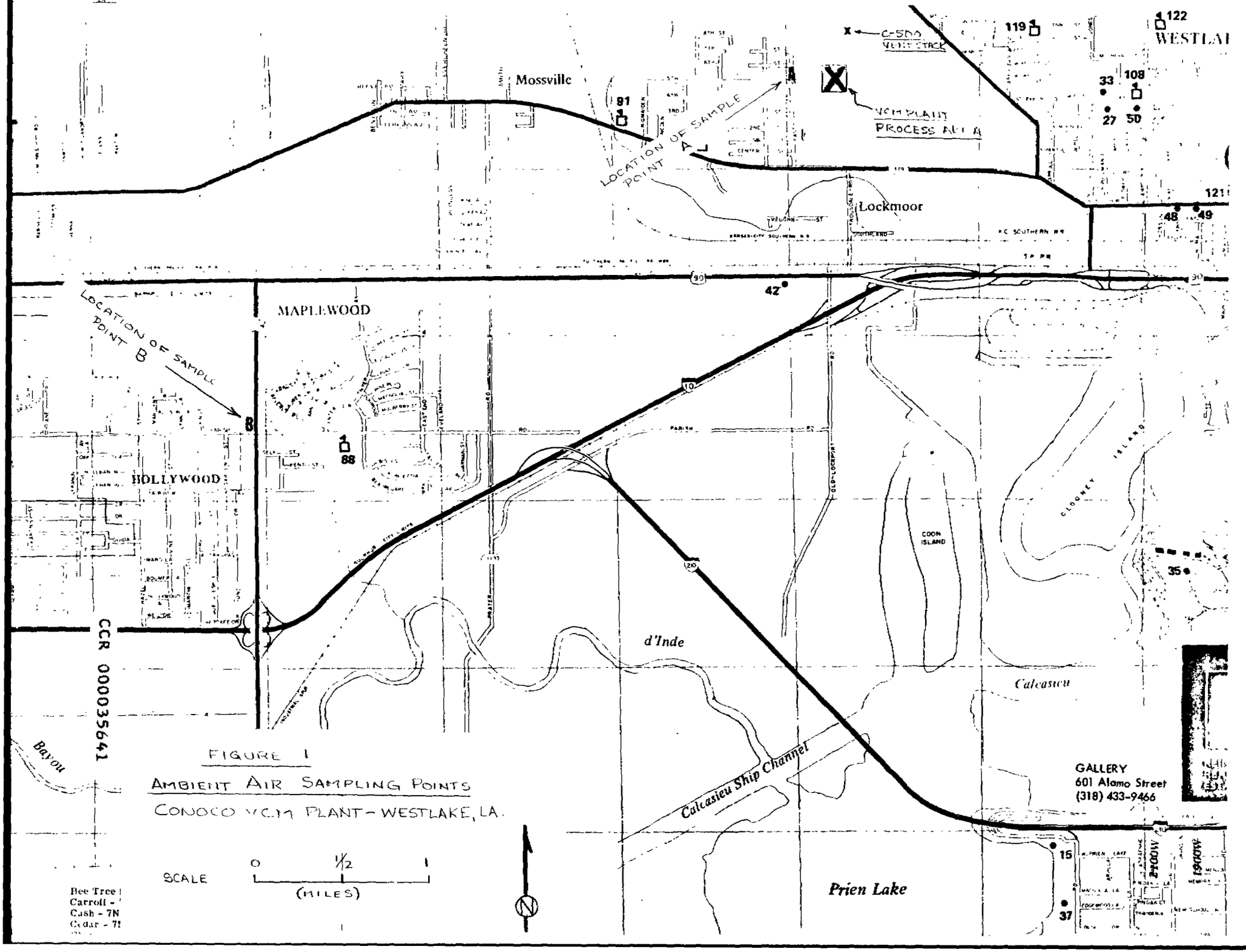
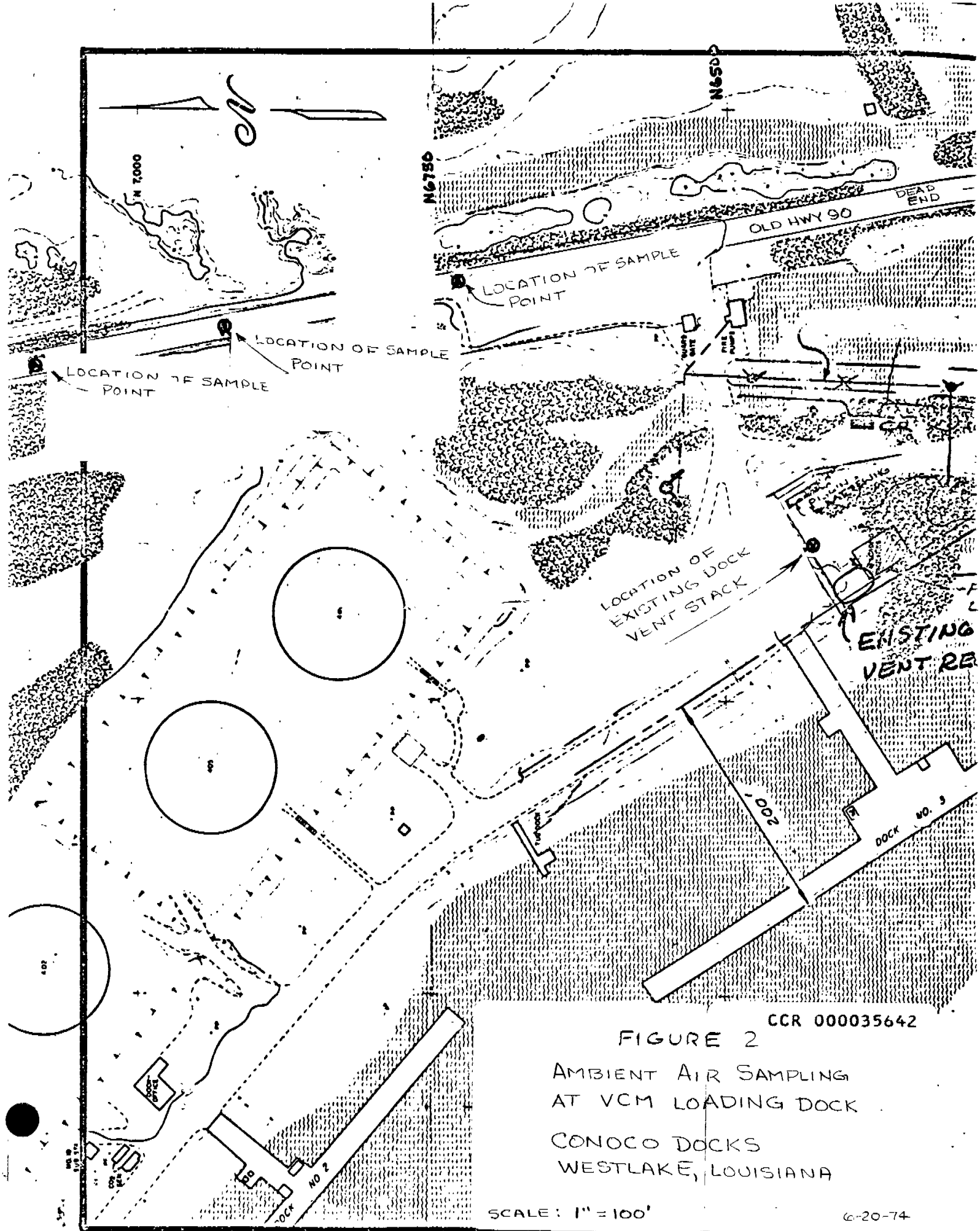


FIGURE 1

AMBIENT AIR SAMPLING POINTS

CONOCO VCM PLANT - WESTLAKE, LA.



CCR 000035642

FIGURE 2

AMBIENT AIR SAMPLING AT VCM LOADING DOCK

CONOCO DOCKS
WESTLAKE, LOUISIANA

SCALE: 1" = 100'

6-20-74

A. Specific vent information is shown on the attached drawings. Other information may be obtained from the EPA Air Pollutant Emission Survey submitted June 7, 1974.