

Data Requirement

US EPA OPPTS Health Effects Test Guideline 870.3700
OECD Guidelines for Testing of Chemicals; OECD Guideline 414
Prenatal Developmental Toxicity Study EPA 712-C-98-207, August 1998

STUDY NO. 03-4253

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY

IN RATS BY INHALATION EXPOSURE

Final Report

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Submitted to: American Petroleum Institute (API)
1220 L Street, Northwest
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Attn:

[REDACTED]

Date: 19 February 2010

GLP STATEMENT

This study was conducted in compliance with the United States Environmental Protection Agency's Good Laboratory Practice Standards 40 CFR Part 792 (TSCA) and Organization for Economic Cooperation and Development (OECD) Principles of Good Laboratory Practices ENV/MC/CHEM(98)17 with the exception of the following that were not considered to have effected the integrity of the study:

1. Animal body weights recorded on GD 0 by the Supplier were a non-GLP data collection.
2. Test substance characterization and storage stability testing was not performed in a GLP compliant laboratory.



19 FEB 10
Date



2/19/10
Date



SIGNATURE PAGE**SCIENTIST**

The following Scientist was responsible for the overall conduct of this study. Departmental supervisory personnel are listed on the personnel page of this report (Appendix T).

[REDACTED]

[REDACTED]

19 Feb 10
Date

SCIENTIFIC REVIEW

The following Scientist has reviewed and approved this report:

[REDACTED]

[REDACTED]

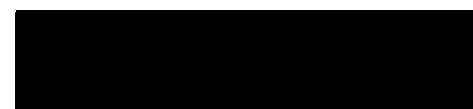
8 Feb 10
Date

[REDACTED] was the original scientific reviewer of this report and is no longer employed at the Testing Facility. [REDACTED] is assuming responsibility for final review of this report.

QUALITY ASSURANCE STATEMENT

Listed below are the dates that this study was inspected by the Quality Assurance Unit of Huntingdon Life Sciences, East Millstone, New Jersey, and the dates that findings were reported to the Study Director and Management. This report reflects the raw data as far as can be reasonably established.

Type of Inspection	Date(s) of Inspection	Reported to Study Director and Management
GLP Protocol Review	31 Jan - 2 Feb 05	2 Feb 05
Exposure, Monitoring and Equipment Records	22 Feb 05	25 Feb 05
Physical Examinations, Body and Feeder Weight Data Collection	2 Mar 05	2 Mar 05
Terminal Maternal Sacrifice, Fetal Examinations, Training Records and Protocol Amendment No.1	8 Mar 05	8 Mar 05
Inhalation Dose Confirmation Data and Report	24 Jun 05	24 Jun 05
Draft Final Report, Study Data and Statistical Analysis	28 Jun - 12 Jul 05	12 Jul 05
Final Report Review & Protocol Amendment No. 2	8 & 9 Apr 09	9 Apr 09
Protocol Amendment No. 3	8 Dec 09	8 Dec 09

9 Feb 10

Date

**LIQUIFIED PETROLEUM GAS:
EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE**

SUMMARY

This study was designed to assess the potential maternal and/or developmental toxicity of liquified petroleum gas (LPG) in the pregnant rat when administered by whole-body inhalation exposure. The study design permitted detection of gross maternal organ changes and effects on the developing conceptus, including death, structural abnormalities or altered growth.

Pregnant female Sprague-Dawley CD[®] rats (24/sex/group) were exposed daily for six hours per day to 0 (air control), 1000, 5000 or 10000 ppm LPG (note: highest exposure level is 50% of the lower explosive limit) for 7 days per week for gestation days 6 to 19. Exposure levels were determined using an infrared spectrophotometer (IR) 4 times per chamber per day. At the end of the treatment period, all animals were euthanized and necropsied. The following parameters were evaluated: viability, clinical observations, body weights, feed consumption, necropsy observations, pre- and post-implantation losses, fetal weights and the incidences of fetal abnormalities and variants including state of skeletal ossification.

The mean ($\pm$ standard deviation) analytical exposure concentrations of LPG were determined to be 0 ± 0 , 1013 ± 60 , 5079 ± 217 and 10426 ± 527 ppm for the air control and the exposure groups, respectively. Particle sizing results indicated that the atmospheres were essentially gas/vapor only, as expected, since there was no substantial difference in particle concentration between the test substance chambers and the air control chamber. Analysis of the major components in the neat test substance and the test atmospheres showed an acceptably close comparison between the neat test substance and the vaporized test substance. The data were consistent pretest and during the study indicating stability of the test substance and the atmosphere generation techniques.

There were no effects of treatment on maternal survival, clinical observations, body weights or feed consumption. There were no test substance related effects on corpora lutea numbers, pre- or post-implantation loss, or litter size and gravid uterine weight. There were no test substance related effects on fetal body weights, fetal variants or abnormalities or on state of ossification of fetal skeleton.

In conclusion, exposure of pregnant female rats to target concentrations of 1000, 5000 or 10000 ppm of LPG by whole-body inhalation for gestation days 6 to 19 resulted in no effects of exposure. Therefore, a no observed adverse effect level (NOAEL) for maternal toxicity and developmental toxicity of 10000 ppm was indicated.

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1. INTRODUCTION

This study was designed to assess the potential maternal and/or developmental toxicity of liquified petroleum gas in the pregnant rat when administered by whole-body inhalation exposure. This study design permitted detection of gross maternal organ changes and effects on the developing conceptus, including death, structural abnormalities or altered growth.

2. MATERIALS AND METHODS**2.1. STUDY MANAGEMENT****2.1.1. SPONSOR**

American Petroleum Institute (API)
1220 L Street, Northwest
Washington, D.C. 20005-4070

2.1.2. SPONSOR REPRESENTATIVE

[REDACTED]

2.1.3. TESTING FACILITY

Huntingdon Life Sciences (HLS)
100 Mettlers Road
East Millstone, New Jersey 08875-2360

2.1.4. STUDY DIRECTOR

[REDACTED]

2.2. STUDY DATES**2.2.1. STUDY INITIATION**

14 February 2005 (date study director signed the protocol)

2.2.2. DATES OF ANIMAL RECEIPT

18 February 2005 (experimental start date) * & 21 February 2005
(gestation days 0, 1 or 2)

*as per OECD GLPs

2.2.3. EXPOSURE INITIATION – FIRST GESTATION DAY 6

22 February 2005 (experimental start date) **

2.2.4. EXPOSURE TERMINATION – LAST GESTATION DAY 19

10 March 2005

2.2.5. TERMINAL SACRIFICES – GESTATION DAY 20

8 to 11 March 2005

**2.2.6. EXPERIMENTAL COMPLETION DATE – DATE OF LAST
FETAL EXAMINATIONS**

4 May 2005

2.2.7. STUDY COMPLETION

19 February 2010 (date final report is signed by the study director)

** as per EPA GLPs

2.3. EXPERIMENTAL OUTLINE

Group	Group Designation	Exposure Levels ^a (ppm)	Treatment Gestation Days	Number of Animals				
				Time-Mated Females	Euthanized Gestation Day 20	Fetal Evaluations (Fetuses/Litter)		
						External	Soft Tissue	Skeletal
1	Control	0 (air only)	6-19	24	All	All	~1/2	~1/2
2	Low	1000	6-19	24	All	All	~1/2	~1/2
3	Mid	5000	6-19	24	All	All	~1/2	~1/2
4	High	10000	6-19	24	All	All	~1/2	~1/2

^aExposures were 6 hours per day for 7 consecutive days per week. Exposure levels are expressed as ppm of test substance in the atmosphere and were conducted by whole-body exposure.

The first day of gestation (gestation day 0 = day of detection of positive sign of mating) was defined as day 0 of the study.

2.4. JUSTIFICATIONS

2.4.1. ROUTE, DURATION AND FREQUENCY OF ADMINISTRATION

The inhalation route is one of the potential routes of human exposure to this test substance. The duration and frequency of the exposures are recommended in the relevant OECD and EPA test guidelines, ensuring adequate exposure of post-implantation embryo-fetal development (see Section 2.17.1).

2.4.2. TEST ANIMAL SELECTION

The rat is used as a surrogate for humans in the detection of embryo-fetal toxicity and is the rodent species that is recommended by the relevant OECD and EPA test guidelines (see Section 2.17.1). Historical control data are also available with this strain of rat for comparative evaluation, if necessary.

2.4.3. NUMBER OF ANIMALS

The number of animals in this study (approximately 24/group) was considered the minimum necessary to allow for meaningful interpretation of study outcome. Some of the endpoints of principal interest (e.g. embryonic death, malformation) are low-frequency events and a target group size of approximately 20 pregnancies provides the necessary degree of consistency between studies. Therefore, in the normal expectation of pregnancy rates of 80-100%, a group size of 24 mated females was considered appropriate for this study. At least 3 exposure groups were required to describe any exposure relationship for any effects that might be observed, in comparison with a concurrent control group.

2.4.4. EXPOSURE LEVEL SELECTION

The Sponsor specified the exposure levels based on results of range-finding study (HLS study no. 03-6140; see Appendix U) which showed no effects at 100, 1000 or 10000 ppm. The upper exposure level was also specified so as not to use (for safety reasons) any more than 50% of the lower explosion limit ($LEL = 2.1\% = 21000 \text{ ppm}$) for the test substance.

2.5. TEST SUBSTANCE

Liquified Petroleum Gas (LPG)

2.5.1. TEST SUBSTANCE CATEGORY

Industrial gas

2.5.2. SUPPLIER

ChevronTexaco Energy Research & Technology Company
100 Chevron Way
Richmond, Virginia 94802

2.5.3. LOT NUMBER

120701-01

2.5.4. PURITY AND STABILITY

100% LPG (see analytical report in Appendix R)

2.5.5. DESCRIPTION

Colorless gas or liquid

2.5.6. DATE RECEIVED

30 August 2004

2.5.7. EXPIRATION DATE

31 December 2007

2.5.8. ANALYSIS

Documentation of the identity, strength, composition, storage stability, and method of synthesis, fabrication, and/or derivation of the test substance and the maintenance of these records were the responsibility of the sponsor. This documentation is maintained by the sponsor. The storage stability was the responsibility of the sponsor but the stability of the test substance under the condition of use was the responsibility of the testing facility.

2.5.9. STORAGE

Liquified petroleum gas was stored (ambient conditions) in an outside solvent shed except when in use in the inhalation laboratory. The test substance was handled as a flammable gas.

2.5.10. ARCHIVAL SAMPLE

The sponsor arranged for storage of an archival sample at a contract archival facility (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA 20166). Since multiple studies (03-6140 and 03-6141 and this study) were conducted with the same test substance, a common archival sample was taken and appropriately labeled. The testing facility arranged for safe transportation on 15 September 2005 of the archival sample to the archival facility, in compliance with all applicable regulations.

2.5.11. DISPOSITION

Following completion of the final study with this test substance, the testing facility informed the sponsor of the volume of remaining test substance as well as the number of test substance containers. The sponsor then instructed the testing facility to ship the test substance and containers to Chevron and this was done on 11 January 2007. No test substance or container (even empty ones) will be disposed of until the issuance of the final report.

2.6. TEST ANIMALS**2.6.1. SPECIES**

Albino Rats (Outbred) VAF/Plus®
Sprague-Dawley Derived (CD®)
CrI:CD® (SD) IGS BR

2.6.2. SUPPLIER

Charles River Laboratories
Raleigh, North Carolina 27610

2.6.3. NUMBER OF ANIMALS

Received: 100 timed-mated females.

Placed on study: 96 females.

2.6.4. AGE AND WEIGHT AT RECEIPT

The animals were 70 to 84 days in age and weighing 225 to 250 grams (non-GLP weights) on gestation day (gestation day) 0. Animals were received on gestation day 0, 1 or 2.

2.6.5. ACCLIMATION PERIOD

Acclimation was 4 to 6 days at the testing facility prior to commencement of exposure, as dictated by the mating and delivery schedule for the animals.

2.7. ANIMAL ASSIGNMENT

More animals than required for the study were purchased and acclimated. Animals considered suitable for study on the basis of pretest physical examinations, body weight and any other pretest evaluations, were randomly assigned to control or treated groups using a computerized randomization program (Toxicology Analysis System Customized, version 1.4). This ranked gestation day 3 body weights (first body weight recorded under GLP) in an attempt to minimize inter-group variability. Disposition of all animals not utilized in the study are maintained in the study file.

2.8. ANIMAL IDENTIFICATION

Each animal was assigned a temporary identification number upon receipt. Each animal was ear-tagged with an identification number, at allocation to a study group. This number served as the animal's permanent identification for the duration of the study. This number plus the HLS study number comprised the unique identification for each animal. Each study animal's cage was also ascribed a cage card, color-coded for exposure level identification and bearing the study number and animal number. Prior to assignment to a study group, each animal was identified only by a temporary number, ascribed to the individual cage that it occupied.

2.9. VETERINARY CARE

Animals were monitored by the technical staff for any conditions requiring possible veterinary care. The staff veterinarian approved the animals for inclusion on test.

2.10. ANIMAL HUSBANDRY DURING NON-EXPOSURE PERIODS**2.10.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY**

Currently acceptable practices of good animal husbandry were followed e.g., *Guide for the Care and Use of Laboratory Animals*; National Academy Press, 1996. Huntingdon Life Sciences, East Millstone, New Jersey is fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC).

2.10.2. HOUSING

All animals were housed individually in stainless steel suspended cages with wire mesh floors and fronts. Cages were arranged in such a way that possible effects due to placement were minimized. Each cage was fitted to secure a glass feeder jar with a stainless steel lid. Clean feed jars and fresh feed was provided at least every 6 days when feed consumption was recorded.

2.10.3. FEED

Certified Rodent Diet, No. 5002; (Meal) (PMI Nutrition International, St. Louis, Missouri) was available without restriction, except during exposure.

2.10.4. FEED ANALYSIS

Analysis of each feed lot used during this study was performed by the manufacturer. Results are maintained on file at the testing facility and included in Appendix Q. There were no known contaminants in the feed that were expected to interfere with the results of this study.

2.10.5. WATER

Water (Elizabethtown Water Company, Westfield, New Jersey) was provided without restriction except during exposures to individual animal cages through an automated watering system.

2.10.6. WATER ANALYSIS

Water analyses are conducted monthly by the Elizabethtown Water Company to ensure that water meets standards specified under the EPA Federal Safe Drinking Water Act Regulations (40 CFR part 141). Water analysis, provided by the supplier, is maintained on file at the testing facility, and included in Appendix Q. In addition, water samples are collected biannually from representative rooms in the testing facility. Chemical and microbiological water analyses are conducted on these samples by a subcontract laboratory (Benchmark, Center Valley, PA). Results are maintained on file at the testing facility, and included in Appendix Q. There were no known contaminants in the water that were expected to interfere with this study.

2.10.7. ENVIRONMENTAL CONDITIONS

Light/Dark Cycle

A twelve-hour light/dark cycle controlled via an automatic timer was provided.

Temperature

Temperature was monitored in accordance with testing facility SOPs and maintained within the specified range to the maximum extent possible.

Desired Range: 18 to 26°C

Actual Range: 22 to 24°C

Daily Average Range: 22 to 23°C

Relative Humidity

Relative humidity was monitored in accordance with testing facility SOPs and maintained within the specified range to the

maximum extent possible. Excursions outside the specified range were considered not to have affected the integrity of the study.

Desired Range: 30 to 70%

Actual Range: 14 to 60%

Daily Average Range: 37 to 53%

Air Changes

The actual number of air changes per hour in each animal room is recorded at least twice each year and the testing facility retains these records.

Desired Range: 10 to 15 air changes/hour

Actual Reading: 14.3 air changes/hour

2.11. TEST SUBSTANCE ADMINISTRATION AND CHAMBER OPERATION

See Appendix N, Inhalation Report.

2.12. EXPERIMENTAL EVALUATIONS

2.12.1. VIABILITY EXAMINATION (CAGE-SIDE)

Observations for mortality and general condition were made at least twice daily (nominally once in the morning and once in the afternoon).

2.12.2. DETAILED PHYSICAL EXAMINATIONS

Out-of-Chamber: Each animal on study was examined daily from receipt through to terminal euthanasia on gestation day 20. Examination included observations of general condition, skin and fur, eyes, nose, oral cavity, abdomen and external genitalia, occurrence of secretions and excretions, and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Changes in gait, posture and response to handling as well as the presence of repetitive circling or bizarre behavior (e.g., self-mutilation, walking backward) were recorded as well as evaluations were performed prior to exposures.

In-Chamber: All animals were observed as a group at least once during each exposure. This was routinely performed near the middle of each exposure. Pertinent behavioral changes and any signs of toxicity were recorded.

2.12.3. BODY WEIGHT

Body weights were recorded on gestation day 3, 6, 9, 12, 15, 18 and 20 (day of scheduled sacrifice). Weight gain was calculated for intervals as found appropriate, including gestation day 6 to 15, gestation day 15 to 20 and gestation day 6 to 20.

2.12.4. FEED CONSUMPTION

Feed consumption was recorded on gestation day 3 to 6, 6 to 9, 9 to 12, 12 to 15, 15 to 18 and 18 to 20. Feed consumption was calculated for these same intervals and for gestation day 6 to 20.

Calculation

Feed consumption (g/kg/day) =

$$\frac{\text{grams of feed consumed}}{\text{body weight (kg)}} \div 2 \text{ to } 3 \text{ days}$$

2.13. TERMINAL OBSERVATIONS

2.13.1. METHOD OF EUTHANASIA

All dams were euthanized on gestation day 20 with an overdose of carbon dioxide inhalation. All live fetuses were euthanized by an intraperitoneal overdose of sodium pentobarbital.

2.13.2. MACROSCOPIC POSTMORTEM EXAMINATIONS

A necropsy was performed for all the dams in the study. Macroscopic lesions or tissues with significant findings were preserved in 10% neutral buffered formalin (NBF).

The following examinations of the reproductive system were made:

The intact uteri (ovaries attached) were removed from the abdominal cavity. The gravid uteri, including the cervix, were weighed. Corpora lutea were counted and the number per ovary recorded. The number and location of the following were recorded for each uterine horn:

- live fetuses
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)
- early embryonic deaths (evidence of implantation but no recognizable fetus), or ammonium sulphide positive (see below)

Each placenta was examined macroscopically. The maternal carcass, uterus, ovaries and placentas were then discarded. Females that did not have visible implantations had their apparent non-pregnant status confirmed by means of staining the uterus with ammonium sulphide (Salewski, 1964).

2.14. FETAL EVALUATIONS

2.14.1. EXTERNAL EXAMINATIONS

All live gestation day 20 fetuses were weighed and individually identified. Each live fetus was given a macroscopic external examination for defects (including observation of the palate).

2.14.2. SOFT TISSUE (VISCERAL) EXAMINATIONS

Approximately one-half of the fetuses in each litter (alternating fetuses within the litter, nominally) were placed in Modified Davidson's fixative for preservation and decalcification. These fetuses were subject to soft tissue examination by gross dissection of the torso and a razor blade sectioning technique for the head derived from that of Wilson (1965). All malformations and variations were recorded. During the dissection process, the sex of each fetus was confirmed by internal inspection of the gonads. Following complete dissection of the fetuses, all carcasses and sections were preserved in 10% neutral buffered formalin.

2.14.3. SKELETAL EXAMINATIONS

Approximately one-half of the fetuses in each litter (alternating fetuses within the litter, nominally) were eviscerated, placed in 70% isopropyl alcohol for preservation and processed for staining of the skeleton using Alizarin Red S. Subsequently, these fetuses were evaluated for skeletal malformations and ossification variations. These skeletons were then stored in 100% glycerin with a mold inhibitor. During the dissection process, the sex of each fetus was confirmed by internal inspection of the gonads.

2.15. STATISTICAL ANALYSIS

Analysis was performed by the Statistics Department of Huntingdon Life Sciences Ltd, Woolley Road, Alconbury, Huntingdon Cambridgeshire, PE28 4HS, England (Gareth D. Thomas, B.Sc. (Hons), principal investigator). The testing facility was responsible for the GLP compliance of this work and the associated archiving of the raw data and original final sub-report.

2.15.1. CONTINUOUS DATA

The following mean measures were analyzed as described below:

- maternal body weight values and body weight changes during gestation (Note: body weight measurements will only be compared to gestation day 6 values or subsequent relevant values)
- maternal feed consumption values (presented as grams of feed/kg of body weight/day)
- gravid uterine weights
- corpora lutea
- implantation data
- pre-implantation loss
- early embryonic deaths (evidence of implantation but no recognizable fetus)
- live fetuses
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)
- total embryo-fetal deaths and as % of implant sites
- mean percent female fetuses

Mean values of all exposure groups were compared to the mean value for the control group at each time interval. Evaluation of equality of group means was made by the appropriate statistical method (either parametric or non-parametric), followed by a multiple comparison test if needed. Bartlett's test (Bartlett, 1937; Sokal and Rohlf, 1995; Snedecor and Cochran, 1967) was performed to determine if groups have equal variances. For all parameters if the variances were equal, parametric procedures were used; if not, nonparametric procedures were used.

The parametric method was the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance (Armitage, 1971; Dunlap and Duffy, 1975). If significant differences among the means were indicated, Dunnett's test (Dunlap et al., 1981; Dunnett, 1955, 1964) was used to determine which means were significantly different from the control. The nonparametric method was the Kruskal-Wallis test (Kruskal and Wallis, 1952, 1953), and if differences were indicated, Steel's test (Steel, 1959) was used to determine which means differed from control. Bartlett's test for equality of variance were conducted at the 1% significance level; all other statistical tests were conducted at the 5% and 1% significance levels.

2.15.2. INCIDENCE DATA

- premature deliveries
- total pregnancy loss (no live fetuses)
- maternal necropsy findings
- external fetal defects
- skeletal malformations and variations
- soft tissue malformations and variations

These data was analyzed based on a Generalized Estimating Equation (GEE) application of the linearized model (Ryan, 1992). For litter endpoints, the model used the litter as the basis for analysis and considered correlation among littermates by incorporating an estimated constant correlation and the litter size as a covariate. If the dose group effect in the model was statistically significant, the dose group least squares means were tested pairwise vs. the control group using t-tests associated with least squares means. The least squares means allow comparisons that

account for differences in litter size. Statistical significance of differences from control was recognized at the 5% or 1%, two-sided levels.

The fetal body weights (by sex and as a composite for both sexes) were analyzed by a mixed model analysis of variance that provides an accurate statistical model of the biology. The analysis used the litter as the basis for analysis and effectively used the litter size as a covariate. The model considered dose group, litter size and fetal sex as explanatory variables. If the dose group effect in the model was statistically significant, the dose group least squares means were tested pairwise vs. the control group using t-tests associated with least squares means. The least squares means allow comparisons that account for differences in litter size and sex. The mathematical model was based on a paper by Chen et. al. (1996). Statistical significance of differences from control was recognized at the 5% or 1%, two-sided levels.

2.16. DATA STORAGE

All data documenting experimental details and study procedures and observations were recorded and maintained as raw data. Following completion of the study, all reports, raw data, preserved specimens and retained samples generated by the testing facility, as well as the original study protocol and amendments, analysis performed by the Statistics Department as well as the original final report, will be maintained in the Archives of the testing facility for a period of 1 year. The sponsor will determine the final disposition of these materials.

2.17. REGULATORY REFERENCES

2.17.1. TEST GUIDELINES

This study complied with the Organization for Economic Cooperation and Development (22 January 2001). OECD Guidelines for Testing of Chemicals; OECD Guideline 414: Prenatal Developmental Toxicity Study and US EPA OPPTS Health Effects Test Guidelines 870.3700, Prenatal Developmental Toxicity Study EPA 712-C-98-207, August 1998.

2.17.2. GOOD LABORATORY PRACTICES

This study was conducted in compliance with Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17 and EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

2.17.3. ANIMAL WELFARE ACT COMPLIANCE

This study complied with all appropriate parts of the Animal Welfare Act Regulations: 9 CFR Parts 1 and 2 Final Rules, Federal Register, Volume 54, No. 168, August 31, 1989, pp. 36112-36163 effective October 30, 1989 and 9 CFR Part 3 Animal Welfare Standards; Final Rule, Federal Register, Volume 56, No. 32, February 15, 1991, pp. 6426-6505 effective March 18, 1991.

2.18. PROTOCOL DEVIATIONS

The following protocol deviation occurred during the study at the testing facility, but did not affect the integrity of the study:

1. Due to scheduling error, clean feed jars and fresh food was provided at least every 6 days (instead of 5 days as per protocol) when feed consumption was recorded.
2. Fetus No. 3767-5 was weighed post-fixation rather than fresh.

3. RESULTS AND DISCUSSION

3.1. CHAMBER MONITORING

(Appendix N)

Pre-study chamber distribution analyses showed that the test substance was evenly distributed within each chamber. Chamber monitoring showed that the chamber oxygen levels were at least 19%. Chamber room monitoring showed that no test substance was present in the room and that the sound and light levels were acceptable.

The target and mean ($\pm$ standard deviation) analytical (IR) and nominal concentrations (by weight of test substance consumed) are summarized as follows:

Group	Test Substance	Target Concentration (ppm)	Analytical Concentration (ppm)	Nominal Concentration (ppm)
1	Air Control	0	0.00 ± 0.00	0 ± 0
2	Liquified Petroleum Gas	1000	1013 ± 60	1100 ± 32
3	Liquified Petroleum Gas	5000	5079 ± 217	5000 ± 113
4	Liquified Petroleum Gas	10000	10426 ± 527	9800 ± 131

The analytically measured (IR) exposure levels of the airborne test substance were acceptably close, in the opinion of the study director, to the targeted exposure levels and to the nominal concentrations. Chamber environmental conditions averaged 24°C temperature and 39% relative humidity.

Mean particle size distribution measurements for the exposures are summarized as follows:

Group	Test Substance	Mass Median Aerodynamic Diameter (μm)	Geometric Standard Deviation	Total Mass Concentration (mg/m^3)
1	Air Control	3.795	2.191	1.39E-03
2	Liquified Petroleum Gas	8.415	2.197	2.44E-03
3	Liquified Petroleum Gas	4.414	2.084	1.47E-03
4	Liquified Petroleum Gas	2.981	2.084	1.62E-03

These results indicated that the atmospheres were essentially gas/vapor only, as expected, since there was no substantial difference between the test substance chambers and the air control chamber.

Analysis of the major components in the neat test substance and the test atmospheres (see Appendix N) showed a reasonably close comparison between the neat test substance and the vaporized test substance. These data demonstrated that the test animals were exposed, as expected, to all of the major components of the test substance in their reasonably proper proportions. The data were consistent pretest and during the study indicating stability of the test substance and the atmosphere generation techniques.

3.2. MORTALITY AND PREGNANCY

(Table 1 & Appendix A)

All animals survived until the scheduled termination of the study and pregnancy rates were 96 to 100% across the groups.

3.3. CLINICAL OBSERVATIONS

3.3.1. EXPOSURE PERIODS

(Table 2 and Appendices B & N)

During the exposure and non-exposure periods, all animals were generally unremarkable.

3.4. BODY WEIGHTS

(Figures 1, Tables 3 - 4 & Appendices C - D)

There were no test substance related differences in absolute body weights or in body weight changes in the test substance exposed animals, compared to the air control animals.

3.5. FEED CONSUMPTION

(Figure 2, Table 5 & Appendix E)

There were no test substance related differences in feed consumption in the test substance exposed animals, compared to the air control animals.

3.6. FEMALE NECROPSY DATA AND PREGNANCY OUTCOME

(Tables 6 - 8; Appendices F - H)

There were no test substance related effects on gross necropsy observations, pregnancy outcome, in terms of corpora lutea numbers, pre- or post-implantation loss, early or late resorptions, or litter size and gravid uterine weight. All values were normal for this strain of animals.

3.7. FETAL DATA

3.7.1. Fetal Body Weights

(Table 7, Appendices G - I)

There were no test substance related differences in fetal body weights among the test substance exposed animals, compared to the air control animals.

3.7.2. Fetal Observations

(Tables 9 - 11, Appendices J - M)

There were low, sporadic incidences of fetal abnormalities and variants across all the groups. There was no indication of any association with exposure to the test substance. Similarly, there was no evidence of an effect on the state of ossification of the fetal skeleton.

4. CONCLUSION

Exposure of pregnant female rats to target concentrations of 1000, 5000 or 10000 ppm of LPG by whole-body inhalation for gestation days 6 to 19 resulted in no effects of exposure. Therefore, a no observed adverse effect level (NOAEL) for maternal toxicity and developmental toxicity of 10000 ppm was indicated.

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CALCULATIONS**Feed Consumption:**

total grams of feed presented - amount of feed remaining ÷ no. days = g/kg/day

Preimplantation Loss:

no. of corpora lutea – no. of implantation sites

Percent Preimplantation Loss:

$[(\text{no. of corpora lutea} - \text{no. of implantation sites}) / \text{no. of corpora lutea}] \times 100$

Postimplantation Loss:

total no. of early and late resorptions and dead fetuses

Percent Postimplantation Loss:

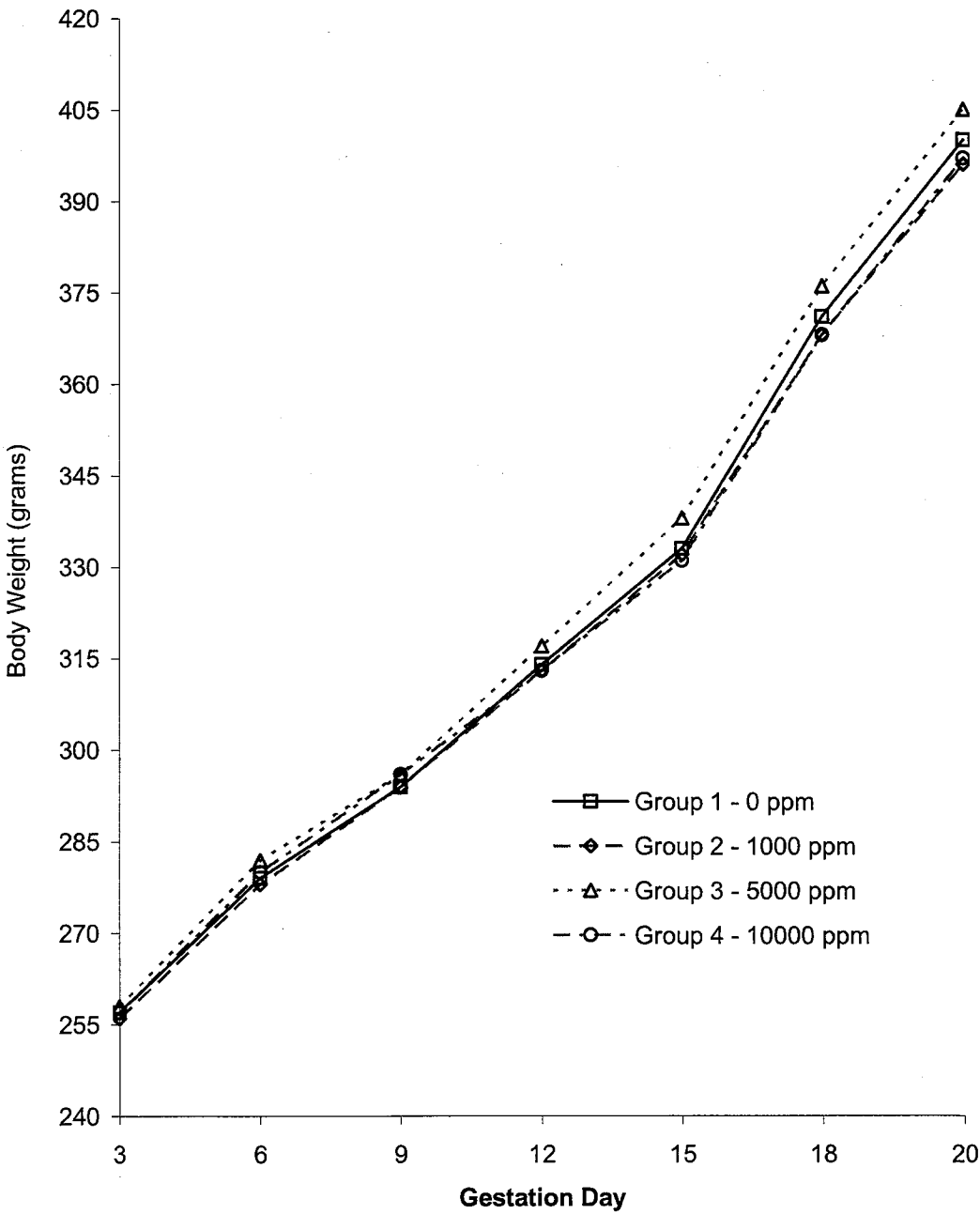
$(\text{no. of early and late resorptions and dead fetuses} / \text{no. of implantation sites}) \times 100$

	General Preface	

General Notes

Individual animal data values presented in this report may be rounded. Unrounded individual animal data values are used to calculate the reported mean and standard deviation values. Therefore, use of the reported individual values to reproduce means, standard deviations and/or to perform any subsequent calculations may produce minor discrepancies between the calculated values and those presented in this report.

	Gestation Body Weights	Figure 1



	Gestation Feed Consumption	Figure 2

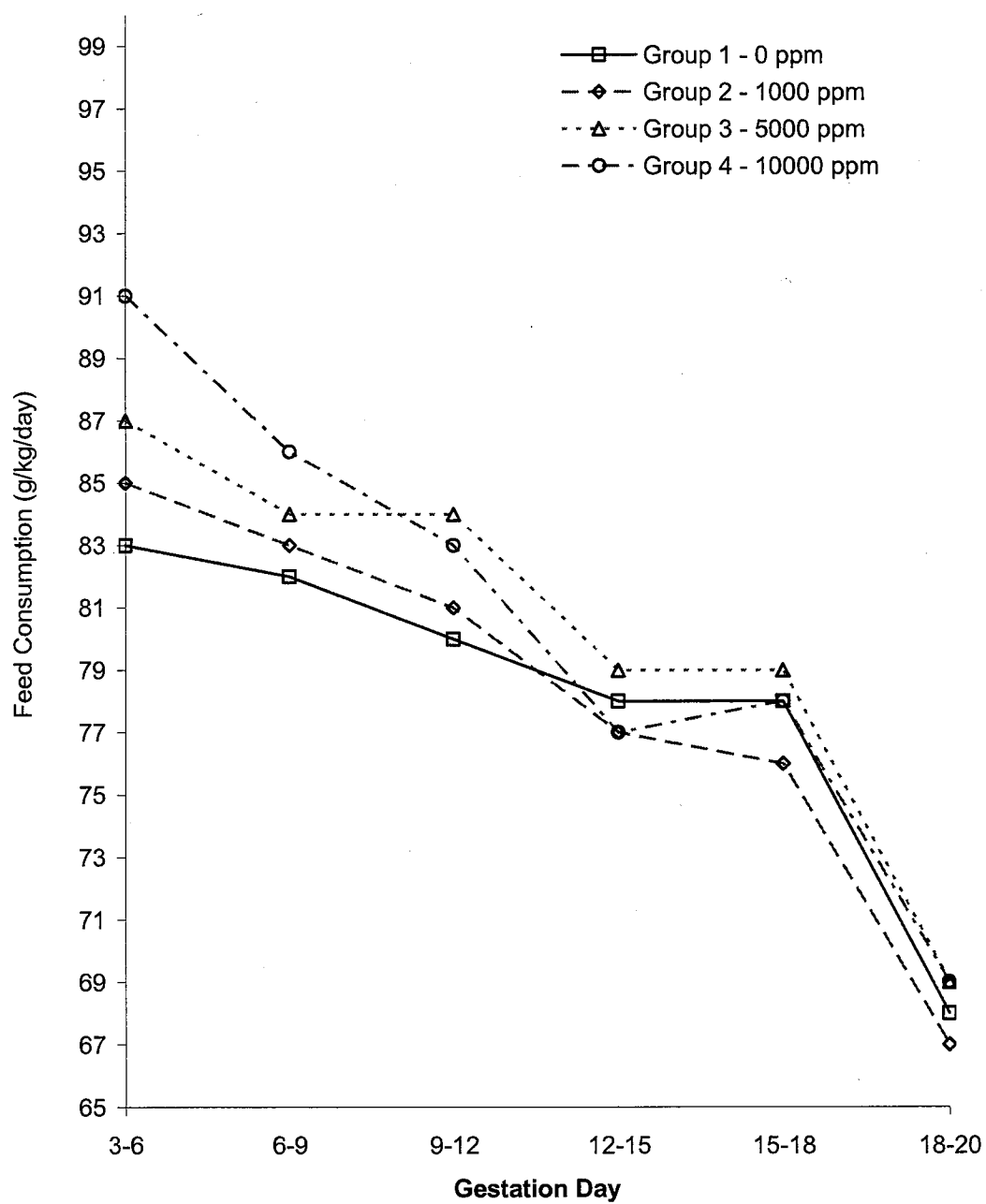


TABLE 1

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF SURVIVAL AND PREGNANCY

DOSE GROUP: DOSE LEVEL (PPM):		1 0	2 1000	3 5000	4 10000
No. of females mated	N	24	24	24	24
Pregnant	N	24	23	24	24
- Died/sacrificed moribund	N	0	0	0	0
- Elective sacrifice	N	0	0	0	0
Nonpregnant	N	0	1	0	0
- Died/sacrificed moribund	N	0	0	0	0
- Elective sacrifice	N	0	0	0	0
Total no. of females died/ sacrificed moribund	N %	0 0.0	0 0.0	0 0.0	0 0.0
Examined at scheduled c-section	N	24	24	24	24
- Nonpregnant	N	0	1	0	0
- With total implant loss	N %	0 0.0	0 0.0	0 0.0	0 0.0
- With viable fetuses	N %	24 100.0	23 95.8	24 100.0	24 100.0

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TABLE 2

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)

	1	2	3	4
DOSE GROUP:	1	2	3	4
DOSE LEVEL (PPM):	0	1000	5000	10000
DAY 0 to 4				
Normal				

WITHIN NORMAL LIMITS	83/24	81/24	82/24	80/24
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	1/ 1	3/ 1	2/ 1	4/ 2

TABLE 2

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)

	1	2	3	4
DOSE GROUP:	1	2	3	4
DOSE LEVEL (PPM):	0	1000	5000	10000
DAY 4 to 6				
Normal				

WITHIN NORMAL LIMITS	69/23	69/23	69/23	66/22
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	3/ 1	3/ 1	3/ 1	6/ 2

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TABLE 2

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)

DOSE GROUP:	1	2	3	4
DOSE LEVEL (PPM):	0	1000	5000	10000
DAY 6 to 10				
Normal				

WITHIN NORMAL LIMITS	115/23	115/23	115/23	109/22
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	5/ 1	5/ 1	5/ 1	10/ 2
Ocular				

LACRIMATION - UNILATERAL	0/ 0	0/ 0	0/ 0	1/ 1

TABLE 2

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)

DOSE GROUP:	1	2	3	4
DOSE LEVEL (PPM):	0	1000	5000	10000
DAY 10 to 13				
Normal				

WITHIN NORMAL LIMITS	92/23	92/23	92/23	84/21
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	4/ 1	4/ 1	4/ 1	8/ 2
Ocular				

LACRIMATION - UNILATERAL	0/ 0	0/ 0	0/ 0	4/ 1

TABLE 2

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)

DOSE GROUP: DOSE LEVEL (PPM):	1 0	2 1000	3 5000	4 10000
DAY 13 to 16				
Normal				

WITHIN NORMAL LIMITS	92/23	92/23	92/23	86/22
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	4/ 1	4/ 1	4/ 1	8/ 2
Ocular				

LACRIMATION - UNILATERAL	0/ 0	0/ 0	0/ 0	2/ 1

TABLE 2

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)				
DOSE GROUP:	1	2	3	4
DOSE LEVEL (PPM):	0	1000	5000	10000
DAY 16 to 20				
Normal				

WITHIN NORMAL LIMITS	115/23	107/23	112/23	101/22
TERMINAL SACRIFICE	24/24	24/24	24/24	24/24
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	5/ 1	13/ 3	5/ 1	13/ 3
Ocular				

LACRIMATION - UNILATERAL	0/ 0	0/ 0	0/ 0	3/ 1
Oral/Buccal				

NASAL DISCHARGE - RED	0/ 0	0/ 0	0/ 0	3/ 2
Palpable masses				

MASS	0/ 0	0/ 0	3/ 1	0/ 0

TABLE 2

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)				
DOSE GROUP:	1	2	3	4
DOSE LEVEL (PPM):	0	1000	5000	10000
DAY 6 to 20				
Normal				

WITHIN NORMAL LIMITS	345/23	337/23	342/23	316/22
TERMINAL SACRIFICE	24/24	24/24	24/24	24/24
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	15/ 1	23/ 3	15/ 1	33/ 3
Ocular				

LACRIMATION - UNILATERAL	0/ 0	0/ 0	0/ 0	8/ 1
Oral/Buccal				

NASAL DISCHARGE - RED	0/ 0	0/ 0	0/ 0	3/ 2
Palpable masses				

MASS	0/ 0	0/ 0	3/ 1	0/ 0

TABLE 3

LIQUIFIED PETROLEUM GAS: EMBRYO-PETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF GESTATION BODY WEIGHTS (GRAMS)

DOSE GROUP: DOSE LEVEL (PPM):		1 0	2 1000	3 5000	4 10000
DAY 3	MEAN	257	256	258	257
	S.D.	10.1	10.1	11.7	11.8
	N	24	23	24	24
DAY 6	MEAN	279	278	282	280
	S.D.	9.9	8.6	10.5	11.7
	N	24	23	24	24
DAY 9	MEAN	294	294	296	296
	S.D.	9.9	10.5	13.0	11.9
	N	24	23	24	24
DAY 12	MEAN	314	313	317	313
	S.D.	12.1	13.2	16.4	12.5
	N	24	23	24	24
DAY 15	MEAN	333	332	338	331
	S.D.	14.7	14.9	15.7	13.8
	N	24	23	24	24
DAY 18	MEAN	371	368	376	368
	S.D.	18.8	16.5	19.7	14.2
	N	24	23	24	24
DAY 20	MEAN	400	396	405	397
	S.D.	23.2	20.3	20.6	15.9
	N	24	23	24	24

TABLE 4

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF GESTATION BODY WEIGHT GAIN (GRAMS)

DOSE GROUP: DOSE LEVEL (PPM):		1 0	2 1000	3 5000	4 10000
DAYS 3 TO 6	MEAN	22	22	24	23
	S.D.	7.3	6.0	6.0	8.4
	N	24	23	24	24
DAYS 6 TO 9	MEAN	15	16	15	16
	S.D.	4.0	4.1	5.5	5.3
	N	24	23	24	24
DAYS 9 TO 12	MEAN	20	19	21	18
	S.D.	5.1	6.2	7.4	5.8
	N	24	23	24	24
DAYS 12 TO 15	MEAN	19	19	21	18
	S.D.	5.5	5.4	3.7	5.6
	N	24	23	24	24
DAYS 15 TO 18	MEAN	38	36	38	37
	S.D.	6.7	5.6	6.7	4.8
	N	24	23	24	24
DAYS 18 TO 20	MEAN	29	28	29	29
	S.D.	6.7	6.8	5.0	4.8
	N	24	23	24	24
DAYS 6 TO 15	MEAN	54	54	56	51
	S.D.	10.0	10.5	9.7	9.4
	N	24	23	24	24
DAYS 6 TO 20	MEAN	121	118	123	118
	S.D.	18.5	16.5	15.1	12.1
	N	24	23	24	24
DAYS 15 TO 20	MEAN	68	64	67	67
	S.D.	11.0	8.3	7.8	6.5
	N	24	23	24	24

TABLE 5

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF GESTATION FEED CONSUMPTION (GRAMS/KG/DAY)

DOSE GROUP: DOSE LEVEL (PPM):		1 0	2 1000	3 5000	4 10000
DAYS 3 TO 6	MEAN	83	85	87	91
	S.D.	11.1	3.5	6.6	12.3
	N	24	23	24	23
DAYS 6 TO 9	MEAN	82	83	84	86
	S.D.	5.1	5.3	5.2	7.2
	N	24	23	24	24
DAYS 9 TO 12	MEAN	80	81	84	83
	S.D.	9.9	7.0	6.6	5.1
	N	24	23	24	24
DAYS 12 TO 15	MEAN	78	77	79	77
	S.D.	5.3	5.8	4.4	5.4
	N	24	23	24	23
DAYS 15 TO 18	MEAN	78	76	79	78
	S.D.	4.9	3.1	5.1	5.0
	N	24	23	24	24
DAYS 18 TO 20	MEAN	68	67	69	69
	S.D.	4.1	4.5	4.0	4.2
	N	24	23	24	24
DAYS 6 TO 20	MEAN	77	77	79	79
	S.D.	4.6	4.1	4.0	4.4
	N	24	23	24	24

TABLE 6

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF MATERNAL NECROPSY OBSERVATIONS

DOSE GROUP: DOSE LEVEL (PPM):		1 0	2 1000	3 5000	4 10000
FEMALES	N	24	24	24	24
SPLEEN	N	1	0	0	0

DISCOLORED	N	1	0	0	0
	%	4.2	0.0	0.0	0.0
LIVER	N	1	0	0	0

ADDITIONAL LOBE	N	1	0	0	0
	%	4.2	0.0	0.0	0.0
KIDNEY	N	0	1	2	1

DILATED RENAL PELVIS	N	0	1	1	1
	%	0.0	4.2	4.2	4.2
CYSTIC KIDNEY	N	0	0	1	0
	%	0.0	0.0	4.2	0.0
MAMMARY GLAND	N	0	0	1	0

MASS	N	0	0	1	0
	%	0.0	0.0	4.2	0.0

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TABLE 6

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF MATERNAL NECROPSY OBSERVATIONS

DOSE GROUP:		1	2	3	4
DOSE LEVEL (PPM):		0	1000	5000	10000
FEMALES	N	24	24	24	24
UTERUS	N	0	2	0	0

ABNORMAL CONTENTS	N	0	1	0	0
	%	0.0	4.2	0.0	0.0
ENLARGED PLACENTA	N	0	1	0	0
	%	0.0	4.2	0.0	0.0

TABLE 7

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

		SUMMARY OF CESAREAN SECTION DATA			
DOSE GROUP: DOSE LEVEL (PPM):		1 0	2 1000	3 5000	4 10000
Pregnant	N	24	23	24	24
(at scheduled sacrifice)					
Dams with no Viable Fetuses	N	0	0	0	0
Dams with Viable Fetuses	N	24	23	24	24
Corpora Lutea	TOTAL	376	347	403	371
No. per animal	MEAN	15.7	15.1	16.8	15.5
	S.D.	2.12	2.13	2.77	1.47
Implantation Sites	TOTAL	342	320	347	336
No. per animal	MEAN	14.3	13.9	14.5	14.0
	S.D.	1.87	2.11	1.47	1.22
Preimplantation Loss	TOTAL	34	27	56	35
No. per animal	MEAN	1.4	1.2	2.3	1.5
	S.D.	1.47	1.30	1.86	1.32
% per animal	MEAN%	8.7	7.6	12.8	9.0
	S.D.	8.69	8.78	8.92	7.45
Live Fetuses	TOTAL	333	306	326	316
No. per animal	MEAN	13.9	13.3	13.6	13.2
	S.D.	2.03	2.30	1.32	1.52
Males	TOTAL	176	141	156	161
	MEAN%	52.6	45.3	47.7	50.8
	S.D.	12.20	12.98	13.55	12.09
Females	TOTAL	157	165	170	155
	MEAN%	47.4	54.7	52.3	49.2
	S.D.	12.20	12.98	13.55	12.09

TABLE 7

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CESAREAN SECTION DATA					
DOSE GROUP: DOSE LEVEL (PPM):		1 0	2 1000	3 5000	4 10000
Postimplantation Loss	TOTAL	9	14	21	20
	No. per animal				
	MEAN	0.4	0.6	0.9	0.8
	S.D.	0.49	0.78	0.85	0.87
% implants per animal	MEAN%	2.8	4.5	5.9	6.0
	S.D.	3.80	5.77	5.47	6.44
Dead Fetuses	TOTAL	0	0	0	0
	No. per animal				
	MEAN	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
% of implants per animal	MEAN%	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
Resorptions: Early	TOTAL	9	14	20	19
	No. per animal				
	MEAN	0.4	0.6	0.8	0.8
	S.D.	0.49	0.78	0.82	0.83
% of implants per animal	MEAN%	2.8	4.5	5.6	5.7
	S.D.	3.80	5.77	5.29	6.20
Resorptions: Late	TOTAL	0	0	1	1
	No. per animal				
	MEAN	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.20	0.20
% of implants per animal	MEAN%	0.0	0.0	0.3	0.3
	S.D.	0.00	0.00	1.28	1.46

TABLE 7

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF CESAREAN SECTION DATA

DOSE GROUP:		1	2	3	4
DOSE LEVEL (PPM):		0	1000	5000	10000
Fetal Body Weight (g)	MEAN	4.1	4.1	4.2	4.2
	S.D.	0.30	0.32	0.26	0.31
	N	24	23	24	24
Male Fetuses	MEAN	4.1	4.2	4.3	4.3
	S.D.	0.37	0.32	0.30	0.30
Female Fetuses	MEAN	4.0	4.0	4.1	4.1
	S.D.	0.29	0.34	0.25	0.34

TABLE 8

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

DOSE GROUP:		1	2	3	4
DOSE LEVEL (PPM):		0	1000	5000	10000
NET BODY WT. CHANGE	MEAN	121	118	123	118
	S.D.	18.5	16.5	15.1	12.1
	N	24	23	24	24
GRAVID UTERINE WT.	MEAN	87	83	87	84
	S.D.	13.1	12.6	8.8	8.7
	N	24	23	24	24
NET WEIGHT CHANGE	MEAN	35	35	36	34
	S.D.	12.7	10.6	12.7	12.3
	N	24	23	24	24

NET BODY WT. CHANGE = TERMINAL BODY WT. MINUS DAY 6 BODY WEIGHT

NET WEIGHT CHANGE = NET BODY WT. CHANGE MINUS UTERINE WEIGHT

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TABLE 9

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF FETAL OBSERVATIONS - MALFORMATIONS				
DOSE GROUP	1	2	3	4
DOSE LEVEL (PPM)	0	1000	5000	10000
Litters Examined Externally	24	23	24	24
Fetuses Examined	333	306	326	316
Litters Examined Viscerally	24	23	24	24
Fetuses Examined	166	157	161	159
Litters Examined Skeletally	24	23	24	24
Fetuses Examined	167	149	165	157
RIGHT AORTIC ARCH, INTERVENTRICULAR SEPTAL DEFECT, ANASARCA, ONE OVARY AGENESIS, ONE OVARY HYPOPLASTIC, ENLARGED UTERINE HORNS, HYPOPLASTIC SPLEEN, HEART AND/OR GREAT VESSEL ANOMALY - RIGHT ATRIUM EXTREMELY ENLARGED, abnormal origin of some vessels from aortic/pulmonary arch, atelectatic lungs, undescended thymic tissue				
Fetal Incidence	0	1	0	0
Litter Incidence	0	1	0	0
INTERVENTRICULAR SEPTAL DEFECT, ANASARCA, HYPOPLASTIC SPLEEN, FOLDED RETINA, abnormal origin of carotid, undescended testis,				
Fetal Incidence	0	1	0	0
Litter Incidence	0	1	0	0
PERSISTENT TRUNCUS ARTERIOSUS, HEART DISPLACED TO RIGHT SIDE, INTERVENTRICULAR SEPTAL DEFECT, AGENESIS OF SPLEEN, abnormal origin of vessels from aortic arch, abnormal lung lobulation, left umbilical artery				
Fetal Incidence	0	0	0	1
Litter Incidence	0	0	0	1
INTERNAL HYDROCEPHALY				
Fetal Incidence	0	1	0	0
Litter Incidence	0	1	0	0

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TABLE 9

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF FETAL OBSERVATIONS - MALFORMATIONS				
SITUS INVERSUS (TOTAL)				
Fetal Incidence	0	0	1	0
Litter Incidence	0	0	1	0
HYPOPLASTIC KIDNEY, distended ureters, displaced				
Fetal Incidence	0	0	1	0
Litter Incidence	0	0	1	0
FUSED JUGAL AND SQUAMOSAL (BILATERAL), MISSHAPEN BASISPHENOID, RIBS FUSED, sutural bone				
Fetal Incidence	0	1	0	0
Litter Incidence	0	1	0	0
CERVICAL ARCHES FUSED, HEMIVERTEBRA WITH FUSED RIBS, cervical rib				
Fetal Incidence	0	0	0	1
Litter Incidence	0	0	0	1
MISSHAPEN FEMURS, cervical rib				
Fetal Incidence	0	1	0	0
Litter Incidence	0	1	0	0

NUMBER WITH EXTERNAL MALFORMATIONS				
Fetal Incidence	0	2	0	0
Litter Incidence	0	2	0	0
NUMBER WITH VISCERAL MALFORMATIONS				
Fetal Incidence	0	3	2	1
Litter Incidence	0	3	2	1
NUMBER WITH SKELETAL MALFORMATIONS				
Fetal Incidence	0	2	0	1
Litter Incidence	0	2	0	1
TOTAL NUMBER WITH MALFORMATIONS				
Fetal Incidence	0	5	2	2
Litter Incidence	0	5	2	2

Entries in lower case: Variations in these fetuses
No statistically significant differences

TABLE 10

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF FETAL OBSERVATIONS - VARIATIONS

DOSE GROUP: DOSE LEVEL (PPM):	1 0	2 1000	3 5000	4 10000
Litters Examined Externally	24	23	24	24
Fetuses Examined	333	306	326	316
Number with findings	0	0	0	0
Litters Examined Viscerally	24	23	24	24
Fetuses Examined	166	157	161	159
HEMORRHAGE 3RD BRAIN VENTRICLE				
Fetal Incidence	1	0	0	0
Litter Incidence	1	0	0	0
SUB-DURAL EDEMA				
Fetal Incidence	1	0	0	0
Litter Incidence	1	0	0	0
AQUEOUS HUMOUR HEMORRHAGE				
Fetal Incidence	1	0	0	0
Litter Incidence	1	0	0	0
INNOMINATE ARTERY ABSENT				
Fetal Incidence	0	0	0	1
Litter Incidence	0	0	0	1
ADDITIONAL SUBCLAVIAN ARTERY				
Fetal Incidence	1	1	1	1
Litter Incidence	1	1	1	1
UNDESCENDED THYMUS				
Fetal Incidence	9	13	4	6
Litter Incidence	7	8	3	5

TABLE 10

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF FETAL OBSERVATIONS - VARIATIONS

DOSE GROUP: DOSE LEVEL (PPM):	1 0	2 1000	3 5000	4 10000
DISPLACED TESTIS				
Fetal Incidence	4	0	0	2
Litter Incidence	4	0	0	2
LEFT UMBILICAL ARTERY				
Fetal Incidence	1	1	2	3
Litter Incidence	1	1	2	3
UNDESCENDED TESTIS				
Fetal Incidence	1	1	0	1
Litter Incidence	1	1	0	1
RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1)				
Fetal Incidence	1	1	5	1
Litter Incidence	1	1	4	1
RENAL PAPILLA (E) NOT DEVELOPED (GRADE 0)				
Fetal Incidence	0	0	1	0
Litter Incidence	0	0	1	0
ATELECTASIS OF LUNG				
Fetal Incidence	0	1	0	0
Litter Incidence	0	1	0	0
ABNORMAL LUNG LOBULATION				
Fetal Incidence	0	0	0	1
Litter Incidence	0	0	0	1
URETER(S) DISTENDED				
Fetal Incidence	0	0	1	0
Litter Incidence	0	0	1	0

TABLE 10

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

SUMMARY OF FETAL OBSERVATIONS - VARIATIONS

DOSE GROUP: DOSE LEVEL (PPM):	1 0	2 1000	3 5000	4 10000
DISPLACED OVARY				
Fetal Incidence	0	0	1	0
Litter Incidence	0	0	1	0
Litters Examined Skeletally	24	23	24	24
Fetuses Examined	167	149	165	157
SUTURAL BONE				
Fetal Incidence	0	1	1	1
Litter Incidence	0	1	1	1
MISSHAPEN BASISPHENOID				
Fetal Incidence	0	1	0	0
Litter Incidence	0	1	0	0
CERVICAL RIB(S) PRESENT				
Fetal Incidence	1	1	1	2
Litter Incidence	1	1	1	2
THORACIC CENTRUM(A)/VERTEBRA(E) UNOSSIFIED				
Fetal Incidence	0	0	0	1
Litter Incidence	0	0	0	1
RIB(S) 14TH RUDIMENTARY				
Fetal Incidence	12	19	14	13
Litter Incidence	7	10	7	5
RIB(S) KINKED				
Fetal Incidence	1	0	0	1
Litter Incidence	1	0	0	1

	Summary of Ossification Parameters	Table 11

Group	1	2	3	4
Dose Level (ppm)	0	1000	5000	10000
Number of Fetuses Examined (Litters)	167 (24)	149 (23)	165 (24)	157 (24)
Fetuses (Litters) Affected				
Incompletely Ossified / Unossified Skull Bones				
<i>Less Than 3 Affected</i>	42 (21)	30 (12)	57 (19)	41 (18)
<i>3 to 5 Affected</i>	15 (13)	5 (5)	18 (9)	5 (4)
<i>More Than 5 Affected</i>	5 (2)	7 (2)	5 (3)	8 (4)
Incompletely Ossified / Unossified Vertebral Arches				
<i>1 Pair</i>	15 (7)	15 (6)	8 (5)	7 (4)
<i>2+ Pairs</i>	11 (7)	4 (3)	14 (5)	8 (4)
Incompletely Ossified / Unossified Vertebral Centrum(a)				
<i>1 Affected</i>	3 (3)	5 (5)	8 (7)	4 (4)
<i>2+ Affected</i>	1 (1)	2 (2)	0 (0)	2 (2)
Incompletely Ossified / Unossified Sternebra(e)				
<i>1 Sternebra Affected</i>	49 (20)	39 (16)	30 (12)	33 (16)
<i>2 Sternebrae Affected</i>	28 (12)	20 (7)	22 (11)	23 (11)
<i>3 or more Sternebrae Affected</i>	1 (1)	4 (3)	1 (1)	4 (3)
Incompletely Ossified / Unossified Pelvic Bones				
<i>1-2 Affected</i>	5 (5)	6 (5)	2 (2)	4 (4)
<i>3-4 Affected</i>	1 (1)	0 (0)	0 (0)	1 (1)
<i>5-6 Affected</i>	0 (0)	0 (0)	0 (0)	0 (0)
Incompletely Ossified / Unossified Metacarpals	1 (1)	1 (1)	2 (2)	0 (0)
Incompletely Ossified / Unossified Metatarsals	0 (0)	1 (1)	1 (1)	2 (2)
Ossification of 1st Cervical Arch (Ventral/Odontoid Process)	34 (14)	49 (17)	68 (20)	47 (18)
Cervical Centrum(a) Ossified				
<i>1 Affected</i>	48 (19)	56 (20)	67 (22)	59 (23)
<i>2+ Affected</i>	44 (14)	47 (16)	37 (14)	29 (15)
Vertebral Arches / Centra Fused				
<i>1 Vert.</i>	27 (14)	20 (12)	22 (17)	25 (13)
<i>2+ Vert.</i>	53 (16)	58 (18)	71 (18)	50 (19)
5th Metacarpals Ossified	126 (24)	127 (23)	138 (23)	130 (24)
Ribs Affected	0 (0)	1 (1)	0 (0)	1 (1)
Number of Caudal Vertebrae Ossified (<i>Litter Mean</i>)	4.2	4.4	4.3	4.3

Note: The findings of "ossified" may indicate precocious or advanced ossification, while "incomplete or unossified" may indicate potential growth retardation. All noted findings indicate the state of ossification and are not considered anomalies.

	Summary of Ossification Parameters	Table 11

Group	1	2	3	4
Dose Level (ppm)	0	1000	5000	10000
Number of Fetuses Examined (Litters)	167 (24)	149 (23)	165 (24)	157 (24)
Mean Incidence per Litter				
Incomplete Ossification / Unossified Skull Bones				
<i>Less Than 3 Affected</i>	1.8	1.3	2.4	1.7
<i>3 to 5 Affected</i>	0.6	0.2	0.8	0.2
<i>More Than 5 Affected</i>	0.2	0.3	0.2	0.3
Incompletely Ossified / Unossified Vertebral Arches				
<i>1 Pair</i>	0.6	0.7	0.3	0.3
<i>2+ Pairs</i>	0.5	0.2	0.6	0.3
Incompletely Ossified / Unossified Vertebral Centrum(a)				
<i>1 Affected</i>	0.1	0.2	0.3	0.2
<i>2+ Affected</i>	0.0	0.1	0.0	0.1
Incompletely Ossified / Unossified Sternebra(e)				
<i>1 Sternebra Affected</i>	2.0	1.7	1.3	1.4
<i>2 Sternebrae Affected</i>	1.2	0.9	0.9	1.0
<i>3 or more Sternebrae Affected</i>	0.0	0.2	0.0	0.2
Incompletely Ossified / Unossified Pelvic Bones				
<i>1-2 Affected</i>	0.2	0.3	0.1	0.2
<i>3-4 Affected</i>	0.0	0.0	0.0	0.0
<i>5-6 Affected</i>	0.0	0.0	0.0	0.0
Incompletely Ossified / Unossified Metacarpals	0.0	0.0	0.1	0.0
Incompletely Ossified / Unossified Metatarsals	0.0	0.0	0.0	0.1
Ossification of 1st Cervical Arch (Ventral/Odontoid Process)	1.4	2.1	2.8	2.0
Cervical Centrum(a) Ossified				
<i>1 Affected</i>	2.0	2.4	2.8	2.5
<i>2+ Affected</i>	1.8	2.0	1.5	1.2
Vertebral Arches / Centra Fused				
<i>1 Vert.</i>	1.1	0.9	0.9	1.0
<i>2+ Vert.</i>	2.2	2.5	3.0	2.1
5th Metacarpals Ossified	5.3	5.5	5.8	5.4
Ribs Affected	0.0	0.0	0.0	0.0

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 1 0 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
1761	TERMINAL SACRIFICE	8-MAR-05	20	P
1762	TERMINAL SACRIFICE	8-MAR-05	20	P
1763	TERMINAL SACRIFICE	8-MAR-05	20	P
1764	TERMINAL SACRIFICE	8-MAR-05	20	P
1765	TERMINAL SACRIFICE	8-MAR-05	20	P
1766	TERMINAL SACRIFICE	8-MAR-05	20	P
1767	TERMINAL SACRIFICE	8-MAR-05	20	P
1768	TERMINAL SACRIFICE	8-MAR-05	20	P
1769	TERMINAL SACRIFICE	9-MAR-05	20	P
1770	TERMINAL SACRIFICE	9-MAR-05	20	P
1771	TERMINAL SACRIFICE	9-MAR-05	20	P
1772	TERMINAL SACRIFICE	9-MAR-05	20	P
1773	TERMINAL SACRIFICE	10-MAR-05	20	P
1774	TERMINAL SACRIFICE	10-MAR-05	20	P
1775	TERMINAL SACRIFICE	10-MAR-05	20	P
1776	TERMINAL SACRIFICE	10-MAR-05	20	P
1777	TERMINAL SACRIFICE	11-MAR-05	20	P
1778	TERMINAL SACRIFICE	11-MAR-05	20	P
1779	TERMINAL SACRIFICE	11-MAR-05	20	P
1780	TERMINAL SACRIFICE	11-MAR-05	20	P
1781	TERMINAL SACRIFICE	11-MAR-05	20	P
1782	TERMINAL SACRIFICE	11-MAR-05	20	P
1783	TERMINAL SACRIFICE	11-MAR-05	20	P
1784	TERMINAL SACRIFICE	11-MAR-05	20	P

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 2 1000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
2761	TERMINAL SACRIFICE	8-MAR-05	20	P
2762	TERMINAL SACRIFICE	8-MAR-05	20	P
2763	TERMINAL SACRIFICE	8-MAR-05	20	P
2764	TERMINAL SACRIFICE	8-MAR-05	20	P
2765	TERMINAL SACRIFICE	8-MAR-05	20	P
2766	TERMINAL SACRIFICE	8-MAR-05	20	P
2767	TERMINAL SACRIFICE	8-MAR-05	20	P
2768	TERMINAL SACRIFICE	8-MAR-05	20	P
2769	TERMINAL SACRIFICE	9-MAR-05	20	P
2770	TERMINAL SACRIFICE	9-MAR-05	20	P
2771	TERMINAL SACRIFICE	9-MAR-05	20	P
2772	TERMINAL SACRIFICE	9-MAR-05	20	P
2773	TERMINAL SACRIFICE	10-MAR-05	20	P
2774	TERMINAL SACRIFICE	10-MAR-05	20	P
2775	TERMINAL SACRIFICE	10-MAR-05	20	P
2776	TERMINAL SACRIFICE	10-MAR-05	20	P
2777	TERMINAL SACRIFICE	11-MAR-05	20	P
2778	TERMINAL SACRIFICE	11-MAR-05	20	P
2779	TERMINAL SACRIFICE	11-MAR-05	20	P
2780	TERMINAL SACRIFICE	11-MAR-05	20	P
2781	TERMINAL SACRIFICE	11-MAR-05	20	P
2782	TERMINAL SACRIFICE	11-MAR-05	20	P
2783	TERMINAL SACRIFICE	11-MAR-05	20	P
2784	TERMINAL SACRIFICE	11-MAR-05	20	NP

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 3 5000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
3761	TERMINAL SACRIFICE	8-MAR-05	20	P
3762	TERMINAL SACRIFICE	8-MAR-05	20	P
3763	TERMINAL SACRIFICE	8-MAR-05	20	P
3764	TERMINAL SACRIFICE	8-MAR-05	20	P
3765	TERMINAL SACRIFICE	8-MAR-05	20	P
3766	TERMINAL SACRIFICE	8-MAR-05	20	P
3767	TERMINAL SACRIFICE	8-MAR-05	20	P
3768	TERMINAL SACRIFICE	8-MAR-05	20	P
3769	TERMINAL SACRIFICE	9-MAR-05	20	P
3770	TERMINAL SACRIFICE	9-MAR-05	20	P
3771	TERMINAL SACRIFICE	9-MAR-05	20	P
3772	TERMINAL SACRIFICE	9-MAR-05	20	P
3773	TERMINAL SACRIFICE	10-MAR-05	20	P
3774	TERMINAL SACRIFICE	10-MAR-05	20	P
3775	TERMINAL SACRIFICE	10-MAR-05	20	P
3776	TERMINAL SACRIFICE	10-MAR-05	20	P
3777	TERMINAL SACRIFICE	11-MAR-05	20	P
3778	TERMINAL SACRIFICE	11-MAR-05	20	P
3779	TERMINAL SACRIFICE	11-MAR-05	20	P
3780	TERMINAL SACRIFICE	11-MAR-05	20	P
3781	TERMINAL SACRIFICE	11-MAR-05	20	P
3782	TERMINAL SACRIFICE	11-MAR-05	20	P
3783	TERMINAL SACRIFICE	11-MAR-05	20	P
3784	TERMINAL SACRIFICE	11-MAR-05	20	P

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 4 10000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
4761	TERMINAL SACRIFICE	8-MAR-05	20	P
4762	TERMINAL SACRIFICE	8-MAR-05	20	P
4763	TERMINAL SACRIFICE	8-MAR-05	20	P
4764	TERMINAL SACRIFICE	8-MAR-05	20	P
4765	TERMINAL SACRIFICE	8-MAR-05	20	P
4766	TERMINAL SACRIFICE	8-MAR-05	20	P
4767	TERMINAL SACRIFICE	8-MAR-05	20	P
4768	TERMINAL SACRIFICE	8-MAR-05	20	P
4769	TERMINAL SACRIFICE	9-MAR-05	20	P
4770	TERMINAL SACRIFICE	9-MAR-05	20	P
4771	TERMINAL SACRIFICE	9-MAR-05	20	P
4772	TERMINAL SACRIFICE	9-MAR-05	20	P
4773	TERMINAL SACRIFICE	10-MAR-05	20	P
4774	TERMINAL SACRIFICE	10-MAR-05	20	P
4775	TERMINAL SACRIFICE	10-MAR-05	20	P
4776	TERMINAL SACRIFICE	10-MAR-05	20	P
4777	TERMINAL SACRIFICE	11-MAR-05	20	P
4778	TERMINAL SACRIFICE	11-MAR-05	20	P
4779	TERMINAL SACRIFICE	11-MAR-05	20	P
4780	TERMINAL SACRIFICE	11-MAR-05	20	P
4781	TERMINAL SACRIFICE	11-MAR-05	20	P
4782	TERMINAL SACRIFICE	11-MAR-05	20	P
4783	TERMINAL SACRIFICE	11-MAR-05	20	P
4784	TERMINAL SACRIFICE	11-MAR-05	20	P

NP-NOT PREGNANT, P-PREGNANT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 1 0 PPM

FEMALE#	OBSERVATIONS	DAY OF	1 1 1 1 1 1 1 1 1 1 2																							
		GESTATION	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0			
1761	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1762	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1763	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1764	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1765	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1766	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1767	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1768	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1769	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1770	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
1771	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 1 0 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 2																							
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0			
1772	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1773	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS								2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	P		
1774	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1775	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1776	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1777	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1778	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1779	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1780	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1781	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
1782	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 1 0 PPM

FEMALE#	OBSERVATIONS	DAY OF	1 1 1 1 1 1 1 1 1 1 2																							
		GESTATION	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0			
1783	TERMINAL SACRIFICE																							P		
	WITHIN NORMAL LIMITS																							P		
1784	TERMINAL SACRIFICE																							P		
	WITHIN NORMAL LIMITS																							P		
CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT																										

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 2 1000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 2																							
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0			
2761	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2762	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2763	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2764	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2765	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2766	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2767	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2768	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2769	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2770	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		
2771	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																							P		

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 2 1000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2																	
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7
2772	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
2773	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS				2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	P
2774	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
2775	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
2776	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
2777	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
2778	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
2779	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS																		2	P
2780	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
2781	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 2 1000 PPM

FEMALE#	OBSERVATIONS	DAY OF	1 1 1 1 1 1 1 1 1 1 2																							
		GESTATION	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0			
2782	TERMINAL SACRIFICE																							P		
	ALOPECIA - EXTREMITIES/SNOUT																				2	2	2	2		
	WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P						
2783	TERMINAL SACRIFICE																							P		
	WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
2784	TERMINAL SACRIFICE																							P		
	WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		
CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT																										

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 3 5000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 2											
			0	1	2	3	4	5	6	7	8	9	0	1
3761	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3762	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS													P
3763	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3764	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3765	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3766	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3767	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3768	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3769	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3770	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P
3771	TERMINAL SACRIFICE WITHIN NORMAL LIMITS													P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

APPENDIX B

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 3 5000 PPM

FEMALE#	OBSERVATIONS	DAY OF	1 1 1 1 1 1 1 1 1 2																					
		GESTATION	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	
3772	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3773	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3774	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3775	TERMINAL SACRIFICE WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3776	TERMINAL SACRIFICE MASS WITHIN NORMAL LIMITS					P	P	P	P	P	P	P	P	P	P	P	P	P	P	P		1	1	1
3777	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3778	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3779	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3780	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3781	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3782	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 3 5000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION																	
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6
3783	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																		P
3784	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																		P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 4 10000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 2																	
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7
4761	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
4762	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
4763	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS																		P	P
4764	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
4765	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
4766	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS																			P
4767	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS																		P	P
4768	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
4769	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P
4770	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 4 10000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 2															
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
4771	TERMINAL SACRIFICE WITHIN NORMAL LIMITS				P	P	P	P	P	P	P	P	P	P	P	P	P	P
4772	TERMINAL SACRIFICE WITHIN NORMAL LIMITS				P	P	P	P	P	P	P	P	P	P	P	P	P	P
4773	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS				P	P	P	P	P	P	P	P	P	P	P	P	P	P
4774	TERMINAL SACRIFICE WITHIN NORMAL LIMITS				P	P	P	P	P	P	P	P	P	P	P	P	P	P
4775	TERMINAL SACRIFICE LACRIMATION - UNILATERAL WITHIN NORMAL LIMITS												2	2	2	2		
4776	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS																	
4777	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	
4778	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	
4779	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	
4780	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 4 10000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 2															
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
4781	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	P
4782	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	P
4783	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	P
4784	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

GROUP 1 0 PPM

ANIMAL#	DAY OF GESTATION						
	3	6	9	12	15	18	20
1761	241	263	274	292	309	347	375
1762	246	277	291	310	326	365	391
1763	247	275	290	310	331	378	413
1764	249	280	290	315	335	368	404
1765	251	271	289	306	330	362	388
1766	257	285	298	318	336	374	395
1767	258	287	304	324	347	386	415
1768	264	293	303	331	341	380	406
1769	248	258	273	293	303	329	340
1770	252	270	285	304	314	357	385
1771	260	282	293	308	331	365	384
1772	271	285	301	322	340	365	399
1773	256	274	299	330	353	400	438
1774	263	273	279	290	298	328	352
1775	266	279	298	315	336	380	411
1776	272	294	305	329	347	393	420
1777	240	270	288	311	334	369	396
1778	246	266	282	307	330	368	403
1779	249	285	302	327	351	395	431
1780	257	280	296	308	334	371	409
1781	261	277	292	312	323	361	390
1782	265	293	304	320	345	396	426
1783	272	285	300	328	343	386	418
1784	274	295	310	325	349	384	422
MEAN	257	279	294	314	333	371	400
S.D.	10.1	9.9	9.9	12.1	14.7	18.8	23.2
N	24	24	24	24	24	24	24

APPENDIX C

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

GROUP 2 1000 PPM

ANIMAL#	DAY OF GESTATION						
	3	6	9	12	15	18	20
2761	236	260	276	287	312	340	373
2762	242	267	282	297	308	350	370
2763	247	283	302	322	340	374	397
2764	249	272	281	296	312	358	384
2765	249	270	288	314	336	372	403
2766	257	279	289	306	328	360	378
2767	258	287	308	323	348	388	414
2768	265	285	301	311	325	357	384
2769	248	264	279	300	311	343	363
2770	255	275	290	303	321	358	379
2771	267	292	308	331	340	372	393
2772	269	290	308	328	348	392	421
2773	260	277	298	314	324	366	395
2774	264	279	299	310	328	358	379
2775	267	286	305	321	342	383	411
2776	272	283	297	313	331	369	394
2777	241	277	296	328	350	391	427
2778	246	270	280	299	325	357	385
2779	254	282	300	331	363	391	434
2780	255	274	282	304	324	354	396
2781	258	279	292	318	336	368	399
2782	265	288	309	337	358	403	439
2783	269	287	295	313	336	367	400
2784x NP	277	284	286	278	279	277	278
MEAN	256	278	294	313	332	368	396
S.D.	10.1	8.6	10.5	13.2	14.9	16.5	20.3
N	23	23	23	23	23	23	23

NP=NOT PREGNANT x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

GROUP 3 5000 PPM
INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

ANIMAL#	DAY OF GESTATION						
	3	6	9	12	15	18	20
3761	236	262	280	289	316	362	392
3762	242	269	286	303	325	361	387
3763	246	274	286	310	330	374	403
3764	249	276	286	304	322	358	377
3765	253	277	294	306	331	359	386
3766	256	290	308	323	346	386	410
3767	260	285	300	316	340	379	414
3768	261	273	286	297	314	334	373
3769	243	270	288	315	333	373	401
3770	259	283	304	335	348	399	426
3771	268	292	315	345	367	410	446
3772	275	306	328	351	369	415	443
3773	260	285	300	327	339	383	407
3774	263	277	284	298	317	352	374
3775	267	287	307	320	336	374	395
3776	278	297	314	332	354	397	426
3777	241	276	293	325	346	378	405
3778	246	265	269	294	316	348	381
3779	251	278	295	320	339	380	412
3780	258	277	293	321	346	386	418
3781	262	290	308	335	358	391	415
3782	262	288	303	328	351	392	426
3783	272	287	291	300	323	357	387
3784	275	292	297	322	345	384	417
MEAN	258	282	296	317	338	376	405
S.D.	11.7	10.5	13.0	16.4	15.7	19.7	20.6
N	24	24	24	24	24	24	24

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LIQUIPIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

GROUP 4 10000 PPM
INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

ANIMAL#	DAY OF GESTATION						
	3	6	9	12	15	18	20
4761	240	268	287	304	322	353	385
4762	245	258	279	293	318	365	394
4763	247	269	288	308	325	369	396
4764	247	281	299	320	342	378	409
4765	254	273	286	306	324	371	399
4766	255	286	304	319	333	369	398
4767	259	294	304	318	338	373	407
4768	261	303	318	340	365	407	435
4769	248	265	277	292	315	352	381
4770	255	275	292	310	321	347	367
4771	260	282	306	316	331	366	401
4772	279	286	305	321	332	369	399
4773	255	275	293	311	323	359	380
4774	261	272	280	298	310	347	374
4775	267	288	311	311	324	365	389
4776	278	293	308	327	336	373	395
4777	232	259	272	292	317	351	384
4778	248	273	281	301	314	356	386
4779	249	281	301	320	336	369	397
4780	257	281	299	333	361	396	424
4781	259	282	299	315	328	368	401
4782	264	277	299	316	335	371	403
4783	268	298	301	324	342	378	413
4784	278	293	303	319	347	381	422
MEAN	257	280	296	313	331	368	397
S.D.	11.8	11.7	11.9	12.5	13.8	14.2	15.9
N	24	24	24	24	24	24	24

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

GROUP 1 0 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
1761	21	11	18	17	38	27	112
1762	32	14	18	16	39	26	114
1763	29	15	20	21	47	35	137
1764	31	10	25	20	33	36	124
1765	20	18	17	24	32	26	117
1766	29	12	20	19	38	21	109
1767	29	17	20	24	39	29	128
1768	29	10	28	11	39	25	113
1769	10	15	20	10	26	11	81
1770	17	16	19	10	43	28	116
1771	23	11	15	23	34	19	102
1772	14	17	21	18	25	35	115
1773	18	26	31	22	48	37	164
1774	10	6	11	9	29	24	79
1775	14	19	17	21	44	31	131
1776	21	11	25	18	47	27	126
1777	30	18	23	23	35	27	126
1778	20	15	25	23	39	35	137
1779	36	17	25	24	44	36	146
1780	22	17	12	26	37	38	130
1781	17	15	20	11	39	29	113
1782	28	11	15	26	50	31	133
1783	13	14	29	15	44	31	133
1784	21	16	15	24	34	39	128
MEAN	22	15	20	19	38	29	121
S.D.	7.3	4.0	5.1	5.5	6.7	6.7	18.5
N	24	24	24	24	24	24	24

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

GROUP 2 1000 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
2761	24	16	11	26	28	33	114
2762	25	15	15	11	42	20	103
2763	36	19	20	19	34	23	114
2764	24	9	14	16	47	26	112
2765	21	18	26	22	36	31	133
2766	22	10	17	22	32	19	99
2767	29	21	15	26	40	26	128
2768	21	15	11	14	32	27	98
2769	15	15	21	12	32	20	100
2770	19	15	13	18	38	20	104
2771	25	17	22	10	32	22	102
2772	22	18	20	20	44	29	131
2773	17	20	16	11	42	29	118
2774	16	20	11	18	31	21	100
2775	19	19	16	21	41	29	125
2776	11	14	16	18	38	25	111
2777	36	19	32	22	41	36	150
2778	23	11	19	25	32	29	116
2779	28	17	32	31	29	42	151
2780	19	8	22	20	30	41	122
2781	21	13	26	18	32	31	120
2782	23	21	28	21	45	36	151
2783	18	8	18	23	31	33	113
2784x NP	7	1	-7	1	-2	1	-7
MEAN	22	16	19	19	36	28	118
S.D.	6.0	4.1	6.2	5.4	5.6	6.8	16.5
N	23	23	23	23	23	23	23

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: EMBRYO-PETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

GROUP 3 5000 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
3761	26	19	9	27	46	30	131
3762	28	16	17	23	36	26	118
3763	28	12	24	20	44	29	129
3764	28	10	17	18	37	19	101
3765	24	17	12	25	28	27	109
3766	34	18	15	22	40	24	119
3767	24	16	16	24	39	34	129
3768	12	14	11	18	19	39	100
3769	27	19	26	18	40	28	131
3770	24	21	32	13	51	28	143
3771	24	24	29	23	42	36	154
3772	31	22	23	17	46	29	138
3773	25	15	28	12	44	24	122
3774	14	7	14	19	35	22	97
3775	20	20	13	16	38	21	108
3776	19	17	18	23	43	29	129
3777	35	17	32	21	32	27	128
3778	19	4	25	22	32	33	115
3779	27	16	25	19	41	32	134
3780	20	15	28	25	40	32	141
3781	28	18	27	22	33	25	125
3782	26	14	26	22	42	34	138
3783	15	4	9	23	34	30	100
3784	17	5	25	23	39	34	126
MEAN	24	15	21	21	38	29	123
S.D.	6.0	5.5	7.4	3.7	6.7	5.0	15.1
N	24	24	24	24	24	24	24

APPENDIX D

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

GROUP 4 10000 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
4761	29	18	18	18	31	32	117
4762	14	21	14	26	47	29	135
4763	22	19	20	17	44	27	128
4764	34	18	21	22	36	31	127
4765	18	14	20	18	47	28	126
4766	31	17	16	13	36	29	112
4767	34	11	14	21	35	34	113
4768	42	15	23	24	43	28	133
4769	17	12	15	23	37	29	116
4770	20	18	18	11	27	20	93
4771	22	24	10	15	35	34	119
4772	7	19	16	12	37	29	113
4773	20	19	17	12	37	21	105
4774	12	8	18	13	37	27	102
4775	21	23	0	13	41	24	101
4776	15	15	19	10	37	22	102
4777	27	12	21	25	34	34	125
4778	25	8	19	14	42	30	113
4779	32	20	20	16	32	29	117
4780	24	18	33	28	35	28	142
4781	23	18	16	13	40	33	120
4782	13	22	17	20	35	32	126
4783	30	3	24	18	36	34	114
4784	15	10	16	28	34	41	129
MEAN	23	16	18	18	37	29	118
S.D.	8.4	5.3	5.8	5.6	4.8	4.8	12.1
N	24	24	24	24	24	24	24

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APPENDIX E

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 1 0 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
1761	40	78	40	78	75	65	67
1762	87	84	80	79	79	63	77
1763	87	86	81	78	81	67	78
1764	82	78	78	73	73	64	73
1765	87	88	84	82	76	65	79
1766	88	82	83	79	77	66	77
1767	89	85	83	79	78	69	79
1768	87	80	82	73	71	59	73
1769	70	77	82	74	74	69	75
1770	83	85	80	73	77	68	77
1771	78	78	78	76	80	71	77
1772	84	84	82	76	70	68	76
1773	78	95	91	84	82	70	84
1774	82	80	74	71	73	72	74
1775	79	81	82	73	78	67	76
1776	81	74	78	74	76	66	73
1777	88	83	83	87	88	75	83
1778	96	85	89	85	84	74	83
1779	102	90	96	94	91	76	89
1780	83	80	81	78	79	68	77
1781	75	79	78	73	76	68	75
1782	86	73	76	75	76	63	72
1783	84	78	85	75	78	64	76
1784	85	81	80	80	77	72	78
MEAN	83	82	80	78	78	68	77
S.D.	11.1	5.1	9.9	5.3	4.9	4.1	4.6
N	24	24	24	24	24	24	24

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APPENDIX E

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 2 1000 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
2761	87	84	79	80	75	71	78
2762	84	82	78	68	75	62	73
2763	86	88	85	78	81	72	81
2764	83	76	72	68	76	65	71
2765	87	88	87	81	78	69	80
2766	84	80	82	80	81	70	79
2767	88	82	77	77	76	62	75
2768	81	77	73	71	71	60	70
2769	79	78	79	75	76	68	75
2770	85	79	76	74	73	68	74
2771	88	88	88	76	77	72	80
2772	83	82	74	71	71	65	72
2773	87	85	77	71	76	63	75
2774	82	82	76	77	75	62	74
2775	85	87	81	79	76	67	78
2776	80	82	79	77	76	64	76
2777	87	86	86	73	74	62	76
2778	81	74	76	73	76	63	72
2779	94	97	102	94	79	66	88
2780	83	82	89	79	77	72	80
2781	82	76	80	73	81	73	77
2782	89	88	91	84	84	74	84
2783	87	78	86	81	75	75	79
2784x NP	80	71	67	60	60	65	64
MEAN	85	83	81	77	76	67	77
S.D.	3.5	5.3	7.0	5.8	3.1	4.5	4.1
N	23	23	23	23	23	23	23

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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APPENDIX E

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 3 5000 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
3761	82	81	80	77	87	76	80
3762	81	83	81	79	76	67	77
3763	83	81	82	80	81	63	77
3764	86	74	80	74	77	67	74
3765	92	87	81	80	77	64	78
3766	98	88	85	83	83	68	81
3767	89	82	79	78	75	67	76
3768	77	77	72	77	70	74	74
3769	90	88	87	81	84	75	83
3770	87	82	81	71	78	67	76
3771	85	90	81	77	77	75	80
3772	98	94	87	82	82	72	84
3773	91	87	96	82	88	76	86
3774	83	80	75	71	73	66	73
3775	83	87	80	74	74	67	77
3776	86	85	79	79	78	68	78
3777	98	86	91	80	84	71	82
3778	77	79	84	83	76	66	78
3779	90	85	91	82	83	66	81
3780	78	87	92	88	85	69	84
3781	94	91	97	86	82	68	85
3782	91	87	87	84	87	71	83
3783	84	74	71	74	72	63	71
3784	76	80	85	78	77	66	77
MEAN	87	84	84	79	79	69	79
S.D.	6.6	5.2	6.6	4.4	5.1	4.0	4.0
N	24	24	24	24	24	24	24

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APPENDIX E

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 4 10000 PPM

ANIMAL#	DAY OF GESTATION						
	3 - 6	6 - 9	9 - 12	12 - 15	15 - 18	18 - 20	6 - 20
4761	141	97	87	81	77	74	83
4762	82	82	78	83	82	70	79
4763	94	86	87	78	84	69	81
4764	83	88	87	81	79	68	81
4765	81	79	80	80	82	70	78
4766	85	82	76	74	70	67	74
4767	96	80	74	74	70	62	72
4768	89	83	83	79	79	68	78
4769	92	81	85	78	78	70	78
4770	91	86	85	69	69	58	73
4771	85	82	73	71	72	64	72
4772	84	88	78	71	76	71	77
4773	95	88	84	71	78	69	78
4774	78	76	78	73	76	65	74
4775	97	99	80	SF	76	68	81
4776	83	84	79	73	80	70	77
4777	SF	104	93	91	87	77	90
4778	99	87	84	78	85	71	81
4779	89	99	92	85	87	72	87
4780	91	83	88	84	82	74	82
4781	93	85	83	73	78	63	76
4782	83	82	84	80	80	74	80
4783	94	80	85	78	77	71	78
4784	88	79	78	75	76	69	75
MEAN	91	86	83	77	78	69	79
S.D.	12.3	7.2	5.1	5.4	5.0	4.2	4.4
N	23	24	24	23	24	24	24

SF = Spilled Feeder

APPENDIX F

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 1 0 PPM

ANIMAL#	ORGAN	OBSERVATION
1761		NO REMARKABLE OBSERVATIONS
1762		NO REMARKABLE OBSERVATIONS
1763		NO REMARKABLE OBSERVATIONS
1764		NO REMARKABLE OBSERVATIONS
1765		NO REMARKABLE OBSERVATIONS
1766		NO REMARKABLE OBSERVATIONS
1767		NO REMARKABLE OBSERVATIONS
1768		NO REMARKABLE OBSERVATIONS
1769		NO REMARKABLE OBSERVATIONS
1770		NO REMARKABLE OBSERVATIONS
1771		NO REMARKABLE OBSERVATIONS
1772	SPLEEN	DISCOLORED; MODERATE DISCOLORED FOCUS - TAN, 0.3 CM IN DIAMETER, TISSUE SAVED
1773	EXTERNAL EXAM	ALOPECIA - EXTREMITIES/SNOUT EXTERNAL FINDING CONFIRMED
1774		NO REMARKABLE OBSERVATIONS
1775		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 1 0 PPM

ANIMAL#	ORGAN	OBSERVATION
1776	LIVER	ADDITIONAL LOBE AT MEDIAN LOBE CLEFT TISSUE SAVED
1777		NO REMARKABLE OBSERVATIONS
1778		NO REMARKABLE OBSERVATIONS
1779		NO REMARKABLE OBSERVATIONS
1780		NO REMARKABLE OBSERVATIONS
1781		NO REMARKABLE OBSERVATIONS
1782		NO REMARKABLE OBSERVATIONS
1783		NO REMARKABLE OBSERVATIONS
1784		NO REMARKABLE OBSERVATIONS

APPENDIX F

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 2 1000 PPM

ANIMAL#	ORGAN	OBSERVATION
2761		NO REMARKABLE OBSERVATIONS
2762		NO REMARKABLE OBSERVATIONS
2763		NO REMARKABLE OBSERVATIONS
2764		NO REMARKABLE OBSERVATIONS
2765		NO REMARKABLE OBSERVATIONS
2766	UTERUS	ABNORMAL CONTENTS PLACENTA #11 SURROUNDED BY RED GELATINOUS MATERIAL- SEVERE TISSUE SAVED
2767		NO REMARKABLE OBSERVATIONS
2768		NO REMARKABLE OBSERVATIONS
2769		NO REMARKABLE OBSERVATIONS
2770		NO REMARKABLE OBSERVATIONS
2771		NO REMARKABLE OBSERVATIONS
2772		NO REMARKABLE OBSERVATIONS
2773	EXTERNAL EXAM	ALOPECIA - EXTREMITIES/SNOUT EXTERNAL FINDING CONFIRMED
2774	KIDNEY	DILATED RENAL PELVIS; MODERATE; BILATERAL TISSUE SAVED

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 2 1000 PPM

ANIMAL#	ORGAN	OBSERVATION
2775		NO REMARKABLE OBSERVATIONS
2776		NO REMARKABLE OBSERVATIONS
2777		NO REMARKABLE OBSERVATIONS
2778		NO REMARKABLE OBSERVATIONS
2779		NO REMARKABLE OBSERVATIONS
2780		NO REMARKABLE OBSERVATIONS
2781	UTERUS	ENLARGED PLACENTA; EXTREME 10TH ALSO FUSED TO 11TH TISSUE SAVED
2782	EXTERNAL EXAM	ALOPECIA - EXTREMITIES/SNOUT EXTERNAL FINDING NOT CONFIRMED
2783		NO REMARKABLE OBSERVATIONS
2784	NP	SALEWSKI'S TEST NO FOCI PRESENT

NP=NOT PREGNANT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 3 5000 PPM

ANIMAL#	ORGAN	OBSERVATION
3761	KIDNEY	DILATED RENAL PELVIS; SLIGHT; RIGHT TISSUE SAVED
3762	EXTERNAL EXAM	ALOPECIA - EXTREMITIES/SNOUT EXTERNAL FINDING NOT CONFIRMED
3763		NO REMARKABLE OBSERVATIONS
3764		NO REMARKABLE OBSERVATIONS
3765		NO REMARKABLE OBSERVATIONS
3766		NO REMARKABLE OBSERVATIONS
3767		NO REMARKABLE OBSERVATIONS
3768		NO REMARKABLE OBSERVATIONS
3769		NO REMARKABLE OBSERVATIONS
3770		NO REMARKABLE OBSERVATIONS
3771		NO REMARKABLE OBSERVATIONS
3772		NO REMARKABLE OBSERVATIONS
3773		NO REMARKABLE OBSERVATIONS
3774		NO REMARKABLE OBSERVATIONS
3775		NO REMARKABLE OBSERVATIONS

APPENDIX F

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 3 5000 PPM

ANIMAL#	ORGAN	OBSERVATION
3776	EXTERNAL EXAM	MASS; LEFT EXTERNAL FINDING CONFIRMED MAMMARY - THORACIC, TAN, FIRM, 2.0 X 2.0 CM TISSUE SAVED
	MAMMARY GLAND	MASS; LEFT THORACIC, TAN, FIRM, 2.0 X 2.0 CM TISSUE SAVED
3777		NO REMARKABLE OBSERVATIONS
3778		NO REMARKABLE OBSERVATIONS
3779		NO REMARKABLE OBSERVATIONS
3780		NO REMARKABLE OBSERVATIONS
3781		NO REMARKABLE OBSERVATIONS
3782		NO REMARKABLE OBSERVATIONS
3783	KIDNEY	CYSTIC KIDNEY; SLIGHT; RIGHT CORTEX - 0.1 CM IN DIAMETER, RED TISSUE SAVED
3784		NO REMARKABLE OBSERVATIONS

APPENDIX F

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 4 10000 PPM

ANIMAL#	ORGAN	OBSERVATION
4761		NO REMARKABLE OBSERVATIONS
4762		NO REMARKABLE OBSERVATIONS
4763		NO REMARKABLE OBSERVATIONS
4764		NO REMARKABLE OBSERVATIONS
4765		NO REMARKABLE OBSERVATIONS
4766	EXTERNAL EXAM	ALOPECIA - EXTREMITIES/SNOUT EXTERNAL FINDING NOT CONFIRMED
4767		NO REMARKABLE OBSERVATIONS
4768		NO REMARKABLE OBSERVATIONS
4769		NO REMARKABLE OBSERVATIONS
4770		NO REMARKABLE OBSERVATIONS
4771		NO REMARKABLE OBSERVATIONS
4772		NO REMARKABLE OBSERVATIONS
4773	EXTERNAL EXAM	ALOPECIA - EXTREMITIES/SNOUT EXTERNAL FINDING NOT CONFIRMED
4774		NO REMARKABLE OBSERVATIONS
4775		NO REMARKABLE OBSERVATIONS

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APPENDIX F

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 4 10000 PPM

ANIMAL#	ORGAN	OBSERVATION
4776	EXTERNAL EXAM	ALOPECIA - EXTREMITIES/SNOUT EXTERNAL FINDING CONFIRMED
4777		NO REMARKABLE OBSERVATIONS
4778	KIDNEY	DILATED RENAL PELVIS; SLIGHT; RIGHT TISSUE SAVED
4779		NO REMARKABLE OBSERVATIONS
4780		NO REMARKABLE OBSERVATIONS
4781		NO REMARKABLE OBSERVATIONS
4782		NO REMARKABLE OBSERVATIONS
4783		NO REMARKABLE OBSERVATIONS
4784		NO REMARKABLE OBSERVATIONS

[illegible]

APPENDIX G

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FEMALE REPRODUCTION DATA AND MEAN FETAL WEIGHTS (GRAMS)

GROUP 2 1000 PPM

ANIMAL#	CORPORA LUTEA	%PREIMPL. LOSS	IMPLANT SITES	FETUSES			RESORPTIONS				SEX		AVERAGE FETAL BODY WEIGHT		
				LIVE	DEAD		EARLY	LATE	TOTAL		MALE	FEMALE	MALES	FEMALES	LITTER
				(n)		%			(n)	%					
2761	14	14.3	12	12	0	0.0	0	0	0	0.0	4	8	3.9	3.6	3.7
2762	15	6.7	14	13	0	0.0	1	0	1	7.1	8	5	4.0	3.8	3.9
2763	12	33.3	8	8	0	0.0	0	0	0	0.0	3	5	4.5	4.4	4.4
2764	17	5.9	16	15	0	0.0	1	0	1	6.3	4	11	4.2	4.2	4.2
2765	15	6.7	14	14	0	0.0	0	0	0	0.0	4	10	4.2	4.0	4.1
2766	17	23.5	13	12	0	0.0	1	0	1	7.7	7	5	4.0	3.7	3.9
2767	15	0.0	15	14	0	0.0	1	0	1	6.7	8	6	4.8	4.5	4.7
2768	14	0.0	14	11	0	0.0	3	0	3	21.4	6	5	4.4	4.2	4.3
2769	11	0.0	11	10	0	0.0	1	0	1	9.1	2	8	4.5	4.1	4.2
2770	14	7.1	13	13	0	0.0	0	0	0	0.0	4	9	4.0	3.8	3.9
2771	13	0.0	13	11	0	0.0	2	0	2	15.4	5	6	4.1	4.3	4.2
2772	15	0.0	15	15	0	0.0	0	0	0	0.0	9	6	4.3	4.0	4.2
2773	17	5.9	16	16	0	0.0	0	0	0	0.0	8	8	3.7	3.4	3.5
2774	13	7.7	12	11	0	0.0	1	0	1	8.3	3	8	4.5	4.1	4.2
2775	17	17.6	14	14	0	0.0	0	0	0	0.0	9	5	4.2	3.9	4.1
2776	13	0.0	13	13	0	0.0	0	0	0	0.0	5	8	4.5	4.3	4.4
2777	21	14.3	18	18	0	0.0	0	0	0	0.0	10	8	3.9	3.6	3.8
2778	15	0.0	15	14	0	0.0	1	0	1	6.7	7	7	4.3	4.1	4.2
2779	17	11.8	15	15	0	0.0	0	0	0	0.0	9	6	4.7	4.4	4.6
2780	16	6.3	15	15	0	0.0	0	0	0	0.0	7	8	4.4	4.1	4.3
2781	14	14.3	12	11	0	0.0	1	0	1	8.3	5	6	4.5	4.3	4.4
2782	16	0.0	16	15	0	0.0	1	0	1	6.3	6	9	4.5	4.3	4.4
2783	16	0.0	16	16	0	0.0	0	0	0	0.0	8	8	3.5	3.3	3.4
2784	NP														
MEAN	15.1	7.6	13.9	13.3	0.0	0.0	0.6	0.0	0.6	4.5	6.1	7.2	4.2	4.0	4.1
S.D.	2.13	8.78	2.11	2.30	0.00	0.00	0.78	0.00	0.78	5.77	2.28	1.72	0.32	0.34	0.32
N	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23

NP=NOT PREGNANT

APPENDIX G

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FEMALE REPRODUCTION DATA AND MEAN FETAL WEIGHTS (GRAMS)

GROUP 3 5000 PPM

[illegible]

INDIVIDUAL FEMALE REPRODUCTION DATA AND MEAN FETAL WEIGHTS (GRAMS)

[illegible]

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APPENDIX H

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 1 0 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
1761	84	291	29	112
1762	85	306	29	114
1763	95	318	42	137
1764	82	322	41	124
1765	93	295	24	117
1766	72	323	37	109
1767	94	321	34	128
1768	98	308	15	113
1769	47	293	34	81
1770	90	295	26	116
1771	73	310	28	102
1772	87	313	28	115
1773	100	338	64	164
1774	65	287	14	79
1775	90	321	41	131
1776	94	326	33	126
1777	74	322	52	126
1778	86	318	51	137
1779	88	343	58	146
1780	100	309	29	130
1781	92	298	20	113
1782	109	317	24	133
1783	93	325	40	133
1784	95	328	33	128
MEAN	87.	314.	35.	121.
S.D.	13.1	14.8	12.7	18.5
N	24	24	24	24

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 2 1000 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
2761	69	304	45	114
2762	78	292	25	103
2763	57	341	58	114
2764	94	290	18	112
2765	88	315	45	133
2766	73	306	26	99
2767	96	318	32	128
2768	72	312	26	98
2769	66	297	34	100
2770	79	299	25	104
2771	69	325	33	102
2772	94	327	36	131
2773	88	306	29	118
2774	73	307	28	100
2775	86	325	39	125
2776	86	308	26	111
2777	101	326	49	150
2778	85	300	31	116
2779	106	328	46	151
2780	91	305	31	122
2781	74	325	46	120
2782	98	341	53	151
2783	87	313	26	113
2784x NP				-7
MEAN	83.	313.	35.	118.
S.D.	12.6	14.3	10.6	16.5
N	23	23	23	23

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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APPENDIX H

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 3 5000 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
3761	83	310	48	131
3762	84	303	34	118
3763	95	308	34	129
3764	77	300	24	101
3765	78	308	31	109
3766	89	320	30	119
3767	104	310	25	129
3768	82	291	18	100
3769	83	317	48	131
3770	101	325	42	143
3771	93	353	61	154
3772	94	349	44	138
3773	77	330	45	122
3774	79	295	18	97
3775	81	314	27	108
3776	95	331	34	129
3777	71	334	57	128
3778	92	289	24	115
3779	94	318	40	134
3780	91	327	50	141
3781	82	333	43	125
3782	87	339	51	138
3783	81	306	19	100
3784	102	315	23	126
MEAN	87.	318.	36.	123.
S.D.	8.8	17.0	12.7	15.1
N	24	24	24	24

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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APPENDIX H

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 4 10000 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
4761	80	305	37	117
4762	89	305	47	135
4763	87	310	41	128
4764	84	324	43	127
4765	94	305	32	126
4766	85	313	27	112
4767	95	312	18	113
4768	91	344	42	133
4769	88	293	28	116
4770	79	288	13	93
4771	91	309	28	119
4772	87	312	25	113
4773	69	312	37	105
4774	83	291	19	102
4775	79	310	22	101
4776	75	320	27	102
4777	77	308	48	125
4778	72	315	41	113
4779	65	332	52	117
4780	76	348	67	142
4781	97	305	23	120
4782	87	315	38	126
4783	81	332	34	114
4784	97	325	32	129
MEAN	84.	314.	34.	118.
S.D.	8.7	14.9	12.3	12.1
N	24	24	24	24

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

APPENDIX I

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

GROUP 1		INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																		
0 PPM																				
FEMALE#	MEAN	FETUS#																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1761	3.7	3.5	3.7	3.7	3.9	3.5	3.7	3.3/	3.8	3.8	E	4.0	3.8	3.7	3.9	3.5				
1762	4.1	4.3	4.5	4.2	3.9	4.2	4.3/	E	4.1	3.9	4.2	3.8	4.0	3.9	4.1					
1763	3.9	3.5	3.8	3.7	4.1	4.2	3.7	4.1	3.9	3.5/	3.9	3.9	4.3	3.9	3.6	3.6	4.2			
1764	4.5	E	4.1	4.8	4.5	4.0	4.7	4.4	4.5/	4.5	4.9	4.6	4.9	4.2						
1765	4.0	4.0	4.0	4.1	4.1	4.2	3.6/	4.3	4.1	4.0	4.1	3.7	4.2	4.5	3.5	3.4				
1766	4.2	4.4	4.2	4.2	3.9	4.4	4.4	E /	4.2	3.8	4.1	4.5	4.2	4.0						
1767	4.0	4.2	4.4	3.9	4.0	4.1	4.0	4.1	4.0	3.6	3.8	4.1/	3.6	4.1	4.1	3.9				
1768	4.6	4.7	5.0	4.7	4.8	4.5	4.2	4.7/	4.8	4.5	4.4	4.6	4.3	4.7	4.5					
1769	3.6	3.9	E	3.9	2.9	3.7	3.2/	4.1	3.7	3.3										
1770	4.2	4.4	4.7	4.4	4.1/	4.3	4.1	4.0	4.2	4.4	3.6	E	4.1	4.5	4.0	4.1				
1771	4.4	4.1	3.8	4.6	4.5	4.5	4.7	4.3/	4.4	4.6	4.5	4.2								
1772	4.1	4.3	4.4	4.0	4.4	4.1	4.1	4.3	3.9/	4.2	3.8	4.2	4.0	4.0	4.2					
1773	4.2	3.9	4.3	4.1	4.2	4.4	4.4/	4.4	4.2	4.2	4.3	4.2	4.5	4.0	4.6	4.0				
1774	3.4	2.9	3.0	3.8	3.8	3.2	3.4	3.4/	3.1	3.5	3.8	3.4	3.9							
1775	4.2	4.1	4.2	3.9	4.2	4.2	4.5	4.0/	4.7	4.1	4.5	4.1	4.0	4.4	4.4					
1776	4.1	3.3	4.2	4.0	4.0	4.2	4.2	4.4	4.1/	4.5	4.3	4.2	4.0	3.8	4.1	4.1				
1777	3.8	3.7	3.8	3.7	3.8	3.8	3.8/	4.1	4.0	3.8	E	4.0	3.7	3.9						
1778	3.8	4.1	3.9	4.0	4.0	4.0	3.5	3.9	3.0/	4.0	4.1	3.7	3.7	3.8	3.4					
1779	4.3	4.1	4.6	4.4	3.8	4.8	4.4	4.4	4.7/	4.7	4.6	4.6	E	3.5	4.1	4.0				
1780	4.3	4.2	4.5	4.3	4.0	4.3	4.4	4.1	4.1/	4.4	4.6	4.1	4.2	4.2	4.5	4.4	3.8			
1781	4.1	4.3	3.8	4.1	3.8	3.9	4.4	4.0	4.0	4.2/	4.0	4.0	4.1	4.2	4.1					
1782	3.7	4.0	4.1	3.8	3.8	4.0	3.9	2.2/	3.7	3.7	3.7	3.7	3.9	3.5	3.5	3.5	3.7	3.8	3.6	
1783	3.8	3.5	3.6	3.6	3.8	3.9	3.7	3.8	3.6	3.9	3.8	4.0/	4.0	3.7	3.8	3.8	3.7	E		
1784	4.4	3.7	4.6	4.7	4.9	4.6	4.2/	4.8	4.3	4.6	3.7	4.5	4.6	3.9	4.7	4.8				
MEAN	4.1																			
S.D.	0.30																			
N	24																			

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

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APPENDIX I

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS BY INHALATION EXPOSURE

GROUP 2		1000 PPM																			
FEMALE#	MEAN	INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																			
		FETUS#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2761	3.7	3.5	3.9	3.9	3.3	3.8	4.0	4.0	3.8/	3.7	3.6	3.6	3.2								
2762	3.9	4.2	4.1	3.9	3.7	4.1/	4.4	3.8	3.9	3.9	3.7	3.5	E	4.1	3.8						
2763	4.4	4.1	4.3	4.7	4.5	4.3	4.5	4.4/	4.5												
2764	4.2	3.9	4.1	3.8	4.2	4.2	4.4	E	4.4	4.0	4.2/	4.5	4.4	4.3	4.1	4.5	4.0				
2765	4.1	3.8	4.2	4.0	3.8	4.3	4.3	4.2/	4.2	4.1	3.7	4.0	4.1	4.1	4.5						
2766	3.9	3.2	E	3.8	4.6	3.9	4.0	3.3	3.6/	4.0	3.5	4.4	4.4	3.6							
2767	4.7	4.1	4.5	4.8	5.2	4.8	4.7	4.5/	4.8	4.8	E	4.9	4.7	4.5	4.4	4.8					
2768	4.3	E	4.6	4.3	E	4.3	E	4.3	4.2/	4.6	4.3	4.1	4.2	4.4	4.2						
2769	4.2	E	4.2	4.2	4.6/	4.1	4.3	3.9	3.9	4.3	4.4	3.7									
2770	3.9	3.7	3.9	3.8	4.1	3.8	4.1	3.9	3.9/	3.8	4.1	3.6	4.0	3.9							
2771	4.2	4.5	4.4	4.5	4.4	E	4.0	4.1	4.4/	4.4	2.6	E	4.4	4.6							
2772	4.2	4.4	4.3	4.4	4.4	4.0/	4.3	4.4	4.4	3.9	4.1	4.1	3.8	3.9	4.1	4.5					
2773	3.5	3.3	3.4	3.2	3.2	3.5	3.4	3.4	3.8	3.4	3.8/	3.8	3.7	3.5	3.5	3.7	4.0				
2774	4.2	4.2	E	4.3	4.1	4.3/	4.3	4.1	4.5	4.3	3.9	3.9	4.6								
2775	4.1	3.5	4.2	3.9	3.9	4.2	3.6	4.1	4.2	4.1	4.2	4.2/	4.2	4.4	4.1						
2776	4.4	4.4	4.5	5.6	4.2/	3.9	4.2	4.4	4.3	4.5	4.2	4.5	4.2	4.0							
2777	3.8	3.4	3.7	3.5	3.6	3.8	3.8	4.0	4.0	4.0/	3.9	3.9	4.0	3.9	3.8	4.1	4.0	3.2	3.5		
2778	4.2	4.3	E	4.2	4.0	4.2	4.1	4.2	3.9	4.1	4.2/	4.4	4.5	4.3	4.3	4.0					
2779	4.6	4.4	4.5	4.5	4.3	4.4	4.9	4.6	4.8	5.0/	4.9	4.7	4.4	4.4	4.8	4.3					
2780	4.3	3.6	4.0	4.4	3.9	4.1	4.1	4.5	4.6/	4.5	4.4	4.5	4.1	4.1	4.7	4.6					
2781	4.4	4.5	E	4.4	4.3	4.1/	4.6	4.1	4.3	4.7	4.1	4.3	4.6								
2782	4.4	4.0	4.1	4.4	4.4	4.4	4.7	4.4	4.3	4.3	4.4	4.7/	4.7	4.7	E	4.5	4.2				
2783	3.4	3.3	3.3	3.2	3.6	3.2	3.3	3.7/	3.3	3.3	3.4	3.7	3.5	3.5	3.5	3.2	3.3				
2784	NP																				
MEAN	4.1																				
S.D.	0.32																				
N	23																				

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

NP=NOT PREGNANT

APPENDIX I

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

GROUP 3		5000 PPM																		
FEMALE#	MEAN	FETUS#																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
3761	4.0	4.0	3.9	4.2	4.1	3.8	4.0	3.8	4.2/	4.1	4.0	4.2	4.1	3.9						
3762	4.3	4.3	4.5	4.5	3.8	4.6	4.2/	3.9	4.4	4.6	4.4	4.8	4.1	4.0						
3763	4.3	4.5	E	4.4	4.3	4.4	5.1	4.2	L	4.3	3.3/	4.4	4.2	4.5	3.9	4.2	4.5			
3764	4.1	3.9	4.3	3.8	4.6	4.3	3.9/	4.0	4.2	4.1	4.3	4.0	4.2							
3765	4.4	E	4.6	4.3	5.0	4.4	E /	4.6	4.2	4.4	4.4	4.4	4.3	4.2						
3766	4.3	4.3	4.3	4.8	3.9	4.3	4.4/	4.8	4.3	3.9	4.5	4.2	4.0	4.0	4.1					
3767	4.7	4.4	4.4	4.8	4.7	4.4	4.7	4.8	4.8/	4.8	4.9	4.5	4.8	4.8	4.9	4.7				
3768	4.1	4.0	4.0	4.0	3.9/	3.9	4.1	4.4	4.3	4.7	4.4	4.0	4.0	3.9	E					
3769	4.0	4.0	4.1	3.6	3.9	E	4.2	3.6	4.0	3.9/	4.3	4.2	4.0	3.9	3.8					
3770	4.2	4.0	4.0	4.3	4.2	4.1	4.1	4.0	4.2/	4.2	4.5	4.0	4.3	4.2	4.4	4.0	4.2			
3771	3.9	3.1	3.9	3.9	4.2	3.7	3.7	E	3.8	3.9/	E	4.0	3.7	3.8	4.3	4.3	E	3.9	4.1	
3772	4.4	4.2	4.5	4.6	4.6	E	4.6/	4.2	4.4	4.2	4.8	3.8	4.6	4.6	4.4	4.4				
3773	3.6	3.1	3.4	3.8	3.5	3.5	3.4	3.7	3.9	3.6/	3.6	3.8	3.7	3.8						
3774	3.9	4.1	4.1	3.9	4.0/	3.7	4.1	4.0	3.7	4.3	3.7	E	4.0	3.8	3.9					
3775	4.2	4.0	4.4	4.0	4.1	4.0	4.3	4.4/	4.2	4.4	4.3	3.8	4.1	4.1	E					
3776	4.3	4.4	4.2	4.4	4.5	4.3	4.2/	4.4	4.1	4.3	4.3	4.0	4.5	4.1	4.4	4.1				
3777	3.8	3.8	3.8	E	4.3	2.8	4.2/	3.5	4.0	3.8	3.4	4.1	3.9							
3778	4.0	4.0	4.1	3.9	3.8	4.0	3.8	3.5	4.0	4.0	3.7/	4.3	E	4.1	4.1	4.1	4.0			
3779	4.3	4.2	4.2	4.5	4.4	4.1	4.2	4.3	4.4/	4.1	3.9	4.7	4.5	4.5	3.9					
3780	4.6	4.8	4.6	4.5	4.8	4.7/	4.8	4.8	4.7	E	E	4.7	4.5	4.1	4.7	4.0				
3781	4.4	4.1	4.3	4.6	4.3	4.5	4.6	4.3	4.5	E /	4.4	4.5	4.7	4.5	4.4					
3782	4.0	3.7	4.1	4.2	E	4.2	4.0	4.1	4.0	3.4	4.2/	4.1	4.2	3.7	4.1	3.8				
3783	4.3	3.8	E	4.3	4.2	4.4	4.3	4.0	E	4.5	4.1	4.4/	4.2	4.5	4.6	4.6				
3784	4.0	4.2	4.2	3.8	4.0	4.3	3.9	4.2/	3.9	3.9	4.1	4.2	3.9	3.7	3.9	E	4.4	4.1		
MEAN	4.2																			
S.D.	0.26																			
N	24																			

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

APPENDIX I

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

GROUP 4		INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																		
10000 PPM																				
FEMALE#	MEAN	FETUS#		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
		1	2																	
4761	3.3	3.7	3.7	4.0	3.1	3.2	3.8	4.0	3.1/	2.3	3.3	3.6	2.9	3.2	2.9	3.1				
4762	4.1	3.9	4.1	4.2	4.0	3.9	4.0	4.0	4.0	3.8/	4.2	4.4	4.3	3.9	4.2					
4763	3.7	2.9	3.9	3.8	4.1	3.7	3.8	3.5	3.7	4.0/	4.2	3.8	3.6	3.6	3.8	2.9				
4764	4.2	3.9	4.9	4.6	4.1	4.0	E	E	4.3	4.7/	4.2	4.3	3.8	4.2	4.3	3.6				
4765	4.3	4.4	4.3	4.4	4.4	4.5	4.1	4.0	4.2/	4.6	4.1	4.3	4.2	4.5	4.1	3.9				
4766	4.4	4.6	4.6	3.9	4.5	4.2	4.1	4.9/	4.2	4.5	4.4	4.3	4.5	4.2						
4767	4.3	4.6	4.6	4.2	E /	4.6	4.2	4.4	4.5	4.1	4.4	4.0	4.1	4.2	4.2	4.4				
4768	4.4	4.0	4.4	4.5	4.6	4.3	4.0	4.3	4.9	4.5	4.3	4.7/	4.6	4.3						
4769	3.9	3.8	3.9	3.7	3.9	3.7	4.0	3.9	3.8	3.9/	4.2	4.0	3.6	4.1	3.8	3.7				
4770	3.8	3.8	3.7	3.5	4.1	3.8	3.8	3.4	E	3.7	3.4/	3.9	4.1	3.6	4.1	3.7				
4771	4.3	4.5	4.3	4.3	4.3	4.3	4.2	4.3	4.3	3.6	4.5/	4.5	4.5	4.6	E	4.4				
4772	3.9	E	3.6	3.8	3.8	4.1	3.8	4.0	3.9	4.0/	4.0	3.4	4.0	4.2	4.2	4.2	4.1			
4773	3.9	3.7	4.0	3.4	3.8	3.9	3.7/	4.4	4.1	E	3.9	E	3.9	3.7						
4774	4.3	4.1	4.2	4.2	4.5	4.2	4.3	4.2	4.3/	4.6	4.3	4.5	4.3	4.2						
4775	4.5	4.3	4.3	E	4.3	4.6/	4.7	4.2	4.5	E	4.7	4.5	4.9	4.6	4.4					
4776	4.2	4.3	4.3	4.3	4.0	E	E	4.1	4.2/	3.8	4.0	4.4	4.0	4.3	4.4					
4777	4.1	3.4	4.0	4.0	4.3	4.0	4.0	4.3	3.9/	4.1	4.1	4.3	4.3							
4778	4.1	E	3.8	4.0	4.2	4.1	4.1	3.9	4.2	E /	4.4	3.9	4.0	4.0						
4779	4.4	E	4.4	3.9	4.5	E	4.8/	4.7	4.2	4.3	4.4	4.4	4.6							
4780	4.6	4.3	E	4.5	4.7	4.5	4.8	4.7	4.8/	4.5	4.9	4.4	4.3							
4781	4.1	4.0	4.0	3.8	4.1	4.2	4.2	4.1	3.9	4.4	E /	4.3	4.3	4.4	4.0	4.3	4.1			
4782	4.6	4.6	4.6	4.4	4.8/	4.8	4.6	4.6	4.7	4.4	4.7	4.4	4.4	4.5						
4783	4.4	4.2	4.5	4.4	4.1	4.0	4.0/	4.7	4.9	L	4.4	E	4.2	4.5	4.4					
4784	4.5	4.4	4.8	4.5	4.6	4.7/	4.5	4.4	4.7	4.8	4.2	4.6	4.0	4.9	4.5					
MEAN	4.2																			
S.D.	0.31																			
N	24																			

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1761	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
1762	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
1763	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1763	(CONTINUED)			
	6 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
	16 M			WITHIN NORMAL LIMITS
1764	2 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
1765	1 F			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1765	(CONTINUED)		
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
1766	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
1767	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1767	(CONTINUED)		
	15 F		WITHIN NORMAL LIMITS
1768	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1769	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
1770	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1770	(CONTINUED)			
	9 F		WITHIN	NORMAL LIMITS
	10 F		WITHIN	NORMAL LIMITS
	12 F		WITHIN	NORMAL LIMITS
	13 M		WITHIN	NORMAL LIMITS
	14 F		WITHIN	NORMAL LIMITS
	15 F		WITHIN	NORMAL LIMITS
1771	1 F		WITHIN	NORMAL LIMITS
	2 F		WITHIN	NORMAL LIMITS
	3 M		WITHIN	NORMAL LIMITS
	4 M		WITHIN	NORMAL LIMITS
	5 M		WITHIN	NORMAL LIMITS
	6 M		WITHIN	NORMAL LIMITS
	7 M		WITHIN	NORMAL LIMITS
	8 F		WITHIN	NORMAL LIMITS
	9 M		WITHIN	NORMAL LIMITS
	10 M		WITHIN	NORMAL LIMITS
	11 F		WITHIN	NORMAL LIMITS
1772	1 M		WITHIN	NORMAL LIMITS
	2 M		WITHIN	NORMAL LIMITS
	3 M		WITHIN	NORMAL LIMITS
	4 M		WITHIN	NORMAL LIMITS
	5 F		WITHIN	NORMAL LIMITS
	6 F		WITHIN	NORMAL LIMITS
	7 M		WITHIN	NORMAL LIMITS
	8 F		WITHIN	NORMAL LIMITS
	9 M		WITHIN	NORMAL LIMITS
	10 F		WITHIN	NORMAL LIMITS
	11 M		WITHIN	NORMAL LIMITS
	12 F		WITHIN	NORMAL LIMITS
	13 F		WITHIN	NORMAL LIMITS
	14 F		WITHIN	NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1773	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
1774	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
1775	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1775	(CONTINUED)		
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
1776	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
1777	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1777	(CONTINUED)		
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
1778	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1779	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1780	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
	15 M			WITHIN NORMAL LIMITS
	16 F			WITHIN NORMAL LIMITS
1781	1 M			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined
CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1782	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	17 M		WITHIN NORMAL LIMITS
	18 F		WITHIN NORMAL LIMITS
1783	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1783	(CONTINUED)			
	16 F			WITHIN NORMAL LIMITS
1784	1 F			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2761	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
2762	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
2763	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2763	(CONTINUED)		
	8 F		WITHIN NORMAL LIMITS
2764	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
2765	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2766	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
2767	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
2768	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2768	(CONTINUED)		
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
2769	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
2770	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
2771	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
2771	(CONTINUED)			
	4 F			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
2772	1 M			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
	15 M			WITHIN NORMAL LIMITS
2773	1 F			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2773	(CONTINUED)		
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
2774	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
2775	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2776	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F	GROSS EXAM	M ANASARCA; EXTREME GENERALIZED SWELLING OF WHOLE BODY
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
2777	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	17 F		WITHIN NORMAL LIMITS
	18 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
2778	1 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
2779	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
2780	1 F			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
2780	(CONTINUED)			
	4 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
	15 M			WITHIN NORMAL LIMITS
2781	1 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M	GROSS EXAM	M	ANASARCA; EXTREME GENERALIZED SWELLING OF WHOLE BODY
	11 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
2782	1 F			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2782	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
2783	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
3761	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
3762	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
3763	1 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
3763	(CONTINUED)			
	8 L	CROWN-RUMP	DISTANCE	
			3.7 CM	
	9 M		WITHIN NORMAL LIMITS	
	10 F		WITHIN NORMAL LIMITS	
	11 F		WITHIN NORMAL LIMITS	
	12 F		WITHIN NORMAL LIMITS	
	13 M		WITHIN NORMAL LIMITS	
	14 F		WITHIN NORMAL LIMITS	
	15 F		WITHIN NORMAL LIMITS	
	16 M		WITHIN NORMAL LIMITS	
3764	1 F		WITHIN NORMAL LIMITS	
	2 M		WITHIN NORMAL LIMITS	
	3 F		WITHIN NORMAL LIMITS	
	4 F		WITHIN NORMAL LIMITS	
	5 M		WITHIN NORMAL LIMITS	
	6 F		WITHIN NORMAL LIMITS	
	7 F		WITHIN NORMAL LIMITS	
	8 M		WITHIN NORMAL LIMITS	
	9 F		WITHIN NORMAL LIMITS	
	10 M		WITHIN NORMAL LIMITS	
	11 M		WITHIN NORMAL LIMITS	
	12 M		WITHIN NORMAL LIMITS	
3765	2 M		WITHIN NORMAL LIMITS	
	3 F		WITHIN NORMAL LIMITS	
	4 M		WITHIN NORMAL LIMITS	
	5 F		WITHIN NORMAL LIMITS	
	7 F		WITHIN NORMAL LIMITS	
	8 M		WITHIN NORMAL LIMITS	
	9 F		WITHIN NORMAL LIMITS	
	10 F		WITHIN NORMAL LIMITS	
	11 F		WITHIN NORMAL LIMITS	
	12 F		WITHIN NORMAL LIMITS	

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

FETAL STATUS CODES: L-late resorption

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3765	(CONTINUED)		
	13 F		WITHIN NORMAL LIMITS
3766	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
3767	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3768	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3769	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
3770	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3770	(CONTINUED)		
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
3771	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	17 F		WITHIN NORMAL LIMITS
	18 M		WITHIN NORMAL LIMITS
3772	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3772	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3773	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3774	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
3774	(CONTINUED)			
	14 F			WITHIN NORMAL LIMITS
3775	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
3776	1 F			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
	15 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
3777	1 F			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
3778	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
	16 M			WITHIN NORMAL LIMITS
3779	1 F			WITHIN NORMAL LIMITS
	2 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3779	(CONTINUED)		
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
3780	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3781	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
3781	(CONTINUED)			
	13 M			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
3782	1 F			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
	15 M			WITHIN NORMAL LIMITS
3783	1 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
	15 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3784	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	17 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
4761	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
4762	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
4763	1 F			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
4763	(CONTINUED)			
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
4764	1 F			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
4765	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4765	(CONTINUED)		
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
4766	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4767	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4767	(CONTINUED)		
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4768	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4769	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4770	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
4771	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4772	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4772	(CONTINUED)		
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
4773	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
4774	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4774	(CONTINUED)		
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4775	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4776	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4777	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4777	(CONTINUED)		
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
4778	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4779	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4780	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
4781	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
4782	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4782	(CONTINUED)		
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4783	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 L	CROWN-RUMP	DISTANCE 2.0 CM
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
4784	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

FETAL STATUS CODES: L=late resorption

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APPENDIX J

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4784	(CONTINUED)		
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1761	2 F		WITHIN	NORMAL LIMITS
	4 M		WITHIN	NORMAL LIMITS
	6 F		WITHIN	NORMAL LIMITS
	8 F		WITHIN	NORMAL LIMITS
	11 M		WITHIN	NORMAL LIMITS
	13 M		WITHIN	NORMAL LIMITS
	15 M		WITHIN	NORMAL LIMITS
1762	1 M		WITHIN	NORMAL LIMITS
	3 M		WITHIN	NORMAL LIMITS
	5 F		WITHIN	NORMAL LIMITS
	8 F		WITHIN	NORMAL LIMITS
	10 M		WITHIN	NORMAL LIMITS
	12 M		WITHIN	NORMAL LIMITS
	14 M		WITHIN	NORMAL LIMITS
1763	2 M		WITHIN	NORMAL LIMITS
	4 M		WITHIN	NORMAL LIMITS
	6 F		WITHIN	NORMAL LIMITS
	8 M		WITHIN	NORMAL LIMITS
	10 F		WITHIN	NORMAL LIMITS
	12 F		WITHIN	NORMAL LIMITS
	14 M		WITHIN	NORMAL LIMITS
	16 M		WITHIN	NORMAL LIMITS
1764	2 F		WITHIN	NORMAL LIMITS
	4 F		WITHIN	NORMAL LIMITS
	6 M		WITHIN	NORMAL LIMITS
	8 F		WITHIN	NORMAL LIMITS
	10 M		WITHIN	NORMAL LIMITS
	12 M		WITHIN	NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1765	2 M	TORSO	V UNDESCENDED THYMUS BILATERAL LOBES
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M	TORSO	V UNDESCENDED THYMUS LEFT LOBE
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1766	1 F	HEAD	V HEMORRHAGE 3RD BRAIN VENTRICLE; MODERATE 3RD
		TORSO	V UNDESCENDED THYMUS LEFT HORN
	3 M	TORSO	V DISPLACED TESTIS; LEFT MEDIALY
	5 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
1767	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M	TORSO	V DISPLACED TESTIS LEFT - MEDIALY
1768	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1768	(CONTINUED)		
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M	TORSO	V UNDESCENDED THYMUS LEFT HORN
1769	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M	TORSO	V UNDESCENDED TESTIS; LEFT
1770	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F	TORSO	V UNDESCENDED THYMUS LEFT HORN
	9 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F	TORSO	V UNDESCENDED THYMUS RIGHT HORN
1771	2 F		WITHIN NORMAL LIMITS
	4 M	TORSO	V DISPLACED TESTIS; LEFT MEDIALY
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
1772	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1773	2 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
1774	1 F			WITHIN NORMAL LIMITS
	3 M	TORSO	V	UNDESCENDED THYMUS RIGHT HORN
	5 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	11 M	HEAD	V	AQUEOUS HUMOUR HEMORRHAGE; MODERATE; LEFT
1775	2 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	10 M	TORSO	V	DISPLACED TESTIS; LEFT MEDIALY
	12 F			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
1776	1 F			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1777	2 M	HEART	V ADDITIONAL SUBCLAVIAN ARTERY LEFT
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
1778	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
1779	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
1780	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M	TORSO	V UNDESCENDED THYMUS LEFT HORN
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1781	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1782	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	17 M		WITHIN NORMAL LIMITS
1783	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F	HEAD	V SUB-DURAL EDEMA
			SUBDURAL - MODERATE
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F	TORSO	V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1)
			BILATERAL
	16 F		WITHIN NORMAL LIMITS
1784	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M	TORSO	V UNDESCENDED THYMUS
			RIGHT HORN

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1784	(CONTINUED)		
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F	TORSO	V LEFT UMBILICAL ARTERY

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2761	2 M		WITHIN NORMAL LIMITS
	4 F	TORSO	V LEFT UMBILICAL ARTERY
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
2762	1 M		WITHIN NORMAL LIMITS
	3 M	HEART	V ADDITIONAL SUBCLAVIAN ARTERY
			LEFT
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
2763	11 F	TORSO	V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1)
			RIGHT
	14 F		WITHIN NORMAL LIMITS
2764	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
2764	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M	TORSO	V UNDESCENDED THYMUS
			LEFT HORN
	16 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2765	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
2766	1 M		WITHIN NORMAL LIMITS
	4 M	TORSO	V UNDESCENDED THYMUS
			LEFT HORN
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
2767	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
2768	2 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
2769	3 F	TORSO	V UNDESCENDED THYMUS
			LEFT HORN
	5 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2769	(CONTINUED)		
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F	HEAD	M HYDROCEPHALY; MODERATE ALL VENTRICLES
2770	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
2771	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
2772	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
2773	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M	TORSO	V UNDESCENDED THYMUS LEFT HORN

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2773	(CONTINUED)		
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	16 M	TORSO	V UNDESCENDED THYMUS LEFT HORN
2774	1 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
2775	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M	TORSO	V UNDESCENDED THYMUS LEFT HORN
	12 M	TORSO	V UNDESCENDED THYMUS LEFT HORN
	14 M	TORSO	V UNDESCENDED THYMUS BILATERAL HORNS
2776	1 M		WITHIN NORMAL LIMITS
	3 F	HEART	M HEART AND/OR GREAT VESSEL ANOMALY LEFT CAROTID ARISES FROM INNOMINATE ARTERY LEFT SUBCLAVIAN ARISES FROM PULMONARY TRUNK [RIGHT ATRIUM EXTREMELY ENLARGED]
		HEART	M INTERVENTRICULAR SEPTAL DEFECT
		HEART	M RIGHT-SIDED AORTIC ARCH
		TORSO	M HYPOPLASTIC SPLEEN; MODERATE
		TORSO	M UTERINE HORN ENLARGED; EXTREME; BILATERAL
		TORSO	M OVARY AGENESIS; RIGHT LEFT -HYPOPLASTIC

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2776	(CONTINUED)		
		TORSO	V ATELECTASIS OF LUNG; MODERATE ALL LOBES
		TORSO	V UNDESCENDED THYMUS BILATERAL
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
2777	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	18 F		WITHIN NORMAL LIMITS
2778	1 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
2779	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
2779	(CONTINUED)			
	14 M			WITHIN NORMAL LIMITS
2780	1 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	15 M			WITHIN NORMAL LIMITS
2781	3 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M	HEAD	M	RETINAS FOLDED; RIGHT
		HEART	M	INTERVENTRICULAR SEPTAL DEFECT
		HEART	M	HEART AND/OR GREAT VESSEL ANOMALY
				LEFT CAROTID ARISES FROM INNOMINATE ARTERY
		TORSO	M	HYPOPLASTIC SPLEEN; MODERATE
		TORSO	V	UNDESCENDED TESTIS; BILATERAL
	11 F			WITHIN NORMAL LIMITS
2782	1 F	TORSO	V	UNDESCENDED THYMUS
				RIGHT HORN
	3 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	16 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2783	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M	TORSO	V UNDESCENDED THYMUS LEFT HORN
	12 F	TORSO	V UNDESCENDED THYMUS LEFT HORN
	14 M		WITHIN NORMAL LIMITS
	16 F	TORSO	V UNDESCENDED THYMUS RIGHT HORN

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3761	2 M	TORSO	V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1) LEFT
	4 M	TORSO	V UNDESCENDED THYMUS RIGHT HORN
	6 F		WITHIN NORMAL LIMITS
	8 M	TORSO	V RENAL PAPILLA (E) NOT DEVELOPED (GRADE 0) LEFT
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
3762	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3763	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	10 F	TORSO	M SITUS INVERSUS WHOLE BODY
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
3764	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3765	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
3766	1 F		WITHIN NORMAL LIMITS
	3 M	TORSO	V LEFT UMBILICAL ARTERY
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3767	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
3768	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M	TORSO	V UNDESCENDED THYMUS
			LEFT HORN
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3769	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3769	(CONTINUED)		
	9 M	TORSO	V LEFT UMBILICAL ARTERY
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3770	1 F	TORSO	V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1)
	3 F		RIGHT
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3771	1 F	TORSO	V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1)
	3 M	TORSO	RIGHT
	6 M		V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1)
	9 F		BILATERAL
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	17 F		WITHIN NORMAL LIMITS
3772	1 F		WITHIN NORMAL LIMITS
	3 F	HEART	V ADDITIONAL SUBCLAVIAN ARTERY
	6 F		LEFT
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3773	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
3774	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
3775	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
3776	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
3777	2 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3777	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
3778	1 M		WITHIN NORMAL LIMITS
	3 F	TORSO	V URETER(S) DISTENDED; MODERATE BILATERAL
		TORSO	V DISPLACED OVARY LEFT - CAUDALLY
		TORSO	M HYPOPLASTIC KIDNEY, EXTREME, RIGHT
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
3779	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F	TORSO	V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1) RIGHT
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
3780	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
3781	2 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
3782	1 F			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	8 M	TORSO	V	UNDESCENDED THYMUS LEFT HORN
	10 M			WITHIN NORMAL LIMITS
	12 M	TORSO	V	UNDESCENDED THYMUS BILATERAL HORNS
	14 F			WITHIN NORMAL LIMITS
3783	3 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	14 M			WITHIN NORMAL LIMITS
3784	1 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	16 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4761	2 M	TORSO	WITHIN NORMAL LIMITS
	4 M		V UNDESCENDED THYMUS
			LEFT HORN
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
4762	12 F	TORSO	WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		V UNDESCENDED THYMUS
4763			LEFT HORN
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
4764	6 M	TORSO	WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	1 F		WITHIN NORMAL LIMITS
	3 M	TORSO	WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	9 M		V UNDESCENDED THYMUS
			LEFT HORN
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4765	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M	TORSO	V LEFT UMBILICAL ARTERY
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
4766	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4767	2 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4768	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M	TORSO	V UNDESCENDED TESTIS; BILATERAL
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4769	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
4770	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4771	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4772	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	16 M	TORSO	V DISPLACED TESTIS; RIGHT MEDIALY

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4773	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F	TORSO	V UNDESCENDED THYMUS
			RIGHT HORN
	12 M		WITHIN NORMAL LIMITS
4774	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F	TORSO	V RENAL PAPILLA (E) NOT FULLY DEVELOPED (GRADE 1)
			LEFT
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4775	2 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	10 M	HEART	V ADDITIONAL SUBCLAVIAN ARTERY
			LEFT
	12 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4776	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M	TORSO	V LEFT UMBILICAL ARTERY
	13 M		WITHIN NORMAL LIMITS
4777	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4777	(CONTINUED)		
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
4778	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4779	3 F		WITHIN NORMAL LIMITS
	6 M	TORSO	V DISPLACED TESTIS
			RIGHT - MEDIALY
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
4780	1 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
4781	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX K

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL VISCERAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4782	1 M	TORSO	V UNDESCENDED THYMUS
			BILATERAL HORNS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F	TORSO	V UNDESCENDED THYMUS
			BILATERAL HORN
4783	13 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M	HEART	M INTERVENTRICULAR SEPTAL DEFECT; EXTREME
		HEART	M HEART AND/OR GREAT VESSEL ANOMALY
			PERSISTENT TRUNCUS ARTERIOSUS
			HEART DISPLACED TOWARDS RIGHT SIDE
		HEART	V INNOMINATE ARTERY ABSENT
			ALL VESSELS ARISE DIRECTLY FROM AORTIC ARCH
		TORSO	V LEFT UMBILICAL ARTERY
		TORSO	V ABNORMAL LUNG LOBULATION
			LEFT LUNG TRI-LOBED, SAME PATTERN AS RIGHT LOBES
4784		TORSO	M AGENESIS OF SPLEEN
	8 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1761	1 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
1762	2 F	RIBS	V	RIB(S) 14TH RUDIMENTARY; RIGHT
	4 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
1763	1 F			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	9 F	RIBS	V	RIB(S) 14TH RUDIMENTARY; BILATERAL
	11 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
1764	3 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
1765	1 F			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1765	(CONTINUED)			
	7 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
1766	2 F			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
1767	1 F			WITHIN NORMAL LIMITS
	3 M	RIBS	V	RIB(S) 14TH RUDIMENTARY; RIGHT
	5 F			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	11 F	RIBS	V	RIB(S) 14TH RUDIMENTARY; LEFT
	13 F	RIBS	V	RIB(S) 14TH RUDIMENTARY; LEFT
	15 F			WITHIN NORMAL LIMITS
1768	2 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	14 F	RIBS	V	RIB(S) 14TH RUDIMENTARY; LEFT
1769	1 M	RIBS	V	RIB(S) 14TH RUDIMENTARY; LEFT
	4 M	RIBS	V	RIB(S) 14TH RUDIMENTARY; BILATERAL
	6 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
1770	2 M			WITHIN NORMAL LIMITS
	4 F			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS
1771	1 F			WITHIN NORMAL LIMITS
	3 M	CERVICAL VERT.	V	CERVICAL RIB(S) PRESENT; RIGHT 7TH
	5 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
1772	2 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	6 F			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
	14 F			WITHIN NORMAL LIMITS
1773	1 M			WITHIN NORMAL LIMITS
	3 F			WITHIN NORMAL LIMITS
	5 F	RIBS	V	RIB(S) 14TH RUDIMENTARY; BILATERAL
	7 F	RIBS	V	RIB(S) 14TH RUDIMENTARY; BILATERAL
	9 F			WITHIN NORMAL LIMITS
	11 F			WITHIN NORMAL LIMITS
	13 M			WITHIN NORMAL LIMITS
	15 F			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-PETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1774	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M	RIBS	V RIB(S) KINKED; SLIGHT; BILATERAL
			10TH, 11TH - MEDIALY
	12 M		WITHIN NORMAL LIMITS
1775	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
1776	2 M	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	14 F		WITHIN NORMAL LIMITS
1777	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
1778	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1778	(CONTINUED)		
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1779	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
1780	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
1781	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
1782	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1782	(CONTINUED)		
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	18 F		WITHIN NORMAL LIMITS
1783	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
1784	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2761	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
2762	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
2763	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
2764	2 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
2765	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2766	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F	SKULL	M FUSED BONES; BILATERAL JUGAL TO SQUAMOSAL
		SKULL	V SUTURAL BONE BETWEEN FRONTALS
		RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
		RIBS	M RIB(S) FUSED AND/OR BRANCHED FUSED - LEFT 9TH TO 10TH, DISTALLY
		SKULL	V MISSHAPEN BASISPHENOID; BILATERAL BASISPHENOID EXTENDING Laterally TO TYMPANIC RINGS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
2767	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	9 M		WITHIN NORMAL LIMITS
	12 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
2768	14 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	3 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
2769	13 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2770	2 F		WITHIN NORMAL LIMITS
	4 M	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	6 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
2771	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	10 M	CERVICAL VERT.	V CERVICAL RIB(S) PRESENT; LEFT
			7TH
		FEMUR	M FEMUR MISSHAPEN; BILATERAL
			BENT OUTWARD
	13 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
2772	2 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
2773	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2774	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	11 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
2775	1 F	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	3 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	5 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	7 F		WITHIN NORMAL LIMITS
	9 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	11 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	13 M		WITHIN NORMAL LIMITS
2776	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
2777	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	17 F		WITHIN NORMAL LIMITS
2778	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2778	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
2779	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
2780	2 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
2781	1 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	8 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
2782	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 2 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2782	(CONTINUED)		
	15 F		WITHIN NORMAL LIMITS
2783	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3761	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3762	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
3763	1 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3764	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
3765	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3765	(CONTINUED)		
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3766	2 F		WITHIN NORMAL LIMITS
	4 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
3767	1 M	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	3 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	15 M		WITHIN NORMAL LIMITS
3768	2 F	CERVICAL VERT.	V CERVICAL RIB(S) PRESENT; BILATERAL 7TH
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
3769	1 M	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	3 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3769	(CONTINUED)		
	14 F		WITHIN NORMAL LIMITS
3770	2 F	SKULL	V SUTURAL BONE; RIGHT PARIETAL
	4 F		WITHIN NORMAL LIMITS
	6 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	14 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	16 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
3771	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	18 M		WITHIN NORMAL LIMITS
3772	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3773	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3773	(CONTINUED)		
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3774	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
3775	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
3776	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
3777	1 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	PETUS#/SEX	ORGAN	CLASS OBSERVATION
3778	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3779	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
3780	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
3781	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
3782	2 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 3 5000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3782 (CONTINUED)			
	9 F		WITHIN NORMAL LIMITS
	11 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	13 M		WITHIN NORMAL LIMITS
	15 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
3783			
	1 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
3784			
	2 M		WITHIN NORMAL LIMITS
	4 F	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	17 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4761	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F	RIBS	V RIB(S) 14TH RUDIMENTARY; RIGHT
	7 M		WITHIN NORMAL LIMITS
	9 M	CERVICAL VERT.	V CERVICAL RIB(S) PRESENT; RIGHT
			7TH
		CERVICAL VERT.	M CERVICAL ARCH(ES) FUSED
			RIGHT EXOCCIPITAL TO 1ST AND 2ND RIGHT ARCHES
		THORACIC VERT.	V THORACIC CENTRUM(A)/VERTEBRA(E) UNOSSIFIED
			5TH RIGHT HEMIVERTEBRA
		RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
		RIBS	M RIB(S) FUSED AND/OR BRANCHED
			FUSED - 5TH TO 6TH, RIGHT, PROXIMALLY
	11 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
4762	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4763	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4764	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 F	CERVICAL VERT.	V CERVICAL RIB(S) PRESENT; BILATERAL 7TH
	14 M		WITHIN NORMAL LIMITS
4765	1 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
4766	2 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
4767	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4768	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	8 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	10 M		WITHIN NORMAL LIMITS
	12 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
4769	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
4770	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
4771	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4772	3 F		WITHIN NORMAL LIMITS
	5 M	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4773	1 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
4774	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	12 M	RIBS	V RIB(S) KINKED; SLIGHT; RIGHT 5TH - MEDIALY
4775	1 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
4776	2 M	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	4 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	8 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4776	(CONTINUED)		
	12 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4777	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
4778	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
4779	2 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
4780	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
4781	1 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

APPENDIX L

LIQUIFIED PETROLEUM GAS: EMBRYO-FETAL TOXICITY STUDY IN RATS
BY INHALATION EXPOSURE

INDIVIDUAL FETAL SKELETAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4781	(CONTINUED)		
	14 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
4782	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	12 F	SKULL	V SUTURAL BONE; RIGHT PARIETAL
4783	1 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
4784	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	8 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	10 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT
	12 F	RIBS	V RIB(S) 14TH RUDIMENTARY; BILATERAL
	14 F	RIBS	V RIB(S) 14TH RUDIMENTARY; LEFT

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

Group 1 – 0 ppm					Individual Ossification Parameters												Appendix M							
		Number of Fetuses Affected																						
Animal Number	Number of Fetuses	Incompletely Ossified / Unossified Skull Bones			Cervical Centrum(a) Ossified		Incompletely Ossified / Unossified Sternebra(e)			Number of Caudal Vertebrae Ossified (<i>Litter Mean</i>)	Incompletely Ossified / Unossified Vertebral Centrum(a)		Ossification of 1st Cervical Arch (Ventral / Odontoid Process)	Incompletely Ossified / Unossified Vertebral Arches		Incompletely Ossified / Unossified Pelvic Bones			Vertebral Arches / Centra Fused		5th Metacarpals Ossified	Incompletely Ossified / Unossified Metacarpals	Incompletely Ossified / Unossified Metatarsals	Ribs Affected
		<3	3-5	>5	1	2+	1	2	3+		1	2+		1 pair	2+ pairs	1-2	3-4	5-6	1 vert.	2+ vert.				
1761	7	2	0	1	2	0	3	0	0	3.7	0	1	0	1	0	0	0	0	2	0	4	0	0	0
1762	6	2	1	0	3	1	1	0	0	4.7	0	0	0	0	0	0	0	0	3	2	6	0	0	0
1763	8	1	0	0	2	3	3	0	0	4.3	0	0	4	0	0	0	0	0	2	4	8	0	0	0
1764	6	1	0	0	2	2	3	0	0	4.5	0	0	1	0	0	0	0	0	0	6	6	0	0	0
1765	8	7	1	0	3	0	3	2	1	4.0	0	0	1	2	0	0	0	0	0	2	6	0	0	0
1766	6	2	1	0	3	2	2	0	0	4.3	0	0	2	0	1	1	1	0	1	5	6	1	0	0
1767	8	0	0	0	2	0	2	0	0	3.8	0	0	2	0	0	0	0	0	2	2	1	0	0	0
1768	7	4	1	0	1	6	3	1	0	4.4	1	0	3	0	0	0	0	0	0	4	7	0	0	0
1769	4	1	0	0	1	0	0	4	0	4.8	0	0	0	0	0	0	0	0	0	0	2	0	0	0
1770	7	2	1	1	0	0	1	3	0	4.0	0	0	0	2	1	1	0	0	0	0	5	0	0	0
1771	6	2	0	0	2	4	0	0	0	5.3	0	0	3	0	0	0	0	0	2	1	6	0	0	0
1772	7	1	0	0	1	6	2	0	0	5.0	0	0	5	0	0	0	0	0	0	7	7	0	0	0
1773	8	2	1	3	2	1	2	1	0	3.6	0	0	4	3	1	0	0	0	0	0	5	0	0	0
1774	6	1	2	0	3	0	1	4	0	4.0	0	0	0	2	1	0	0	0	0	0	3	0	0	0
1775	7	1	0	0	1	2	0	0	0	4.4	0	0	0	0	0	0	0	0	1	0	7	0	0	0
1776	7	1	0	0	5	2	2	2	0	4.3	0	0	0	0	0	0	0	0	3	2	5	0	0	0
1777	6	3	1	0	3	0	2	4	0	3.5	0	0	3	4	0	1	0	0	0	0	1	0	0	0
1778	7	0	1	0	0	0	5	2	0	3.3	1	0	1	0	3	1	0	0	0	0	2	0	0	0
1779	7	2	2	0	0	0	3	1	0	4.1	0	0	1	1	2	1	0	0	3	2	6	0	0	0
1780	8	3	1	0	4	2	2	0	0	4.0	0	0	2	0	0	0	0	0	1	4	7	0	0	0
1781	7	1	0	0	0	7	1	1	0	4.7	0	0	0	0	0	0	0	0	1	3	7	0	0	0
1782	9	2	1	0	3	1	2	0	0	4.0	1	0	2	0	0	0	0	0	3	5	8	0	0	0
1783	8	1	1	0	4	0	3	0	0	3.9	0	0	0	0	2	0	0	0	2	3	5	0	0	0
1784	7	0	0	0	1	5	3	3	0	4.1	0	0	0	0	0	0	0	0	1	1	6	0	0	0
Number of Fetuses (Litters)	167 (24)	42 (21)	15 (13)	5 (2)	48 (19)	44 (14)	49 (20)	28 (12)	1 (1)	4.2	3 (3)	1 (1)	34 (14)	15 (7)	11 (7)	5 (5)	1 (1)	0 (0)	27 (14)	53 (16)	126 (24)	1 (1)	0 (0)	0 (0)

Group 2 – 1000 ppm					Individual Ossification Parameters												Appendix M								
		Number of Fetuses Affected																							
Animal Number	Number of Fetuses	Incompletely Ossified / Unossified Skull Bones			Cervical Centrum(a) Ossified		Incompletely Ossified / Unossified Sternebra(e)			Number of Caudal Vertebrae Ossified (<i>Litter Mean</i>)	Incompletely Ossified / Unossified Vertebral Centrum(a)		Ossification of 1st Cervical Arch (Ventral / Odontoid Process)	Incompletely Ossified / Unossified Vertebral Arches		Incompletely Ossified / Unossified Pelvic Bones			Vertebral Arches / Centra Fused		5th Metacarpals Ossified	Incompletely Ossified / Unossified Metacarpals - Upper Limbs	Incompletely Ossified / Unossified Metatarsals - Lower Limbs	Ribs Affected	
		<3	3-5	>5	1	2+	1	2	3+		1	2+		1 pair	2+ pairs	1-2	3-4	5-6	1 vert.	2+ vert.					
2761	6	1	0	5	4	0	1	5	0	3.8	0	0	1	4	2	2	0	0	0	0	0	2	0	0	1
2762	6	4	0	0	2	1	2	0	0	4.5	0	0	6	0	0	0	0	0	0	5	6	0	0	0	
2763	4	0	0	0	2	0	1	0	0	5.0	0	0	2	0	0	0	0	0	0	4	4	0	0	0	
2764	7	0	0	0	3	4	1	0	0	4.1	0	0	2	0	0	0	0	0	1	5	7	0	0	0	
2765	7	0	0	0	1	6	5	2	0	4.3	1	0	0	0	0	0	0	0	4	1	7	0	0	0	
2766	6	0	0	0	3	2	1	0	0	4.8	0	1	1	0	0	0	0	0	1	4	6	0	0	0	
2767	7	4	1	2	0	7	0	0	0	5.3	1	0	5	1	1	1	0	0	3	4	7	0	0	0	
2768	5	0	0	0	1	2	0	0	0	4.4	0	0	2	0	0	0	0	0	0	4	5	0	0	0	
2769	5	1	0	0	0	5	0	0	0	4.6	0	0	4	0	0	0	0	0	0	3	5	0	0	0	
2770	6	4	1	0	2	2	4	0	0	4.3	0	0	0	0	0	0	0	0	1	2	6	0	0	0	
2771	6	2	1	0	1	1	1	0	1	4.3	0	1	2	1	0	1	0	0	1	1	4	1	1	0	
2772	7	0	0	0	3	4	0	1	0	4.4	0	0	1	0	0	0	0	0	2	1	6	0	0	0	
2773	8	3	1	0	4	0	1	5	2	3.3	0	0	1	6	1	0	0	0	0	0	2	0	0	0	
2774	5	0	0	0	4	0	4	0	0	4.2	0	0	0	0	0	0	0	0	0	0	3	0	0	0	
2775	7	0	0	0	4	2	3	0	0	4.7	0	0	5	0	0	0	0	0	3	1	7	0	0	0	
2776	6	2	0	0	4	1	1	0	0	5.2	0	0	6	0	0	0	0	0	0	6	6	0	0	0	
2777	9	1	0	0	3	0	8	1	0	4.1	0	0	0	0	0	0	0	0	1	0	9	0	0	0	
2778	7	0	0	0	5	2	2	0	0	4.3	0	0	2	1	0	0	0	0	0	4	7	0	0	0	
2779	8	2	0	0	4	4	0	0	0	4.9	0	0	0	0	0	0	0	0	1	7	7	0	0	0	
2780	7	0	0	0	2	2	1	0	0	3.9	0	0	2	0	0	0	0	0	1	3	5	0	0	0	
2781	5	0	0	0	2	2	0	0	0	4.4	1	0	0	0	0	0	0	0	1	1	5	0	0	0	
2782	7	3	0	0	0	0	0	1	1	4.4	1	0	6	0	0	1	0	0	0	2	6	0	0	0	
2783	8	3	1	0	2	0	3	5	0	2.9	1	0	1	2	0	1	0	0	0	0	5	0	0	0	
Number of Fetuses (Litters)	149 (23)	30 (12)	5 (5)	7 (2)	56 (20)	47 (16)	39 (16)	20 (7)	4 (3)	4.4	5 (5)	2 (2)	49 (17)	15 (6)	4 (3)	6 (5)	0 (0)	0 (0)	20 (12)	58 (18)	127 (23)	1 (1)	1 (1)	1 (1)	

Group 3 – 5000 ppm					Individual Ossification Parameters												Appendix M							
		Number of Fetuses Affected																						
Animal Number	Number of Fetuses	Incompletely Ossified / Unossified Skull Bones			Cervical Centrum(a) Ossified		Incompletely Ossified / Unossified Sternebra(e)			Number of Caudal Vertebrae Ossified (Litter Mean)	Incompletely Ossified / Unossified Vertebral Centrum(a)		Ossification of 1st Cervical Arch (Ventral / Odontoid Process)	Incompletely Ossified / Unossified Vertebral Arches		Incompletely Ossified / Unossified Pelvic Bones			Vertebral Arches / Centra Fused		5th Metacarpals Ossified	Incompletely Ossified / Unossified Metacarpals	Incompletely Ossified / Unossified Metatarsals	Ribs Affected
		<3	3-5	>5	1	2+	1	2	3+		1	2+		1 pair	2+ pairs	1-2	3-4	5-6	1 vert.	2+ vert.				
3761	7	0	0	0	3	3	0	0	0	4.0	1	0	5	0	0	0	0	0	1	1	7	0	0	0
3762	6	1	1	0	6	0	3	1	0	4.3	0	0	1	0	0	0	0	0	0	3	6	0	0	0
3763	7	0	0	0	2	5	0	0	0	5.3	0	0	1	0	0	0	0	0	1	3	7	0	0	0
3764	6	3	0	0	4	1	1	0	0	3.8	0	0	2	0	1	0	0	0	1	3	5	0	0	0
3765	6	4	0	0	4	2	0	0	0	5.2	0	0	3	0	0	0	0	0	1	3	6	0	0	0
3766	7	5	2	0	3	4	4	0	0	4.6	0	0	6	0	0	0	0	0	2	5	7	0	0	0
3767	8	2	0	0	2	6	0	0	0	4.6	0	0	8	0	0	0	0	0	1	7	8	0	0	0
3768	6	3	0	0	3	2	0	0	0	4.5	0	0	3	0	0	0	0	0	1	2	6	0	0	0
3769	7	3	3	0	0	1	0	0	0	4.1	0	0	4	2	3	1	0	0	1	0	4	1	0	0
3770	8	4	3	0	4	0	2	0	0	4.1	1	0	5	1	0	0	0	0	1	3	8	0	0	0
3771	8	0	0	0	3	0	0	0	0	4.1	0	0	8	0	0	0	0	0	1	4	6	0	0	0
3772	7	6	0	0	3	1	3	3	0	4.3	0	0	1	0	0	0	0	0	1	5	6	0	0	0
3773	7	3	3	0	2	0	3	4	0	3.3	1	0	0	1	4	0	0	0	0	0	0	1	0	0
3774	6	2	0	0	5	0	0	0	0	4.3	0	0	0	0	0	0	0	0	2	1	4	0	0	0
3775	7	4	0	2	2	4	0	0	0	4.3	0	0	4	0	0	0	0	0	1	6	7	0	0	0
3776	7	1	0	0	3	1	0	0	0	4.4	1	0	1	0	0	0	0	0	0	6	7	0	1	0
3777	6	0	0	0	0	0	0	2	0	4.3	1	0	5	0	0	0	0	0	3	0	3	0	0	0
3778	7	6	1	0	1	0	3	2	0	4.0	0	0	1	2	2	0	0	0	0	0	1	0	0	0
3779	7	2	0	0	2	0	3	1	1	4.1	2	0	3	0	0	1	0	0	0	0	6	0	0	0
3780	6	1	0	0	1	3	1	1	0	4.8	0	0	4	0	0	0	0	0	1	5	6	0	0	0
3781	7	2	1	0	4	2	2	1	0	4.6	0	0	1	0	0	0	0	0	1	4	7	0	0	0
3782	7	2	2	2	3	2	1	1	0	4.6	1	0	0	0	4	0	0	0	2	4	7	0	0	0
3783	7	0	0	0	2	0	4	2	0	4.0	0	0	0	0	0	0	0	0	0	0	7	0	0	0
3784	8	3	2	1	5	0	0	4	0	4.1	0	0	2	2	0	0	0	0	0	6	7	0	0	0
Number of Fetuses (Litters)	165 (24)	57 (19)	18 (9)	5 (3)	67 (22)	37 (14)	30 (12)	22 (11)	1 (1)	4.3	8 (7)	0 (0)	68 (20)	8 (5)	14 (5)	2 (2)	0 (0)	0 (0)	22 (17)	71 (18)	138 (23)	2 (2)	1 (1)	0 (0)

Group 4 – 10000 ppm	Individual Ossification Parameters	Appendix M

Animal Number		Number of Fetuses		Number of Fetuses Affected																							
				Incompletely Ossified / Unossified Skull Bones			Cervical Centrum(a) Ossified		Incompletely Ossified / Unossified Sternebra(e)			Number of Caudal Vertebrae Ossified (Litter Mean)	Incompletely Ossified / Unossified Vertebral Centrum(a)		Ossification of 1st Cervical Arch (Ventral / Odontoid Process)	Incompletely Ossified / Unossified Vertebral Arches			Incompletely Ossified / Unossified Pelvic Bones			Vertebral Arches / Centra Fused		5th Metacarpals Ossified	Incompletely Ossified / Unossified Metacarpals	Incompletely Ossified / Unossified Metatarsals	Ribs Affected
<3	3-5	>5	1	2+	1	2	3+	1	2+	Ossification of 1st Cervical Arch (Ventral / Odontoid Process)	1 pair	2+ pairs	1-2	3-4	5-6	1 vert.	2+ vert.										
4761	8	3	1	0	2	0	1	4	2	3.8	0	1	4	0	2	1	0	0	1	0	3	0	0	0			
4762	7	0	0	0	2	0	1	2	0	3.6	1	0	1	0	0	0	0	0	0	0	6	0	0	0			
4763	8	3	0	0	3	0	1	5	1	4.0	0	0	1	0	1	0	0	0	1	1	5	0	1	0			
4764	6	0	0	0	3	3	2	0	0	4.3	0	0	1	0	0	0	0	0	0	1	6	0	0	0			
4765	8	2	0	0	2	2	0	0	0	3.9	0	0	3	0	0	0	0	0	1	3	8	0	0	1			
4766	6	0	0	0	3	0	0	0	0	4.8	0	0	1	0	0	0	0	0	2	2	6	0	0	0			
4767	7	0	0	0	2	4	2	0	0	4.9	0	0	5	0	0	0	0	0	1	1	7	0	1	0			
4768	6	3	1	0	1	4	0	0	0	4.7	1	0	3	0	0	0	0	0	0	6	5	0	0	0			
4769	8	1	1	1	4	1	4	1	1	4.6	0	0	5	1	0	0	0	0	3	5	4	0	0	0			
4770	7	3	0	0	3	1	0	0	0	5.0	0	0	5	0	0	0	0	0	0	2	6	0	0	0			
4771	7	1	0	0	4	2	0	0	0	4.3	0	0	4	0	0	0	0	0	1	2	6	0	0	0			
4772	7	4	0	0	4	3	0	1	0	4.7	0	0	1	0	0	0	0	0	2	4	7	0	0	0			
4773	6	0	0	0	2	0	3	1	0	4.3	1	0	0	0	0	0	0	0	0	2	5	0	0	0			
4774	6	2	0	4	2	0	2	1	0	4.0	0	0	1	0	4	1	1	0	6	0	5	0	0	0			
4775	6	3	0	0	4	0	2	0	0	4.5	0	0	1	0	0	0	0	0	1	4	6	0	0	0			
4776	6	1	0	0	2	1	1	1	0	4.3	0	0	0	0	0	0	0	0	0	2	6	0	0	0			
4777	6	2	0	0	0	0	3	3	0	4.2	0	1	0	0	1	0	0	0	0	0	3	0	0	0			
4778	5	4	0	0	3	1	2	0	0	3.8	0	0	0	3	0	1	0	0	1	0	4	0	0	0			
4779	5	1	0	0	2	1	2	2	0	4.0	0	0	0	0	0	0	0	0	0	2	5	0	0	0			
4780	5	1	0	0	2	0	0	0	0	4.6	1	0	3	0	0	0	0	0	0	1	5	0	0	0			
4781	8	2	0	0	3	1	2	2	0	4.6	0	0	3	1	0	0	0	0	2	6	8	0	0	0			
4782	6	2	0	1	2	1	1	0	0	4.2	0	0	1	2	0	0	0	0	3	2	5	0	0	0			
4783	6	0	0	0	2	1	4	0	0	4.0	0	0	0	0	0	0	0	0	0	1	2	0	0	0			
4784	7	3	2	2	2	3	0	0	0	4.6	0	0	4	0	0	1	0	0	0	3	7	0	0	0			
Number of Fetuses (Litters)	157 (24)	41 (18)	5 (4)	8 (4)	59 (23)	29 (15)	33 (16)	23 (11)	4 (3)	4.3	4 (4)	2 (2)	47 (18)	7 (4)	8 (4)	4 (4)	1 (1)	0 (0)	25 (13)	50 (19)	130 (24)	0 (0)	2 (2)	1 (1)			

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1. INTRODUCTION

This appendix presents the methodology for exposure generation, monitoring and results.

2. MATERIALS AND METHODS

2.1. HUSBANDRY DURING EXPOSURE PERIODS

2.1.1. HOUSING

Animals were individually housed in stainless steel, wire mesh cages within 1000-Liter stainless steel and glass whole-body exposure chambers. The placement of each animal in the chamber was rotated at each exposure to ensure uniform exposure of the animals. A description of the animal rotation is included in the raw data.

2.1.2. FEED

None was provided during exposure.

2.1.3. WATER

None was provided during exposure.

2.1.4. ENVIRONMENTAL CONDITIONS

Chamber temperature and relative humidity were recorded every half-hour during exposure and maintained, to the maximum extent possible, within the ranges presented below. Excursions outside the specified range were considered not to have affected the integrity of the study.

Temperature

Desired: 20 to 24 °C
Actual: 22 to 25 °C

Relative Humidity

Desired: 40 to 60%
Actual: 29 to 67%

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2.2. TEST SUBSTANCE ADMINISTRATION AND CHAMBER OPERATIONS

2.2.1. ROUTE OF ADMINISTRATION

Inhalation, as a gas/vapor, via whole-body exposure.

2.2.2. FREQUENCY AND DURATION OF ADMINISTRATION

The test substance was administered for 6 hours per day for 7 consecutive days per week for Gestation Days (GD) 6 to 19.

2.2.3. PRE-STUDY TRIALS

Trials were performed (at least three 6-hour periods) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the targeted exposure levels.

2.2.4. TARGET EXPOSURE LEVELS

Group 1 – 0 ppm
Group 2 – 1000 ppm
Group 3 – 5000 ppm
Group 4 – 10000 ppm

2.2.5. CHAMBER OPERATION

The whole-body exposure chambers each had a volume of 1000 Liters. Each chamber was operated dynamically under slight negative pressure at a minimum calibrated flow rate of 200 Liters per minute. The final airflow was set to provide at least one air change (calculated by dividing the chamber volume by the airflow rate) in 5.0 minutes (12 air changes/hour) and a T_{99} equilibrium time (calculated by multiplying the air change by the exponential factor 4.6) of at most 23 minutes. The chamber airflow rate, total flow rate, time for air change and 99% equilibrium time (T_{99}) for each group (initial conditions) are summarized below:

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Group	Airflow Rate (Lpm)	Air Change (min)	T ₉₉ (min)
1	218	4.6	21
2	204	4.9	23
3	216	4.6	21
4	203	4.9	23

This chamber size and airflow rates were considered adequate to maintain the animal loading factor below 5% and the oxygen level at 19% or higher. At the end of the exposure, all animals remained in chamber for a minimum of the T₉₉ equilibrium time. During this time, the chamber was operated at the same flow rate as used during the exposure using clean air only. Recordings of airflow rate and static pressure were made every half-hour during the exposure.

The chamber atmospheres were exhausted through the in-house filtering system, which consisted of a coarse filter, a HEPA filter, and an activated charcoal bed.

Refer to Figures 1 & 2 and Table III for equipment details.

2.2.6. EXPOSURE PROCEDURE

Group 1

Animals were exposed to room air only.

Groups 2, 3 and 4

Houseline nitrogen was delivered through a regulator and backpressure gauge via 1/4" tubing to the test substance cylinder to pressurize it. The test substance flowed from the cylinder via the liquid outlet through a quick-connect fitting with toggle valve, through 1/8" copper tubing coil. The copper coil was maintained in a warm water bath, and monitored by a thermometer. From the coil, the test substance flowed through a metering valves to a mass flowmeter, via 1/4" tubing. The test substance exited the flowmeter and was directed via 1/4" tubing to the turret of a

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1000 Liter stainless steel and glass exposure chamber, where it mixed with room air.

Refer to Figures 1 & 2 and Table III for equipment details.

2.3. EXPOSURE CONCENTRATION DETERMINATION

2.3.1. NOMINAL CONCENTRATION

A nominal exposure concentration was calculated daily. The flow of air through the chambers was monitored using appropriate calibrated equipment. The nominal concentrations in parts per million were determined by weighing the generation apparatus containing the test substance before and after the exposure and dividing the difference in these weights by the total volume of air used during the exposure (flowrate multiplied by total exposure time) and the molecular weight of the test substance.

Calculation

$$\text{Conc (ppm)} = \frac{\text{amount consumed (g)} \times 1000 \text{ (mg/g)} \times 1000 \text{ (}\mu\text{g/mg)} \times 22.4 \text{ (}\mu\text{L/}\mu\text{mole)} \times 295^\circ\text{K}}{\text{exposure duration (min)} \times \text{airflow (Lpm)} \times \text{MW (}\mu\text{g/}\mu\text{mole)} \times 273^\circ\text{K}}$$

where average MW = 44 $\mu\text{g/}\mu\text{mole}$

2.3.2. CHAMBER SAMPLING

During each exposure, measurements of airborne concentrations were performed in the animals' breathing zone at least 4 times using an appropriate sampling procedure and Infra-Red Spectrophotometric (IR) analytical method. Also, one charcoal tube sample per chamber per week was analyzed by gas chromatography (GC) to characterized at least 5 major components (comprising at least 90% by weight of the test substance) to show test substance stability and comparison between the neat liquid test substance and the vaporized test atmospheres.

See Table III for equipment details. See Appendix N for Analytical Report.

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2.3.3. PARTICLE SIZE DISTRIBUTION

Once during each week of exposures, particle size distribution measurements were performed using a TSI Aerodynamic Particle Sizer. The samples were drawn for 20 seconds at a rate of 5.0 Lpm. A computer was used to program the system to the appropriate settings prior to sampling. The particle size distributions were calculated by the computer and printed out. The mass median aerodynamic diameter, geometric standard deviation and total mass concentration were calculated. For comparison, room air samples were similarly collected once each week.

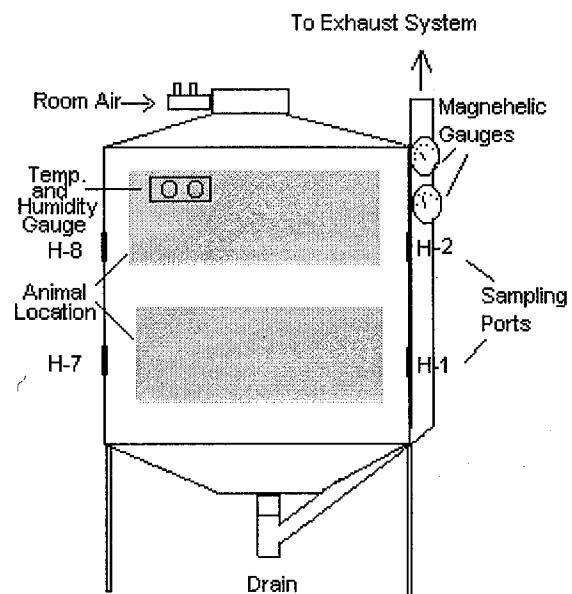
Refer to Table III for equipment details.

2.3.4. CHAMBER AND EXPOSURE ROOM ENVIRONMENT

Chamber oxygen levels (maintained at least 19%) were measured pretest and at the beginning, middle and end of the study. Air samples were taken in the vapor generation area pretest and at the beginning, middle and end of the study. Light (maintained approximately 30 foot-candles at 1.0 meters above the floor) and noise levels (maintained below 85 decibels) in the exposure room were measured pretest and at the beginning, middle and end of the study.

Refer to Table III for equipment details and results in Table VI.

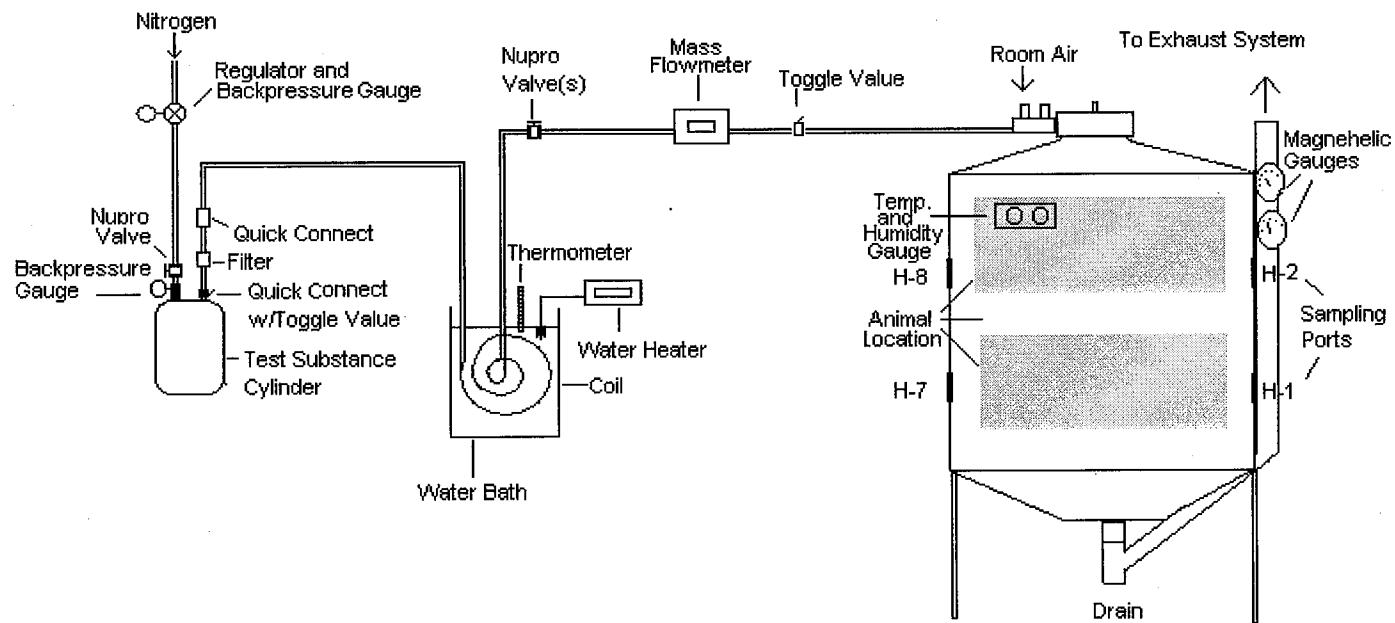
Group 1	Diagram of 1000-Liter Whole-Body Exposure Chamber and Generation System	Figure 1



Group 2, 3 & 4

Diagram of 1000 Liter Whole-Body Exposure
Chamber and Generation System

Figure 2



	Summary of In-Chamber Observations												Table I				
Exposure Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Group 1 – 0 ppm																	
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 2 – 1000 ppm																	
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 3 – 5000 ppm																	
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 4 – 10000 ppm																	
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All

All = 100% of the animals exhibiting a given observation.

	Chamber Monitoring Results	Table II

Cumulative Exposure Record													
Group 1 - 0 ppm (Air Control)													
Day	Date	Exposure Number							Particle Size Determinations			Chamber Environment	
			Nominal	Analytical Chamber Concentration								Temperature	Mean Humidity
				(ppm)	Mean (ppm)	Individual (ppm)				MMAD (μm)	GSD		
6	22-Feb-05	1	0	0.00	0.00	0.00	0.00	0.00	4.635	1.996	1.90E-03	22	37
7	23-Feb-05	2	0	0.00	0.00	0.00	0.00	0.00				23	38
8	24-Feb-05	3	0	0.00	0.00	0.00	0.00	0.00				23	34
9	25-Feb-05	4	0	0.00	0.00	0.00	0.00	0.00				24	33
10	26-Feb-05	5	0	0.00	0.00	0.00	0.00	0.00				24	34
11	27-Feb-05	6	0	0.00	0.00	0.00	0.00	0.00				24	31
12	28-Feb-05	7	0	0.00	0.00	0.00	0.00	0.00	4.102	2.447	1.28E-03	24	35
13	1-Mar-05	8	0	0.00	0.00	0.00	0.00	0.00				24	37
14	2-Mar-05	9	0	0.00	0.00	0.00	0.00	0.00				24	34
15	3-Mar-05	10	0	0.00	0.00	0.00	0.00	0.00				24	35
16	4-Mar-05	11	0	0.00	0.00	0.00	0.00	0.00				24	40
17	5-Mar-05	12	0	0.00	0.00	0.00	0.00	0.00				24	42
18	6-Mar-05	13	0	0.00	0.00	0.00	0.00	0.00	2.647	2.130	1.00E-03	24	44
19	7-Mar-05	14	0	0.00	0.00	0.00	0.00	0.00				24	48
20	8-Mar-05	15	0	0.00	0.00	0.00	0.00	0.00				23	45
21	9-Mar-05	16	0	0.00	0.00	0.00	0.00	0.00				23	42
22	10-Mar-05	17	0	0.00	0.00	0.00	0.00	0.00				22	43
Mean			0		0.00							3.795	2.191
S.D.			0		0.00				1.029	0.232	4.61E-04	0.7	4.9

	Chamber Monitoring Results	Table II

Cumulative Exposure Record													
Group 2 - 1000 ppm													
Day	Date	Exposure Number							Particle Size Determinations			Chamber Environment	
			Nominal	Analytical Chamber Concentration								Temperature	Humidity
				(ppm)	Mean (ppm)	Individual (ppm)			MMAD (µm)	GSD	TMC (mg/m³)		
6	22-Feb-05	1	1100	1000	1100	990	970	1000	3.156	1.985	1.63E-03	22	38
7	23-Feb-05	2	1100	990	1000	1000	1000	960				22	39
8	24-Feb-05	3	1100	990	1000	960	980	1000				23	34
9	25-Feb-05	4	1000	950	960	940	990	910				24	33
10	26-Feb-05	5	1100	1000	1000	1000	970	1100				23	35
11	27-Feb-05	6	1100	1000	1000	1000	1000	1000				24	31
12	28-Feb-05	7	1100	990	1000	970	1000	1000				24	35
13	1-Mar-05	8	1100	1100	960	1200	1100	1000	12.590	2.082	3.88E-03	24	40
14	2-Mar-05	9	1100	1000	1000	1000	1000	1000				23	35
15	3-Mar-05	10	1100	1000	980	950	1100	1000				24	36
16	4-Mar-05	11	1200	1000	900	970	1100	1200				24	43
17	5-Mar-05	12	1100	1000	1000	1000	1000	1100				24	43
18	6-Mar-05	13	1100	1000	950	1000	1100	1100				24	45
19	7-Mar-05	14	1100	1000	990	990	1000	1000				24	47
20	8-Mar-05	15	1100	990	980	960	1000	1000	9.500	2.525	1.81E-03	23	46
21	9-Mar-05	16	1100	1100	1100	1100	1100	1100				22	44
22	10-Mar-05	17	1100	1000	1000	1000	970	1100				22	45
Mean			1100		1013				8.415	2.197	2.44E-03	23.3	39.4
S.D.			32		60				4.810	0.288	1.25E-03	0.8	5.1

	Chamber Monitoring Results	Table II

Cumulative Exposure Record													
Group 3 - 5000 ppm													
Day	Date	Exposure Number							Particle Size Determinations			Chamber Environment	
			Nominal	Analytical Chamber Concentration								Temperature	Humidity
				(ppm)	Mean (ppm)	Individual (ppm)			MMAD (µm)	GSD	TMC (mg/m³)		
6	22-Feb-05	1	5000	5500	5000	5700	5800	5400	6.752	2.306	2.30E-03	23	37
7	23-Feb-05	2	4800	5300	5500	5300	5200	5200				23	38
8	24-Feb-05	3	4900	5100	4600	5300	5300	5200				24	33
9	25-Feb-05	4	4900	5300	5600	5300	5100	5100				24	33
10	26-Feb-05	5	4900	4900	4800	4800	4900	5000				24	35
11	27-Feb-05	6	5200	5000	4800	4800	5300	5200	1.133	1.812	4.09E-04	24	32
12	28-Feb-05	7	5100	5200	5200	5100	5100	5200				24	36
13	1-Mar-05	8	4900	5100	5300	5100	5000	5000				24	40
14	2-Mar-05	9	5100	5100	5100	5100	5100	5100				24	35
15	3-Mar-05	10	5100	5100	5100	5000	5000	5100				24	36
16	4-Mar-05	11	5100	5100	5000	5100	5100	5100	5.357	2.133	1.69E-03	24	44
17	5-Mar-05	12	5000	5000	5300	4800	5000	5000				24	44
18	6-Mar-05	13	5000	5000	4900	5000	5000	5000				24	45
19	7-Mar-05	14	5100	5000	5000	5100	5000	5000				24	45
20	8-Mar-05	15	5200	4800	4900	4800	4700	4700				24	44
21	9-Mar-05	16	5000	5000	5100	5000	5000	4900	5.357	2.133	1.69E-03	23	44
22	10-Mar-05	17	5000	5000	5000	4900	5000	5000				23	47
Mean			5018		5076				4.414	2.084	1.47E-03	23.8	39.3
S.D.			113		217				2.926	0.251	9.65E-04	0.4	5.1

	Chamber Monitoring Results	Table II

Cumulative Exposure Record													
Group 4 - 10000 ppm													
Day	Date	Exposure Number							Particle Size Determinations			Chamber Environment	
												Mean	
			Nominal	Analytical Chamber Concentration					MMAD (µm)	GSD	TMC (mg/m³)	Temperature	Humidity
(ppm)	Mean (ppm)	Individual (ppm)				(°C)	(%)						
6	22-Feb-05	1	9800	10000	10000	10000	10000	10000	1.139	2.167	9.86E-04	23	35
7	23-Feb-05	2	9700	10000	11000	10000	10000	10000				23	36
8	24-Feb-05	3	9500	11000	11000	11000	11000	11000				23	33
9	25-Feb-05	4	10000	10000	10000	10000	11000	10000				24	33
10	26-Feb-05	5	9700	10000	10000	10000	10000	10000				24	34
11	27-Feb-05	6	9800	10000	11000	10000	10000	10000				24	32
12	28-Feb-05	7	9800	11000	11000	11000	10000	10000				24	34
13	1-Mar-05	8	9600	10000	10000	10000	10000	10000	5.592	2.018	2.28E-03	24	40
14	2-Mar-05	9	9700	10000	11000	10000	10000	10000				24	34
15	3-Mar-05	10	9800	11000	11000	11000	10000	12000				24	35
16	4-Mar-05	11	9900	11000	11000	10000	11000	11000				24	42
17	5-Mar-05	12	9800	11000	11000	10000	11000	10000				24	42
18	6-Mar-05	13	9900	11000	11000	11000	11000	11000				24	43
19	7-Mar-05	14	9900	11000	11000	11000	11000	11000				24	43
20	8-Mar-05	15	9900	11000	11000	11000	10000	10000	2.213	2.067	1.59E-03	24	42
21	9-Mar-05	16	9900	10000	10000	10000	10000	10000				23	42
22	10-Mar-05	17	9700	10000	10000	10000	10000	10000				23	42
Mean			9788		10426				2.981	2.084	1.62E-03	23.7	37.8
S.D.			131		527				2.324	0.076	6.47E-04	0.5	4.3

	Equipment List	Table III

Exposure Chamber

1000-Liter (1m³) glass and stainless steel chamber (Wahmann)

Compound Generator

Liquified Petroleum Gas Cylinder (Chevron)

Flowmeters

Top Trak™ Mass Flow Meter, sizes 0 – 10 and 0 – 20 Lpm,
Model 822-130V1-PV1-VI and 821-1 (Sierra Instruments)

Flowmeter, size 0 – 20 and 0 - 40 Lpm (Dwyer®)

Pressure/Vacuum Gauges

Matheson backpressure gauge, Model # 63-3142

Union Carbide vacuum gauge, Model SG-6310

USG Backpressure gauge

Regulator

MG Industries, Series 325

Valve

Metering Valve, Model No. SS-4L (Nupro)

Metering Valve; Model No.SS-SS2-VH (Swagelok)

Tubing

Teflon® size 1/8" and 1/4"

Plastic, size 1/4" and 1/2" (Norton, Baxter)

Stainless steel, size 1/2"

Quick-disconnect with toggle valve (REGO®)

Swagelok Quick-connect

Copper tubing coil, size 1/8"

Vacuum Pump

Thomas Industries Inc., Model 707CM 50

	Equipment List	Table III

Air Analyzer

MIRAN[®] 1A-CVF Ambient Air Analyzer (Wilks) with a Cole Parmer Strip Chart Recorder, Model 201, and a Micronta[®] LCD Benchtop Digital Multimeter No. 22-195

Balston[®] Microfibre[™] Disposable Filter Unit, Grade DQ, was attached in-line

Particle Sizer

TSI Aerodynamic Particle Sizer, Model 331001 and a DELL computer, Model 486P/25, equipped with an Epson LQ-570+ Dot matrix printer, Model P630B

Environmental Monitoring

VWR Temperature and Humidity Gauge, tested prestudy with a Traceable Big Digit Hygrometer/Thermometer

Oxygen/Gas Analyzer, Model 1214S (Gastech)

Digital Sound Level Meter, Model 840029 (SPER Scientific)

Photometer 1 Light Meter (Quantum Instruments)

Balance

Mettler PM30000K (Mettler Instrument Corporation)

Chamber Air Flow

Dwyer[®] Magnehelic[®] gauge, calibrated pre-study with Side Trak[™] III, with Digital Meter, Model 831-N2 (Sierra Instruments Inc.), calibrated on-study with a Dry Gas Meter, Model 2M (Singer)

Chamber Static Pressure

Dwyer[®] Magnehelic[®] gauge (Dwyer[®] Instruments Inc.); calibrated prestudy with a Dwyer[®] Mark II Manometer, Model 25 (Dwyer[®] Instruments Inc.)

Miscellaneous

Water bath

Thermomix 1420

Precision thermometer, range -10-260°C (ERTCO)

Precision thermometer, range -20-150°C (ACE-USA)

Syringes, size 0 – 10 and 0 - 100 mL (Precision, Hamilton)

Swagelok filter

	Chamber Distribution Results (Pretest)	Table IV

<u>Group (target)</u>	<u>Date</u>	<u>Port</u>	<u>IR Conc (ppm)</u>	<u>Ratio to H-1</u>
2 (1000 ppm)	2 Feb 2005	H-1	1000	1.00
		H-2	1000	1.00
		H-7	1000	1.00
		H-8	1000	1.00
3 (5000 ppm)	1 Feb 2005	H-1	5100	1.00
		H-2	5100	1.00
		H-1	4800	1.00
		H-7	5100	1.06
		H-8	5100	1.06
4 (10000 ppm)	2 Feb 2005	H-1	10000	1.00
		H-2	10000	1.00
		H-7	10000	1.00
		H-8	10000	1.00

	MIRAN [®] Calibration	Table V

Methodology for Liquified Petroleum Gas

Miran No. B/D 2225

Settings: The instrument settings for the unit are summarized below:

Wavelength, microns	10.9
Pathlength, dial setting	4.65
Slit width, mm	1
Range, absorbance	1A
Response, seconds	1
Gain	High
Chart speed, cm/min	1
Chart volts	1

Calibrations: The MIRAN[®] was turned on and allowed to warm up for approximately 10 minutes. The cell was flushed with room air for approximately one minute. The loop was closed, the unit was zeroed and the calibration series was performed as shown below. The resultant data were plotted to obtain a calibration curve. Each observer used a separate syringe for calibration.

Injection Volume (μ L)	Calculated Concentration ¹ (ppm)	Absorbance		
		Operator 1 (volts)	Operator 2 (volts)	Average (volts)
4000	709	0.0530	0.0540	0.0535
6000	1064	0.0766	0.0809	0.0788
17000	3014	0.2090	0.2227	0.2159
28000	4965	0.337	0.342	0.340
45000	7979	0.514	0.530	0.522
56000	9929	0.620	0.646	0.633
68000	12057	0.729	0.741	0.735

¹Calculated Conc. (ppm) = $\frac{\text{Volume injected } (\mu\text{L})}{5.64\text{L}}$

where: 5.64L = volume of MIRAN[®] closed-loop

	MIRAN® Calibration	Table V

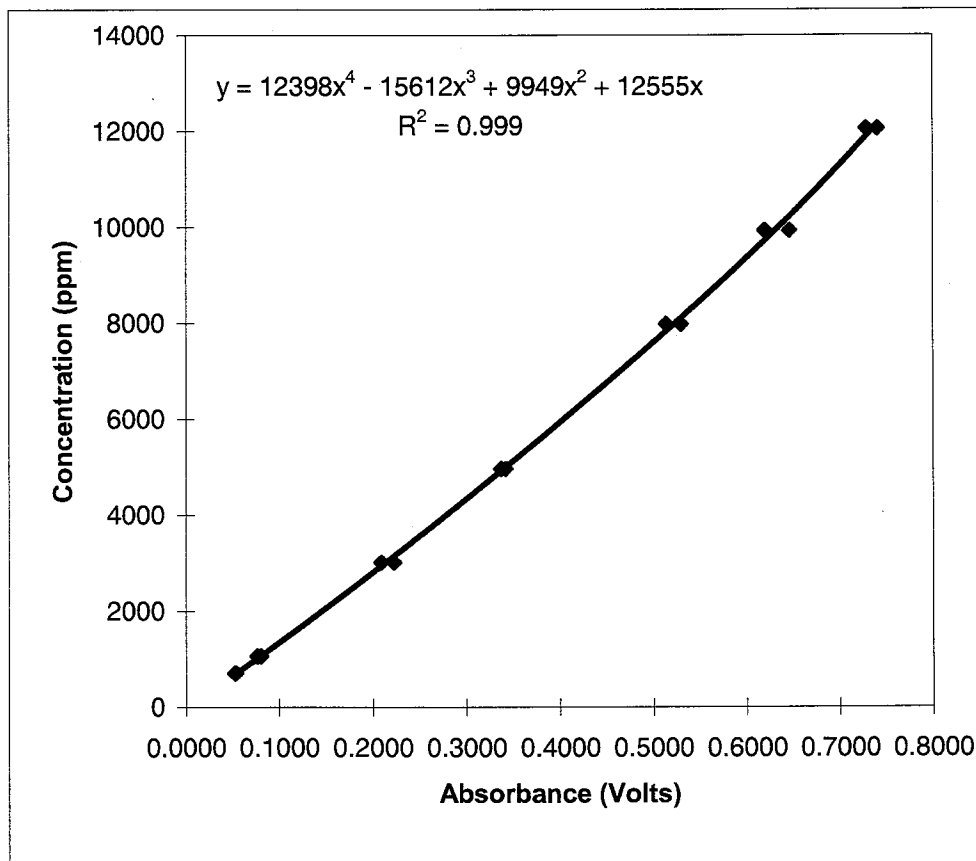
Calibration Checks: A three-point calibration check of the MIRAN® was performed prior to each exposure. The parameters are shown below:

Injection Volume (µL)	Calculated Concentration (ppm)	Expected Absorbance Reading (volts)	Acceptable Absorbance Range (volts)
6000	1064	0.0788	0.0670 – 0.0906
28000	4965	0.340	0.2890 – 0.391
56000	9929	0.633	0.538 – 0.728

The absorbance was recorded after each injection. The absorbance was considered satisfactory if it was within 15% of the original calibration series. If the absorbance value fell outside the 15% range, the injection was rechecked as follows. The volume for the value that was out of range was reinjected twice. The closer pair of the three injections were averaged and the results were compared to the original curve. If the average of the pair was within the 15% range, the original was accepted. If the value of the average was outside the 15% range, the Study Director decided if a new graph was to be prepared.

	MIRAN® Calibration	Table V

Calibration Curve for Liquified Petroleum Gas



	Chamber and Exposure Room Environmental Monitoring	Table VI

Interval	Location	Test Substance (ppm) ^a	Light (Ft Candles)	Noise (dB)	Oxygen (%)	Particle Sizing (mg/m ³) ^b
Pretest	Front Room	0	36.0	67.6	NM	NM
	Back Room	0	33.7	64.0	NM	NM
	Group 1	0	NM	NM	21	3.08 x 10 ⁻³
	Group 2	1020	NM	NM	21	3.20 x 10 ⁻³
	Group 3	5200	NM	NM	21	3.68 x 10 ⁻³
	Group 4	10500	NM	NM	21	3.73 x 10 ⁻³
Exposure 3	Front Room	0	35.6	66.0	NM	
	Back Room	0	35.1	63.8	NM	
	Group 1	0	NM	NM	21	
	Group 2	990	NM	NM	21	
	Group 3	5100	NM	NM	21	
	Group 4	11000	NM	NM	21	
Exposure 10	Front Room	0	34.7	68.1	NM	
	Back Room	0	34.2	65.2	NM	
	Group 1	0	NM	NM	21	
	Group 2	1000	NM	NM	21	
	Group 3	5100	NM	NM	21	
	Group 4	11000	NM	NM	21	
Exposure 17	Front Room	0	35.5	66.7	NM	
	Back Room	0	35.4	64.1	NM	
	Group 1	0	NM	NM	21	
	Group 2	1000	NM	NM	21	
	Group 3	5000	NM	NM	21	
	Group 4	10000	NM	NM	21	

NM = Not measured

^aValues presented are the daily average for the chamber samples and a single time point for the room air samples.^bPretest results presented. For on-test results, see CMR (Table II).

	Analytical Report	Appendix O

STUDY TITLE

Analytical Report For:

**Liquified Petroleum Gas:
Embryo-Fetal Toxicity Study in Rats by Inhalation Exposure**

AUTHOR



REPORT DATE

9 February 2010

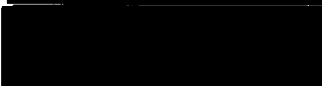
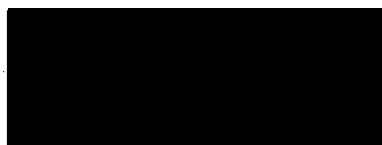
STUDY NUMBER

03-4253

	Analytical Report	Appendix O

SIGNATURES

Written by:



Formulation Chemistry Services

09 Feb 10

Date

Reviewed by:

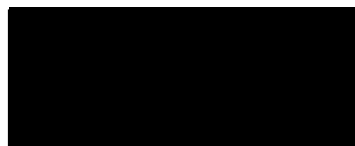


Formulation Chemistry Services

9 Feb 10

Date

Approved by:

for.

Analytical Services

9 Feb 10

Date

	Analytical Report	Appendix O

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	Analytical Report	Appendix O

1. Summary

The Liquified Petroleum Gas (LPG) chamber samples were analyzed to determine the purity and stability of the test substance by comparison to the Liquid Petroleum Gas (LPG) test substance. The analytical method (HLS-012-04R1) was validated at Huntingdon Life Sciences (HLS). The analytical method involved gas bag sampling of the test substance and quantification using Gas Chromatography with Flame Ionization Detection (FID).

2. Experimental Procedures

The analytical method (HLS-012-04R1) was validated by Formulation Chemistry at HLS. Details of the analytical method is maintained in study files 04-6140 & 04-6141.

Gas bag sampling of the test substance and the analytical standard was performed in the Inhalation Department at HLS. The test substance and the analytical standard were analyzed using a Gas Chromatograph equipped with a HP Plot Q (30 m x 0.32 mm, 20 µm) column and Flame Ionization Detector (FID) to determine the purity of LPG test substance. An HP 3396A integrator was used for data collection and Excel was used for processing the data.

Date of sample analysis is listed as follows:

Interval	Date Analyzed
Pretest/Trial 1	04 Feb 05
Pretest/Trial 3	08 Feb 05
Exposure 3	24 Feb 05
Exposure 10	03 Mar 05
Exposure 17	10 Mar 05

3. Results and Discussion

The Liquified Petroleum Gas (LPG) chambers were analyzed prior to the initiation of the study and at two intervals during the study to determine the purity and stability of the test substance. The results of the characterization of the pretest/trials and exposures are presented in Table I A & B and Tables II-A-C, respectively. Typical chromatograms of Liquified Petroleum Gas (LPG) chamber samples are presented in Figures I-IV.

	Analytical Report	Appendix O

Table I A: LPG Characterization (“Pre-Study/Trial 1”)

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.02	6.31	85.80	1.81	4.65	99.59
LPG-2	1.02	6.42	85.53	1.90	4.68	99.55
LPG-3	1.01	6.37	86.05	1.81	4.68	99.92
Group-1	<LOQ	ND	<LOQ	ND	ND	0.00
Group-2	0.92	4.84	86.86	1.90	4.98	99.50
Group-3	1.42	6.65	85.74	1.75	4.33	99.89
Group-4	1.01	6.39	85.43	1.95	4.85	99.63

LPG = Liquified Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

Table I B: LPG Characterization (“Pre-Study/Trial 3”)

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.02	6.35	86.08	1.90	4.63	99.99
LPG-2	1.03	6.46	85.98	1.91	4.62	99.99
LPG-3	1.03	6.44	86.03	1.83	4.63	99.96
Group-1	<LOQ	ND	ND	ND	ND	0.00
Group-2	1.13	6.27	85.54	1.75	4.79	99.48
Group-3	1.42	6.66	85.84	1.64	4.34	99.90
Group-4	0.96	6.43	85.76	1.87	4.94	99.96

LPG = Liquified Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

	Analytical Report	Appendix O

Table II-A: LPG Characterization ("Exposure 3")

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.61	6.92	86.82	1.37	3.24	99.96
LPG-2	1.61	7.02	86.72	1.36	3.24	99.95
LPG-3	1.61	6.99	86.70	1.45	3.32	99.98
Group-1	<LOQ	ND	ND	ND	ND	0.00
Group-2	0.65	6.33	85.65	1.84	5.13	99.60
Group-3	1.41	6.69	85.62	1.80	4.39	99.91
Group-4	0.95	6.41	85.66	1.99	4.95	99.96

LPG = Liquefied Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

Table II-B: LPG Characterization ("Exposure 10")

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	0.88	6.34	85.33	1.98	4.88	99.41
LPG-2	1.04	6.48	85.72	1.94	4.76	99.94
LPG-3	1.34	6.70	85.95	1.74	4.18	99.91
Group-1	<LOQ	ND	ND	ND	ND	0.00
Group-2	0.78	6.33	85.50	1.98	5.11	99.70
Group-3	1.30	6.62	85.80	1.73	4.53	99.98
Group-4	0.84	6.28	85.54	2.02	5.29	99.97

LPG = Liquefied Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

	Analytical Report	Appendix O

Table II-C: LPG Characterization ("Exposure 17")

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	0.86	6.30	85.56	2.05	5.12	99.89
LPG-2	0.86	6.24	85.66	2.00	5.01	99.77
LPG-3	0.93	6.38	85.67	1.89	4.93	99.80
Group-1	<LOQ	ND	ND	ND	ND	0.00
Group-2 A	1.21	6.61	86.77	ND	5.05	99.64
Group-2 B	1.02	6.44	84.97	1.89	5.12	99.44
Group-3 A	0.81	6.27	85.66	1.98	5.23	99.95
Group-3 B	0.82	6.26	85.51	2.09	5.28	99.96
Group-4 A	1.13	6.54	85.69	1.89	4.67	99.92
Group-4 B	1.12	6.55	85.64	1.90	4.69	99.90

LPG = Liquefied Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

	Analytical Report	Appendix O

Figure I. A Typical Gas Chromatogram of Group 1 (Air Control) Chamber Sample

* RUN # 5 MAR 3, 2005 10:18:30 C₁p-1
START
1.363
1.709

STOP

RUN# 5 MAR 3, 2005 10:18:30

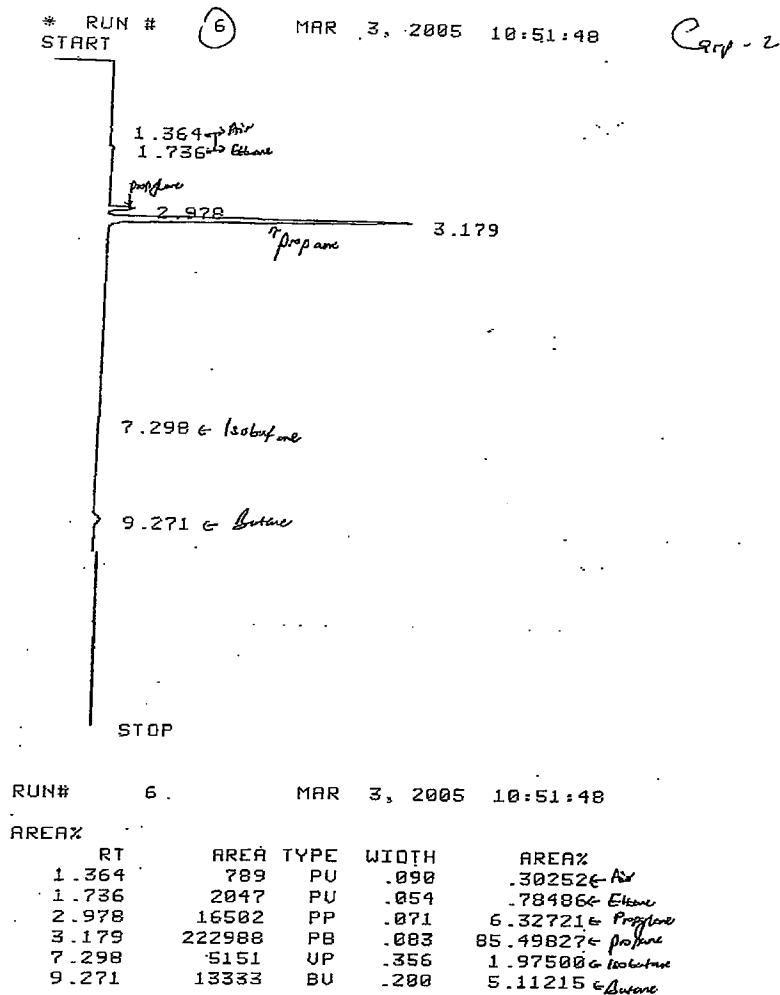
AREA#

RT	AREA	TYPE	WIDTH	AREA%
1.363	332	BU	.034	57.142856 <i>by hand</i>
1.709	249	BU	.029	42.857156 <i>by hand</i>

TOTAL AREA= 581
MUL FACTOR=1.0000E+00

Response (mV) vs Time (minutes)

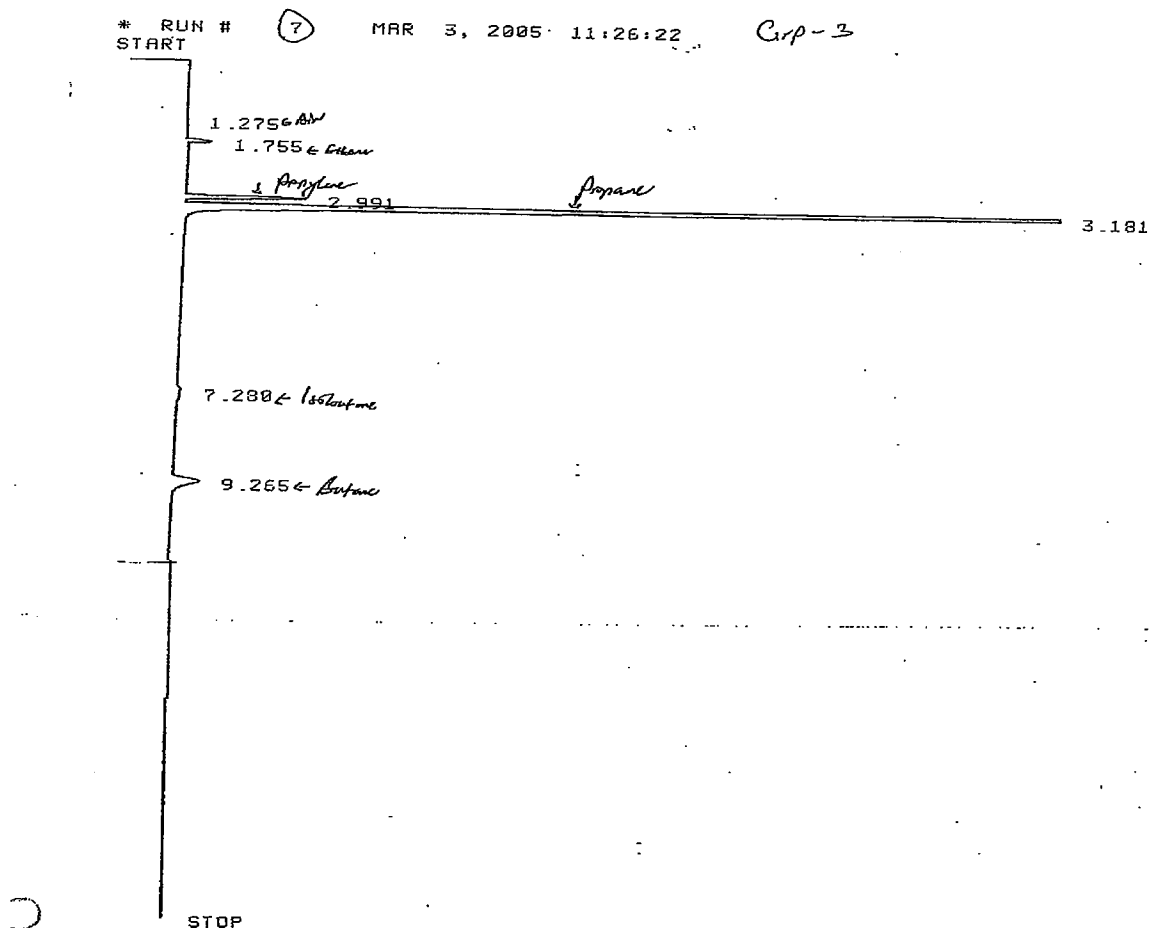
	Analytical Report	Appendix O

Figure II. A Typical Gas Chromatogram of Group 2 (LPG) Chamber Sample

Response (mV) vs Time (minutes)

	Analytical Report	Appendix O

Figure III. A Typical Gas Chromatogram of Group 3 (LPG) Chamber Sample



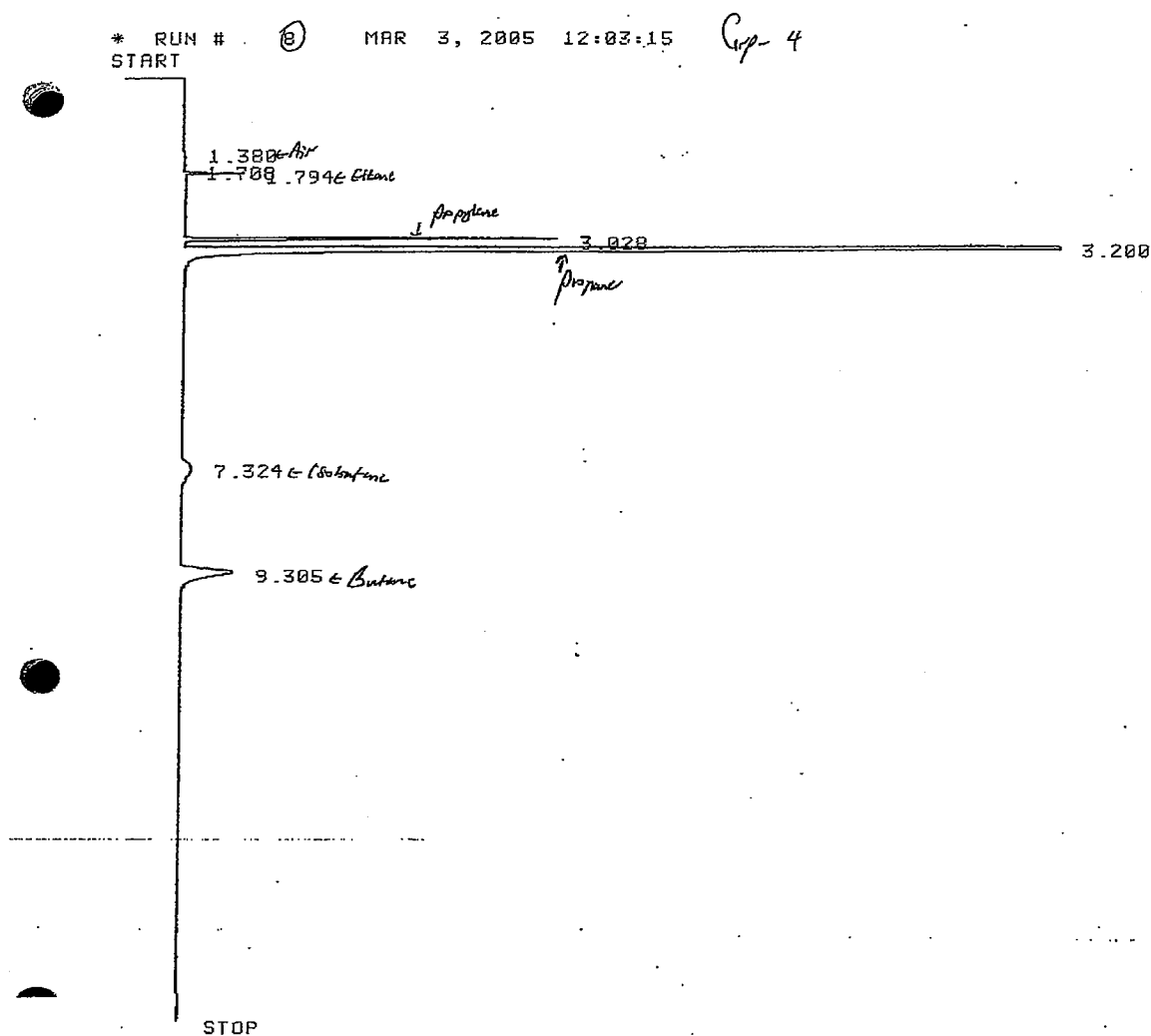
RUN# 7 MAR 3, 2005 11:26:22

RT	AREA	TYPE	WIDTH	AREA%
1.275	176	BU	.018	.01612 Air
1.755	14152	UB	.066	1.29601 Ethane
2.991	72341	PP	.068	6.62485 Propane
3.181	936924	PB	.077	85.80163 Propane
7.280	18939	BP	.339	1.73440 Isobutane
9.265	49433	PB	.196	4.52698 Butane

Response (mV) vs Time (minutes)

	Analytical Report	Appendix O

Figure IV. A Typical Gas Chromatogram of Group 4 (LPG) Chamber Sample



RUN# 8 MAR 3, 2005 12:03:15

AREAX

RT	AREA	TYPE	WIDTH	AREAX
1.380	503	PV	.032	.029996 Air
1.708	258	PV	.031	.01538 Ethane
1.794	13715	VB	.026	.01777 Ethane
3.028	105260	PB	.032	6.27625 Propane
3.200	1434686	PB	.053	85.54483 Propane
7.324	33914	PP	.339	2.02216 Isobutane
9.305	88780	BB	.190	5.29361 Butane

TOTAL 8850-107211

Response (mV) vs Time (minutes)

03-4253

**LIQUIFIED PETROLEUM GAS
EMBRYO-FETAL TOXICITY STUDY IN RATS BY INHALATION EXPOSURE**

Statistical Analysis

Author



Statistics Department

Statistical analysis



19/11/09

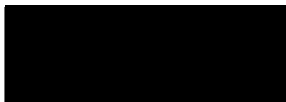
03-4253

COMPLIANCE STATEMENT

This phase of the study was performed at Huntingdon Life Sciences UK in compliance with principles of Good Laboratory Practice Standards as set forth in:

Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17 and EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

Principal Investigator



19th November 2007



03-4253

STUDY PERSONNEL

Original Principal Investigator

[REDACTED]

Replacement Principal Investigator

[REDACTED]

03-4253

INTRODUCTION AND EXPERIMENTAL DESIGN

This rat study had a control and three groups treated with LPG at 1000 ppm, 5000 ppm and 10000 ppm. There were up to 24 dams per group. The data for animal 2784 were excluded since the animal did not become pregnant.

The following parameters were subjected to statistical analysis in this phase of the study:

Continuous maternal parameters

Maternal body weight (d3, d6, d9, d12, d15, d18, d20)

Maternal body weight change (d3-d6, d6-d9, d9-d12, d12-d15, d15-d18, d18-d20, d6-d20)

Maternal feed consumption (d3-d6, d6-d9, d9-d12, d12-d15, d15-d18, d18-d20, d6-20)

Maternal uterus weight (absolute and adjusted)

Reproductive performance

Corpora lutea

%Preimplantation loss

Number of implant sites

Fetuses alive

Early resorptions

Late resorptions

Total resorptions

%Total resorptions/implant sites

Number of males

Number of females

Fetal body weight

Mean fetal body weight: males

Mean fetal body weight: females

Mean fetal body weight: litter

Discrete findings

Maternal necropsy findings

Fetal findings: visceral, skeletal and external malformations and variations

There were no dead fetuses, therefore the Fetuses dead and %Fetuses dead/total parameters were not analyzed.

METHODOLOGY

Continuous maternal parameters

The analysis was performed at each timepoint separately.

Bartlett's test (Bartlett, 1937) was first applied (Proc GLM, SAS Institute 1999) to determine if the groups had equal variances. If the test was not significant at the 1% level, parametric procedures were used. If the test was significant then non-parametric procedures were used.

For the parametric choice, a one-way analysis of variance was initially applied (Proc GLM, SAS Institute 1999). If this was significant at the 5% level, then each treatment group was compared with the control using Dunnett's test (Dunnett 1955, 1964).

For the non-parametric choice, a Kruskal-Wallis test (Kruskal and Wallis 1952, 1953) was initially applied (Proc Npar1way, SAS Institute 1999). If this was significant at the 5% level, then each treatment group was compared with the control using Steel's test (Steel 1959).

Reproductive performance

The %Preimplantation loss and %Total resorptions/implant sites parameters were analyzed using the same methods as for continuous maternal parameters, described above.

The Fetuses alive parameter (litter size) was analyzed using a generalized linear model (Proc Genmod, SAS Institute 1999). If the dose group effect in the model was statistically significant, each dose group was compared with the control group using pairwise tests on the least squares means.

The remaining parameters, Corpora lutea, Number of implant sites, Early, Late and Total resorptions and Numbers of males and females were analyzed using a generalized linear model (Proc Genmod, SAS Institute 1999) with litter size as a covariate, thus allowing for any dependence of the parameter on litter size. If the dose group effect in the model was statistically significant, each dose group was compared with the control group using pairwise tests on the least squares means, in this case being the means adjusted for litter size.

Fetal body weight

The fetal body weight was analyzed using a mixed model analysis of variance (Proc Mixed, SAS Institute 1999) with dose group and fetal sex and their interaction as explanatory variables and litter size as covariate. If the dose group effect was significant at the 5% level, then each treatment group was compared with the control using Dunnett's test (Dunnett 1955, 1964),

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with the means being adjusted for litter size. For completion, the analysis was also performed on separate sexes.

Discrete findings

These parameters were analyzed using a binary generalized linear model (Proc Genmod, SAS Institute 1999) with the litter as the basis for analysis. A constant correlation among littermates was incorporated and litter-size was included as a covariate. If the dose group effect in the model was statistically significant, each dose group was compared with the control group using pairwise tests associated with least squares means, in this case being the mean incidence adjusted for litter size.

Only parameters having at least one group with an incidence of greater than or equal to two were included in the statistical analysis. For less frequent parameters, there was no chance of statistical significance.

PROTOCOL DEVIATIONS

None - The protocol statistical section was found not to be detailed enough, particularly for the reproductive parameters. However, all methods eventually used were covered by the protocol. Since SAS® was used for all analysis, references to the SAS® on-line manual have been cited in preference to source references which in general do not cover the practical side adequately.

DATA HANDLING

Data were received as text files and re-formatted for software input. The software used for all the analyses was SAS 8.2 (SAS Institute 1999).

RESULTS

Continuous maternal parameters

Summary statistics are presented in Tables 1 to 4 respectively. The results can be summarised as follows:

Maternal body weight	No significant differences at any timepoint.
Maternal body weight change	No significant differences at any timepoint.
Maternal feed consumption	No significant differences at any timepoint, except d3-d6.

: 6 :

Statistical analysis

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For d3-d6, Bartlett's test and Kruskal-Wallis test both significant. 10000 ppm (increase, $p=0.031$) by Steel's test.

Uterus weight	No significant differences.
Uterus weight (adjusted)	No significant differences.

Reproductive performance

Summary statistics are presented in Table 5. The results can be summarised as follows:

Corpora lutea	No significant differences.
%Preimplantation loss	No significant differences.
Number of implant sites	5000 ppm (increase, $p=0.023$) (adjusted for litter size)
Fetuses alive	No significant differences.
Early resorptions	No significant differences.
Late resorptions	No significant differences.
Total resorptions	5000 ppm (increase, $p=0.023$) (adjusted for litter size)
%Total resorptions/implant sites	No significant differences.
Number of males	No significant differences.
Number of females	No significant differences.

Fetal bodyweight

Summary statistics are presented in Table 6. The results can be summarised as follows:

For the litter analysis there was a strong sex difference, but no evidence for a difference between treatment groups.

Male fetal body weight	No significant differences.
Female fetal body weight	No significant differences.
Litter body weight	No significant differences.

Discrete findings (malformations and variations)

The incidence of Maternal necropsy findings, where at least one group had an incidence of two or more, are presented in Table 7. Similarly, the incidence of Fetal findings is presented in Table 8. The results can be summarised as follows:

Maternal necropsy findings	No significant differences.
Fetal visceral	No significant differences.
Fetal skeletal	No significant differences.
Fetal external	No significant differences.

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- KRUSKAL, W.H. and WALLIS, W.A. (1953) Errata for Kruskal-Wallis (1952) *Journal of the American Statistical Association* 48: 907-911.
- SAS INSTITUTE (1999) SAS OnlineDoc® *Version Eight*. SAS Institute Inc., Cary, NC, USA
- STEEL, R.G.D. (1959) A multiple comparison rank sum test: treatment versus control. *Biometrics* 15, 560-572.

TABLE 1**Maternal body weight (g)**

	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
Day of gestation	mean (sd)	mean (sd)	mean (sd)	mean (sd)
3	256.9 (10.1)	256.2 (10.1)	257.6 (11.7)	256.9 (11.8)
6	279.0 (9.9)	278.5 (8.6)	281.5 (10.5)	279.7 (11.7)
9	293.6 (9.9)	294.1 (10.5)	296.5 (13.0)	295.5 (11.9)
12	314.0 (12.0)	313.3 (13.1)	317.3 (16.3)	313.1 (12.4)
15	332.8 (14.7)	332.4 (15.0)	338.0 (15.8)	330.8 (13.9)
18	371.1 (18.7)	368.3 (16.6)	376.3 (19.8)	368.0 (14.2)
20	400.5 (23.1)	396.4 (20.4)	405.0 (20.5)	397.5 (16.0)

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

p values vs control using Dunnett's test following ANOVA significant at 5%.

Animal 2784 (1000 ppm) was not pregnant and data were therefore omitted.

n = number of litters, sd = standard deviation

03-4253

TABLE 2**Maternal body weight change (g)**

Days of gestation	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
Period	mean (sd)	mean (sd)	mean (sd)	mean (sd)
3-6	22.3 (7.4)	22.3 (6.0)	24.0 (6.0)	22.8 (8.4)
6-9	14.6 (4.0)	15.6 (4.1)	15.0 (5.5)	15.9 (5.2)
9-12	20.4 (5.2)	19.2 (6.2)	20.9 (7.3)	17.7 (5.8)
12-15	19.0 (5.5)	19.3 (5.3)	20.6 (3.7)	17.9 (5.6)
15-18	38.5 (6.7)	36.0 (5.7)	38.4 (6.7)	37.3 (4.8)
18-20	29.3 (6.7)	28.2 (6.6)	28.8 (4.9)	29.4 (4.7)
6-20	121.4 (18.4)	118.0 (16.5)	123.5 (15.1)	117.8 (12.0)

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

p values vs control using Dunnett's test following ANOVA significant at 5%.

Animal 2784 (1000 ppm) was not pregnant and data were therefore omitted.

n = number of litters, sd = standard deviation

TABLE 3**Maternal feed consumption (g/kg/day)**

Days of gestation	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
Period	mean (sd)	mean (sd)	mean (sd)	mean (sd)
3-6	82.5 (11.1)	84.9 (3.4)	86.6 (6.6)	91.0 (12.3)*
6-9	81.8 (5.0)	82.7 (5.3)	84.0 (5.1)	85.8 (7.2)
9-12	80.3 (9.8)	81.4 (7.0)	83.5 (6.7)	82.5 (5.2)
12-15	77.9 (5.4)	76.5 (5.7)	79.2 (4.4)	77.4 (5.4)
15-18	77.9 (4.9)	76.5 (3.1)	79.4 (5.1)	78.3 (5.0)
18-20	67.9 (4.1)	67.2 (4.5)	68.8 (4.0)	68.9 (4.3)
6-20	77.0 (4.5)	76.8 (4.3)	79.0 (4.0)	78.0 (3.8)

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

p values vs control using Dunnett's test following ANOVA significant at 5%.

Animal 2784 (1000 ppm) was not pregnant and its data were therefore omitted.

n = number of litters, sd = standard deviation

n=23 at 3-6 and 12-15 due to single missing values

03-4253

TABLE 4

Maternal uterus weights (g)

	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
Parameter	mean (sd)	mean (sd)	mean (sd)	mean (sd)
Uterus weight	86.9 (13.2)	83.0 (12.5)	87.3 (8.8)	83.7 (8.7)
Uterus weight (adjusted)	313.6 (14.8)	313.5 (14.3)	317.7 (17.1)	313.9 (14.8)

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

p values vs control using Dunnett's test following ANOVA significant at 5%.

Animal 2784 (1000 ppm) was not pregnant and its data were therefore omitted.

n = number of litters, sd = standard deviation

TABLE 5

Reproductive performance

	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
Parameter	mean (sd)	mean (sd)	mean (sd)	mean (sd)
corpora lutea (3)	15.7 (2.1)	15.1 (2.1)	16.8 (2.8)	15.5 (1.5)
%preimplantation loss (1)	8.7 (8.7)	7.6 (8.8)	12.8 (8.9)	9.1 (7.4)
number of implant sites (3)				
unadjusted for litter size:	14.3 (1.9)	13.9 (2.1)	14.5 (1.5)	14.0 (1.2)
adjusted for litter size:	13.9	14.1	14.4 *	14.3
fetuses alive (2)	13.9 (2.0)	13.3 (2.3)	13.6 (1.3)	13.2 (1.5)
early resorptions (3)	0.4 (0.5)	0.6 (0.8)	0.8 (0.8)	0.8 (0.8)
late resorptions (3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.2)	0.0 (0.2)
total resorptions (3)				
unadjusted for litter size	0.4 (0.5)	0.6 (0.8)	0.9 (0.9)	0.8 (0.9)
adjusted for litter size	0.4	0.6	0.9 *	0.8
%total resorp./implant sites (1)	2.8 (3.8)	4.5 (5.8)	5.9 (5.5)	6.0 (6.4)
number of males (3)	7.3 (2.1)	6.1 (2.3)	6.5 (2.0)	6.7 (1.8)
number of females (3)	6.5 (1.9)	7.2 (1.7)	7.1 (1.9)	6.5 (1.6)

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

(1) p values vs control following ANOVA significant at 5%.

(2) p values vs control following generalized linear model significant at 5%.

(3) p values vs control following generalized linear model significant at 5%, adjusted for litter size.

Animal 2784 (1000 ppm) not pregnant, therefore omitted.

n = number of litters, sd = standard deviation

03-4253

TABLE 6**Mean fetal bodyweight (g)**

	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
	mean (sd)	mean (sd)	mean (sd)	mean (sd)
male	4.1 (0.4)	4.2 (0.3)	4.3 (0.3)	4.3 (0.3)
female	4.0 (0.3)	4.0 (0.3)	4.1 (0.2)	4.1 (0.3)
litter	4.1 (0.3)	4.1 (0.3)	4.2 (0.3)	4.2 (0.3)

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

p values vs control using Dunnett's test following mixed model ANOVA significant at 5%.

Animal 2784 (1000 ppm) was not pregnant and its data were therefore omitted.

n = number of litters, sd = standard deviation

TABLE 7**Maternal necropsy findings**

Organ	Finding	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
External exam	Alopecia Extremities: Snout	1	2	1	3

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

Only findings where at least one group had incidence ≥ 2 are included.

p values vs control following generalized linear model significant at 5%.

Animal 2784 (1000 ppm) was not pregnant and was therefore omitted.

n = number of animals

03-4253

TABLE 8**Fetal findings**

Tissue	Organ	Finding	0 ppm (n=24)	1000 ppm (n=23)	5000 ppm (n=24)	10000 ppm (n=24)
Visceral	Heart	V-Heart or vessel anomaly	0	2 ^{a,b}	0	1
		M-Interventricular septal defect	0	2 ^{a,b}	0	1
	Torso	V-Displaced testis	4	0	0	2
		M-Hypoplastic spleen	0	2 ^{a,b}	0	0
		V-Left umbilical artery	1	1	2	3
		V-Renal papilla (U) (Grade 1)	0	1	5	1
		V-Undescended thymus	9	13	4	6
Skeletal	Cervical vertebrae	V-Cervical rib(s) present	1	1	1	2
	Ribs	V-Rib(s) 14th rudimentary	12	19	14	13
External	Gross examination	M Anasarca	0	2 ^{a,b}	0	0

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

Only findings where at least one group had incidence ≥ 2 are included.
 p values vs control following generalized linear model significant at 5%.

Animal 2784 (1000 ppm) was not pregnant and was therefore omitted.

n = number of litters.

a = 2776-3

b = 2781-10

M = malformation

V = variation

	Certificates of Analysis Preface	Appendix Q

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Return to Certified Analysis Retrieval

Product Code: 5002M
 Product Desc: CERTIFIED RODENT DIET MEAL
 Lab Number: L0427303-2
 Lot Code: DEC 02 04 1B
 Entered: 12/17/2004

Assay	Analysis	Units
PROTEIN	20.8	%
FAT ACID (HYDRO.)	6.23	%
FIBER (CRUDE)	4.81	%
ARSENIC	LESS THAN 0.2	PPM
CADMIUM	0.0786	PPM
CALCIUM	0.82	%
LEAD	0.205	PPM
MERCURY	LESS THAN 0.025	PPM
PHOSPHORUS	0.62	%
SELENIUM	0.235	PPM

ORGANOPHOSPHATES	PPM	ORGANOPHOSPHATES	PPM
Diazinon	LESS THAN 0.02	Disulfoton	LESS THAN 0.02
Ethion	LESS THAN 0.02	Malathion	LESS THAN 0.02
Methyl Parathion	LESS THAN 0.02	Parathion	LESS THAN 0.02
Thimet	LESS THAN 0.02	Thiodan	LESS THAN 0.02
Trithion	LESS THAN 0.02		

PESTICIDES AND PCB	PPM	PESTICIDES AND PCB	PPM
Aldrin	LESS THAN 0.02	Alpha-BHC	LESS THAN 0.02
Beta-BHC	LESS THAN 0.02	Chlordane	LESS THAN 0.02
DDE	LESS THAN 0.02	DDT	LESS THAN 0.02
Delta-BHC	LESS THAN 0.02	Dieldrin	LESS THAN 0.02
Endrin	LESS THAN 0.02	HCB	LESS THAN 0.02
Heptachlor	LESS THAN 0.02	Heptachlor Epoxide	LESS THAN 0.02
Lindane	LESS THAN 0.02	Methoxychlor	LESS THAN 0.02

Mirex	LESS THAN 0.02	PCB	LESS THAN 0.15

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Analysis Notes

Aflatoxin Less than 5 ppb

For additional information, please contact:

- 1) Customer Service at (314) 982-1310 – for assay methodology
- 2) Dr. Dorrance Haught at (314) 768-4362 – for nutritional interpretation
- 3) Richmond, IN Manufacturing Plant at (765) 962-9561 – all other questions

The term "Less Than" is used to signify the lower limit of quantitation of the procedure under the conditions employed.
The use of the term "Less Than" does not imply that traces of analyte were present.

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:

NAME: Terry Kuszniir
 COMPANY: Huntingdon Life Sciences
 ADDRESS: PO Box 2360, Mettlers Road
 East Millstone, NJ 08875-2360

INV #: 360876-360877

360879-360881

PAGE: 1 OF 6

PHONE: (732) 873-2550 x2100

FAX: (732) 873-3992

PO #:

TEST REPORT

PWS ID#:

PROJECT NAME:	ANIMAL DRINKING WATER	GRAB SAMPLES:	360876-360877
SAMPLED BY:	CLIENT		360879-360881
LOCATION:	SEE BELOW	COMPOSITE SAMPLES:	NONE
DATE:	01/20/05	DATE RECEIVED BY LAB:	01/21/05
TIME:	SEE BELOW	TIME RECEIVED BY LAB:	0844
		RECEIVED FOR LAB BY:	R. SMOLENAK

SAMPLE: SITE #1, F-WING ROOM 545

TIME: 1553

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS *	<1	PER 100 ML	SM#19 9215 B	360877	01/21/05	1130	01/22/05	JD
STANDARD PLATE COUNT	<1	CFU/ML	SM#20 9215 B	360877	01/21/05	1005	01/23/05	JD
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	360876	01/21/05	1329	01/22/05	DNG
E. COLI	0	PER 100 ML	EPA 600-R-00-013	360876	01/21/05	1329	01/22/05	DNG

SAMPLE: SITE #2, V-1 ROOM 724

TIME: 1557

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS *	<1	PER 100 ML	SM#19 9215 B	360879	01/21/05	1130	01/22/05	JD
STANDARD PLATE COUNT	<1	CFU/ML	SM#20 9215 B	360881	01/21/05	1005	01/23/05	JD
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	360880	01/21/05	1329	01/22/05	DNG
E. COLI	0	PER 100 ML	EPA 600-R-00-013	360880	01/21/05	1329	01/22/05	DNG

REMARKS:

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.
 S PARAMETER IS NOT CURRENTLY UNDER THE NELAC CERTIFICATION PROGRAM.

REVIEWED
 r 3 Feb 05

MANAGER:

Stephanie Olsen

DATE:

Jan 27, 2005

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100

FAX (610) 974-8104

SEND DATA TO:

NAME: Terry Kuszniir
COMPANY: Huntingdon Life Sciences
ADDRESS: PO Box 2360, Mettlers Road
East Millstone, NJ 08875-2360

INV #: 360878,360882
360886

PAGE: 2 OF 6

PHONE: (732) 873-2550 x 2100
FAX: (732) 873-3992

PO #:
PWS ID#:

TEST REPORT

PROJECT NAME: ANIMAL DRINKING WATER
SAMPLED BY: CLIENT
LOCATION: SEE BELOW
DATE: 01/20/05
TIME: SEE BELOW

GRAB SAMPLES: 360878,360882
360886
COMPOSITE SAMPLES: NONE
DATE RECEIVED BY LAB: 01/21/05
TIME RECEIVED BY LAB: 0844
RECEIVED FOR LAB BY: R. SMOLENAK

SAMPLE: SITE #1, F-WING ROOM 545

TIME: 1553

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.059	MG/L	EPA 200.7	360878	01/24/05	0745	01/24/05	GR
LEAD	0.001	MG/L	EPA 200.9	360878	01/24/05	0745	01/25/05	KFW

SAMPLE: SITE #2, V-1 ROOM 724

TIME: 1557

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.004	MG/L	EPA 200.7	360882	01/24/05	0745	01/24/05	GR
LEAD	<0.001	MG/L	EPA 200.9	360882	01/24/05	0745	01/25/05	KFW

SAMPLE: SITE #3, V-2 ROOM 916

TIME: 1605

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.024	MG/L	EPA 200.7	360886	01/24/05	0745	01/24/05	GR
LEAD	<0.001	MG/L	EPA 200.9	360886	01/24/05	0745	01/25/05	KFW

REMARKS:

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

REVIEWED
m 3 Feb 05

MANAGER: Stephanie Oliver DATE: Jan 24, 2005

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100

FAX (610) 974-8104

SEND DATA TO:

NAME: Terry Kuszniir
 COMPANY: Huntingdon Life Sciences
 ADDRESS: PO Box 2360, Mettlers Road
 East Millstone, NJ 08875-2360

INV #: 360883-360885
 360887-360888

PAGE: 3 OF 6

PHONE: (732) 873-2550 x2100
 FAX: (732) 873-3992

PO #:

PWS ID#:

TEST REPORT

PROJECT NAME: ANIMAL DRINKING WATER
 SAMPLED BY: CLIENT
 LOCATION: SEE BELOW
 DATE: 01/20/05
 TIME: SEE BELOW

GRAB SAMPLES: 360883-360885
 360887-360888
 COMPOSITE SAMPLES: NONE
 DATE RECEIVED BY LAB: 01/21/05
 TIME RECEIVED BY LAB: 0844
 RECEIVED FOR LAB BY: R. SMOLENAK

SAMPLE: SITE #3, V-2 ROOM 916

TIME: 1605

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS *	<1	PER 100 ML	SM#19 9215 B	360883	01/21/05	1130	01/22/05	JD
STANDARD PLATE COUNT	<1	CFU/ML	SM#20 9215 B	360885	01/21/05	1005	01/23/05	JD
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	360884	01/21/05	1329	01/22/05	DNG
E. COLI	0	PER 100 ML	EPA 600-R-00-013	360884	01/21/05	1329	01/22/05	DNG

SAMPLE: SITE #4, V-3 ROOM 951

TIME: 1611

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS *	<1	PER 100 ML	SM#19 9215 B	360888	01/21/05	1130	01/22/05	JD
STANDARD PLATE COUNT	<1	CFU/ML	SM#20 9215 B	360888	01/21/05	1005	01/23/05	JD
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	360887	01/21/05	1329	01/22/05	DNG
E. COLI	0	PER 100 ML	EPA 600-R-00-013	360887	01/21/05	1329	01/22/05	DNG

REMARKS:

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.
 S PARAMETER IS NOT CURRENTLY UNDER THE NELAC CERTIFICATION PROGRAM.

REVIEWED

r3f205

MANAGER:

Stephanie Oliva

DATE:

Jan 27, 2005

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100

FAX (610) 974-8104

SEND DATA TO:

NAME: Terry Kuszniir
COMPANY: Huntingdon Life Sciences
ADDRESS: PO Box 2360, Mettlers Road
East Millstone, NJ 08875-2360INV #: 360889,360893
360896

PAGE: 4 OF 6

PHONE: (732) 873-2550 x2100
FAX: (732) 873-3992PO #:
PWS ID#:

TEST REPORT

=====

PROJECT NAME: ANIMAL DRINKING WATER GRAB SAMPLES: 360889,360893
SAMPLED BY: CLIENT 360896
LOCATION: SEE BELOW COMPOSITE SAMPLES: NONE
DATE: 01/20/05 DATE RECEIVED BY LAB: 01/21/05
TIME: SEE BELOW TIME RECEIVED BY LAB: 0844
RECEIVED FOR LAB BY: R. SMOLENAK

SAMPLE: SITE #4, V-3 ROOM 951

TIME: 1611

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.027	MG/L	EPA 200.7	360889	01/24/05	0745	01/24/05	GR
LEAD	<0.001	MG/L	EPA 200.9	360889	01/24/05	0745	01/25/05	KFW

SAMPLE: SITE #5, INHALATION ROOM 810

TIME: 1623

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.010	MG/L	EPA 200.7	360893	01/24/05	0745	01/24/05	GR
LEAD	<0.001	MG/L	EPA 200.9	360893	01/24/05	0745	01/25/05	KFW

SAMPLE: L-WING ROOM 457

TIME: 1630

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.029	MG/L	EPA 200.7	360896	01/24/05	0745	01/24/05	GR
LEAD	<0.001	MG/L	EPA 200.9	360896	01/24/05	0745	01/25/05	KFW

REMARKS:

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

REVIEWED
T 36205MANAGER: Stephanie Allen DATE: Jan 27, 2005

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100

FAX (610) 974-8104

SEND DATA TO:

NAME: Terry Kuszniir
 COMPANY: Huntingdon Life Sciences
 ADDRESS: PO Box 2360, Mettlers Road
 East Millstone, NJ 08875-2360

INV #: 360890-360892

360894-360895

PAGE: 5 OF 6

PO #:

PHONE: (732) 873-2550 x2100

FAX: (732) 873-3992

TEST REPORT

PWS ID#:

PROJECT NAME: ANIMAL DRINKING WATER GRAB SAMPLES: 360890-360892
 SAMPLED BY: CLIENT 360894-360895
 LOCATION: SEE BELOW COMPOSITE SAMPLES: NONE
 DATE: 01/20/05 DATE RECEIVED BY LAB: 01/21/05
 TIME: SEE BELOW TIME RECEIVED BY LAB: 0844
 RECEIVED FOR LAB BY: R. SMOLENAK

SAMPLE: SITE #5, INHALATION ROOM 810

TIME: 1623

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS *	<1	PER 100 ML	SM#19 9215 B	360890	01/21/05	1130	01/22/05	JD
STANDARD PLATE COUNT	<1	CFU/ML	SM#20 9215 B	360892	01/21/05	1005	01/23/05	JD
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	360891	01/21/05	1329	01/22/05	DNG
E. COLI	0	PER 100 ML	EPA 600-R-00-013	360891	01/21/05	1329	01/22/05	DNG

SAMPLE: SITE #6, L-WING ROOM 457

TIME: 1630

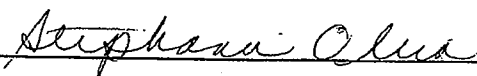
TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS *	<1	PER 100 ML	SM#19 9215 B	360895	01/21/05	1130	01/22/05	JD
STANDARD PLATE COUNT	<1	CFU/ML	SM#20 9215 B	360895	01/21/05	1005	01/23/05	JD
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	360894	01/21/05	1329	01/22/05	DNG
E. COLI	0	PER 100 ML	EPA 600-R-00-013	360894	01/21/05	1329	01/22/05	DNG

REMARKS:

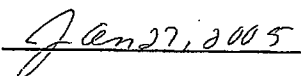
THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.
 THIS PARAMETER IS NOT CURRENTLY UNDER THE NELAC CERTIFICATION PROGRAM.

REVIEWED
 m 3 Feb 05

MANAGER:



DATE:



BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:

NAME: Terry Kuszniir
COMPANY: Huntingdon Life Sciences
ADDRESS: PO Box 2360, Mettlers Road
East Millstone, NJ 08875-2360

INV #: 360897-360899

PAGE: 6 OF 6

PO #:

PHONE: (732) 873-2550 x2100
FAX: (732) 873-3992

TEST REPORT

PWS ID#:

PROJECT NAME: ANIMAL DRINKING WATER
SAMPLED BY: CLIENT
LOCATION: SEE BELOW
DATE: 01/20/05
TIME: SEE BELOW

GRAB SAMPLES: 360897-360899
COMPOSITE SAMPLES: NONE
DATE RECEIVED BY LAB: 01/21/05
TIME RECEIVED BY LAB: 0844
RECEIVED FOR LAB BY: R. SMOLENAK

SAMPLE: SITE #7 PHARMACY 1

TIME: 1517

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS *	<1	PER 100 ML	SM#19 9215 B	360897	01/21/05	1130	01/22/05	JD
STANDARD PLATE COUNT	87	CFU/ML	SM#20 9215 B	360899	01/21/05	1005	01/23/05	JD
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	360898	01/21/05	1329	01/22/05	DNG
E. COLI	0	PER 100 ML	EPA 600-R-00-013	360898	01/21/05	1329	01/22/05	DNG

REMARKS:

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

REVIEWED
m 3 Feb 05

MANAGER: Stephanie Oliva DATE: Jan 27, 2005

Elizabethtown Water Company									
Physical & Chemical Analyses									
								Date	February 8, 2005
General Source	Raritan-Millstone Plant								
Sample No. 1	Plant Delivered Water - 7:30 a.m. 2-08-05 KK								
Sample No. 2									
Sample No. 3									
Sample No. 4									
Sample No. 5									
Sample No. 6									
Sample No. 7									
Sample No. 8									
Parameter	MCL (mg/l)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
Temperature ° F	-	39							
Turbidity (NTU)	0.3 NTU	0.13							
Color	10 *	1.0							
Threshold Odor 40 ° C	3 TON *	2.7/2cc							
Threshold Taste	3 TTN *	2.8							
Conductivity (micromhos / cm)	-	489							
Hardness, Total (as mg / l CaCO3)	250 mg / l *	110							
Alkalinity	-	51							
pH	6.5-8.5 *	7.1							
Chlorine, Free / Total (mg / l Cl)	-	<0.05/0.86							
Calcium (as mg / l CaCO3)	-	76							
Magnesium (as mg / l CaCO3)	-	34							
Iron, Total (mg / l Fe)	0.3 mg / l *	<0.05							
Sulfates (mg / l SO4)	250 mg / l *	32.9							
Chlorides (mg / l Cl)	250 mg / l *	88.5							
Fluoride (mg / l F)	2 mg / l *	<0.01							
Total Dissolved Solids (mg / l)	500 mg / l *	296							
Total Suspended Solids (mg / l)	-	0.0							
Ammonia Nitrogen (mg / l N)	-	<0.05							
Nitrate Nitrogen (mg / l N)	10 mg / l	1.53							
Dissolved Oxygen (mg / l O2)	-	12.6							
BOD 5 (mg / l O2)	-								
Langelier Index	+/- 1.0	-1.50							
Surfactants (mg / l LAS)	0.5 mg / l *	-							
Hydrogen Sulfide (mg / l H2S as S)	-	0							
Nitrite Nitrogen (mg / l N)	1 mg / l	<.01							
Phosphate (mg / l PO3)	-	<0.05							
Manganese (mg / l MN)	0.05 mg / l *	<0.05							
Zinc	5 mg / l *	0.24							
T.O.C. (mg / l)	5 mg / l *	1.0							
						Laboratory Analyst: MT			
* Secondary or Recommended MCL									
Any questions please call Water Quality Specialist- (908) 301-3163									

TV
2/11/05

REVIEWED

Elizabethtown Water Company									
Physical & Chemical Analyses									
							Date	March 8, 2005	
General Source	Raritan-Millstone Plant								
Sample No. 1	Plant Delivered Water - 7:30 a.m. 3-08-05 DD								
Sample No. 2									
Sample No. 3									
Sample No. 4									
Sample No. 5									
Sample No. 6									
Sample No. 7									
Sample No. 8									
Parameter	MCL (mg/l)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
Temperature ° F	-	42							
Turbidity (NTU)	0.3 NTU	0.10							
Color	10 *	1.0							
Threshold Odor 40 ° C	3 TON *	2.7/2cc							
Threshold Taste	3 TTN *	2.5							
Conductivity (micromhos / cm)	-	476							
Hardness, Total (as mg / l CaCO3)	250 mg / l *	110							
Alkalinity	-	42							
pH	6.5-8.5 *	6.7							
Chlorine, Free / Total (mg / l Cl)	-	<0.05/0.61							
Calcium (as mg / l CaCO3)	-	80							
Magnesium (as mg / l CaCO3)	-	30							
Iron, Total (mg / l Fe)	0.3 mg / l *	<0.05							
Sulfates (mg / l SO4)	250 mg / l *	39.8							
Chlorides (mg / l Cl)	250 mg / l *	86.2							
Fluoride (mg / l F)	2 mg / l *	<0.1							
Total Dissolved Solids (mg / l)	500 mg / l *	334							
Total Suspended Solids (mg / l)	-	0.0							
Ammonia Nitrogen (mg / l N)	-	<0.05							
Nitrate Nitrogen (mg / l N)	10 mg / l	1.30							
Dissolved Oxygen (mg / l O2)	-	16.6							
BOD 5 (mg / l O2)	-								
Langelier Index	+/- 1.0	-2.08							
Surfactants (mg / l LAS)	0.5 mg / l *	-							
Hydrogen Sulfide (mg / l H2S as S)	-	0							
Nitrite Nitrogen (mg / l N)	1 mg / l	<.01							
Phosphate (mg / l PO3)	-	<0.05							
Manganese (mg / l MN)	0.05 mg / l *	<0.05							
Zinc	5 mg/l *	0.31							
T.O.C. (mg / l)	5 mg/l *	1.1							
							Laboratory Analyst: KK		
* Secondary or Recommended MCL									
Any questions please call Water Quality Specialist- (908) 301-3163									

REVIEWED
 M 15 Apr 05

ChevronTexaco Energy Research
& Technology Company
Integrated Lab Technologies
100 Chevron Way
P.O.Box 1627
Richmond, CA 94802-0627
Tel 510-242-4993



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APPENDIX R

July 23, 2003

ChevronTexaco



American Petroleum Institute
1220 L Street, Northwest
Washington, DC 20005-4070

Dear 

Enclosed are the analytical results for each of the five 100 gallon cylinders of liquefied petroleum gas that have been prepared for HPV light gases task group and are being stored at our facility. I have included individual analyses of each of the tanks plus two duplicates. Additionally since the five cylinders were filled from the same truck, should theoretically have the same composition, and in fact calculate to have very similar compositions, I summed the chromatographic signals of all seven analyses and calculated the average results for the LPG based on the summed signal. This technique reduces signal to noise and provides a more precise measurement of the smaller concentration constituents.

Liquid samples were injected at 100 psig using a liquid sampling loop. The coefficient of variation of the seven total sample areas was 12.8%, and the average total sample area had a 95% confidence limit of +/- 11.8 %, reflecting the difficulty of injecting truly repeatable amounts of such a volatile material.

Results were quantified by normalizing the total area counts to the average area counts for all seven analyses and then calculating the concentration of ethane, n-butane, isobutene, and isopentane by comparing peak areas with the average areas of a certified LPG master standard from Scott Specialty gases, run in triplicate. The concentrations of all other compounds heavier than propane were determined by applying weight response factors and ratioing adjusted peak areas to the n-butane adjusted peak area. The concentration of methane was treated similarly but ratioed to ethane. We were unfortunately unable to separate propane and propylene, given the high concentration of the propane. The two compounds were quantified by difference from 100.0 percent to account for detector overload, and were reported as a sum.

Neither benzene nor 1,3-butadiene were detected in any of the samples. The instrument detection limit for 1,3-butadiene was <10 ppm for all samples except LPG1 duplicate. In that sample the baseline was noisier than usual in the region where 1,3-butadiene elutes, necessitating an instrument detection limit of <20 ppm.

ChevronTexaco

If you have any questions concerning this report please feel free to contact me.

Sincerely,

A solid black rectangular box used to redact a signature.A solid black rectangular box used to redact a signature.

Sample Name: LPG 1, tank V64452

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.015	0.025
ethane	2.048	1.947	2.262
propane + propylene	93.263	92.176	92.688
n-butane	2.857	3.607	3.167
n-pentane	0.068	0.079	0.061
isoparaffins			
isobutane	1.264	1.538	1.301
neopentane	0.003	0.004	0.003
isopentane	0.392	0.523	0.396
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.036	0.045	0.042
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.011	0.010
c-2-butene	0.009	0.010	0.010
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.011	0.012	0.010
2-methyl-1-butene	0.004	0.005	0.004
t-2-pentene	0.006	0.007	0.006
c-2-pentene	0.004	0.005	0.004
2-methyl-2-butene	0.010	0.011	0.009
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EQ# 7/23/03

Sample Name: LPG 1, tank V64452, duplicate injection

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.007	0.009	0.014
ethane	1.652	1.647	1.915
propane + propylene	93.647	92.178	92.778
n-butane	2.867	3.794	3.335
n-pentane	0.062	0.076	0.058
isoparaffins			
isobutane	1.262	1.610	1.363
neopentane	0.002	0.003	0.002
isopentane	0.393	0.549	0.416
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.040	0.051	0.048
1,3-butadiene	nd<0.002	nd<0.002	nd<0.002
t-2-butene	0.008	0.010	0.010
c-2-butene	0.009	0.011	0.011
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.019	0.023	0.018
2-methyl-1-butene	0.010	0.011	0.009
t-2-pentene	0.012	0.014	0.011
c-2-pentene	0.002	0.002	0.002
2-methyl-2-butene	0.006	0.007	0.006
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EQ# 7/23/03

Sample Name: LPG 2, tank V641461

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.014	0.016	0.026
ethane	2.175	1.914	2.223
propane + propylene	92.887	92.362	92.856
n-butane	2.999	3.503	3.075
n-pentane	0.066	0.071	0.054
isoparaffins			
isobutane	1.358	1.529	1.293
neopentane	0.002	0.002	0.001
isopentane	0.404	0.499	0.377
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.042	0.047	0.044
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.008	0.008
c-2-butene	0.011	0.012	0.011
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.010	0.011	0.009
2-methyl-1-butene	0.006	0.007	0.005
t-2-pentene	0.005	0.005	0.004
c-2-pentene	0.003	0.003	0.003
2-methyl-2-butene	0.007	0.007	0.006
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EAX 7/23/03

Sample Name: LPG 3, tank V641455

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.020	0.027	0.044
ethane	2.076	2.108	2.448
propane + propylene	93.650	92.169	92.625
n-butane	2.633	3.550	3.115
n-pentane	0.059	0.074	0.056
isoparaffins			
isobutane	1.123	1.458	1.233
neopentane	0.003	0.004	0.003
isopentane	0.351	0.501	0.378
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.036	0.047	0.044
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.009	0.009
c-2-butene	0.009	0.011	0.011
3-methyl-1-butene	nd<0.001	nd<0.001	nd<0.001
1-pentene	0.011	0.013	0.011
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.006	0.008	0.006
c-2-pentene	0.005	0.006	0.005
2-methyl-2-butene	0.004	0.005	0.004
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EAX 7/23/03

Sample Name: LPG 3, tank V641455, duplicate injection

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.016	0.027
ethane	1.809	1.849	2.150
propane + propylene	93.517	91.854	92.436
n-butane	2.854	3.872	3.402
n-pentane	0.064	0.080	0.061
isoparaffins			
isobutane	1.246	1.629	1.380
neopentane	0.003	0.004	0.003
isopentane	0.404	0.579	0.438
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.038	0.050	0.047
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.012	0.011
c-2-butene	0.007	0.008	0.008
3-methyl-1-butene	0.004	0.004	0.003
1-pentene	0.014	0.017	0.014
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.005	0.006	0.005
c-2-pentene	0.004	0.005	0.004
2-methyl-2-butene	0.006	0.007	0.005
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EO# 7/23/03

Sample Name: LPG 4, tank V641456

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.016	0.019	0.031
ethane	2.264	2.027	2.355
propane + propylene	92.619	91.935	92.455
n-butane	3.111	3.698	3.247
n-pentane	0.072	0.079	0.060
isoparaffins			
isobutane	1.357	1.554	1.315
neopentane	0.003	0.003	0.002
isopentane	0.443	0.557	0.421
2,3-dimethylbutane	0.008	0.008	0.005
cycloparaffins			
cyclopentane	0.003	0.003	0.003
olefins, dienes			
isobutene	0.042	0.048	0.045
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.010	0.011	0.011
c-2-butene	0.009	0.010	0.010
3-methyl-1-butene	0.003	0.004	0.003
1-pentene	0.015	0.017	0.013
2-methyl-1-butene	0.007	0.008	0.006
t-2-pentene	0.005	0.005	0.004
c-2-pentene	0.005	0.005	0.004
2-methyl-2-butene	0.009	0.009	0.007
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EQ# 7/23/03

Sample Name: LPG 5, tank V641437

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.014	0.022	0.036
ethane	1.816	2.100	2.439
propane + propylene	94.328	92.023	92.509
n-butane	2.332	3.581	3.143
n-pentane	0.057	0.080	0.061
isoparaffins			
isobutane	1.027	1.520	1.286
neopentane	0.004	0.006	0.004
isopentane	0.330	0.535	0.405
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.032	0.048	0.045
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.011	0.010
c-2-butene	0.008	0.012	0.012
3-methyl-1-butene	0.003	0.004	0.003
1-pentene	0.014	0.020	0.016
2-methyl-1-butene	0.010	0.014	0.011
t-2-pentene	0.005	0.007	0.006
c-2-pentene	0.005	0.007	0.006
2-methyl-2-butene	0.007	0.009	0.008
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

END 7/23/03

Sample Name: Average Signal

Integration of the summed chromatographic signal of all samples and duplicates to gain improved signal to noise

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.016	0.027
ethane	1.809	1.849	2.150
propane + propylene	93.513	91.851	92.434
n-butane	2.854	3.872	3.402
n-pentane	0.064	0.080	0.061
isoparaffins			
isobutane	1.246	1.629	1.380
neopentane	0.003	0.004	0.003
isopentane	0.404	0.579	0.438
2,3-dimethylbutane	0.006	0.007	0.005
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.038	0.050	0.047
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.012	0.011
c-2-butene	0.007	0.008	0.008
3-methyl-1-butene	0.004	0.004	0.003
1-pentene	0.014	0.017	0.014
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.003	0.003	0.003
c-2-pentene	0.003	0.004	0.003
2-methyl-2-butene	0.005	0.006	0.005
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

END 7/23/03

API LPG Comparative Analysis -- August 23, 2004

Cylinder Serial Number	K634083	K634086	K634106	V641453	12/19/2001	
33# Cylinder Number				420#	Trap Target	
Filling Sequence	42	20	1	Cylinder 5	Wagon Spec's	
	wt %	wt %	wt %	wt %	wt %	vol %
methane	0.00	0.00	0.00	0.00	0.02	
ethylene	0.00	0.00	0.00	0.00		
ethane	0.56	1.10	1.14	1.32	2.48	
propylene	0.00	0.00	0.00	0.00		<10
propane	88.84	91.60	91.00	91.12	87.32	>85
isobutane	2.44	1.85	1.94	1.88	1.21	
1-butene + isobutene	0.09	0.06	0.07	0.06	0.04	<2
butane	6.52	4.52	4.82	4.65	2.75	<5
trans-2-butene	0.02	0.02	0.02	0.00	0.01	
2,2-dimethylpropane	0.02	0.01	0.01	0.02		
cis-2-butene	0.02	0.01	0.01	0.01	0.39	
3-methyl-1-butene	0.01	0.00	0.00	0.01		
isopentane	1.23	0.68	0.80	0.76		
1-pentene	0.04	0.02	0.02	0.03		
2-methyl-1-butene	0.01	0.01	0.01	0.01		
pentane	0.18	0.10	0.11	0.11		<0.5
isoprene	0.02	0.00	0.01	0.01		
trans-2-pentene	0.00	0.00	0.03	0.00		
cis-2-pentene	0.02	0.01	0.01	0.01		

August 23, 2004
file: P:API LPG

Sample ID: K634083, 33# Cyl, 3rd sample

	wt %
methane	0.00
ethylene	0.00
ethane	0.56
propylene	0.00
propane	88.84
isobutane	2.44
1-butene + isobutene	0.09
butane	6.52
trans-2-butene	0.02
2,2-dimethylpropane	0.02
cis-2-butene	0.02
3-methyl-1-butene	0.01
isopentane	1.23
1-pentene	0.04
2-methyl-1-butene	0.01
pentane	0.18
isoprene	0.02
trans-2-pentene	0.00
cis-2-pentene	0.02

K634086.AIA

	wt %
methane	0.00
ethylene	0.00
ethane	1.10
propylene	0.00
propane	91.60
isobutane	1.85
1-butene + isobutene	0.06
butane	4.52
trans-2-butene	0.02
2,2-dimethylpropane	0.01
cis-2-butene	0.01
3-methyl-1-butene	0.00
isopentane	0.68
1-pentene	0.02
2-methyl-1-butene	0.01
pentane	0.10
isoprene	0.00
trans-2-pentene	0.00
cis-2-pentene	0.01

K634106

	wt %	
methane	0.00	0
ethylene	0.00	0
ethane	1.14	1.14
propylene	0.00	0
propane	91.00	91
isobutane	1.94	1.94
1-butene + isobutene	0.07	0.07
butane	4.82	4.82
trans-2-butene	0.02	0.02
2,2-dimethylpropane	0.01	0.01
cis-2-butene	0.01	
3-methyl-1-butene	0.00	
isopentane	0.80	
1-pentene	0.02	
2-methyl-1-butene	0.01	
pentane	0.11	
isoprene	0.01	
trans-2-pentene	0.03	
cis-2-pentene	0.01	

V641453

	wt %
methane	0.00
ethylene	0.00
ethane	1.32
propylene	0.00
propane	91.12
isobutane	1.88
1-butene + isobutene	0.06
butane	4.65
trans-2-butene	0.00
2,2-dimethylpropane	0.02
cis-2-butene	0.01
3-methyl-1-butene	0.01
isopentane	0.76
1-pentene	0.03
2-methyl-1-butene	0.01
pentane	0.11
isoprene	0.01
trans-2-pentene	0.00
cis-2-pentene	0.01

APPENDIX S

PROTOCOL

LIQUIFIED PETROLEUM GAS

EMBRYO-FETAL TOXICITY STUDY IN RATS BY INHALATION EXPOSURE

CONFIDENTIAL

HLS Study No.:	03-4253
Protocol Version:	Final Protocol
Date:	4 February 2005

Huntingdon Life Sciences
Study No. 03-4253

Final Protocol

PROTOCOL SIGNATURES/PREFACE

(Confidential Information - to be distributed on a need-to-know basis)

Study Title: **Liquified Petroleum Gas: Embryo-Fetal Toxicity Study
in Rats by Inhalation Exposure**

HLS Study No.: 03-4253

This is the Final Protocol. It has been reviewed and approved by:

14 Feb 5
Date

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2/11/05
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1. INTRODUCTION

HLS Study No.: 03-4253

Study Title: Liquified Petroleum Gas: Embryo-Fetal Toxicity Study in Rats by Inhalation Exposure

Test Substance: Liquified Petroleum Gas (LPG)

Testing Facility: Huntingdon Life Sciences
100 Mettlers Road
East Millstone, NJ 08875-2360

Purpose:

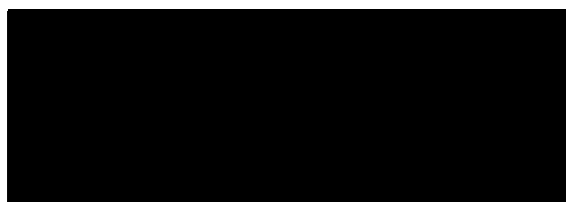
This study is designed to assess the potential maternal and/or developmental toxicity of Liquified Petroleum Gas in the pregnant rat when administered by whole-body inhalation exposure. The study should permit detection of gross maternal organ changes and effects on the developing conceptus, including death, structural abnormalities or altered growth.

2. STUDY PERSONNEL

Study Director



Alternate Contact



Additional key personnel will be documented in the project file and presented in the final report.

3. PROPOSED STUDY DATES

Study Initiation Date	Date Study Director Signs Protocol
Receipt of test animals:	18 February 2005 (Experimental Start Date)* & 21 February 2005 (GD 0, 1 or 2)
Initiation of exposures:	22 February 2005 (Experimental Start Date)** (First GD 6)
Termination of exposures:	10 March 2005 (Last GD 19)
Necropsy:	8-11 March 2005 (GD 20)
Experimental Termination:	June 2005 (Date of last data collection)
Submission of Draft Final Report:	22 July 2005
Study Completion Date:	Date Final Report signed by Study Director

*as per OECD GLPs; ** as per EPA GLPs

4. EXPERIMENTAL DESIGN

Group	Group Designation	Exposure Levels ^a (ppm)	Treatment Gestation Days	Number of Animals				
				Time-Mated Females	Euthanized Gestation Day 20 ^b	Fetal Evaluations (Fetuses/Litter)		
						External	Soft Tissue	Skeletal
1	Control	0 (air only)	6-19	24	All	All	~1/2	~1/2
2	Low	1000	6-19	24	All	All	~1/2	~1/2
3	Mid	5000	6-19	24	All	All	~1/2	~1/2
4	High	10000	6-19	24	All	All	~1/2	~1/2

^aExposures will be 6 hours per day for 7 consecutive days per week for gestation days 6-19. Exposure levels are expressed as ppm of test substance. The exposures will be conducted via whole-body exposure. Exposure levels were determined by a 14-Day Range-Finding Study 03-6140. Control animals will be treated with air only with the same treatment regimen as the treated groups.

^bComplete postmortem evaluations will also be performed on animals which are found dead or euthanized in a moribund condition during the course of the study.

The first day of gestation (Gestation Day 0 = day of detection of positive sign of mating) will be defined as Day 0 of the study.

4.1. JUSTIFICATION FOR ROUTE, DURATION AND FREQUENCY OF ADMINISTRATION

The inhalation route is one of the potential routes of human exposure to this test substance. The duration and frequency of the exposures are as recommended in the relevant OECD and EPA test guidelines, ensuring adequate exposure of post-implantation embryo-fetal development.

4.2. JUSTIFICATION FOR TEST ANIMAL SELECTION

The rat is used as a surrogate for humans in the detection of embryo-fetal toxicity and is the rodent species that is recommended by the relevant OECD and EPA test guidelines. Historical control data are also available with this strain of rat for comparative evaluation, if necessary.

4.3. JUSTIFICATION FOR NUMBER OF ANIMALS

The number of animals in this study is considered the minimum necessary to allow for meaningful interpretation of the data as required by OECD and EPA test guidelines. Some of the endpoints of principal interest (*eg* embryo-fetal death, fetal malformations) are low-frequency events and a group size of ~20 litters tends to provide the necessary degree of consistency between studies. In the expectation of pregnancy rates of 80-100%, the group size of 24 mated female rats is considered appropriate for this study and should provide a sufficient number of litters for evaluation in each group.

4.4. EXPOSURE LEVEL SELECTION AND JUSTIFICATION

Sponsor specified based on results of range-find testing 03-6140 which showed no effects at 10000 and 1000 and 100 ppm. The exposure levels were also selected based on establishing (for safety reasons) the high exposure level as no more than 50% of the lower explosion limit (LEL = 2.1% = 21000 ppm) for the test substance.

5. TEST SUBSTANCE

5.1. TEST SUBSTANCE

Liquified Petroleum Gas (LPG)

TEST SUBSTANCE CATEGORY: industrial gas

Description, lot number, storage, expiration date (if available) and handling procedures, as well as other pertinent information will be documented in the study data and final report. The test substance is supplied by the Sponsor and will be stored (ambient conditions) in an

outside solvent shed except when in use in the inhalation laboratory. The test substance will be handled as a flammable gas.

5.2. IDENTIFICATION OF TEST SUBSTANCE

Unless otherwise noted, the identity, strength, composition, stability and method of synthesis, fabrication and/or derivation of each batch of the test substance will be documented by the Sponsor before its use in the study. This documentation will be maintained by the Sponsor at the address indicated on the signature page of this protocol.

5.3. ARCHIVAL SAMPLES

Sponsor will arrange for storage of an archival sample at a contract archival facility (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA 20166, 703-435-8780 ext 201: Sam Busey). Since multiple studies are conducted with the same test substance, a common archival sample will be taken and appropriately labeled. Laboratory will arrange for safe transportation of the archival sample to the archival facility, in compliance with all applicable regulations.

5.4. UNUSED TEST SUBSTANCE

Following completion of the final report for the final study with this test substance, the Testing Facility will inform the Sponsor of the volume of remaining test substance as well as the number of test substance containers. The Sponsor will then instruct the Testing Facility whether to dispose of the remaining test substance and containers or to ship the test substance and containers to another location. No test substance or container (even empty ones) will be disposed of until the issuance of the final report.

6. TEST ANIMALS

6.1. SPECIES

Albino Rats (Outbred), Sprague Dawley - derived
[CrI: CD® IGS BR, VAF/Plus®]

6.2. SUPPLIER

Charles River Laboratories: Documentation of the specific breeding facility will be maintained in the study file and included in the final report.

6.3. ANIMAL REQUIREMENTS/SPECIFICATIONS

6.3.1. NUMBER

Order: 100 time-mated rats.

Place on study: 96 time-mated rats.

6.3.2. AGE AND WEIGHT

Time-mated female rats 70-84 days in age and weighing 210-250 grams on Gestation Day 0 will be purchased. Animals will be received on GD 0, 1 or 2.

6.4. ACCLIMATION PERIOD

Animals will be acclimated for a minimum of 4 days from time of receipt until initiation of exposures (GD 6).

6.5. ANIMAL CARE AND HUSBANDRY

6.5.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY

Currently acceptable practices of good animal husbandry will be followed, e.g., *Guide for the Care and Use of Laboratory Animals*; National Academy Press, 1996. Huntingdon Life Sciences Inc. is fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC).

6.5.2. VETERINARY CARE

Animals are monitored by the technical staff for any conditions requiring possible veterinary care. If any such conditions are identified, a staff veterinarian will be notified for an examination and evaluation. Animals will be treated as outlined in the Animal Welfare Act Compliance section of this protocol. **The staff veterinarian will approve the animals for inclusion on test.**

6.5.3. ENVIRONMENTAL CONDITIONS

Light/Dark Cycle

Twelve-hour light/dark cycle provided by an automatic timer.

Temperature

Temperature will be monitored in accordance with HLS SOPs to ensure that the desired range of 18-26°C is maintained. Temperature will be maintained within this range to the maximum extent possible. The actual temperature range will be included in the final report.

Humidity

Humidity will be monitored in accordance with HLS SOPs to ensure that the desired range of 30 to 70% is maintained. Humidity will be maintained within this range to the maximum extent possible. The actual humidity range will be included in the final report.

Air Changes

Animal quarters will have 10-15 air changes per hour. The actual number of air changes per hour in each animal room is recorded at least twice each year and the Testing Facility retains these records.

6.5.4. HOUSING

All animals will be housed individually in stainless steel suspended cages with wire mesh floors and fronts. Cages will be arranged in such a way that possible effects due to placement are minimized. (as per EPA guideline). Each cage will be fitted to secure a glass feeder jar with a stainless steel lid. Clean feed jars and fresh feed will be provided at least weekly for periods when feed consumption is not being recorded and at least every 5 days when feed consumption will be recorded.

6.5.5. FEED

Certified Rodent Diet, No. 5002; (Meal) (PMI Feeds, Inc., St. Louis, MO) *ad libitum* except during exposures.

6.5.6. FEED ANALYSIS

Analytical certification of batches of feed provided by the manufacturer will be maintained on file at the Testing Facility and included in the final report. There are no known contaminants in the feed that are expected to interfere with the objectives of this study.

6.5.7. WATER

Facility water is supplied by Elizabethtown Water Company, (Westfield, NJ) and will be provided *ad libitum* except during exposures to individual animal cages through an automated watering system.

6.5.8. WATER ANALYSIS

Water analyses are conducted monthly by the Elizabethtown Water Company to ensure that water meets standards specified under the EPA Federal Safe Drinking Water Act Regulations (40 CFR part 141). Water analyses, provided by the supplier, will be maintained on file at the Testing Facility and included in the final report. In addition, water samples are collected biannually from representative rooms in the Testing Facility. Chemical and microbiological water analyses are conducted on these samples by a subcontract laboratory (Benchmark, Center Valley, PA). Results are maintained on file at the Testing Facility and included in the final report. There are no known contaminants in the water that are expected to interfere with this study.

6.6. ANIMAL HUSBANDRY DURING EXPOSURE

Housing: Individually in stainless steel wire mesh cages.
Feed: None.
Water: None.

6.7. ANIMAL IDENTIFICATION

Each animal will be assigned a temporary identification number upon receipt. After selection for study, each animal will be ear-tagged by the Testing Facility with a number assigned by the Testing Facility. The number assigned by the Testing Facility plus the study number will comprise the unique animal number for each animal. If the tag is lost, it will be replaced or the animal will be tattooed for identification. Each cage will be provided with a cage card that will be color-coded for exposure level identification and will contain the study number and animal number.

6.8. ASSIGNMENT OF ANIMALS INTO GROUPS

Animals will be placed into study groups using a computerized randomization program. This ranks Gestation Day 3 body weights into blocks and randomly assigns each animal within each block into one of the study groups. Animals may be replaced based on physical examinations and/or body weight changes up to GD 6, prior to exposures. Disposition of all animals not utilized in the study will be maintained in the study file.

7. TEST SUBSTANCE ADMINISTRATION

7.1. ROUTE OF ADMINISTRATION

Inhalation by whole-body exposures.

7.2. FREQUENCY OF ADMINISTRATION

Once daily.

7.3. DURATION OF ADMINISTRATION

The test substance will be administered for 6 hours/day, 7 days per week for Gestation Days (GD) 6-19.

7.4. ADMINISTRATION OF TEST SUBSTANCE

The test substance will be administered as a gas in the breathing air of the animals. The test atmosphere will be generated by an appropriate procedure determined during pre-study trials. The trials will be performed (at least three 6-hour periods) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the target exposure levels. The method will be described in the raw data of the study and in the report.

The whole-body exposure chambers will each have a volume of approximately 1000 liters. Each chamber will be operated at a minimum flow rate of 200 liters per minute. The final airflow will be set to provide at least one air change in 5.0 minutes (12 air changes/hour) and a T₉₉ equilibrium time of at most 23 minutes. This chamber size and airflow rate is considered adequate to maintain the oxygen level at least 19% and the animal loading factor below 5%. At the end of the exposure, all animals will remain in the chamber for a minimum of the T₉₉ equilibrium time. During this time, the chamber will be operated at approximately the same flow rate using clean air only.

7.5. EXPOSURE CONCENTRATION DETERMINATION

A nominal exposure concentration will be calculated daily. The flow of air through the chamber will be monitored using appropriate calibrated equipment (dry test meter). The test substance consumed during the exposure (weight difference of test substance cylinder) will be divided by the total volume of air passing through the chamber (volumetric flow rate times total exposure time) to give the nominal concentration.

During each exposure, measurements of airborne concentrations will be performed in the animals' breathing zone at least 4 times using an appropriate sampling procedure (samples drawn through the IR monitor by a vacuum pump) and infrared spectrophotometric analytical procedure (samples assayed at 10.9 μ m wavelength). Also, one sample (gas tight syringe) per chamber per week (as well as at start and end of the pre-study trials) will be analyzed by gas chromatography (GC) to characterize at least 5 major components (comprising at least 90% by weight of the test substance) to show test substance stability and comparison between the neat test substance and the test atmospheres.

If more than the normal amount of trials is required because of test substance generation or monitoring problems (80 technician hours), the Sponsor will be consulted prior to additional trials (additional cost).

7.6. PARTICLE SIZE DISTRIBUTION ANALYSIS

During each week of exposure, particle size determinations will be performed using a TSI Aerodynamic Particle Sizer to demonstrate the absence of any condensation aerosol.

7.7. CHAMBER AND EXPOSURE ROOM ENVIRONMENT

Chamber temperature, humidity, airflow rate and static pressure will be monitored continuously and recorded every 30 minutes during exposure. Chamber temperature and relative humidity will be maintained, to the maximum extent possible, between 20 to 24°C and 40 to 60%, respectively. Chamber oxygen levels (maintained at least 19%) will be measured pretest and at the beginning, middle and end of the study.

Air samples will be taken in the vapor generation area pretest and at the beginning, middle and end of the study. Light (maintained approximately 30-40 foot-candles at 1.0 meter above the floor) and noise levels (maintained below 85 decibels) in the exposure room will be measured pretest and at the beginning, middle and end of the study.

7.8. SUMMARY OF CHAMBER ACTIVITY

The minimum frequency of chamber activity is summarized below:

Activity	Frequency/chamber
Measured Test Substance Concentration	4X/day
Measured Test Substance Characterization	1X/week
Particle Size	1X/week
Temperature	13X/day
Relative Humidity	13X/day
Airflow Rate	13X/day
Static Pressure	13X/day
Nominal Test Substance Concentration (excluding the air control chamber)	1X/day
Rotation Pattern of Exposure Cages	1X/day
Loading/Unloading Verification	1X/day

8. IN-LIFE EXPERIMENTAL OBSERVATIONS

8.1. CLINICAL OBSERVATIONS

8.1.1. VIABILITY OBSERVATIONS (cage-side)

Observations for mortality, morbidity, and signs of severe toxicity will be made at least twice daily. Animals in extremely poor health or in a possibly moribund condition will be identified for further monitoring and possible euthanasia.

8.1.2. DETAILED PHYSICAL EXAMINATIONS

In-Chamber: All animals will be observed as a group at least once during each exposure. This will routinely be performed near the middle of each exposure and may be performed more frequently if significant signs of toxicity are noted. Pertinent behavioral changes and all signs of toxicity, including mortality, should be recorded. These signs should include time of onset, degree and duration.

Out-of-Chamber: Animals on study will be examined daily from receipt through to terminal euthanasia on GD 20. Examinations will include observations of general condition, skin and fur, eyes, nose, oral cavity, abdomen and external genitalia, occurrence of secretions and excretions, and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Changes in gait, posture and response to handling as well as the presence of clonic or tonic movements, stereotypy (e.g., excessive grooming, repetitive circling) or bizarre behavior (e.g., self-mutilation, walking backward) will be recorded as well as evaluations of respiration. During the treatment period these evaluations will be performed prior to exposures.

8.2. BODY WEIGHTS

Body weights will be recorded on GD 3 (for randomization into test groups), 6, 9, 12, 15, 18 and 20 (day of scheduled sacrifice). Weight gain will be calculated for intervals as found appropriate, including (but not limited to) GD 6-15, GD 15-20 and 6-20.

8.3. FEED CONSUMPTION

Feed consumption will be recorded and reported for these intervals: GD 3-6, 6-9, 9-12, 12-15, 15-18, 18-20 and 6-20.

9. TERMINAL OBSERVATIONS

9.1. METHOD OF EUTHANASIA

All dams will be euthanized by an overdose of carbon dioxide inhalation. All live fetuses will be euthanized by an intraperitoneal overdose of sodium pentobarbital.

9.2. MACROSCOPIC POSTMORTEM EXAMINATIONS

A macroscopic postmortem examination will be performed on all the dams, including those dying spontaneously or euthanized in either a moribund condition or after prematurely delivering a litter. Macroscopic lesions or tissues with significant findings will be saved (10% Neutral Buffered Formalin).

Females that are found dead or sacrificed prior to schedule termination will have implantation data (*ie* number of fetuses and early/late embryo-fetal deaths) determined at necropsy. Corpora lutea will not be counted for these animals.

Dams showing signs of premature delivery will be euthanized on the day such evidence is observed. Reproductive tracts will be examined for implantation data (implantation sites, live/dead fetuses and early/late embryo-fetal deaths). Fetuses obtained earlier than Gestation Day (GD) 20 will be evaluated for external malformations, euthanized and discarded.

Any dams initiating delivery on GD 20 will be immediately euthanized and the fetuses processed with the other GD 20 fetuses.

Dams surviving on GD 20 will have the following examinations of their pregnancies:

9.2.1. Reproductive System

The intact uteri (ovaries attached) will be removed from the abdominal cavity. The gravid uteri, including the cervix, will be weighed. Corpora lutea will be counted and the number per ovary recorded. The number and location of the following will be recorded for each uterine horn:

- live fetuses
- dead fetuses (no significant degeneration)
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)

- early embryonic deaths (evidence of implantation but no recognizable fetus)

Each placenta will be examined macroscopically. The maternal carcass, uterus and placenta will then be discarded.

9.3. FETAL EVALUATIONS

9.3.1. External Evaluations

All live fetuses will be weighed and individually identified within cassettes. Each live and dead retained fetus will be given a macroscopic external examination for defects including observation of the palate.

9.3.2. Fetal Soft Tissue (Visceral) Evaluation

Approximately one-half of the fetuses in each litter (alternating fetuses within the litter, nominally) will be placed in Modified Davidson's fixative for preservation and decalcification. These fetuses will be subjected to soft tissue examination by gross dissection of the torso and a razor blade sectioning technique for the head (derived from that of Wilson, J.S., Warkany, J. (1965), Teratology: Principles and Techniques. The University of Chicago Press. Chicago and London. Page 271). All malformations and variations will be recorded. During the dissection process, the sex of each fetus will be confirmed by internal inspection of the gonads. Following complete dissection of the fetuses, all carcasses and sections will be preserved in 10% neutral buffered formalin.

9.3.3. Fetal Skeletal Evaluations

Approximately one-half of the fetuses in each litter (alternating fetuses within the litter, nominally) will be eviscerated and processed for staining of the skeleton using Alizarin Red S. Subsequently, these fetuses will be evaluated for skeletal malformations and ossification variations. These skeletons will then be stored in 100% glycerin with a mold inhibitor.

9.3.4. Dead Fetuses

These will be removed from the uterus and examined for external malformations. Only those with obvious external malformations will be preserved (10% neutral buffered formalin) for possible future examination. All other dead fetuses, and early embryonic deaths, will be discarded.

10. ARCHIVING OF RECORDS AND SPECIMENS

All data documenting experimental details and study procedures and observations will be recorded and maintained as raw data.

At the completion of the study, all reports, raw data, preserved specimens and retained samples will be maintained in the Testing Facility's Archives for a period of one year after submission of the signed final report.

The Sponsor will be contacted in order to determine the final disposition of these materials. The Sponsor is responsible for all costs associated with the storage of these materials beyond one year from the issuance of the final report and for any costs associated with the shipment of these materials to the Sponsor or to any other facility designated by the Sponsor.

11. STATISTICAL EVALUATIONS

Parameters will be analyzed statistically where it is considered necessary in support of interpretation. Statistical significance of differences from control will be recognized at the 5% or 1%, two-sided levels.

11.1. CONTINUOUS DATA

For example (not limited to):

- Body weight and feed consumption data
- Corpora lutea
- Uterine implantation data (live fetuses, implantations)
- Pre- or post-implantation loss
- Fetal weight (by sex and as a composite for both sexes), litter as the experimental unit

Evaluation of equality of group means will be made by the appropriate statistical method, followed by a multiple comparison test if needed. The parametric method will be the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance (Dunlap and Duffy, 1975). If significant differences among the means are indicated, additional tests will be used to determine which means are significantly different from the control: Dunnett's (Dunlap et al., 1981). The nonparametric method will be the Kruskal-Wallis test (Siegel, 1956) and if differences are indicated, the pairwise comparison test, Siegel (Siegel, 1956) will be used to determine which means differ from control. All statistical tests will be conducted at the 5% and 1% significance levels.

References for these procedures are: Dunlap, W.P., Marx, M.S. and Agamy, G.G. 1981. Fortran IV functions for calculating probabilities

associated with Dunnett's test. Behav. Res. Methods and Instrumentation 13: 363-366; Dunlap, W.P. and Duffy, J.A. 1975. Fortran IV Functions for Calculating Exact Probabilities Associated with Z, Chi-Square, T and F Values. Behav. Res. Methods and Instrumentations 7:59-60; Seigel, S. 1956. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill.

11.2. INCIDENCE DATA

For example (not limited to):

- Incidence of females showing premature delivery or otherwise showing total pregnancy loss (no live fetuses)
- Incidence of litters containing fetuses with observations (individual findings or groups of findings; external, soft tissue and/or skeletal)

A Fisher Exact Test with Bonferonni correction (Seigel, S. 1956. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill) will be performed to identify differences between the control and treatment groups. All statistical tests will be conducted at the 5% and 1%, two-sided risk levels.

12. REPORTING

12.1. STATUS REPORTS

Periodic verbal and written updates on study progress will be provided by the Study Director. In general, a written status report will be submitted weekly and following completion of the GD 20 terminations.

12.2. FINAL REPORT

One unbound hard copy and one electronic copy of an audited draft report will be submitted following termination of the study. After receipt and review of the Sponsor's comments, appropriate changes will be made and an unbound hard copy and electronic copy of the revised report will be forwarded to the Sponsor for a final review. Upon receipt of the Sponsor's final comments, appropriate changes will be made and two hard copies and one electronic copy of a signed, final report will be issued. (Additional copies will be provided at additional cost). The report will minimally include:

12.2.1. Body of Report

- Compliance Statement (including Sponsor signature line)

- Quality Assurance Statement
- Abstract
- Introduction
- Experimental Design (including justifications for exposure levels)
- Materials and Methods
- Results and Discussion
- Conclusion and No-Observed-Effect-Level (NOEL) or No-Observed-Adverse-Effect-Level (NOAEL) Statement
- Statistical Procedures
- Protocol Deviations and Study Impact Statements

12.2.2. Summary Tables

- Exposure data
- Mortality data
- Pregnancy data
- Summary of maternal physical in-life observations
- Maternal body weight and weight change data during gestation
- Maternal feed consumption data
- Mean number of corpora lutea and implantation sites
- Mean number and percent of resorptions and live fetuses
- Summary of maternal macroscopic postmortem examination data including gravid uterine weights
- Pre-implantation loss
- Post-implantation loss
- Mean fetal weight
- Total number of male and female fetuses per group and mean percent male/percent female per group
- Incidence of litters and fetuses with observations (external, visceral and skeletal)

12.2.3. Appendix Tables (Individual data)

- Individual animal termination history
- Individual clinical observations
- Individual maternal body weight data and weight change data
- Individual maternal feed consumption data
- Individual uterine implantation data and corpora lutea data
- Maternal macroscopic postmortem observations
- Individual fetal observations (external, visceral and skeletal)

12.2.4. Appendices

- Analytical results
- Feed and water analysis
- Personnel involved in the study
- Protocol and Amendment(s)

12.3. ROBUST SUMMARY

This report will be separately provided by the Testing Facility's UK office in both IUCLID and WORD[®] electronic formats.

13. REGULATORY REFERENCES

13.1. TEST GUIDELINES

This study complies with the Organization for Economic Cooperation and Development (22 January 2001). OECD Guidelines for Testing of Chemicals; OECD Guideline 414: Prenatal Developmental Toxicity Study and US EPA OPPTS Health Effects Test Guidelines 870.3700, Prenatal Developmental Toxicity Study EPA 712-C-98-207, August 1998.

13.2. GOOD LABORATORY PRACTICES

This study will be conducted in compliance with Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17 and EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

13.3. ANIMAL WELFARE ACT COMPLIANCE

This study will comply with all appropriate parts of the Animal Welfare Act regulations: 9 CFR Parts 1 and 2 Final Rules, Federal Register, Volume 54, No. 168, August 31, 1989, pp. 36112-36163 effective October 30, 1989 and 9 CFR Part 3 Animal Welfare Standards; Final Rule, Federal Register, Volume 56, No. 32, February 15, 1991, pp. 6426-6505 effective March 18, 1991. The Sponsor should make particular note of the following:

1. The Sponsor's signature on this protocol documents for the study described, there are no generally accepted non-animal alternatives and the study does not unnecessarily duplicate previous experiments.

2. All procedures used in this study have been designed to avoid discomfort, distress and pain to the animals. All methods are described in this study protocol or in written laboratory standard operating procedures.
3. Any procedures outlined in this study protocol which are expected to cause more than momentary or slight pain or distress to the animals will be performed with appropriate sedatives, analgesics or anaesthetics unless the withholding of these agents is justified for scientific reasons, in writing, by the Sponsor and the Study Director and approved by the IACUC; in which case the procedure will continue for the minimum time necessary. Documentation of the justification for withholding treatment for pain or distress and IACUC approval of the procedures will be made prior to study initiation on the IACUC Protocol Review form.
4. Animals experiencing more than momentary or slight pain or distress due to the test substance, injury or illness may be treated by the Testing Facility's veterinary staff with approved analgesics or agents to relieve pain after consultation with the Study Director/Sponsor. However, in emergency situations, the veterinary staff is authorized to administer emergency treatment as necessary. Any subsequent treatment or euthanasia will be administered after consultation with the Study Director. The Sponsor will be advised by the Study Director of all emergency situations in as timely a manner as possible.
5. Methods of euthanasia used during this study are in conformance with the above referenced regulations.

13.4. INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

The IACUC Protocol Review subcommittee has reviewed this protocol and found it to be in compliance with all appropriate animal welfare regulations.

14. QUALITY ASSURANCE MONITORING

The Quality Assurance Unit of Huntingdon Life Sciences (East Millstone, NJ) will monitor the facilities, equipment, personnel, methods, practices, records, protocols, study conduct, raw data, draft and final reports and controls used/produced at the Testing Facility in this study, to assure that they are in conformance with this protocol, company Standard Operating Procedures, and the appropriate Good Laboratory Practice regulations. The Sponsor's GLP Compliance Department will be responsible for monitoring these aspects with regard to exposures formulation concentration and stability analyses.

15. ALTERATION OF PROTOCOL AND STUDY DESIGN

Alterations to this protocol may be made as the study progresses. No changes in the protocol will be made without the consent of the Sponsor. In the event that the Sponsor authorizes a protocol change verbally, such changes will be honored by the Testing Facility and will be followed by a written verification. The Study Director and a Sponsor representative will sign all protocol modifications. Two members of the Institutional Animal Care and Use Committee prior to the modification's implementation will also sign any modifications potentially affecting animal welfare.

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Final Protocol

Protocol Amendment No. 1

Study Title: Liquified Petroleum Gas: Embryo-Fetal Toxicity Study
in Rats by Inhalation Exposure

Changes

1. Macroscopic Postmortem Examinations, page 13:

Add: **Females that do not have fetuses when caesarean-sectioned will have their uterus' examined for implantation sites and resorptions, including confirmation of apparent non-pregnant status, by means of staining with ammonium sulphide (modified Salewski test).**

2. Macroscopic Postmortem Examinations, page 14:

Revise: Each placenta will be examined macroscopically. The maternal carcass, uterus, ovaries and placenta will then be discarded.

3. Fetal Skeletal Evaluations, page 14:

Revise: Approximately one-half of the fetuses in each litter (alternating fetuses within the litter, nominally) will be eviscerated, **placed in 70% isopropyl alcohol for preservation** and processed for staining of the skeleton using Alizarin Red S. Subsequently, these fetuses will be evaluated for skeletal malformations and ossification variations. These skeletons will then be stored in 100% glycerin with a mold inhibitor. **During the dissection process, the sex of each fetus will be confirmed by internal inspection of the gonads.**

Reasons for Changes

1. Clarification of the procedure for evaluating non-pregnant test animals.
2. Clarification of the disposition of the ovaries after counting corpora lutea.
3. Clarification of the sample preservation and evaluation of these fetuses.

Additional Cost: No

Amendment approved by:

[Redacted signature]
[Redacted signature]
[Redacted signature]

3/2/05

Date

3/2/05

Date

Huntingdon Life Sciences
Study No. 03-4253

Page 1 of 4
Final Protocol

Protocol Amendment No. 2

Study Title: Liquified Petroleum Gas: Embryo-Fetal Toxicity Study
in Rats by Inhalation Exposure

Changes

Statistical Evaluations, page 15:

Replace current section with the following:

Analysis will be performed by [REDACTED] (Principal Investigator) of Huntingdon Life Sciences Ltd, Woolley Road, Alconbury, Huntingdon, Cambridgeshire, PE28 4HS, England. The Testing Facility will be responsible for the GLP compliance and the archiving of the raw data and original final report.

11.1 CONTINUOUS DATA

The following mean measures will be analyzed as described below:

- maternal body weight values and body weight changes during gestation (Note: body weight measurements will only be compared to GD 6 values or subsequent relevant values)
- maternal feed consumption values (presented as grams of feed/kg of body weight/day)
- gravid uterine weights
- corpora lutea
- implantation data
- pre-implantation loss
- early embryonic deaths (evidence of implantation but no recognizable fetus)
- live fetuses
- dead fetuses (no significant degeneration)
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)
- total embryo-fetal deaths and as % of implant sites
- number of males and females per litter

Mean values of all exposure groups will be compared to the mean value for the control group at each time interval. Evaluation of equality of group means will be made by the appropriate statistical method (either parametric or non-parametric methods), followed by a multiple comparison test if needed. Bartlett's test (Bartlett, 1937; Sokal and Rohlf, 1995; Snedecor and Cochran, 1967) will be performed to determine if groups have equal variances. For all

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parameters if the variances are equal, parametric procedures will be used; if not, nonparametric procedures will be used.

The parametric method will be the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance (Armitage, 1971; Dunlap and Duffy, 1975). If significant differences among the means are indicated Dunnett's (Dunlap et al., 1981; Dunnett, 1955, 1964) test will be used to determine which means are significantly different from the control. The nonparametric method will be the Kruskal-Wallis test (Kruskal and Wallis, 1952, 1953) and if differences are indicated, Steel's test (Steel, 1959) will be used to determine which means differ from control. Bartlett's test for equality of variance will be conducted at the 1% significance level; all other statistical tests will be conducted at the 5% and 1% significance levels.

References for these procedures are:

Armitage, P. 1971. Statistical Methods in Medical Research. Oxford, UK: Blackwell Scientific Publications.

Bartlett, M.S. 1937. Properties of sufficiency and statistical tests. Proceedings of the Royal Society, Series A 160:268-282.

Dunlap, W.P. and Duffy, J.A. 1975. Fortran IV functions for calculating exact probabilities associated with z, chi-Square, t and F Values. Behav. Res. Methods and Instrumentations 7:59-60.

Dunlap, W.P., Marx, M.S. and Agamy, G.G. 1981. Fortran IV functions for calculating probabilities associated with Dunnett's test. Behav. Res. Methods and Instrumentation 13: 363-366.

Dunnett, C.W. 1955. A multiple comparison procedure for comparing several treatments with a control. Journal of the American Statistical Association 50: 1096-1121.

Dunnett, C.W. 1964. New tables for multiple comparisons with a control. Biometrics 20: 482-491.

Kruskal, W.H. and Wallis, W.A. 1952. Use of ranks in one-criterion variance analysis. Journal of the American Statistical Association 47: 583-621.

Kruskal, W.H. and Wallis, W.A. 1953. Errata for Kruskal-Wallis (1952) Journal of the American Statistical Association 48: 907-911.

Snedecor, G.W. and Cochran, W.G. (1989) Statistical Methods. 8th edition Iowa State University Press, Iowa, USA.

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Sokal, R.R. and Rohlf, F.J. 1995. *Biometry*. 3rd Edition. San Francisco: W.H. Freeman, pp. 369-371.

Steel, R.G.D. 1959. A multiple comparison rank sum test: treatment versus control. *Biometrics* 15: 560-572.

11.1a FETAL BODY WEIGHT

The fetal body weight (by sex and as a composite for both sexes) will be analyzed by a mixed model analysis of variance that provides an accurate statistical model of the biology. The analysis uses the litter as the basis for analysis and effectively uses the litter size as a covariate. The model considers dose group, litter size, and fetal sex as explanatory variables. If the dose group effect in the model is statistically significant the dose group least squares means will be tested pairwise vs. the control group using t-tests associated with least squares means. The least squares means allows comparisons that account for differences in litter size and sex. The mathematical model is based on a paper by Chen et. al. (1996). Statistical significance of differences from control will be recognized at the 5% or 1%, two-sided levels.

Reference:

Chen, J.J., Gaylor, D.W. and Laborde, J.B. 1996. Dose-response modeling of growth for developmental toxicity. *Environmetrics* 7:135-144.

11.2 INCIDENCE DATA

- premature deliveries
- total pregnancy loss (no live fetuses)
- maternal necropsy findings
- external fetal defects
- skeletal malformations and variations
- soft tissue malformations and variations

These data will be analyzed based on a Generalized Estimating Equation (GEE) application of the linearized model (Ryan, 1992). For litter endpoints, the model uses the litter as the basis for analysis and considers correlation among littermates by incorporating an estimated constant correlation and the litter size as a covariate. If the dose group effect in the model is statistically significant the dose group least squares means will be tested pairwise vs. the control group using t-tests associated with least squares means. The least

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squares means allows comparisons that account for differences in litter size. Statistical significance of differences from control will be recognized at the 5% or 1%, two-sided levels.

Reference:

Ryan, L. 1992. The use of generalized estimating equations for risk assessment in developmental toxicity. Risk Analysis, 12:439-447.

Reasons for Changes

Replacement of the current procedure with an enhanced procedure as specified by the Sponsor and their consulting statistician.

Additional Cost: Yes

Amendment approved by:

[Redacted signature]
[Redacted signature]
[Redacted signature]

15 July 05
Date

7/15/05
Date

Huntingdon Life Sciences
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Protocol Amendment No. 3

Study Title: Liquified Petroleum Gas: Embryo-Fetal Toxicity Study
in Rats by Inhalation Exposure

Changes

Statistical Evaluations, page 15:

Revise:

Analysis will be performed by [REDACTED] (Principal Investigator) of Huntingdon Life Sciences Ltd, Woolley Road, Alconbury, Huntingdon, Cambridgeshire, PE28 4HS, England. The Testing Facility will be responsible for the GLP compliance and the archiving of the raw data and original final report.

Reasons for Changes

[REDACTED] has retired from HLS and this study was reassigned to [REDACTED] to assume the responsibilities of Principal Investigator that had belonged to [REDACTED].

Amendment approved by:

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

8/5/09
Date

9/2/2009
Date

	Testing Facility Personnel	Appendix T

TITLE/DEPARTMENT	NAME/DEGREE
SENIOR VICE PRESIDENT, SAFETY ASSESSMENT	
DIRECTOR REPRODUCTIVE AND DEVELOPMENTAL TOXICOLOGY	
DIRECTOR, ANALYTICAL SERVICES	
DIRECTOR, TOXICOLOGY OPERATIONS	
DIRECTOR, QUALITY ASSURANCE	
STUDY DIRECTOR	
STUDY MONITOR	
VETERINARIAN	
MANAGER/SUPERVISOR	
Rodent and Reproductive Toxicology Inhalation Toxicology Pharmacy Analytical Services Necropsy and Fetal Pathology	

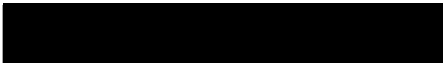
	2-Week Range-Finding Study Report Preface	Appendix U

STUDY NO. 03-6140
LIQUIFIED PETROLEUM GAS:
A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

Final Report

Performed by: Huntingdon Life Sciences (HLS)
100 Mettlers Road
East Millstone, New Jersey 08875-2360

Submitted to: American Petroleum Institute (API)
1220 L Street, Northwest
Washington, D.C. 20005-4070

Attn: 

Date: 19 February 2010

Huntingdon Life Sciences

03-6140

Page 2
Final Report**GLP STATEMENT**

This study was conducted in compliance with the United States Environmental Protection Agency's Good Laboratory Practice Standards 40 CFR Part 792 (TSCA) and Organization for Economic Cooperation and Development (OECD) Principles of Good Laboratory Practices ENV/MC/CHEM(98)17 with the exception of the following that was not considered to have affected the integrity of the study:

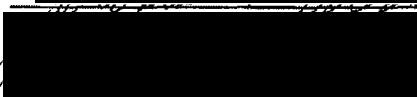
Test substance characterization and storage stability testing was not performed in a GLP compliant laboratory.

19 Feb 10

Date

2/19/10

Date



SIGNATURE PAGE**SCIENTIST**

The following Scientist was responsible for the overall conduct of this study. Departmental supervisory personnel are listed on the personnel page of this report (Appendix T).

[REDACTED]

19 FEB 10

Date

SCIENTIFIC REVIEW

The following Scientist has reviewed and approved this report:

[REDACTED]

8 FEB 10

Date

¹ [REDACTED] was the original scientific reviewer of this report and is no longer employed at the Testing Facility. [REDACTED] is assuming responsibility for final review of this report.

QUALITY ASSURANCE STATEMENT

Listed below are the dates that this study was inspected by the Quality Assurance Unit of Huntingdon Life Sciences, East Millstone, New Jersey, and the dates that findings were reported to the Study Director and Management. This report reflects the raw data as far as can be reasonably established.

Type of Inspection	Date(s) of Inspection	Reported to Study Director and Management
GLP Protocol Review	1 – 2 Sep 04	2 Sep 04
Exposure, Monitoring & Equipment Records	21 Oct 04	26 Oct 04
Concentration Measurement	28 Oct 04	28 Oct 04
Terminal Necropsy & Training Records	3 Nov 04	4 Nov 04
Formulation Chemistry Data and Report	7 Jan 05	10 Jan 05
Final Report & Study Data	4 – 10 Jan 05	10 Jan 05
Final Report Review	3 Apr 09	9 Apr 09
Protocol Amendment No. 1	29 Jan 10	29 Jan 10


9 Feb 10
Date

**LIQUIFIED PETROLEUM GAS:
A 2-WEEK RANGE-FINDING INHALATION TOXICITY STUDY
IN THE RAT VIA WHOLE-BODY EXPOSURES**

SUMMARY

This study was designed to provide a preliminary assessment of the toxicity of Liquefied Petroleum Gas (LPG) when administered as a gas/vapor via whole-body inhalation to rats for 2 weeks in order to determine appropriate exposure levels for a subsequent 13 week inhalation study and developmental inhalation study. These studies are intended to be used by the Petroleum Gases HPV Test Group in the EPA HPV Challenge Program.

Male and time-mated pregnant female Sprague-Dawley CD[®] rats (10/sex/group) were exposed daily for six hours per day to 0 (Air Control), 100, 1000 or 10000 ppm LPG for 7 days per week for 2 consecutive weeks. Exposure levels were determined using an infrared spectrophotometer 4 times per chamber per day. Particle size distribution measurements were also made once per chamber per day using a TSI Aerodynamic Particle Sizer. At the end of the treatment period, all animals were euthanized and necropsied. The following parameters were evaluated: viability, clinical observations, body weights, feed consumption, organ weights, macroscopic observations and reproductive outcome.

The mean ($\pm$ standard deviation) analytical exposure concentrations of LPG were determined to be 0.0 ± 0.0 , 99.3 ± 9.8 , 999 ± 421 and 10000 ± 412 ppm for the Air Control and the exposure groups, respectively. Particle sizing results indicated that the atmospheres were essentially gas/vapor only, as expected, since there was no substantial difference between the test substance chambers and the Air Control chamber.

All animals survived to termination. The test animals were unremarkable during the daily exposure periods and the non-exposure periods. There were no exposure-related differences in body weights or in feed consumption or reproductive outcome in the test substance exposed animals compared to the Air Control animals. No gross abnormalities related to test substance exposure were evident at necropsy examination and there were no exposure-related differences in organ weights (absolute and relative to body weight or brain weight) in the test substance exposed animals compared to the Air Control animals.

In conclusion, two weeks of exposure of rats (males and time-mated pregnant females) to LPG at exposure levels of 100, 1000 and 10000 ppm resulted in no effects on the animals. Therefore, the 10000 ppm exposure level was a no observed effect level (NOEL) and was considered an acceptable high exposure level (limited by safety considerations for a flammable gas) for a subsequent developmental toxicity study and 13 week subchronic inhalation toxicity study.

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1. INTRODUCTION

The purpose of this study was to assess of the toxicity of Liquified Petroleum Gas when administered via whole-body inhalation to rats for 2 weeks in order to determine appropriate exposure levels for a subsequent 13 Week Inhalation Study 03-6141 and a Developmental Inhalation Study 03-4253. The studies are intended to be used by the Petroleum Gases HPV Test Group in the EPA HPV Challenge Program.

2. MATERIALS AND METHODS**2.1. STUDY MANAGEMENT****2.1.1. SPONSOR**

American Petroleum Institute (API)
1220 L Street, Northwest
Washington, D.C. 20005-4070

2.1.2. SPONSOR REPRESENTATIVE

[REDACTED]

2.1.3. TESTING FACILITY

Huntingdon Life Sciences (HLS)
100 Mettlers Road
East Millstone, New Jersey 08875-2360

2.1.4. STUDY DIRECTOR

[REDACTED]

2.2. STUDY DATES**2.2.1. STUDY INITIATION**

8 October 2004 (Date Study Director signed the Protocol)

2.2.2. DATE OF ANIMAL RECEIPT

7 October 2004 (Males)* - Experimental Start Date
15 & 18 October 2004 (Females)

2.2.3. EXPOSURE INITIATION

20 October 2004** (Experimental Start Date), 21 and 22 October
2004

2.2.4. EXPOSURE TERMINATION

2, 3 and 4 November 2004

2.2.5. TERMINAL SACRIFICES

3, 4 and 5 November 2004

2.2.6. EXPERIMENTAL TERMINATION

5 November 2004 (Date of Last Data Collection)

2.2.7. STUDY COMPLETION

19 February 2010 (Date Final Report is signed by the Study
Director)

*as per OECD GLPs; ** as per EPA GLPs

2.3. EXPERIMENTAL OUTLINE

Group	Test Substance	Exposure Level ^a	Number of Animals			
			Initial		Necropsy	
			M	F	M	F
1	Air Control	0	10	10	10	10
2	Liquified Petroleum Gas	100	10	10	10	10
3	Liquified Petroleum Gas	1000	10	10	10	10
4	Liquified Petroleum Gas	10000	10	10	10	10

^aExposures were 6 hours per day for 7 consecutive days per week for 2 weeks for a total of exactly 14 exposures. Exposure levels are expressed as ppm of test substance. The exposures were conducted via whole-body exposure.

M = male; F = female (these animals were timed-mated and were exposed from gestation days 6 to 19).

The first day of exposures was defined as day 0 of the study (males).

The first day of gestation was defined as day 0 of the study (females).

2.4. JUSTIFICATIONS

2.4.1. ROUTE, DURATION AND FREQUENCY OF ADMINISTRATION

The inhalation route is one of the potential routes of human exposure to this test substance. The duration of the study and frequency of the exposures were considered to be the minimum necessary for determining exposure levels for a subsequent 13 week inhalation study 03-6141 and a developmental inhalation study 03-4253.

2.4.2. EXPOSURE LEVEL SELECTION

The exposure levels were selected based on establishing (for safety reasons) the high exposure level as no more than 50% of the lower explosion limit (LEL = 2.1% = 21000 ppm) for the test substance.

2.4.3. TEST ANIMAL SELECTION

The rat is an animal model commonly utilized in toxicity studies as recommended in OECD and EPA guidelines and will be used in the subsequent subchronic toxicity study 03-6141. The female rats were time-mated because this study also served as a range-find study for a developmental toxicity study 03-4253. In addition, a historical database is available for comparative evaluation.

2.4.4. NUMBER OF ANIMALS

The number of animals in the study was considered to be the minimum necessary for scientific and statistical reasons in order to evaluate the data with sufficient confidence levels.

2.5. TEST SUBSTANCE

Liquified Petroleum Gas

2.5.1. TEST SUBSTANCE CATEGORY

Industrial Gas

2.5.2. SUPPLIER

ChevronTexaco Energy Research and Technology Co.
100 Chevron Way
Richmond, Virginia 94802

2.5.3. LOT NUMBER

120701-01

2.5.4. PURITY

100% LPG (see Chevron analytical report in Appendix Q)

2.5.5. DESCRIPTION

Colorless gas or liquid

2.5.6. DATE RECEIVED

30 August 2004

2.5.7. EXPIRATION DATE

31 December 2007

2.5.8. ANALYSIS

Documentation of the identity, strength, purity, composition, storage stability, and method of synthesis, fabrication, and/or derivation of the test substance and the maintenance of these records were the responsibility of the Sponsor.

2.5.9. STORAGE

Ambient conditions

2.5.10. ARCHIVAL SAMPLE

The sponsor arranged for storage of an archival sample at a contract archival facility (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA 20166). Since multiple studies (03-6141 & 03-4253) were conducted with the same test substance, a common archival sample was taken and appropriately labeled. The testing facility arranged for safe transportation on 15 September 2005 of the archival sample to the archival facility, in compliance with all applicable regulations.

2.5.11. DISPOSITION

Following completion of the final study with this test substance, the testing facility informed the sponsor of the volume of remaining test substance as well as the number of test substance containers. The sponsor then instructed the testing facility to ship the test substance and containers to Chevron and this was done on 11 January 2007. No test substance or container (even empty ones) will be disposed of until the issuance of the final report.

2.6. TEST ANIMALS**2.6.1. SPECIES**

Albino Rats (Outbred) VAF/Plus®
CD® (Sprague-Dawley derived) [CrI: CD® BR]
CrI: CD (SD) IGS BR

2.6.2. SUPPLIER

Charles River Laboratories
Kingston, New York 12484

2.6.3. NUMBER OF ANIMALS

Received:

88 total (44 males, 44 females)

Placed on test:

80 total (40 males, 40 females)

2.6.4. AGE AT RECEIPT

Approximately 6 weeks (males)

Approximately 75 to 85 days in age (females)

2.6.5. AGE AT INITIATION OF DOSING

Approximately 8 weeks (males)

Approximately 78 to 90 days in age (females)

2.6.6. WEIGHT AT INITIATION OF DOSING (GRAMS)

	Mean	Range
Male:	258	234 to 279
Female:	255	226 to 282

Individual weights of animals placed on test were within $\pm 20\%$ of the mean weight for each sex.

2.6.7. ACCLIMATION PERIOD

Animals were acclimated for approximately 2 weeks for male animals. Female animals were received on days 1, 2 or 3 of gestation and were quarantined until start of exposures on gestation day 6. All animals were checked for viability twice daily. Prior to assignment to study, all animals were examined to ascertain suitability for study.

2.7. ANIMAL ASSIGNMENT

More animals than required for the study were purchased and acclimated. Male animals considered suitable for study on the basis of pretest physical examinations, body weight data and any other pretest evaluations, were distributed into 4 groups of 10 males by a computerized random sort program so that body weights means for each group were comparable. Female animals considered suitable for study on the basis of pretest physical examinations were randomized into groups on gestation day 4 using a method that ranked the gestation day 4 body weights and randomly assigned each female animal within the block into groups. Disposition of all animals not utilized in the study is maintained in the study file.

2.8. ANIMAL IDENTIFICATION

Each animal was assigned a temporary identification number upon receipt. Each rat was identified with a metal ear tag bearing its assigned animal number. The assigned animal number plus the study number comprised the unique animal number for each animal. In addition, each cage was provided with a cage card that was color-coded for dose level identification and contained study number and animal number information.

2.9. VETERINARY CARE

Animals were monitored by the technical staff for any conditions requiring possible veterinary care and treated as necessary.

2.10. ANIMAL HUSBANDRY DURING NON-EXPOSURE PERIODS

2.10.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY

Currently acceptable practices of good animal husbandry were followed e.g., *Guide for the Care and Use of Laboratory Animals*; National Academy Press, 1996. Huntingdon Life Sciences, East Millstone, New Jersey is fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC).

2.10.2. HOUSING

Animals were individually housed in suspended, stainless steel wire mesh cages during the study.

2.10.3. FEED

Certified Rodent Diet, No. 5002 (Meal) (PMI Nutrition International, St. Louis, Missouri) was available without restriction 7 days a week except during exposures. Fresh feed was presented weekly.

2.10.4. FEED ANALYSIS

Analysis of each feed lot used during this study was performed by the manufacturer. Results are maintained on file by the Testing Facility. There were no known contaminants in the feed which were expected to interfere with the results of this study.

2.10.5. WATER

Water (Elizabethtown Water Company, Westfield, New Jersey) was available without restriction via an automated watering system.

2.10.6. WATER ANALYSIS

Water analyses are conducted by Elizabethtown Water Company, Westfield, New Jersey (Raritan-Millstone Plant) to ensure that water meets standards specified under the EPA Federal Safe Drinking Water Act Regulations (40 CFR Part 141). In addition, water samples are collected biannually from representative rooms in the Testing Facility; chemical and microbiological water analyses are conducted on these samples by a subcontract laboratory. Results of all water analyses are maintained on file at the Testing Facility. There were no known contaminants in the water which were expected to interfere with the results of this study.

2.10.7. ENVIRONMENTAL CONDITIONS**Light/Dark Cycle**

A twelve hour light/dark cycle controlled via an automatic timer was provided.

Temperature

Temperature was monitored in accordance with Testing Facility SOPs and maintained within the specified range to the maximum extent possible.

Desired Range: 18 to 26 °C

Actual Range: 20 to 22°C

Daily Average Range: 21 to 22°C

Relative Humidity

Relative humidity was monitored in accordance with Testing Facility SOPs and maintained within the specified range to the maximum extent possible.

Desired Range: 30 to 70%

Actual Range: 45 to 67%

Daily Average Range: 51 to 57%

2.11. HUSBANDRY DURING EXPOSURE**2.11.1. HOUSING**

Animals were individually housed in stainless steel, wire mesh cages within 1000-Liter stainless steel and glass whole-body exposure chambers. The placement of each animal in the chamber was rotated at each exposure to ensure uniform exposure of the animals. A description of the animal rotation is included in the raw data.

2.11.2. FEED

None was provided during exposure.

2.11.3. WATER

None was provided during exposure.

2.11.4. ENVIRONMENTAL CONDITIONS

Chamber temperature and relative humidity were recorded every half-hour during exposure, and maintained, to the maximum extent possible, within the ranges presented below. Excursions in

humidity outside the specified range occurred a total of 71 times (out of 832 total readings) across the 4 groups and were not considered to have affected the integrity of the study.

Temperature

Desired Range: 20 to 24 °C

Actual Range: 20 to 24 °C

Relative Humidity

Desired Range: 40 to 60%

Actual Range: 42 to 68%

2.12. TEST SUBSTANCE PREPARATION

Test substance was received in cans and used as supplied.

2.13. TEST SUBSTANCE ADMINISTRATION AND CHAMBER OPERATION**2.13.1. ROUTE OF ADMINISTRATION**

Inhalation, as a gas/vapor, via whole-body exposure.

2.13.2. FREQUENCY AND DURATION OF ADMINISTRATION

The test substance was administered for 6 hours per day for 7 consecutive days per week for 14 days.

2.13.3. PRE-STUDY TRIALS

Trials were performed (at least two 6-hour periods) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the targeted exposure levels. During this time, samples were taken to determine the distribution of the test substance in the exposure chamber.

2.13.4. CHAMBER OPERATION

The whole-body exposure chambers each had a volume of 1000 Liters. Each chamber was operated dynamically under slight negative pressure at a minimum calibrated flow rate of 180 Liters per minute. The final airflow was set to provide at least one air

change (calculated by dividing the chamber volume by the airflow rate) in 5.6 minutes (11 air changes/hour) and a T_{99} equilibrium time (calculated by multiplying the air change by the exponential factor 4.6) of at most 26 minutes. The chambers were recalibrated during the study due to discrepancies in the nominal vs. analytical concentrations, and the new air flows were used beginning day 7 for the remainder of the study. The chamber airflow rate, total flow rate, time for air change and 99% equilibrium time (T_{99}) for each group (initial conditions) are summarized below:

Group	Airflow Rate (Lpm)		Air Change (min)		T_{99} (min)	
Exposure No.	1-6	7-16	1-6	7-16	1-6	7-16
1	204	177	4.9	5.6	23	26
2	215	183	4.7	5.5	21	25
3	221	181	4.5	5.5	21	25
4	224	189	4.5	5.3	21	24

This chamber size and airflow rates were considered adequate to maintain the animal loading factor below 5% and the oxygen level at 19% or higher. At the end of the exposure, all animals remained in chamber for a minimum of the T_{99} equilibrium time. During this time, the chamber was operated at the same flow rate as used during the exposure using clean air only. Recordings of airflow rate and static pressure were made every half-hour during the exposure.

The chamber atmospheres were exhausted through the in-house filtering system, which consisted of a coarse filter, a HEPA filter, and an activated charcoal bed.

Refer to Figures 1 & 2 and Appendix M for equipment details.

2.13.5. EXPOSURE PROCEDURE

Group 1

Animals were exposed to room air only.

Groups 2, 3 and 4

Houseline nitrogen was delivered through a regulator and backpressure gauge via 1/4" tubing to the test substance cylinder to

pressurize it. The test substance flowed from the cylinder via the liquid outlet through a quick-connect fitting with toggle valve, through 1/8" copper tubing coil. The copper coil was maintained in a warm water bath, and monitored by a thermometer. From the coil, the test substance flowed through a metering valve to a mass flowmeter, via 1/8" or 1/4" tubing. The test substance exited the flowmeter and was directed via 1/8" or 1/4" tubing to the turret of a 1000 Liter stainless steel and glass exposure chamber, where it mixed with room air.

Refer to Figures 1 & 2 and Appendix M for equipment details.

2.14. EXPOSURE CHAMBER SAMPLING

2.14.1. CHAMBER SAMPLING

Determination of the exposure levels were made using a MIRAN[®] Ambient Air analyzer equipped with a strip chart recorder. The test atmosphere was drawn from the normal sampling portal through the MIRAN[®] and measurements were recorded at least 4 times during each exposure. The exposure levels were determined by comparison of the measured absorbance to a calibrated response curve constructed using the same instrument settings.

Additionally, one sample was taken per chamber per week (and pretest) using a gas tight syringe for analysis by gas chromatography (GC) to characterize at least 5 major components of the test substance (comprising at least 90% by weight of the test substance). These samples were performed to show test substance stability and comparison between the neat test substance and the test atmospheres.

Refer to Appendix M for equipment details.

2.14.2. PARTICLE SIZE DISTRIBUTION ANALYSIS

Particle size samples were drawn once during each exposure for the chambers and room air using a TSI Aerodynamic Particle Sizer. The samples were drawn for 20 seconds at a rate of 5.0 Lpm. The mass median aerodynamic diameter, geometric standard deviation and total mass concentration were calculated. A computer was used to program the system to the appropriate

settings prior to sampling. The particle size distributions were calculated by the computer and printed out.

Refer to Appendix M for equipment details.

2.14.3. NOMINAL CONCENTRATION

The nominal exposure concentration (ppm) was calculated as follows:

$$\text{Conc (ppm)} = \frac{\text{amount consumed (g)} \times 1000 \text{ (mg/g)} \times 1000 \text{ (}\mu\text{g/mg)} \times 22.4 \text{ (}\mu\text{L}/\mu\text{mole)} \times 295^\circ\text{K}}{\text{exposure duration (min)} \times \text{airflow (Lpm)} \times \text{MW (}\mu\text{g}/\mu\text{mole)} \times 273^\circ\text{K}}$$

where average MW = 44 $\mu\text{g}/\mu\text{mole}$

2.14.4. CHAMBER AND EXPOSURE ROOM ENVIRONMENT

Chamber oxygen levels (maintained at least 19%) were measured pretest and at the beginning, middle and end of the study. Air samples were taken in the vapor generation area pretest and at the beginning, middle and end of the study. Light (maintained approximately 30 to 40 foot-candles at 1.0 meter above the floor) and noise levels (maintained below 85 decibels) in the exposure room were measured pretest and at the beginning, middle and end of the study.

Refer to Appendix M for equipment details and results in Appendix P.

2.15. EXPERIMENTAL EVALUATIONS

2.15.1. VIABILITY CHECKS (CAGE-SIDE)

Animals were observed in their cages twice daily (once in the morning and once in the afternoon) for mortality and signs of severe toxic or pharmacologic effects.

2.15.2. PHYSICAL EXAMINATIONS

All animals were observed as a group at least once during each exposure.

Each animal was removed from its cage and examined at least twice pretest and during each week of the study period.

Examinations included observations of general condition, skin and fur, eyes, nose, oral cavity, abdomen and external genitalia, occurrence of secretions and excretions, and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Changes in gait, posture and response to handling as well as the presence of clonic or tonic movements, stereotypy (e.g., excessive grooming, repetitive circling) or bizarre behavior (e.g., self-mutilation, walking backward) was recorded.

2.15.3. BODY WEIGHT

Animals were removed from their cages and weighed at least once pretest (on gestation day 4 for the females) and once per week (on gestation day 6, 13, and 20 for the females) during the study period. Terminal, fasted body weights were obtained just prior to necropsy (males only).

2.15.4. FEED CONSUMPTION

Feed consumption was measured (weighed) during the week prior to treatment initiation and once per week during the study period. Feed was available without restriction 7 days/week except during exposures. Animals were presented with weighed feeders at the scheduled intervals. After 6 or 7 days (males) or 2, 4 or 7 days (females) the feeders were reweighed and the resulting weight subtracted from the initial feeder weight to obtain the grams of feed consumed per animal per day. The grams consumed per kilogram of body weight per day was then calculated for each animal.

Calculation

Feed Consumption (g/kg/day) =

$$\frac{\text{grams of feed consumed}}{\text{body weight (kg)}^a} \div \text{\# days (see above)}$$

^aAn average of the current and previous weights was used for the males, and the previous weight or an average of the current and previous weights was used for the females.

2.16. POSTMORTEM

2.16.1. NECROPSY INFORMATION

Necropsy was performed on 10 animals/sex/group after animals were treated for 14 days. Male animals only were fasted overnight prior to necropsy. A necropsy schedule was established to ensure that approximately equal numbers of males and females were examined on each day of necropsy and that examination of animals of both sexes were performed at similar times of the day throughout the necropsy period.

Method of Euthanasia

Exsanguination following carbon dioxide inhalation. All live fetuses were euthanized by an intraperitoneal overdose of sodium pentobarbital.

2.16.2. MACROSCOPIC EXAMINATIONS

Complete macroscopic examinations were performed on all animals. The macroscopic examination included examination of the external surface and all orifices; the external surfaces of the brain and spinal cord; the organs and tissues of the cranial, thoracic, abdominal and pelvic cavities and neck; and the remainder of the carcass for the presence of macroscopic morphologic abnormalities.

2.16.3. ORGAN WEIGHTS

Organs indicated in Table I (page 24) were weighed for all animals at the scheduled sacrifice interval. Prior to weighing, the organs were carefully dissected and properly trimmed to remove adipose and other contiguous tissues in a uniform manner. Organs were weighed as soon as possible after dissection in order to avoid drying. Paired organs were weighed together.

2.16.4. TISSUES PRESERVED AND EXAMINED HISTOPATHOLOGICALLY

The tissues listed in Table I (page 24) were obtained at necropsy and preserved for all animals.

No microscopic examination was performed.

TABLE I

ORGAN NAME	WEIGHED	PRESERVED FOR MALES	PRESERVED FOR FEMALES
adrenal glands	X	X	X
aorta (thoracic)		X	
bone marrow smear (rib) ^a		X	
bone (sternum, femur with joint)		X	
bone marrow (sternum, femur)		X	
brain (medulla, pons, cerebrum and cerebellum)	X	X	X
epididymides	X	X	
esophagus		X	
eyes (with optic nerves)		X	
heart	X	X	X
kidneys	X	X	X
lacrimal gland		X	
large intestine (cecum, colon, rectum)		X	
larynx		X	
liver	X	X	X
lungs (with mainstem bronchi)	X	X	X
lymph nodes (mesenteric, mediastinal)		X	
mammary gland (inguinal)		X	
muscle (biceps femoris)		X	
nasopharyngeal tissue		X	
nerve (sciatic)		X	
ovaries			X
pancreas		X	
pituitary gland	X ^b	X	X
prostate gland		X	
salivary gland with submandibular lymph node		X	
seminal vesicles	X	X	

ORGAN NAME	WEIGHED	PRESERVED FOR MALES	PRESERVED FOR FEMALES
skin		X	
small intestine (duodenum, ileum, jejunum)		X	
spinal cord (cervical, thoracic, lumbar)		X	
spleen	X	X	X
stomach		X	
testes	X	X	
thymus	X	X	X
thyroid/parathyroid glands		X	
trachea		X	
urinary bladder		X	
uterus (body/horns) with cervix			X
Zymbal's gland		X	X
gross lesions		X	X

^aSmears were prepared but will only be examined if needed.

^bWeighed post-fixation.

Preservatives

All tissues - 10% neutral buffered formalin.

Eyes, testes and epididymides were placed in Modified Davidson's solution initially and then retained in 10% formalin. Lungs and urinary bladder were infused with formalin prior to their immersion into a larger volume of the same fixative.

Smear preparations of the marrow from the rib were air dried and fixed in absolute methanol.

2.17. EVALUATION OF DAMS AND PUPS

A macroscopic postmortem examination was performed on all the dams.

Females that were apparently not pregnant had implantation data (i.e., number of fetuses and early/late embryo-fetal deaths) determined at necropsy (Salewski's test, Salewski, 1964). Corpora lutea were not counted for these animals.

Any dams initiating delivery on GD 20 were immediately euthanized and the fetuses processed with the other GD 20 fetuses. Dams surviving on GD 20 had the following examinations of their pregnancies:

The intact uteri (ovaries attached) was removed from the abdominal cavity and weighed intact. Corpora lutea were counted (without dissection) and the number per ovary recorded. The number of the following were recorded:

- live fetuses
- dead fetuses (no significant degeneration)
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)
- early embryonic deaths (evidence of implantation but no recognizable fetus)

The maternal carcass was then discarded.

All live fetuses were weighed individually. Each (live and dead) fetus was given a macroscopic external examination for defects including observation of the palate. The sex was determined by external examination only. Fetuses with obvious external malformations were preserved (10% neutral buffered formalin) for possible future examination. All other fetuses, and intra-uterine deaths, were discarded.

2.18. STATISTICAL ANALYSIS

The following parameters were analyzed statistically:

mean body weight values
mean feed consumption values
mean terminal organ weights, organ/body and organ/brain weight ratios
number of implantation sites and corpora lutea
pre- and post-implantation loss
number of pups per litter
number of male and female pups per litter
average pup weight per litter as a composite for both sexes
total litter weight

2.18.1. METHOD OF ANALYSIS

Mean values of all exposure groups were compared to the mean value for the control group at each time interval.

Evaluation of equality of group means was made by the appropriate statistical method, followed by a multiple comparison test if needed. Bartlett's test (Snedecor and Cochran, 1967) was performed to determine if groups had equal variances. For all parameters except organ weights, if the variances were equal, parametric procedures were used; if not, nonparametric procedures were used. Organ weight data was analyzed only by parametric methods. The parametric method was the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance (Dunlap and Duffy, 1975). If significant differences among the means were indicated, additional tests were used to determine which means were significantly different from the control: Dunnett's (Dunlap et al., 1981). The nonparametric method was the Kruskal-Wallis test (Siegal, 1956) and if differences were indicated a Pairwise Comparison (Siegal, 1956) were used to determine which means differed from control. Bartlett's test for equality of variance was conducted at the 1% significance level; all other statistical tests were conducted at the 5% and 1% significance levels.

2.19. DATA STORAGE

All raw data, preserved specimens, and retained samples, as well as the original study protocol and the original final report are to be maintained in the Archives of the Testing Facility upon completion of the study. The Sponsor will determine the final disposition of these materials.

2.20. REGULATORY REFERENCES

2.20.1. TEST GUIDELINES

This study was not designed to meet regulatory requirements. It was designed to assess the toxicity of the test substance in order to determine appropriate exposure levels for a subsequent 13-Week Inhalation Study 03-6141 and a Developmental Inhalation Study

03-4253. The studies are intended to be used by the Petroleum Gases HPV Test Group in the EPA HPV Challenge Program

2.20.2. GOOD LABORATORY PRACTICES

This study was conducted in compliance with Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17 and EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

2.20.3. ANIMAL WELFARE ACT COMPLIANCE

This study complied with all appropriate parts of the Animal Welfare Act Regulations: 9 CFR Parts 1 and 2 Final Rules, Federal Register, Volume 54, No. 168, August 31, 1989, pp. 36112-36163 effective October 30, 1989 and 9 CFR Part 3 Animal Welfare Standards; Final Rule, Federal Register, Volume 56, No. 32, February 15, 1991, pp. 6426-6505 effective March 18, 1991.

2.21. PROTOCOL DEVIATIONS

The following protocol deviations occurred during the study but were not considered to have compromised the validity or integrity of the study:

1. Animal 4035 had a gross exam performed. However, due to oversight, the technician did not record the animal properly in the computer system. At this time, it can no longer be determined if the animal was within normal limits as the exam records are incomplete.
2. Due to oversight, during the first test week for the females, feed consumption was weighed for only 4 days instead of at least 5 days as per protocol.

3. RESULTS AND DISCUSSION

3.1. CHAMBER MONITORING

(Appendices A, N, O & P)

Pre-study chamber distribution analyses (see Appendix O) showed that the test substance was evenly distributed within each chamber. Chamber monitoring (see Appendix O) showed that the chamber oxygen levels were at least 19%. Chamber room monitoring (see Appendix P) showed that no test substance was present in the room and that the sound and light levels were acceptable.

The target and mean ($\pm$ standard deviation) analytical (IR) and nominal concentrations (see Appendix A) are summarized as follows:

Group	Test Substance	Target Concentration (ppm)	Analytical Concentration (ppm)	Nominal Concentration (ppm)
1	Air Control	0	0.00 ± 0.00	0 ± 0
2	Liquified Petroleum Gas	100	99.3 ± 9.8	154 ± 54.5
3	Liquified Petroleum Gas	1000	999 ± 421	953 ± 217
4	Liquified Petroleum Gas	10000	10000 ± 412	9440 ± 643

The analytically measured (IR) exposure levels of the airborne test substance were acceptably close, in the opinion of the study director, to the targeted exposure levels. The differences between measured and nominal concentrations varied somewhat from the expected 1:1 ratio for this type of gas/vapor exposure, especially for the Group 2. The exact cause of the differences for the Group 2 was not determined but was probably a result of a combination of slight variances in the calibration of the chamber airflows and the calibration of the IR monitor as well as the 'dead-space' in the system that had to be refilled at the start of each exposure day. A considerable amount of sample-to-sample variability was seen, especially for the Group 3. These differences for the Group 3 appeared to be caused

by technical (e.g. metering valves) problems that were not resolved until the final 2 exposure days. Chamber environmental conditions averaged 23°C temperature and 53% relative humidity.

Mean particle size distribution measurements for the exposures (see Appendix A) are summarized as follows:

Group	Test Substance	Mass Median Aerodynamic Diameter (µm)	Geometric Standard Deviation	Total Mass Concentration (mg/m ³)
1	Air Control	2.064	1.920	1.74E-03
2	Liquified Petroleum Gas	1.755	1.804	1.57E-03
3	Liquified Petroleum Gas	2.436	2.034	1.61E-03
4	Liquified Petroleum Gas	1.112	1.877	2.83E-03

These results indicated that the atmospheres were essentially gas/vapor only, as expected, since there was no substantial difference between the test substance chambers and the air control chamber.

Analysis of the major components in the neat test substance and the test atmospheres (see Appendix Q) showed a reasonably close comparison between the neat test substance and the vaporized test substance. This data demonstrated that the test animals were exposed, as expected, to all of the major components of the test substance in their reasonably proper proportion. The data was consistent from pretest and during the study indicating stability of the test substance and the atmosphere generation techniques.

3.2. MORTALITY AND PREGNANCY

(Table 1 & Appendix B)

All animals survived to termination. There was no effect of test substance exposures on pregnancies as at least 9 of 10 dams in each test group

(1 non-pregnant in the 100 ppm group) were found pregnant and delivered viable fetuses.

3.3. CLINICAL OBSERVATIONS

3.3.1. EXPOSURE PERIODS

(Table 2)

The test animals were unremarkable during the exposure periods.

3.3.2. NON-EXPOSURE PERIODS

(Table 3 & Appendix C)

The test animals were generally unremarkable during the non-exposure periods. Scattered observations such as red nasal discharge were noted but the scattered low incidence did not increase with the exposure level.

3.4. BODY WEIGHTS

(Figures 3-4, Tables 4-5 & Appendices D - E)

There were no statistically significant or exposure-related differences in absolute body weights or in body weight gains in the test substance exposed animals, compared to the Air Control animals.

3.5. FEED CONSUMPTION

(Figure 5-6, Table 6 & Appendix F)

There were no statistically significant or exposure-related differences in feed consumption in the test substance exposed animals, compared to the Air Control animals.

3.6. ORGAN WEIGHTS

(Table 7 & Appendix G)

There were no statistically significant or exposure-related differences in organ weights (absolute and relative to body weight or brain weight) in the test substance exposed animals, compared to the Air Control animals.

3.7. MACROSCOPIC PATHOLOGY

(Table 8 & Appendix H)

No gross abnormalities related to test substance exposure were evident at necropsy examination. The macroscopic lesions noted were similar to those routinely encountered in animals of this age and species or were represented by individual animals and considered incidental findings.

3.8. CESAREAN SECTION DATA

(Tables 9-10 & Appendices I-J)

There were no statistically significant or exposure-related differences in gravid uterine weights, pre- or post-implantation loss, live litter size or in fetal weight in the test substance exposed animals, compared to the Air Control animals.

3.9. FETAL EXTERNAL EXAMINATION DATA

(Table 11 & Appendix K)

There were no statistically significant or exposure-related differences in the incidence of external findings in the fetuses from the test substance exposed animals, compared to the fetuses from the Air Control animals.

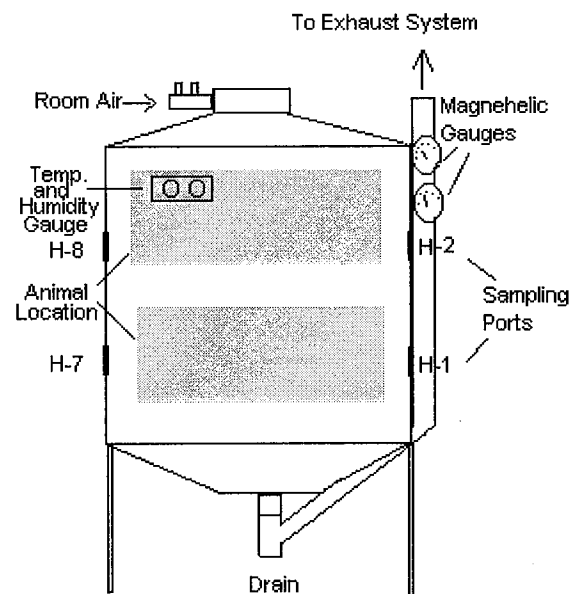
4. CONCLUSION

Two weeks of exposure of rats (males and time-mated pregnant females) to LPG at exposure levels of 100, 1000 and 10000 ppm resulted in no effects on the animals. Therefore, the 10000 ppm exposure level was a no observed effect level (NOEL) and was considered an acceptable high exposure level (limited by safety considerations for a flammable gas) for a subsequent developmental toxicity study and 13 week subchronic inhalation toxicity study.

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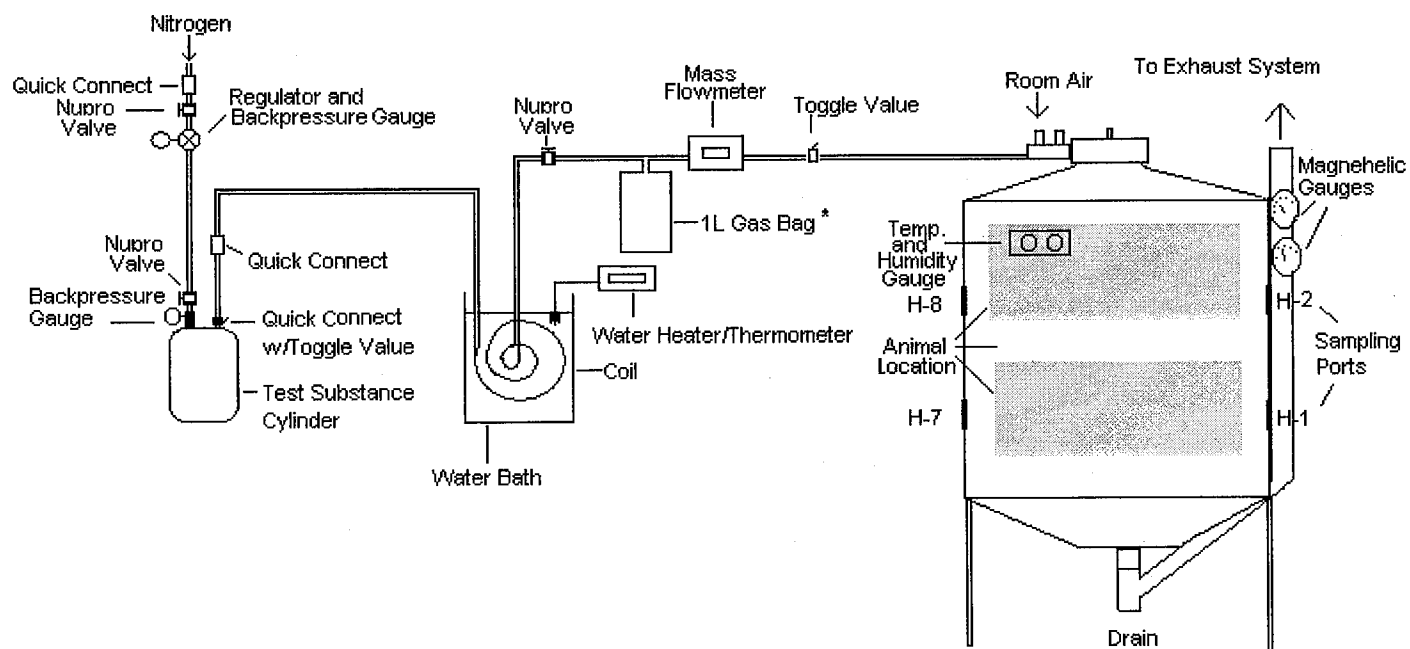
Group 1	Diagram of 1000-Liter Whole-Body Exposure Chamber and Generation System	Figure 1



Group 2, 3 & 4

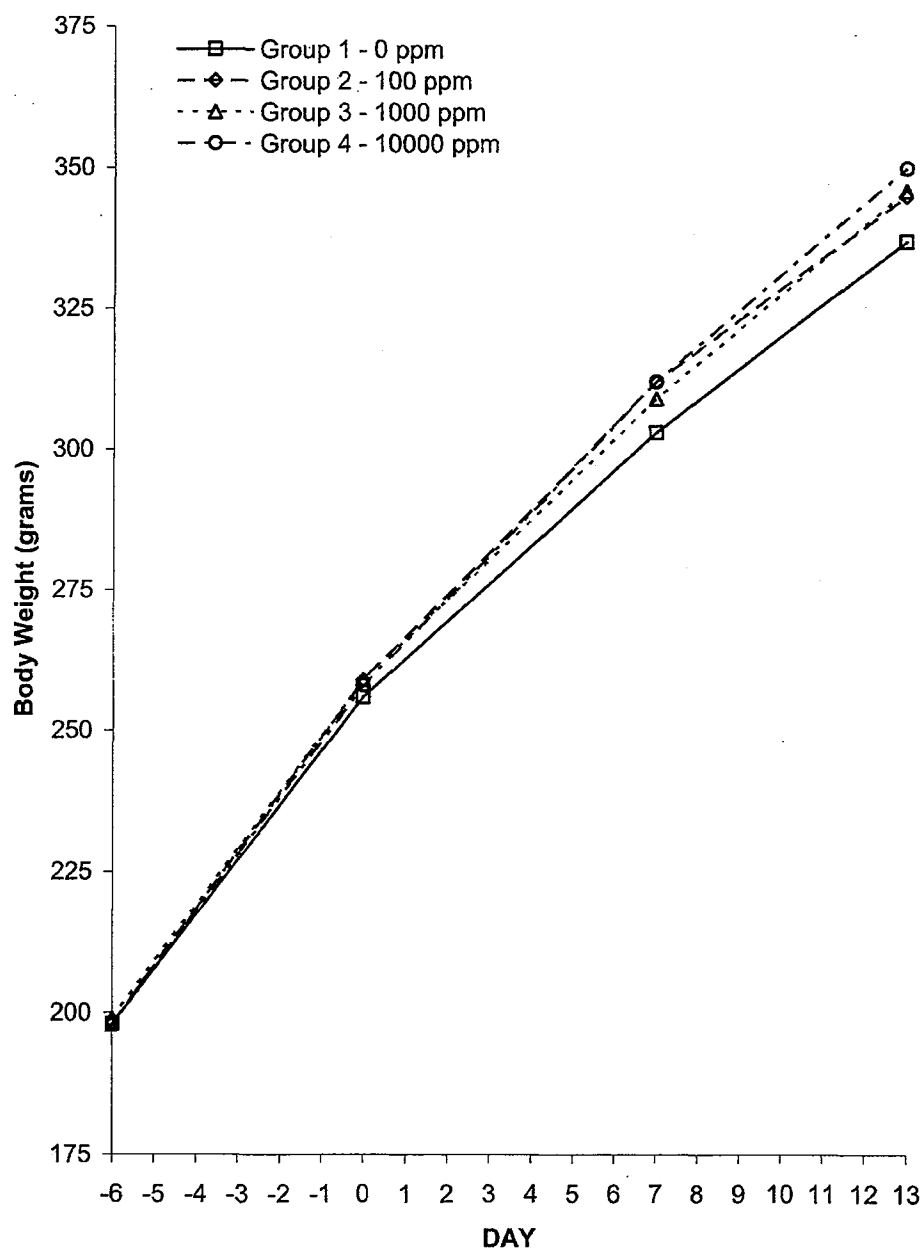
Diagram of 1000 Liter Whole-Body Exposure
Chamber and Generation System

Figure 2

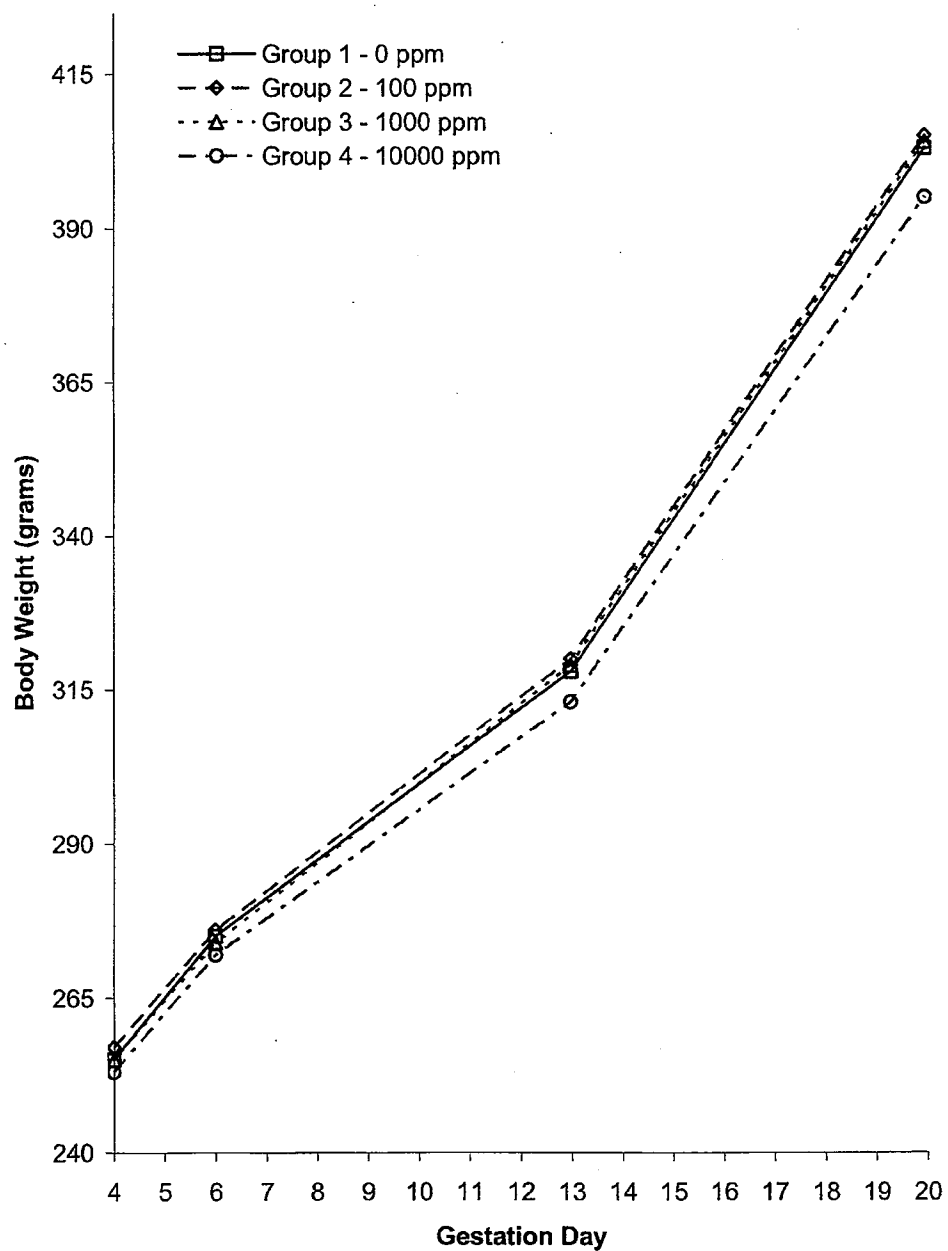


* = Not used for Group 4

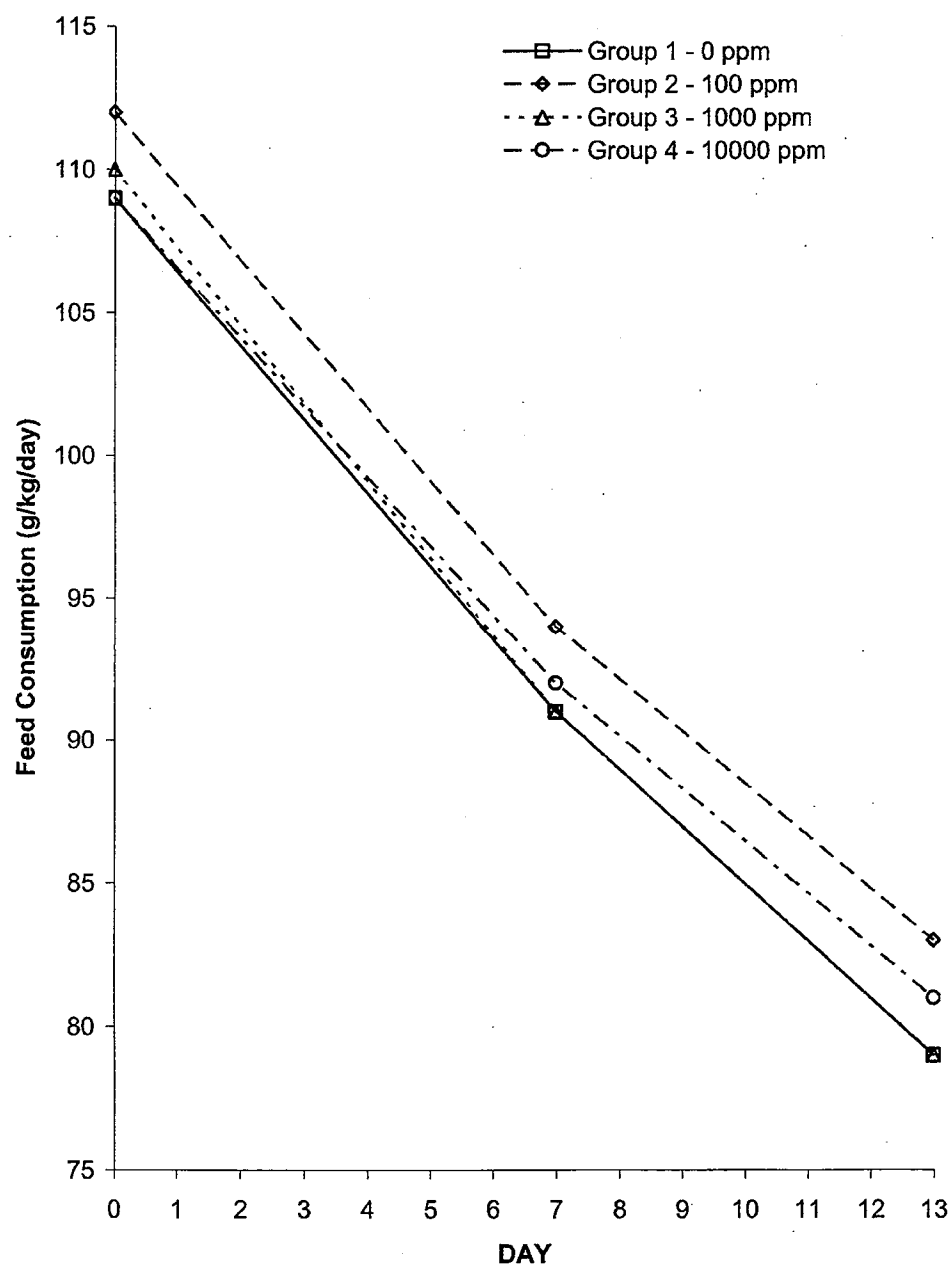
Males	Mean Body Weights (grams)	Figure 3



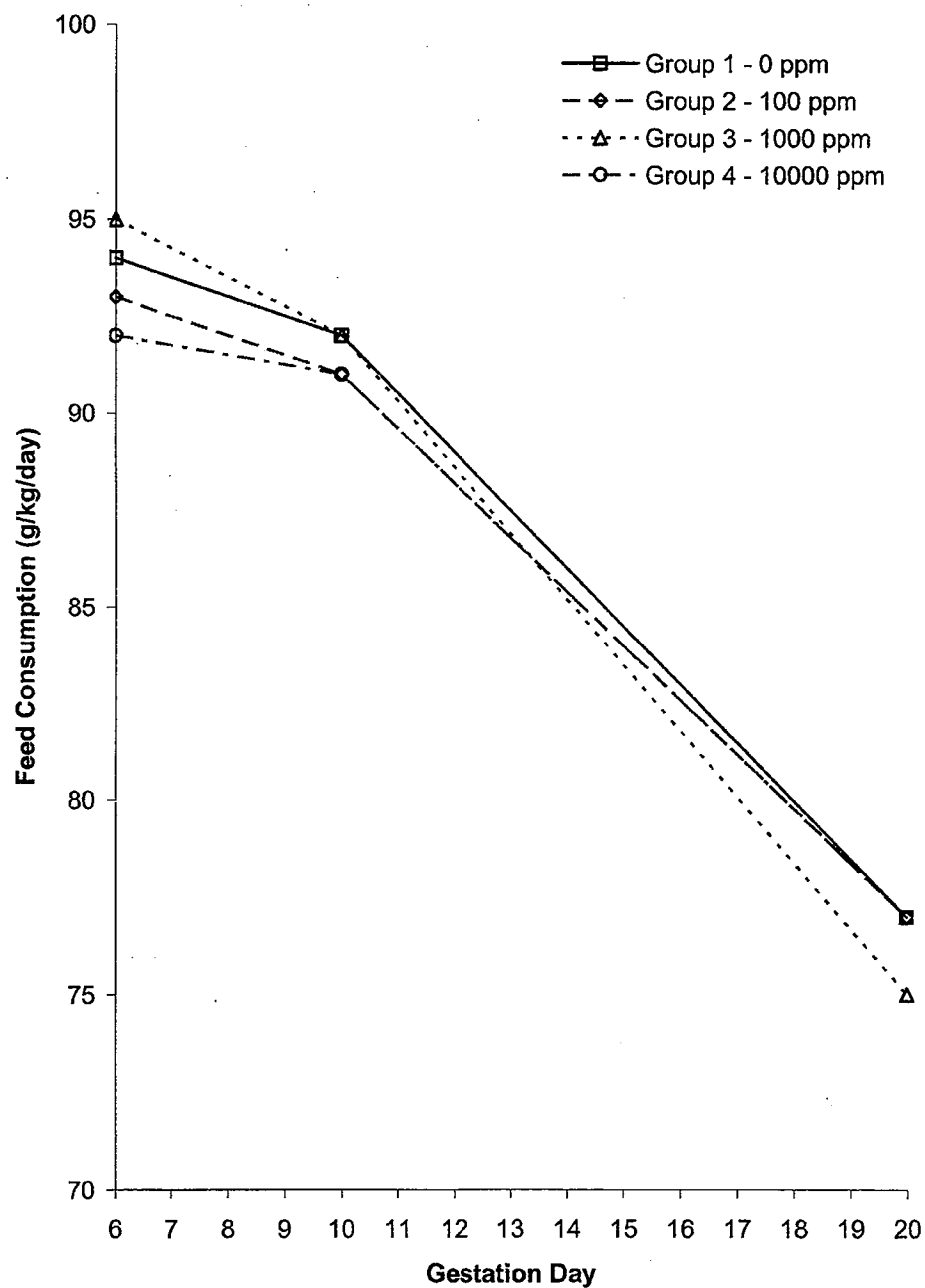
Females	Mean Body Weights (grams)	Figure 4



Males	Mean Feed Consumption (grams/kg/day)	Figure 5



Females	Mean Feed Consumption (grams/kg/day)	Figure 6



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TABLE 1

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF SURVIVAL AND PREGNANCY

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
No. of females mated	N	10	10	10	10
Pregnant	N	10	9	10	10
- Died/sacrificed moribund	N	0	0	0	0
- Elective sacrifice	N	0	0	0	0
Nonpregnant	N	0	1	0	0
- Died/sacrificed moribund	N	0	0	0	0
- Elective sacrifice	N	0	0	0	0
Total no. of females died/ sacrificed moribund	N %	0 0.0	0 0.0	0 0.0	0 0.0
Examined at scheduled c-section	N	10	10	10	10
- Nonpregnant	N	0	1	0	0
- With total implant loss	N %	0 0.0	0 0.0	0 0.0	0 0.0
- With viable fetuses	N %	10 100.0	9 90.0	10 100.0	10 100.0

No statistically significant differences

	Summary of In-Chamber Observations											Table 2			
Exposure Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Group 1 – 0 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 2 – 100 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 3 – 1000 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All
Group 4 – 10000 ppm															
Within Normal Limits	All	All	All	All	All	All	All	All	All	All	All	All	All	All	All

All = 100% of the animals exhibiting a given observation.

	Summary of Clinical Observations Preface	Table 3

Summary of Clinical Observation (Males).....	43
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Number of animals examined represents the total number of animals observed and animals which were killed at a scheduled sacrifice for a given interval.

For summarization purposes, descriptive comments [i.e., location of scab(s) and/or sore(s), etc.] are not presented in this table. These data are contained in the study raw data if needed.

Total represents a cumulative total of all animals with the indicated observation one or more times during the study.

Corresponding exposure levels for each group were as follows:

Group 1	-	0 ppm
Group 2	-	100 ppm
Group 3	-	1000 ppm
Group 4	-	10000 ppm

Note: Due to computer limitation, Group numbers are presented as Roman numerals instead of Arabic numerals.

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TABLE 3

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES

SUMMARY OF CLINICAL OBSERVATIONS

	GROUP#	DAY OF STUDY						TOTAL
		-6	0	7	13	14	15	
# OF ANIMALS EXAMINED	I	10	10	10	10	5	5	
	II	10	10	10	10	5	5	
	III	10	10	10	10	5	5	
	IV	10	10	10	10	5	5	
Normal								
WITHIN NORMAL LIMITS	I	10	10	10	10	0	0	10
	II	10	10	7	7	0	0	10
	III	10	10	8	8	0	0	10
	IV	10	10	9	9	0	0	10
Dead								
TERMINAL SACRIFICE	I	0	0	0	0	5	5	10
	II	0	0	0	0	5	5	10
	III	0	0	0	0	5	5	10
	IV	0	0	0	0	5	5	10
Dermal-General								
SCABS	I	0	0	0	0	0	0	0
	II	0	0	0	1	0	0	1
	III	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	0
ALOPECIA - GENERAL	I	0	0	0	0	0	0	0
	II	0	0	0	1	0	0	1
	III	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	0
Oral/Buccal								
NASAL DISCHARGE - RED	I	0	0	0	0	0	0	0
	II	0	0	3	2	0	0	4
	III	0	0	2	2	0	0	2
	IV	0	0	1	1	0	0	1

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TABLE 3

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CLINICAL OBSERVATIONS DURING GESTATION - (frequency/animals)

DOSE GROUP DOSE LEVEL (PPM)	1 0	2 100	3 1000	4 10000
DAY 4 to 20				
Normal				

WITHIN NORMAL LIMITS	39/10	39/10	36/10	37/10
TERMINAL SACRIFICE	10/10	10/10	10/10	10/10
Dermal-General				

ALOPECIA - EXTREMITIES/SNOUT	0/ 0	0/ 0	2/ 1	0/ 0
Oral/Buccal				

NASAL DISCHARGE - RED	1/ 1	1/ 1	2/ 2	3/ 2

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TABLE 4

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES			MEAN BODY WEIGHT VALUES (GRAMS)			
DOSE GROUP			1	2	3	4
DOSE LEVEL (PPM)			0	100	1000	10000
DAY -6	MEAN		198	198	199	198
	S.D.		8.5	8.7	7.1	8.4
	N		10	10	10	10
DAY 0	MEAN		256	259	259	258
	S.D.		12.2	13.8	10.2	11.9
	N		10	10	10	10
DAY 7	MEAN		303	312	309	312
	S.D.		18.4	21.3	15.3	15.4
	N		10	10	10	10
DAY 13	MEAN		337	345	346	350
	S.D.		20.3	27.5	20.3	24.4
	N		10	10	10	10

No statistically significant differences

TABLE 4

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF GESTATION BODY WEIGHTS (GRAMS)					
DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
DAY 4	MEAN	255	257	255	253
	S.D.	15.4	11.7	13.3	11.4
	N	10	9	10	10
DAY 6	MEAN	275	276	274	272
	S.D.	14.6	12.4	15.3	13.0
	N	10	9	10	10
DAY 13	MEAN	318	320	319	313
	S.D.	15.6	11.4	17.1	15.9
	N	10	9	10	10
DAY 20	MEAN	403	405	404	395
	S.D.	19.1	14.6	34.0	30.2
	N	10	9	10	10

No statistically significant differences

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TABLE 5

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES			MEAN BODY WEIGHT GAIN (GRAMS)			
			1	2	3	4
DOSE GROUP			0	100	1000	10000
DOSE LEVEL (PPM)						
DAY -6 TO 0		MEAN	58	61	61	60
		S.D.	5.0	6.5	6.2	5.7
		N	10	10	10	10
DAY 0 TO 7		MEAN	46	52	50	55
		S.D.	8.2	9.2	7.1	7.7
		N	10	10	10	10
DAY 7 TO 13		MEAN	34	33	37	38
		S.D.	5.3	7.5	6.2	9.5
		N	10	10	10	10
DAY 0 TO 13		MEAN	80	85	87	93
		S.D.	10.1	15.1	11.3	15.3
		N	10	10	10	10

No statistically significant differences

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TABLE 5

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF GESTATION BODY WEIGHT GAIN (GRAMS)

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
DAYS 4 TO 6	MEAN	20	19	19	18
	S.D.	5.0	5.6	6.9	5.8
	N	10	9	10	10
DAYS 6 TO 13	MEAN	43	44	45	41
	S.D.	8.6	6.4	6.9	6.5
	N	10	9	10	10
DAYS 13 TO 20	MEAN	84	85	85	82
	S.D.	7.6	11.3	19.1	19.3
	N	10	9	10	10
DAYS 4 TO 20	MEAN	148	148	149	141
	S.D.	12.5	11.5	26.7	23.6
	N	10	9	10	10

No statistically significant differences

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TABLE 6

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES			MEAN FEED CONSUMPTION (GRAMS/KG/DAY)			
DOSE GROUP DOSE LEVEL (PPM)			1 0	2 100	3 1000	4 10000
DAY 0	MEAN		109	112	110	109
	S.D.		3.6	2.8	4.3	4.7
	N		10	10	10	10
DAY 7	MEAN		91	94	91	92
	S.D.		3.7	3.7	4.2	3.1
	N		10	10	10	10
DAY 13	MEAN		79	83	79	81
	S.D.		2.3	4.1	3.3	2.4
	N		10	10	10	10

No statistically significant differences

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TABLE 6

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF GESTATION FEED CONSUMPTION (GRAMS/KG/DAY)

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
DAYS 4 TO 6	MEAN	94	93	95	92
	S.D.	8.6	6.7	6.3	7.8
	N	10	9	10	10
DAYS 6 TO 10	MEAN	92	91	92	91
	S.D.	8.6	5.6	4.6	4.8
	N	10	9	10	9
DAYS 13 TO 20	MEAN	77	77	75	77
	S.D.	6.6	3.7	5.6	3.1
	N	10	9	10	10

No statistically significant differences

	Mean Organ Weights Preface	Table 7

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Key to Abbreviations:

g	=	Grams
kg	=	kilograms
wt.	=	Weight
observ.	=	Observed
Sem. Ves	=	Seminal Vesicles

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
FINAL BODY WEIGHT g	MEAN	308	318	317	319
	S.D.	17.9	24.1	17.9	18.9
	N	10	10	10	10
ADRENALS g	MEAN	0.0643	0.0623	0.0644	0.0604
	S.D.	.00961	.00744	.01070	.00463
	N	10	10	10	10
BRAIN g	MEAN	2.0556	2.0116	2.0584	1.9960
	S.D.	.09435	.09132	.09451	.03736
	N	10	10	10	10
EPIDIDYIMIDES g	MEAN	0.8090	0.8354	0.8119	0.8175
	S.D.	.08359	.08189	.04993	.08589
	N	10	10	10	10
HEART WITH THYROID g	MEAN	1.3190	1.3461	1.2903	1.3334
	S.D.	.13463	.09991	.09998	.10524
	N	10	10	10	10
KIDNEYS g	MEAN	3.0760	3.2939	3.1497	3.1558
	S.D.	.31839	.37461	.20386	.29758
	N	10	10	10	10
LIVER g	MEAN	11.277	11.654	12.353	11.623
	S.D.	1.2255	1.4192	1.7224	.88314
	N	10	10	10	10
LUNGS g	MEAN	1.7794	1.8453	1.7649	1.9070
	S.D.	.23417	.25344	.21840	.34224
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
PITUITARY g	MEAN	0.0100	0.0104	0.0100	0.0102
	S.D.	.00222	.00323	.00149	.00151
	N	10	10	10	10
SEM.VES & CO.GL. g	MEAN	1.3280	1.0965	1.2916	1.0354
	S.D.	.51375	.19078	.53085	.10064
	N	10	10	10	10
SPLEEN g	MEAN	0.7123	0.7998	0.6800	0.7561
	S.D.	.12190	.14820	.05797	.10582
	N	10	10	10	10
TESTES g	MEAN	3.1013	3.0632	3.1036	3.0792
	S.D.	.26239	.24954	.19008	.11383
	N	10	10	10	10
THYMUS g	MEAN	0.6155	0.6150	0.5683	0.6315
	S.D.	.09257	.08966	.09949	.11304
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
FINAL BODY WEIGHT g	MEAN	308	318	317	319
	S.D.	17.9	24.1	17.9	18.9
	N	10	10	10	10
ADRENALS Ratio	MEAN	0.0002	0.0002	0.0002	0.0002
	S.D.	.00002	.00002	.00002	.00001
	N	10	10	10	10
BRAIN Ratio	MEAN	0.0067	0.0063	0.0065	0.0063
	S.D.	.00041	.00034	.00041	.00039
	N	10	10	10	10
EPIDIDYMIDES Ratio	MEAN	0.0026	0.0026	0.0026	0.0026
	S.D.	.00032	.00023	.00019	.00031
	N	10	10	10	10
HEART WITH THYROID Ratio	MEAN	0.0043	0.0042	0.0041	0.0042
	S.D.	.00034	.00016	.00033	.00026
	N	10	10	10	10
KIDNEYS Ratio	MEAN	0.0100	0.0103	0.0099	0.0099
	S.D.	.00074	.00068	.00065	.00079
	N	10	10	10	10
LIVER Ratio	MEAN	0.0365	0.0366	0.0390	0.0365
	S.D.	.00273	.00348	.00523	.00217
	N	10	10	10	10
LUNGS Ratio	MEAN	0.0058	0.0058	0.0056	0.0060
	S.D.	.00064	.00066	.00062	.00082
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
PITUITARY Ratio	MEAN	0.0000	0.0000	0.0000	0.0000
	S.D.	.00001	.00001	.00000	.00000
	N	10	10	10	10
SEM.VES & CO.GL. Ratio	MEAN	0.0044	0.0034	0.0042	0.0033
	S.D.	.00212	.00054	.00206	.00047
	N	10	10	10	10
SPLEEN Ratio	MEAN	0.0023	0.0025	0.0021	0.0024
	S.D.	.00038	.00034	.00018	.00034
	N	10	10	10	10
TESTES Ratio	MEAN	0.0101	0.0097	0.0098	0.0097
	S.D.	.00081	.00093	.00088	.00043
	N	10	10	10	10
THYMUS Ratio	MEAN	0.0020	0.0019	0.0018	0.0020
	S.D.	.00027	.00025	.00029	.00035
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BRAIN WEIGHT RATIO

MALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
ADRENALS Ratio	MEAN	0.0312	0.0310	0.0313	0.0302
	S.D.	.00400	.00355	.00524	.00224
	N	10	10	10	10
EPIDIDYMIDES Ratio	MEAN	0.3934	0.4158	0.3945	0.4094
	S.D.	.03403	.04158	.01809	.04028
	N	10	10	10	10
HEART WITH THYROID Ratio	MEAN	0.6431	0.6691	0.6271	0.6682
	S.D.	.07481	.03763	.04372	.05340
	N	10	10	10	10
KIDNEYS Ratio	MEAN	1.4967	1.6341	1.5352	1.5818
	S.D.	.14177	.12762	.15136	.15419
	N	10	10	10	10
LIVER Ratio	MEAN	5.4934	5.7867	6.0280	5.8267
	S.D.	.64026	.59501	1.0015	.47949
	N	10	10	10	10
LUNGS Ratio	MEAN	0.8649	0.9184	0.8578	0.9556
	S.D.	.09921	.12770	.10414	.17203
	N	10	10	10	10
PITUITARY Ratio	MEAN	0.0049	0.0052	0.0048	0.0051
	S.D.	.00119	.00158	.00070	.00077
	N	10	10	10	10
SEM.VES & CO.GL. Ratio	MEAN	0.6500	0.5446	0.6315	0.5187
	S.D.	.27008	.08811	.27422	.05057
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF ORGAN WEIGHT TO BRAIN WEIGHT RATIO

MALES

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
SPLEEN Ratio	MEAN	0.3468	0.3964	0.3307	0.3787
	S.D.	.05984	.06307	.02837	.05189
	N	10	10	10	10
TESTES Ratio	MEAN	1.5108	1.5235	1.5081	1.5428
	S.D.	.13857	.11444	.07076	.05470
	N	10	10	10	10
THYMUS Ratio	MEAN	0.3005	0.3061	0.2753	0.3158
	S.D.	.05287	.04560	.04069	.05280
	N	10	10	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

FEMALES

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
FINAL BODY WEIGHT g	MEAN	403	405	404	395
	S.D.	19.1	14.6	34.0	30.2
	N	10	9	10	10
ADRENALS g	MEAN	0.0809	0.0967	0.0868	0.0929
	S.D.	.00947	.01558	.00933	.02150
	N	10	9	10	10
BRAIN g	MEAN	2.0464	2.0174	2.0534	1.9873
	S.D.	.05223	.06238	.07592	.04910
	N	10	9	10	10
HEART WITH THYROID g	MEAN	1.0482	1.0954	1.0832	1.0903
	S.D.	.07587	.08577	.08025	.08820
	N	10	9	10	10
KIDNEYS g	MEAN	2.3710	2.3639	2.4699	2.4341
	S.D.	.19796	.12339	.32104	.31909
	N	10	9	10	10
LIVER g	MEAN	18.072	17.506	17.390	17.045
	S.D.	1.2801	1.1557	1.2789	2.1024
	N	10	9	10	10
LUNGS g	MEAN	1.6129	1.6120	1.6167	1.6055
	S.D.	.19866	.18531	.10381	.16078
	N	10	9	10	10
PITUITARY g	MEAN	0.0126	0.0121	0.0143	0.0137
	S.D.	.00312	.00292	.00261	.00321
	N	10	9	10	9

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ABSOLUTE ORGAN WEIGHTS

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
SPLEEN g	MEAN	0.7110	0.7196	0.7462	0.7481
	S.D.	.08505	.13745	.10194	.09036
	N	10	9	10	10
THYMUS g	MEAN	0.4916	0.4022	0.4907	0.4955
	S.D.	.05725	.08007	.09602	.13910
	N	10	9	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
FINAL BODY WEIGHT g	MEAN	403	405	404	395
	S.D.	19.1	14.6	34.0	30.2
	N	10	9	10	10
ADRENALS Ratio	MEAN	0.0002	0.0002	0.0002	0.0002
	S.D.	.00002	.00003	.00003	.00005
	N	10	9	10	10
BRAIN Ratio	MEAN	0.0051	0.0050	0.0051	0.0051
	S.D.	.00029	.00022	.00049	.00042
	N	10	9	10	10
HEART WITH THYROID Ratio	MEAN	0.0026	0.0027	0.0027	0.0028
	S.D.	.00018	.00022	.00019	.00022
	N	10	9	10	10
KIDNEYS Ratio	MEAN	0.0059	0.0058	0.0062	0.0062
	S.D.	.00059	.00032	.00108	.00125
	N	10	9	10	10
LIVER Ratio	MEAN	0.0449	0.0432	0.0431	0.0432
	S.D.	.00355	.00221	.00193	.00430
	N	10	9	10	10
LUNGS Ratio	MEAN	0.0040	0.0040	0.0040	0.0041
	S.D.	.00043	.00041	.00042	.00028
	N	10	9	10	10
PITUITARY Ratio	MEAN	0.0000	0.0000	0.0000	0.0000
	S.D.	.00001	.00001	.00001	.00001
	N	10	9	10	9

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ORGAN WEIGHT TO BODY WEIGHT RATIO

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
SPLEEN Ratio	MEAN	0.0018	0.0018	0.0018	0.0019
	S.D.	.00019	.00029	.00021	.00022
	N	10	9	10	10
THYMUS Ratio	MEAN	0.0012	0.0010	0.0012	0.0013
	S.D.	.00015	.00020	.00028	.00043
	N	10	9	10	10

No statistically significant differences

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TABLE 7

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF ORGAN WEIGHT TO BRAIN WEIGHT RATIO

FEMALES

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
ADRENALS Ratio	MEAN	0.0396	0.0480	0.0423	0.0468
	S.D.	.00481	.00822	.00471	.01074
	N	10	9	10	10
HEART WITH THYROID Ratio	MEAN	0.5126	0.5432	0.5273	0.5488
	S.D.	.04111	.04296	.03031	.04440
	N	10	9	10	10
KIDNEYS Ratio	MEAN	1.1587	1.1727	1.2053	1.2251
	S.D.	.09229	.07122	.17642	.15902
	N	10	9	10	10
LIVER Ratio	MEAN	8.8399	8.6815	8.4749	8.5878
	S.D.	.71909	.58805	.62678	1.1569
	N	10	9	10	10
LUNGS Ratio	MEAN	0.7878	0.8005	0.7891	0.8076
	S.D.	.08861	.10126	.07126	.07587
	N	10	9	10	10
PITUITARY Ratio	MEAN	0.0062	0.0060	0.0069	0.0069
	S.D.	.00154	.00150	.00116	.00157
	N	10	9	10	9
SPLEEN Ratio	MEAN	0.3481	0.3566	0.3632	0.3763
	S.D.	.04654	.06768	.04558	.04292
	N	10	9	10	10
THYMUS Ratio	MEAN	0.2401	0.2001	0.2403	0.2494
	S.D.	.02614	.04252	.05265	.07092
	N	10	9	10	10

No statistically significant differences

	Summary of Necropsy Observations Preface	Table 8

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TABLE 8

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

SUMMARY OF NECROPSY OBSERVATIONS					
DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
MALES	N	10	10	10	10
GROSS EXAM	N	0	0	1	1
CONGENITAL ANOMALY	N	0	0	1	0
	%	0.0	0.0	10.0	0.0
EXAMINATION NOT COMPLETE	N	0	0	0	1
	%	0.0	0.0	0.0	10.0
KIDNEY	N	1	1	0	0
CYSTIC KIDNEY	N	1	0	0	0
	%	10.0	0.0	0.0	0.0
DILATED RENAL PELVIS	N	0	1	0	0
	%	0.0	10.0	0.0	0.0
No statistically significant differences					

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TABLE 8

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF MATERNAL NECROPSY OBSERVATIONS

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
FEMALES	N	10	10	10	10
KIDNEY	N	0	0	0	1

DILATED RENAL PELVIS	N	0	0	0	1
	%	0.0	0.0	0.0	10.0

No statistically significant differences

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TABLE 9

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CESAREAN SECTION DATA

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
Pregnant (at scheduled sacrifice)	N	10	9	10	10
Dams with no Viable Fetuses	N	0	0	0	0
Dams with Viable Fetuses	N	10	9	10	10
Corpora Lutea	TOTAL	145	133	144	137
No. per animal	MEAN	14.5	14.8	14.4	13.7
	S.D.	2.22	2.68	1.96	2.98
Implantation Sites	TOTAL	139	126	135	127
No. per animal	MEAN	13.9	14.0	13.5	12.7
	S.D.	2.47	2.69	2.51	4.30
Preimplantation Loss	TOTAL	6	7	9	10
No. per animal	MEAN	0.6	0.8	0.9	1.0
	S.D.	0.70	1.09	0.99	1.49
% per animal	MEAN%	4.5	5.3	6.7	11.7
	S.D.	5.29	7.40	7.38	25.39
Live Fetuses	TOTAL	134	125	127	123
No. per animal	MEAN	13.4	13.9	12.7	12.3
	S.D.	2.55	2.52	3.16	4.11
Males	TOTAL	58	62	62	72
	MEAN%	43.6	49.5	49.7	52.7
	S.D.	12.36	8.45	13.80	25.47
Females	TOTAL	76	63	65	51
	MEAN%	56.4	50.5	50.3	47.3
	S.D.	12.36	8.45	13.80	25.47

No statistically significant differences

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TABLE 9

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CESAREAN SECTION DATA

DOSE GROUP DOSE LEVEL (PPM)		1 0	2 100	3 1000	4 10000
Postimplantation Loss No. per animal	TOTAL	5	1	8	4
	MEAN	0.5	0.1	0.8	0.4
	S.D.	1.08	0.33	1.32	0.52
% implants per animal	MEAN%	3.4	0.6	7.1	2.7
	S.D.	7.35	1.85	13.80	3.54
Dead Fetuses No. per animal	TOTAL	0	0	0	0
	MEAN	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
% of implants per animal	MEAN%	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
Resorptions: Early No. per animal	TOTAL	5	1	8	4
	MEAN	0.5	0.1	0.8	0.4
	S.D.	1.08	0.33	1.32	0.52
% of implants per animal	MEAN%	3.4	0.6	7.1	2.7
	S.D.	7.35	1.85	13.80	3.54
Resorptions: Late No. per animal	TOTAL	0	0	0	0
	MEAN	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00
% of implants per animal	MEAN%	0.0	0.0	0.0	0.0
	S.D.	0.00	0.00	0.00	0.00

No statistically significant differences

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TABLE 9

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF CESAREAN SECTION DATA

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
Fetal Body Weight (g)	MEAN	4.1	4.1	4.1	4.2
	S.D.	0.36	0.23	0.20	0.25
	N	10	9	10	10
Male Fetuses	MEAN	4.2	4.2	4.2	4.3
	S.D.	0.36	0.24	0.24	0.20
Female Fetuses	MEAN	4.0	4.0	4.0	4.0
	S.D.	0.36	0.23	0.22	0.31

No statistically significant differences

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TABLE 10

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
NET BODY WT. CHANGE	MEAN	127	129	130	123
	S.D.	10.8	10.6	22.0	21.4
	N	10	9	10	10
GRAVID UTERINE WT.	MEAN	85	87	82	79
	S.D.	11.6	13.6	19.7	25.9
	N	10	9	10	10
NET WEIGHT CHANGE	MEAN	42	42	48	44
	S.D.	15.2	9.7	9.3	10.9
	N	10	9	10	10

No statistically significant differences

NET BODY WT. CHANGE = TERMINAL BODY WT. MINUS DAY 6 BODY WEIGHT

NET WEIGHT CHANGE = NET BODY WT. CHANGE MINUS UTERINE WEIGHT

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TABLE 11

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

SUMMARY OF FETAL EXTERNAL OBSERVATIONS					
DOSE GROUP		1	2	3	4
DOSE LEVEL (PPM)		0	100	1000	10000
Litters Evaluated	N	10	9	10	10
Fetuses Evaluated	N	134	125	127	123
Live	N	134	125	127	123
Dead	N	0	0	0	0
GROSS EXAM					
Litter Incidence	N	0	0	1	0
Fetal Incidence	N	0	0	1	0
M EDEMATOUS					
Fetal Incidence	N	0	0	1	0
	%	0.0	0.0	0.8	0.0
Litter Incidence	N	0	0	1	0
	%	0.0	0.0	10.0	0.0

No statistically significant differences

OBSERVATION CODE: M-MALFORMATION V-VARIATION

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Final Report

	Chamber Monitoring Results	Appendix A

Cumulative Exposure Record Group 1 - 0 ppm (Air Control)													
Day	Date	Exposure Number							Particle Size			Chamber Environment	
			Nominal (ppm)	Analytical Chamber Concentration								Temperature (°C)	Humidity (%)
				Mean (ppm)	Individual (ppm)				MMAD (µm)	GSD	TMC (mg/m³)		
0	20-Oct-04	1	0	0.00	0.00	0.00	0.00	0.00	1.097	1.551	9.98E-04	22	54
1	21-Oct-04	2	0	0.00	0.00	0.00	0.00	0.00	1.387	1.789	1.08E-03	22	56
2	22-Oct-04	3	0	0.00	0.00	0.00	0.00	0.00	3.290	2.184	1.16E-03	23	54
3	23-Oct-04	4	0	0.00	0.00	0.00	0.00	0.00	4.982	2.165	2.71E-03	23	53
4	24-Oct-04	5	0	0.00	0.00	0.00	0.00	0.00	2.080	1.986	1.26E-03	23	57
5	25-Oct-04	6	0	0.00	0.00	0.00	0.00	0.00	1.388	1.923	1.18E-03	23	56
6	26-Oct-04	7	0	0.00	0.00	0.00	0.00	0.00	0.9332	1.832	4.10E-03	23	53
7	27-Oct-04	8	0	0.00	0.00	0.00	0.00	0.00	0.8596	1.664	1.26E-03	23	57
8	28-Oct-04	9	0	0.00	0.00	0.00	0.00	0.00	3.082	2.085	3.11E-03	23	53
9	29-Oct-04	10	0	0.00	0.00	0.00	0.00	0.00	1.260	2.003	1.30E-03	23	56
10	30-Oct-04	11	0	0.00	0.00	0.00	0.00	0.00	0.8124	1.263	3.47E-03	23	60
11	31-Oct-04	12	0	0.00	0.00	0.00	0.00	0.00	5.005	2.934	2.25E-03	23	53
12	1-Nov-04	13	0	0.00	0.00	0.00	0.00	0.00	3.525	1.987	8.53E-04	23	53
13	2-Nov-04	14	0	0.00	0.00	0.00	0.00	0.00	1.432	1.873	6.03E-04	23	57
14	3-Nov-04	15	0	0.00	0.00	0.00	0.00	0.00	0.8615	1.879	1.70E-03	22	51
15	4-Nov-04	16	0	0.00	0.00	0.00	0.00	0.00	1.037	1.594	8.81E-04	20	42
Mean			0		0.00				2.064	1.920	1.74E-03	22.6	54.1
S.D.			0		0.00				1.450	0.362	1.06E-03	0.8	3.9

	Chamber Monitoring Results	Appendix A

Cumulative Exposure Record Group 2 - 100 ppm													
Day	Date	Exposure Number	Analytical Chamber Concentration						Particle Size			Chamber Environment	
			Nominal (ppm)	Mean (ppm)	Individual (ppm)				Determinations			Mean	
					79	81	87	85	MMAD (µm)	GSD	TMC (mg/m³)	Temperature (°C)	Humidity (%)
0	20-Oct-04	1	250	83.0	79	81	87	85	1.764	1.980	1.41E-03	21	54
1	21-Oct-04	2	120	83.3	88	82	78	85	1.699	1.836	1.10E-03	22	57
2	22-Oct-04	3	86	97.8	99	100	92	100	1.593	1.820	9.45E-04	22	55
3	23-Oct-04	4	180	100	91	100	110	100	2.087	2.177	1.13E-03	22	54
4	24-Oct-04	5	110	92.8	91	85	95	100	2.337	2.168	1.23E-03	22	58
5	25-Oct-04	6	140	96.8	100	87	100	100	1.171	1.591	9.19E-04	22	56
6	26-Oct-04	7	150	108	120	100	110	100	0.9057	1.449	3.71E-03	23	54
7	27-Oct-04	8	180	106	85	110	110	120	0.8642	1.735	1.26E-03	23	55
8	28-Oct-04	9	300	105	110	100	110	100	1.799	2.014	1.79E-03	22	53
9	29-Oct-04	10	160	98.8	99	100	96	100	1.096	1.576	1.23E-03	22	57
10	30-Oct-04	11	140	107	110	120	100	97	0.8269	1.471	4.00E-03	23	60
11	31-Oct-04	12	150	102	110	97	99	100	0.9052	1.501	7.27E-04	22	54
12	1-Nov-04	13	120	103	110	100	100	100	5.242	2.068	2.27E-03	23	55
13	2-Nov-04	14	120	108	110	110	110	100	3.688	2.136	1.04E-03	22	58
14	3-Nov-04	15	110	94.0	86	95	95	100	0.7943	1.520	1.26E-03	21	51
15	4-Nov-04	16	140	105	100	110	110	100	1.309	1.817	1.04E-03	20	50
Mean			153.5		99.3				1.755	1.804	1.57E-03	22.0	55.1
S.D.			54.5		9.8				1.194	0.263	9.65E-04	0.8	2.6

	Chamber Monitoring Results	Appendix A

Cumulative Exposure Record Group 3 - 1000 ppm													
Day	Date	Exposure Number	Nominal (ppm)	Analytical Chamber Concentration					Particle Size			Chamber Environment	
				Mean (ppm)	Individual (ppm)				Determinations			Temperature (°C)	Humidity (%)
									MMAD (µm)	GSD	TMC (mg/m³)		
0	20-Oct-04	1	740	1060	1100	1100	1200	840	1.272	1.847	1.25E-03	22	50
1	21-Oct-04	2	840	1080	1200	1000	1000	1100	7.320	2.303	3.88E-03	23	54
2	22-Oct-04	3	890	1110	1100	1500	1200	620	1.358	1.514	5.81E-04	23	54
3	23-Oct-04	4	620	585	610	500	560	670	5.384	2.331	1.32E-03	23	52
4	24-Oct-04	5	660	813	730	810	780	930	4.063	2.487	1.59E-03	23	57
5	25-Oct-04	6	770	920	980	920	950	830	2.463	2.492	1.29E-03	23	55
6	26-Oct-04	7	820	890	840	840	870	1000	0.9241	1.689	3.97E-03	23	54
7	27-Oct-04	8	920	938	860	930	970	990	1.047	2.008	1.74E-03	23	54
8	28-Oct-04	9	1000	1230	1100	580	2600	630	1.966	2.075	1.93E-03	23	50
9	29-Oct-04	10	890	840	720	780	760	1100	1.773	1.954	1.83E-03	23	55
10	30-Oct-04	11	1200	863	630	910	910	1000	0.8356	1.492	4.18E-04	23	60
11	31-Oct-04	12	1200	1150	890	2100	790	800	1.495	2.085	1.09E-03	24	54
12	1-Nov-04	13	1100	1120	1200	1300	1000	990	5.121	2.051	1.06E-03	24	54
13	2-Nov-04	14	1400	1230	380	1200	3000	350	1.450	2.021	1.14E-03	24	59
14	3-Nov-04	15	1100	1080	1000	1100	1100	1100	0.8081	2.140	1.30E-03	23	51
15	4-Nov-04	16	1100	1100	1100	1100	1100	1100	1.702	2.055	1.34E-03	22	48
Mean			953		999				2.436	2.034	1.61E-03	23.1	53.8
S.D.			217		421				1.956	0.296	9.88E-04	0.6	3.2

	Chamber Monitoring Results	Appendix A

Cumulative Exposure Record Group 4 - 10000 ppm													
Day	Date	Exposure Number	Analytical Chamber Concentration						Particle Size			Chamber Environment	
			Nominal (ppm)	Mean (ppm)	Individual (ppm)				Determinations			Mean	
									MMAD (µm)	GSD	TMC (mg/m ³)	Temperature (°C)	Humidity (%)
0	20-Oct-04	1	9000	10300	10000	11000	10000	10000	0.8475	1.567	1.72E-03	23	50
1	21-Oct-04	2	8800	10200	9800	11000	10000	10000	0.8634	1.566	2.35E-03	22	47
2	22-Oct-04	3	9100	10000	10000	10000	10000	10000	1.086	1.843	1.54E-03	23	49
3	23-Oct-04	4	8800	10300	10000	10000	10000	11000	0.9885	2.125	2.41E-03	23	48
4	24-Oct-04	5	8800	9730	9500	9800	9600	10000	1.308	1.870	9.60E-04	23	51
5	25-Oct-04	6	8700	9950	10000	10000	10000	9800	0.9081	1.694	2.13E-03	23	50
6	26-Oct-04	7	10000	9930	9700	10000	10000	10000	0.9592	1.932	4.84E-03	23	49
7	27-Oct-04	8	10000	9780	9700	9800	9800	9800	0.9277	1.998	2.96E-03	23	50
8	28-Oct-04	9	9700	9900	10000	11000	9300	9300	1.807	2.035	1.72E-03	23	47
9	29-Oct-04	10	8200	9830	8300	11000	10000	10000	0.9320	1.987	3.88E-03	23	51
10	30-Oct-04	11	10000	10000	10000	10000	10000	10000	0.8478	1.682	8.07E-03	23	57
11	31-Oct-04	12	10000	10000	10000	10000	10000	10000	0.8962	2.076	2.90E-03	23	50
12	1-Nov-04	13	10000	10000	10000	10000	10000	10000	0.8478	1.740	1.89E-03	24	49
13	2-Nov-04	14	10000	10000	10000	10000	10000	10000	2.782	1.889	2.10E-03	23	52
14	3-Nov-04	15	10000	10300	11000	10000	10000	10000	0.8209	1.788	2.65E-03	22	47
15	4-Nov-04	16	10000	9980	10000	10000	9900	10000	0.9665	2.241	3.09E-03	22	46
Mean			9440		10000				1.112	1.877	2.83E-03	22.9	49.6
S.D.			643		412				0.509	0.197	1.69E-03	0.5	2.6

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APPENDIX B

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSUREINDIVIDUAL ANIMAL TERMINATION HISTORY
MALES GROUP 1 0 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
1032	TERMINAL SACRIFICE	3-NOV-04	14
1033	TERMINAL SACRIFICE	3-NOV-04	14
1034	TERMINAL SACRIFICE	3-NOV-04	14
1035	TERMINAL SACRIFICE	3-NOV-04	14
1036	TERMINAL SACRIFICE	3-NOV-04	14
1037	TERMINAL SACRIFICE	4-NOV-04	15
1038	TERMINAL SACRIFICE	4-NOV-04	15
1039	TERMINAL SACRIFICE	4-NOV-04	15
1040	TERMINAL SACRIFICE	4-NOV-04	15
1041	TERMINAL SACRIFICE	4-NOV-04	15

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APPENDIX B

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES GROUP 2 100 PPM INDIVIDUAL ANIMAL TERMINATION HISTORY

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
2032	TERMINAL SACRIFICE	3-NOV-04	14
2033	TERMINAL SACRIFICE	3-NOV-04	14
2034	TERMINAL SACRIFICE	3-NOV-04	14
2035	TERMINAL SACRIFICE	3-NOV-04	14
2036	TERMINAL SACRIFICE	3-NOV-04	14
2037	TERMINAL SACRIFICE	4-NOV-04	15
2038	TERMINAL SACRIFICE	4-NOV-04	15
2039	TERMINAL SACRIFICE	4-NOV-04	15
2040	TERMINAL SACRIFICE	4-NOV-04	15
2041	TERMINAL SACRIFICE	4-NOV-04	15

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APPENDIX B

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

MALES GROUP 3 1000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
3032	TERMINAL SACRIFICE	3-NOV-04	14
3033	TERMINAL SACRIFICE	3-NOV-04	14
3034	TERMINAL SACRIFICE	3-NOV-04	14
3035	TERMINAL SACRIFICE	3-NOV-04	14
3036	TERMINAL SACRIFICE	3-NOV-04	14
3037	TERMINAL SACRIFICE	4-NOV-04	15
3038	TERMINAL SACRIFICE	4-NOV-04	15
3039	TERMINAL SACRIFICE	4-NOV-04	15
3040	TERMINAL SACRIFICE	4-NOV-04	15
3041	TERMINAL SACRIFICE	4-NOV-04	15

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL ANIMAL TERMINATION HISTORY

MALES GROUP 4 10000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY
4032	TERMINAL SACRIFICE	3-NOV-04	14
4033	TERMINAL SACRIFICE	3-NOV-04	14
4034	TERMINAL SACRIFICE	3-NOV-04	14
4035	TERMINAL SACRIFICE	3-NOV-04	14
4036	TERMINAL SACRIFICE	3-NOV-04	14
4037	TERMINAL SACRIFICE	4-NOV-04	15
4038	TERMINAL SACRIFICE	4-NOV-04	15
4039	TERMINAL SACRIFICE	4-NOV-04	15
4040	TERMINAL SACRIFICE	4-NOV-04	15
4041	TERMINAL SACRIFICE	4-NOV-04	15

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INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 1 0 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
1532	TERMINAL SACRIFICE	3-NOV-04	20	P
1533	TERMINAL SACRIFICE	3-NOV-04	20	P
1534	TERMINAL SACRIFICE	3-NOV-04	20	P
1535	TERMINAL SACRIFICE	4-NOV-04	20	P
1536	TERMINAL SACRIFICE	4-NOV-04	20	P
1537	TERMINAL SACRIFICE	4-NOV-04	20	P
1538	TERMINAL SACRIFICE	5-NOV-04	20	P
1539	TERMINAL SACRIFICE	5-NOV-04	20	P
1540	TERMINAL SACRIFICE	5-NOV-04	20	P
1541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 2 100 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
2532	TERMINAL SACRIFICE	3-NOV-04	20	P
2533	TERMINAL SACRIFICE	3-NOV-04	20	P
2534	TERMINAL SACRIFICE	3-NOV-04	20	P
2535	TERMINAL SACRIFICE	4-NOV-04	20	NP
2536	TERMINAL SACRIFICE	4-NOV-04	20	P
2537	TERMINAL SACRIFICE	4-NOV-04	20	P
2538	TERMINAL SACRIFICE	5-NOV-04	20	P
2539	TERMINAL SACRIFICE	5-NOV-04	20	P
2540	TERMINAL SACRIFICE	5-NOV-04	20	P
2541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 3 1000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
3532	TERMINAL SACRIFICE	3-NOV-04	20	P
3533	TERMINAL SACRIFICE	3-NOV-04	20	P
3534	TERMINAL SACRIFICE	3-NOV-04	20	P
3535	TERMINAL SACRIFICE	4-NOV-04	20	P
3536	TERMINAL SACRIFICE	4-NOV-04	20	P
3537	TERMINAL SACRIFICE	4-NOV-04	20	P
3538	TERMINAL SACRIFICE	5-NOV-04	20	P
3539	TERMINAL SACRIFICE	5-NOV-04	20	P
3540	TERMINAL SACRIFICE	5-NOV-04	20	P
3541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL ANIMAL TERMINATION HISTORY

FEMALES GROUP 4 10000 PPM

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	STUDY DAY	PREGNANCY STATUS
4532	TERMINAL SACRIFICE	3-NOV-04	20	P
4533	TERMINAL SACRIFICE	3-NOV-04	20	P
4534	TERMINAL SACRIFICE	3-NOV-04	20	P
4535	TERMINAL SACRIFICE	4-NOV-04	20	P
4536	TERMINAL SACRIFICE	4-NOV-04	20	P
4537	TERMINAL SACRIFICE	4-NOV-04	20	P
4538	TERMINAL SACRIFICE	5-NOV-04	20	P
4539	TERMINAL SACRIFICE	5-NOV-04	20	P
4540	TERMINAL SACRIFICE	5-NOV-04	20	P
4541	TERMINAL SACRIFICE	5-NOV-04	20	P

NP-NOT PREGNANT, P-PREGNANT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES GROUP 1 0 PPM

INDIVIDUAL CLINICAL OBSERVATIONS

ANIMAL#	OBSERVATIONS	DAY OF STUDY	-	1	1	1
			6	0	7	3 4 5
1032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1040	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P
1041	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 2 100 PPM

ANIMAL#	OBSERVATIONS	DAY OF STUDY					
			-	1	1	1	
			6	0	7	3	4 5
2032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
2033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P	P		P
2034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
2035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE SCABS TOP OF HEAD ALOPECIA - GENERAL		P	P	P		P
2036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P	P		P
2037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
2038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P			P
2039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 2 100 PPM

ANIMAL#	OBSERVATIONS	DAY OF STUDY	-	1	1	1			
			6	0	7	3	4	5	
2040	WITHIN NORMAL LIMITS					P	P	P	
	TERMINAL SACRIFICE								P
	NASAL DISCHARGE - RED						P		
2041	WITHIN NORMAL LIMITS					P	P	P	P
	TERMINAL SACRIFICE								P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 3 1000 PPM

ANIMAL#	OBSERVATIONS	DAY OF STUDY	-	1	1	1
			6	0	7	3 4 5
3032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P		P
3034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3040	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P
3041	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P		P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES GROUP 4 10000 PPM INDIVIDUAL CLINICAL OBSERVATIONS

ANIMAL#	OBSERVATIONS	DAY OF STUDY	- 1 1 1				
			6	0	7	3	4 5
4032	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4033	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4034	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4035	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4036	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4037	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4038	WITHIN NORMAL LIMITS TERMINAL SACRIFICE NASAL DISCHARGE - RED		P	P			P
4039	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4040	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P
4041	WITHIN NORMAL LIMITS TERMINAL SACRIFICE		P	P	P	P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 1 0 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION																		
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7
1532	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1533	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1534	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1537	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																			
1541	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS																			

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 2 100 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2																	
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7
2532	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2533	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2534	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS																		P	P
2535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2537	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P
2541	TERMINAL SACRIFICE WITHIN NORMAL LIMITS								P	P									P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 3 1000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2																	
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7
3532	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P						P	P
3533	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS						P	P					P						P	P
3534	TERMINAL SACRIFICE ALOPECIA - EXTREMITIES/SNOUT WITHIN NORMAL LIMITS						P	P					3						3	3
3535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P						P	P
3536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P						P	P
3537	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS						P	P					P						P	P
3538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P						P	P
3539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P						P	P
3540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P						P	P
3541	TERMINAL SACRIFICE WITHIN NORMAL LIMITS						P	P					P						P	P

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS DURING GESTATION

GROUP 4 10000 PPM

FEMALE#	OBSERVATIONS	DAY OF GESTATION	1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2																											
			0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5		
4532	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4533	TERMINAL SACRIFICE NASAL DISCHARGE - RED WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4534	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4535	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4536	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4537	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4538	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4539	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4540	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		
4541	TERMINAL SACRIFICE WITHIN NORMAL LIMITS																											P		
							P	P										P										P		

CODE: 1-SLIGHT 2-MODERATE 3-MARKED P-PRESENT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES	GROUP 1	0 PPM			

ANIMAL#	DAY OF STUDY				
	-6	0	7	13	

1032	192	249	290	328	
1033	208	269	308	345	
1034	199	254	299	335	
1035	203	272	328	356	
1036	210	272	325	360	
1037	200	258	310	344	
1038	204	258	306	351	
1039	187	244	294	326	
1040	197	254	304	336	
1041	184	234	263	289	
MEAN	198	256	303	337	
S.D.	8.5	12.2	18.4	20.3	
N	10	10	10	10	

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSUREINDIVIDUAL BODY WEIGHTS (GRAMS)
MALES GROUP 2 100 PPM

ANIMAL#	DAY OF STUDY			
	-6	0	7	13
2032	197	262	325	354
2033	212	279	331	371
2034	182	241	282	303
2035	203	260	315	347
2036	207	271	336	383
2037	199	262	311	339
2038	204	273	331	369
2039	200	265	319	356
2040	190	242	293	324
2041	192	241	276	304
MEAN	198	259	312	345
S.D.	8.7	13.8	21.3	27.5
N	10	10	10	10

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 3 1000 PPM

ANIMAL#	DAY OF STUDY			
	-6	0	7	13
3032	195	264	323	362
3033	192	252	298	330
3034	204	265	312	357
3035	194	260	318	356
3036	207	264	320	353
3037	208	264	309	347
3038	198	256	293	327
3039	202	269	322	366
3040	201	264	318	363
3041	186	234	276	302
MEAN	199	259	309	346
S.D.	7.1	10.2	15.3	20.3
N	10	10	10	10

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 4 10000 PPM

ANIMAL#	DAY OF STUDY			
	-6	0	7	13
4032	206	277	348	406
4033	206	265	313	353
4034	202	260	318	362
4035	197	263	313	349
4036	192	246	304	338
4037	183	238	288	309
4038	187	248	311	347
4039	208	270	318	357
4040	197	257	305	338
4041	201	253	303	345
MEAN	198	258	312	350
S.D.	8.4	11.9	15.4	24.4
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURESGROUP 1 0 PPM
INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
1532	258	281	334	431
1533	261	277	309	393
1534	265	283	321	403
1535	229	254	294	371
1536	237	250	293	379
1537	282	300	330	419
1538	247	273	330	401
1539	249	271	313	394
1540	256	283	333	416
1541	267	282	328	421
MEAN	255	275	318	403
S.D.	15.4	14.6	15.6	19.1
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURESGROUP 2 100 PPM
INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
2532	250	271	309	398
2533	262	274	329	415
2534	267	283	324	410
2535x NP	226	241	262	278
2536	242	252	299	374
2537	276	294	329	414
2538	244	271	317	406
2539	249	271	318	403
2540	262	280	321	426
2541	265	288	338	401
MEAN	257	276	320	405
S.D.	11.7	12.4	11.4	14.6
N	9	9	9	9

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 3 1000 PPM INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
3532	240	259	309	386
3533	264	285	324	427
3534	282	296	352	453
3535	236	256	304	389
3536	250	265	314	393
3537	254	269	307	394
3538	247	262	312	386
3539	253	263	298	339
3540	258	293	340	444
3541	266	289	328	428
MEAN	255	274	319	404
S.D.	13.3	15.3	17.1	34.0
N	10	10	10	10

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APPENDIX D

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION BODY WEIGHTS (GRAMS)

GROUP 4 10000 PPM

ANIMAL#	DAY OF GESTATION			
	4	6	13	20
4532	257	280	323	405
4533	262	287	330	425
4534	266	274	306	385
4535	230	249	277	350
4536	250	268	310	344
4537	254	265	310	397
4538	242	254	304	381
4539	253	278	321	419
4540	254	273	318	404
4541	268	288	331	435
MEAN	253	272	313	395
S.D.	11.4	13.0	15.9	30.2
N	10	10	10	10

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APPENDIX E

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES		INDIVIDUAL BODY WEIGHT GAIN (GRAMS)			
GROUP 1		0 PPM			
ANIMAL#	DAY OF STUDY				
	-6-0	0-7	7-13	0-13	
1032	57	41	38	78	
1033	61	39	37	76	
1034	55	45	36	81	
1035	69	57	28	84	
1036	62	53	35	87	
1037	59	52	34	86	
1038	54	48	44	93	
1039	57	50	31	82	
1040	57	50	32	82	
1041	50	29	26	55	
MEAN	58	46	34	80	
S.D.	5.0	8.2	5.3	10.1	
N	10	10	10	10	

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHT GAIN (GRAMS)

MALES GROUP 2 100 PPM

ANIMAL#	DAY OF STUDY			
	-6-0	0-7	7-13	0-13
2032	65	64	29	92
2033	68	52	41	92
2034	58	42	21	63
2035	57	55	32	87
2036	65	65	47	112
2037	63	49	28	77
2038	69	59	37	96
2039	64	54	37	91
2040	53	51	32	82
2041	50	35	28	62
MEAN	61	52	33	85
S.D.	6.5	9.2	7.5	15.1
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHT GAIN (GRAMS)

MALES GROUP 3 1000 PPM

ANIMAL#	DAY OF STUDY			
	-6-0	0-7	7-13	0-13
3032	69	59	39	98
3033	60	47	31	78
3034	60	47	45	92
3035	66	58	38	96
3036	57	56	33	89
3037	56	45	38	82
3038	58	38	34	72
3039	66	53	44	97
3040	64	53	45	98
3041	48	42	26	69
MEAN	61	50	37	87
S.D.	6.2	7.1	6.2	11.3
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL BODY WEIGHT GAIN (GRAMS)				
MALES GROUP 4 10000 PPM				
ANIMAL#	DAY OF STUDY			
	-6-0	0-7	7-13	0-13
4032	71	71	58	129
4033	59	49	40	89
4034	58	58	45	102
4035	66	50	36	86
4036	54	58	35	92
4037	55	51	21	72
4038	61	63	35	99
4039	62	48	39	87
4040	59	49	32	81
4041	52	50	42	92
MEAN	60	55	38	93
S.D.	5.7	7.7	9.5	15.3
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 1 0 PPM INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 13	13 - 20	4 - 20
1532	23	53	97	173
1533	16	32	84	132
1534	18	38	82	138
1535	25	40	77	142
1536	13	43	86	142
1537	18	31	89	137
1538	26	57	70	153
1539	22	42	81	145
1540	27	50	84	161
1541	15	46	93	154
MEAN	20	43	84	148
S.D.	5.0	8.6	7.6	12.5
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURESGROUP 2 100 PPM
INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 13	13 - 20	4 - 20
2532	21	38	89	148
2533	13	55	86	153
2534	16	40	86	143
2535x NP	15	21	15	52
2536	10	48	75	132
2537	18	34	85	138
2538	27	46	89	162
2539	22	47	85	154
2540	18	41	105	164
2541	24	50	63	136
MEAN	19	44	85	148
S.D.	5.6	6.4	11.3	11.5
N	9	9	9	9

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)

GROUP 3 1000 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 13	13 - 20	4 - 20
3532	19	49	78	146
3533	22	39	103	164
3534	15	56	102	172
3535	20	49	84	153
3536	15	49	79	143
3537	15	38	87	141
3538	15	50	74	139
3539	10	35	42	86
3540	35	48	103	186
3541	23	39	101	162
MEAN	19	45	85	149
S.D.	6.9	6.9	19.1	26.7
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 4		10000 PPM				INDIVIDUAL GESTATION BODY WEIGHT GAIN (GRAMS)			
		DAY OF GESTATION							
ANIMAL#	4 - 6	6 - 13	13 - 20	4 - 20					
4532	22	44	82	147					
4533	25	43	96	163					
4534	8	32	79	119					
4535	19	28	73	120					
4536	19	42	34	95					
4537	11	44	88	143					
4538	12	50	77	139					
4539	25	44	98	166					
4540	20	45	85	150					
4541	21	43	104	167					
MEAN	18	41	82	141					
S.D.	5.8	5.5	19.3	23.6					
N	10	10	10	10					

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

MALES		GROUP 1		0 PPM		INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)	
		DAY OF STUDY					
ANIMAL#	0	7	13				
1032	108	89	80				
1033	108	90	80				
1034	105	86	78				
1035	113	98	78				
1036	110	90	77				
1037	110	91	78				
1038	104	89	78				
1039	112	91	82				
1040	116	96	84				
1041	107	86	79				
MEAN	109	91	79				
S.D.	3.6	3.7	2.3				
N	10	10	10				

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)

MALES GROUP 2 100 PPM

ANIMAL#	DAY OF STUDY		
	0	7	13
2032	114	99	90
2033	110	92	80
2034	109	88	75
2035	116	93	83
2036	111	93	87
2037	112	96	82
2038	114	97	84
2039	115	98	84
2040	111	95	82
2041	107	90	80
MEAN	112	94	83
S.D.	2.8	3.7	4.1
N	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSUREMALES GROUP 3 1000 PPM
INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)

ANIMAL#	DAY OF STUDY		
	0	7	13
3032	110	92	78
3033	103	83	74
3034	110	89	83
3035	115	98	82
3036	106	88	78
3037	110	90	82
3038	109	87	77
3039	118	96	84
3040	113	91	80
3041	112	91	76
MEAN	110	91	79
S.D.	4.3	4.2	3.3
N	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL FEED CONSUMPTION (GRAMS/KG/DAY)

MALES GROUP 4 10000 PPM

ANIMAL#	DAY OF STUDY		
	0	7	13
4032	110	93	85
4033	107	91	79
4034	105	88	79
4035	114	92	81
4036	103	90	78
4037	114	98	84
4038	115	93	79
4039	106	87	80
4040	114	94	80
4041	106	91	81
MEAN	109	92	81
S.D.	4.7	3.1	2.4
N	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 1 0 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
1532	104	99	85	96
1533	78	77	64	73
1534	94	92	76	87
1535	100	100	86	95
1536	95	96	76	89
1537	89	80	71	80
1538	99	101	83	94
1539	90	89	76	85
1540	104	100	75	93
1541	84	87	76	82
MEAN	94	92	77	88
S.D.	8.6	8.6	6.6	7.5
N	10	10	10	10

CF=Contaminated Feeder

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 2 100 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
2532	96	92	75	88
2533	84	86	73	81
2534	88	85	73	82
2535x NP	100	94	87	94
2536	98	93	74	88
2537	84	84	72	80
2538	105	102	79	95
2539	92	91	82	88
2540	94	93	81	89
2541	93	95	78	89
MEAN	93	91	77	87
S.D.	6.7	5.6	3.7	4.9
N	9	9	9	9

NP=NOT PREGNANT

x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 3 1000 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
3532	96	93	76	88
3533	102	97	68	89
3534	87	88	72	82
3535	101	95	84	93
3536	99	90	76	88
3537	93	84	78	85
3538	95	98	70	88
3539	85	89	83	86
3540	104	95	69	89
3541	92	88	74	85
MEAN	95	92	75	87
S.D.	6.3	4.6	5.6	3.0
N	10	10	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GESTATION FEED CONSUMPTION -- (GRAMS/KG/DAY)

GROUP 4 10000 PPM

ANIMAL#	DAY OF GESTATION			
	4 - 6	6 - 10	13 - 20	4 - 20
4532	96	95	76	89
4533	90	86	76	84
4534	76	84	78	79
4535	104	89	72	88
4536	96	93	83	91
4537	97	98	76	90
4538	83		75	79
4539	94	97	81	91
4540	91	91	77	86
4541	90	90	77	86
MEAN	92	91	77	86
S.D.	7.8	4.8	3.1	4.3
N	10	9	10	10

	Organ and Final Body Weights Preface	Appendix G

Key to Abbreviations:

g = Grams
Sem. Ves = Seminal Vesicals

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APPENDIX G

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1032	297	0.0529	0.0002	0.0252	2.1018	0.0071	1.0000	0.8045	0.0027	0.3828	1.1757	0.0040	0.5594
1033	304	0.0652	0.0002	0.0302	2.1578	0.0071	1.0000	1.0020	0.0033	0.4644	1.2614	0.0042	0.5846
1034	305	0.0584	0.0002	0.0279	2.0905	0.0069	1.0000	0.7563	0.0025	0.3618	1.3429	0.0044	0.6424
1035	324	0.0841	0.0003	0.0379	2.2198	0.0068	1.0000	0.8213	0.0025	0.3700	1.3469	0.0042	0.6068
1036	322	0.0734	0.0002	0.0365	2.0132	0.0063	1.0000	0.7344	0.0023	0.3648	1.6505	0.0051	0.8198
1037	319	0.0699	0.0002	0.0339	2.0641	0.0065	1.0000	0.7592	0.0024	0.3678	1.2834	0.0040	0.6218
1038	328	0.0653	0.0002	0.0322	2.0291	0.0062	1.0000	0.8196	0.0025	0.4039	1.3584	0.0041	0.6695
1039	304	0.0586	0.0002	0.0309	1.8934	0.0062	1.0000	0.7154	0.0024	0.3778	1.3347	0.0044	0.7049
1040	315	0.0613	0.0002	0.0302	2.0296	0.0064	1.0000	0.8834	0.0028	0.4353	1.2656	0.0040	0.6236
1041	267	0.0535	0.0002	0.0273	1.9566	0.0073	1.0000	0.7936	0.0030	0.4056	1.1703	0.0044	0.5981

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2032	330	0.0628	0.0002	0.0314	1.9970	0.0060	1.0000	0.8651	0.0026	0.4332	1.4353	0.0043	0.7187
2033	336	0.0658	0.0002	0.0331	1.9895	0.0059	1.0000	0.8290	0.0025	0.4167	1.3631	0.0041	0.6851
2034	282	0.0612	0.0002	0.0327	1.8714	0.0066	1.0000	0.7734	0.0027	0.4133	1.2567	0.0045	0.6715
2035	317	0.0613	0.0002	0.0312	1.9678	0.0062	1.0000	0.9391	0.0030	0.4772	1.2457	0.0039	0.6330
2036	352	0.0578	0.0002	0.0269	2.1494	0.0061	1.0000	0.8749	0.0025	0.4070	1.4611	0.0042	0.6798
2037	313	0.0731	0.0002	0.0366	1.9993	0.0064	1.0000	0.8054	0.0026	0.4028	1.3321	0.0043	0.6663
2038	338	0.0690	0.0002	0.0337	2.0505	0.0061	1.0000	0.9862	0.0029	0.4810	1.4911	0.0044	0.7272
2039	332	0.0692	0.0002	0.0318	2.1735	0.0066	1.0000	0.7432	0.0022	0.3419	1.3899	0.0042	0.6395
2040	301	0.0549	0.0002	0.0282	1.9464	0.0065	1.0000	0.7350	0.0024	0.3776	1.2966	0.0043	0.6662
2041	281	0.0482	0.0002	0.0245	1.9708	0.0070	1.0000	0.8030	0.0029	0.4074	1.1889	0.0042	0.6033

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3032	327	0.0565	0.0002	0.0274	2.0651	0.0063	1.0000	0.7801	0.0024	0.3778	1.2456	0.0038	0.6032
3033	306	0.0607	0.0002	0.0285	2.1272	0.0069	1.0000	0.8344	0.0027	0.3923	1.4606	0.0048	0.6866
3034	324	0.0653	0.0002	0.0300	2.1790	0.0067	1.0000	0.7764	0.0024	0.3563	1.2827	0.0040	0.5887
3035	321	0.0648	0.0002	0.0319	2.0327	0.0063	1.0000	0.8385	0.0026	0.4125	1.2903	0.0040	0.6348
3036	325	0.0685	0.0002	0.0355	1.9279	0.0059	1.0000	0.7580	0.0023	0.3932	1.3197	0.0041	0.6845
3037	314	0.0637	0.0002	0.0306	2.0786	0.0066	1.0000	0.8592	0.0027	0.4134	1.3019	0.0041	0.6263
3038	302	0.0562	0.0002	0.0283	1.9852	0.0066	1.0000	0.8061	0.0027	0.4061	1.3227	0.0044	0.6663
3039	340	0.0833	0.0002	0.0421	1.9785	0.0058	1.0000	0.7791	0.0023	0.3938	1.2058	0.0036	0.6095
3040	335	0.0785	0.0002	0.0353	2.2210	0.0066	1.0000	0.9166	0.0027	0.4127	1.3849	0.0041	0.6235
3041	278	0.0467	0.0002	0.0235	1.9892	0.0071	1.0000	0.7702	0.0028	0.3872	1.0884	0.0039	0.5472

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			EPIDIDYIMIDES			HEART		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4032	362	0.0678	0.0002	0.0340	1.9958	0.0055	1.0000	0.9274	0.0026	0.4647	1.5692	0.0043	0.7863
4033	322	0.0633	0.0002	0.0317	1.9947	0.0062	1.0000	0.7995	0.0025	0.4008	1.3414	0.0042	0.6725
4034	321	0.0518	0.0002	0.0262	1.9780	0.0062	1.0000	0.7667	0.0024	0.3876	1.3756	0.0043	0.6954
4035	318	0.0641	0.0002	0.0321	1.9948	0.0063	1.0000	0.7501	0.0024	0.3760	1.4194	0.0045	0.7116
4036	301	0.0587	0.0002	0.0290	2.0215	0.0067	1.0000	0.9729	0.0032	0.4813	1.3609	0.0045	0.6732
4037	290	0.0564	0.0002	0.0288	1.9575	0.0067	1.0000	0.7813	0.0027	0.3991	1.2587	0.0043	0.6430
4038	314	0.0632	0.0002	0.0313	2.0175	0.0064	1.0000	0.9024	0.0029	0.4473	1.2345	0.0039	0.6119
4039	326	0.0621	0.0002	0.0311	1.9993	0.0061	1.0000	0.7248	0.0022	0.3625	1.2296	0.0038	0.6150
4040	308	0.0588	0.0002	0.0284	2.0699	0.0067	1.0000	0.8070	0.0026	0.3899	1.2878	0.0042	0.6222
4041	325	0.0573	0.0002	0.0297	1.9314	0.0059	1.0000	0.7433	0.0023	0.3849	1.2568	0.0039	0.6507

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1032	297	2.5407	0.0085	1.2088	10.6737	0.0359	5.0784	1.5840	0.0053	0.7536	0.0088	0.0000	0.0042
1033	304	3.1221	0.0103	1.4469	10.9952	0.0362	5.0956	1.7646	0.0058	0.8178	0.0113	0.0000	0.0052
1034	305	3.4100	0.0112	1.6312	12.1977	0.0400	5.8348	1.7581	0.0058	0.8410	0.0093	0.0000	0.0044
1035	324	3.4254	0.0106	1.5431	11.5414	0.0356	5.1993	2.1906	0.0068	0.9868	0.0106	0.0000	0.0048
1036	322	3.3612	0.0105	1.6696	11.3651	0.0353	5.6453	1.9696	0.0061	0.9783	0.0051	0.0000	0.0025
1037	319	3.0217	0.0095	1.4639	11.3344	0.0355	5.4912	1.7421	0.0055	0.8440	0.0102	0.0000	0.0049
1038	328	3.1660	0.0097	1.5603	12.3488	0.0377	6.0859	2.0802	0.0063	1.0252	0.0113	0.0000	0.0056
1039	304	2.8869	0.0095	1.5247	12.1570	0.0400	6.4207	1.4946	0.0049	0.7894	0.0137	0.0000	0.0072
1040	315	3.2361	0.0103	1.5945	11.9973	0.0381	5.9112	1.5166	0.0048	0.7472	0.0093	0.0000	0.0046
1041	267	2.5899	0.0097	1.3237	8.1621	0.0306	4.1716	1.6935	0.0063	0.8655	0.0106	0.0000	0.0054

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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APPENDIX G

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2032	330	3.3199	0.0101	1.6624	11.0622	0.0335	5.5394	2.1158	0.0064	1.0595	0.0103	0.0000	0.0052
2033	336	3.4317	0.0102	1.7249	11.3201	0.0337	5.6899	1.8051	0.0054	0.9073	0.0105	0.0000	0.0053
2034	282	3.0249	0.0107	1.6164	9.6011	0.0340	5.1304	1.8898	0.0067	1.0098	0.0068	0.0000	0.0036
2035	317	3.1978	0.0101	1.6251	11.5444	0.0364	5.8667	1.9931	0.0063	1.0129	0.0125	0.0000	0.0064
2036	352	3.6894	0.0105	1.7165	12.8386	0.0365	5.9731	2.0451	0.0058	0.9515	0.0134	0.0000	0.0062
2037	313	3.2526	0.0104	1.6269	14.2107	0.0454	7.1078	1.6784	0.0054	0.8395	0.0170	0.0001	0.0085
2038	338	3.4522	0.0102	1.6836	13.0875	0.0387	6.3826	2.1891	0.0065	1.0676	0.0060	0.0000	0.0029
2039	332	3.9815	0.0120	1.8318	12.0911	0.0365	5.5630	1.6520	0.0050	0.7601	0.0094	0.0000	0.0043
2040	301	2.8515	0.0095	1.4650	10.5787	0.0352	5.4350	1.7322	0.0058	0.8900	0.0086	0.0000	0.0044
2041	281	2.7371	0.0098	1.3888	10.2060	0.0364	5.1786	1.3520	0.0048	0.6860	0.0100	0.0000	0.0051

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3032	327	3.1535	0.0097	1.5270	10.9098	0.0334	5.2829	1.7306	0.0053	0.8380	0.0092	0.0000	0.0045
3033	306	2.9719	0.0097	1.3971	10.8893	0.0355	5.1191	1.9016	0.0062	0.8939	0.0093	0.0000	0.0044
3034	324	2.9880	0.0092	1.3713	11.4878	0.0354	5.2721	1.5847	0.0049	0.7273	0.0106	0.0000	0.0049
3035	321	3.1390	0.0098	1.5443	14.9211	0.0465	7.3405	1.8929	0.0059	0.9312	0.0105	0.0000	0.0052
3036	325	3.5229	0.0109	1.8273	13.5564	0.0418	7.0317	2.0551	0.0063	1.0660	0.0081	0.0000	0.0042
3037	314	3.2540	0.0104	1.5655	10.0976	0.0322	4.8579	1.7931	0.0057	0.8626	0.0080	0.0000	0.0038
3038	302	3.3346	0.0110	1.6797	14.3158	0.0474	7.2113	1.5408	0.0051	0.7761	0.0113	0.0000	0.0057
3039	340	3.2630	0.0096	1.6492	14.0026	0.0412	7.0774	1.5470	0.0046	0.7819	0.0118	0.0000	0.0060
3040	335	3.0513	0.0091	1.3738	12.4171	0.0371	5.5908	2.0974	0.0063	0.9443	0.0121	0.0000	0.0054
3041	278	2.8191	0.0101	1.4172	10.9327	0.0393	5.4960	1.5055	0.0054	0.7568	0.0089	0.0000	0.0045

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	KIDNEYS			LIVER			LUNGS			PITUITARY		
		Weight	%FBW	%Brain	Weight	%FBW	%Brain	Weight	%FBW	%Brain	Weight	%FBW	%Brain
		g			g			g			g		
4032	362	3.6590	0.0101	1.8333	12.1977	0.0337	6.1117	2.7992	0.0077	1.4025	0.0132	0.0000	0.0066
4033	322	3.4379	0.0107	1.7235	12.4265	0.0386	6.2298	1.6128	0.0050	0.8085	0.0100	0.0000	0.0050
4034	321	3.1457	0.0098	1.5903	12.4559	0.0388	6.2972	2.0394	0.0064	1.0310	0.0081	0.0000	0.0041
4035	318	3.0940	0.0097	1.5510	10.6193	0.0334	5.3235	1.8139	0.0057	0.9093	0.0090	0.0000	0.0045
4036	301	3.1382	0.0104	1.5524	11.3354	0.0377	5.6074	1.9007	0.0063	0.9402	0.0117	0.0000	0.0058
4037	290	3.1597	0.0109	1.6142	10.2468	0.0353	5.2346	1.8515	0.0064	0.9458	0.0104	0.0000	0.0053
4038	314	2.6488	0.0084	1.3129	12.0166	0.0383	5.9562	1.5701	0.0050	0.7782	0.0112	0.0000	0.0056
4039	326	3.4480	0.0106	1.7246	12.4083	0.0380	6.2063	1.8222	0.0056	0.9114	0.0094	0.0000	0.0047
4040	308	2.9219	0.0095	1.4116	10.4456	0.0339	5.0464	1.8999	0.0062	0.9179	0.0089	0.0000	0.0043
4041	325	2.9052	0.0089	1.5042	12.0791	0.0372	6.2541	1.7602	0.0054	0.9114	0.0105	0.0000	0.0054

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1032	297	1.3381	0.0045	0.6366	0.8257	0.0028	0.3929	3.1772	0.0107	1.5117	0.6140	0.0021	0.2921
1033	304	1.1517	0.0038	0.5337	0.6376	0.0021	0.2955	3.0655	0.0101	1.4207	0.6190	0.0020	0.2869
1034	305	1.3913	0.0046	0.6655	0.8870	0.0029	0.4243	3.0421	0.0100	1.4552	0.6155	0.0020	0.2944
1035	324	1.3205	0.0041	0.5949	0.7034	0.0022	0.3169	3.0238	0.0093	1.3622	0.5826	0.0018	0.2625
1036	322	1.0234	0.0032	0.5083	0.6522	0.0020	0.3240	3.6722	0.0114	1.8241	0.6563	0.0020	0.3260
1037	319	0.9790	0.0031	0.4743	0.6273	0.0020	0.3039	2.9805	0.0093	1.4440	0.5517	0.0017	0.2673
1038	328	1.1267	0.0034	0.5553	0.7055	0.0022	0.3477	3.4145	0.0104	1.6828	0.6888	0.0021	0.3395
1039	304	1.2001	0.0040	0.6338	0.7637	0.0025	0.4033	2.7760	0.0091	1.4661	0.7899	0.0026	0.4172
1040	315	1.0166	0.0032	0.5009	0.8415	0.0027	0.4146	2.9185	0.0093	1.4380	0.6075	0.0019	0.2993
1041	267	2.7322	0.0102	1.3964	0.4789	0.0018	0.2448	2.9424	0.0110	1.5038	0.4299	0.0016	0.2197

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2032	330	1.0471	0.0032	0.5243	0.7367	0.0022	0.3689	2.7705	0.0084	1.3873	0.5860	0.0018	0.2934
2033	336	1.1165	0.0033	0.5612	0.7554	0.0022	0.3797	2.9333	0.0087	1.4744	0.8027	0.0024	0.4035
2034	282	1.1994	0.0042	0.6409	0.6544	0.0023	0.3497	3.0917	0.0110	1.6521	0.5878	0.0021	0.3141
2035	317	0.8011	0.0025	0.4071	0.9339	0.0029	0.4746	3.4254	0.0108	1.7407	0.7221	0.0023	0.3670
2036	352	1.3687	0.0039	0.6368	1.0680	0.0030	0.4969	3.1058	0.0088	1.4450	0.6517	0.0019	0.3032
2037	313	1.1606	0.0037	0.5805	0.8858	0.0028	0.4431	3.0881	0.0099	1.5446	0.5060	0.0016	0.2531
2038	338	1.3647	0.0040	0.6655	0.8527	0.0025	0.4158	3.0179	0.0089	1.4718	0.5630	0.0017	0.2746
2039	332	1.0813	0.0033	0.4975	0.8563	0.0026	0.3940	3.5238	0.0106	1.6213	0.6274	0.0019	0.2887
2040	301	0.8456	0.0028	0.4344	0.6894	0.0023	0.3542	2.8998	0.0096	1.4898	0.5517	0.0018	0.2834
2041	281	0.9800	0.0035	0.4973	0.5651	0.0020	0.2867	2.7759	0.0099	1.4085	0.5520	0.0020	0.2801

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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APPENDIX G

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES.			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3032	327	0.9260	0.0028	0.4484	0.6766	0.0021	0.3276	2.8687	0.0088	1.3891	0.4493	0.0014	0.2176
3033	306	1.0369	0.0034	0.4874	0.7233	0.0024	0.3400	3.2460	0.0106	1.5259	0.5944	0.0019	0.2794
3034	324	1.1838	0.0037	0.5433	0.6294	0.0019	0.2888	3.3713	0.0104	1.5472	0.7345	0.0023	0.3371
3035	321	1.2408	0.0039	0.6104	0.7819	0.0024	0.3847	2.9673	0.0093	1.4598	0.6693	0.0021	0.3293
3036	325	0.8579	0.0026	0.4450	0.7065	0.0022	0.3665	3.0498	0.0094	1.5819	0.5537	0.0017	0.2872
3037	314	1.2965	0.0041	0.6237	0.6707	0.0021	0.3227	3.2938	0.0105	1.5846	0.5584	0.0018	0.2686
3038	302	1.5984	0.0053	0.8052	0.6002	0.0020	0.3023	3.1291	0.0104	1.5762	0.5162	0.0017	0.2600
3039	340	1.1141	0.0033	0.5631	0.6462	0.0019	0.3266	2.8004	0.0082	1.4154	0.4912	0.0014	0.2483
3040	335	0.9855	0.0029	0.4437	0.7421	0.0022	0.3341	3.2610	0.0097	1.4683	0.6746	0.0020	0.3037
3041	278	2.6758	0.0096	1.3452	0.6229	0.0022	0.3131	3.0486	0.0110	1.5326	0.4412	0.0016	0.2218

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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APPENDIX G

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

ORGAN AND FINAL BODY WEIGHTS

MALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	SEM.VES			SPLEEN			TESTES			THYMUS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4032	362	1.0016	0.0028	0.5019	0.8149	0.0023	0.4083	3.2819	0.0091	1.6444	0.7078	0.0020	0.3546
4033	322	1.0164	0.0032	0.5096	0.6469	0.0020	0.3243	3.0980	0.0096	1.5531	0.5796	0.0018	0.2906
4034	321	0.9558	0.0030	0.4832	0.6487	0.0020	0.3280	2.9571	0.0092	1.4950	0.4865	0.0015	0.2460
4035	318	1.0146	0.0032	0.5086	0.7504	0.0024	0.3762	3.0804	0.0097	1.5442	0.6445	0.0020	0.3231
4036	301	1.1117	0.0037	0.5499	0.9053	0.0030	0.4478	3.1907	0.0106	1.5784	0.7027	0.0023	0.3476
4037	290	1.2474	0.0043	0.6372	0.6005	0.0021	0.3068	2.8768	0.0099	1.4696	0.4452	0.0015	0.2274
4038	314	0.9630	0.0031	0.4773	0.8900	0.0028	0.4411	3.0984	0.0099	1.5358	0.7442	0.0024	0.3689
4039	326	1.0966	0.0034	0.5485	0.8181	0.0025	0.4092	3.1339	0.0096	1.5675	0.7503	0.0023	0.3753
4040	308	1.0610	0.0034	0.5126	0.6919	0.0022	0.3343	3.0340	0.0099	1.4658	0.7239	0.0024	0.3497
4041	325	0.8855	0.0027	0.4585	0.7943	0.0024	0.4113	3.0407	0.0094	1.5744	0.5307	0.0016	0.2748

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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APPENDIX G

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
1532	431	0.0954	0.0002	0.0483	1.9760	0.0046	1.0000	1.1412	0.0027	0.5775	2.2676	0.0053	1.1476
1533	393	0.0828	0.0002	0.0400	2.0701	0.0053	1.0000	1.0219	0.0026	0.4936	1.9640	0.0050	0.9487
1534	403	0.0809	0.0002	0.0387	2.0931	0.0052	1.0000	1.0980	0.0027	0.5246	2.4369	0.0060	1.1643
1535	371	0.0866	0.0002	0.0423	2.0449	0.0055	1.0000	0.9996	0.0027	0.4888	2.4619	0.0066	1.2039
1536	379	0.0828	0.0002	0.0404	2.0490	0.0054	1.0000	1.0115	0.0027	0.4937	2.4370	0.0064	1.1894
1537	419	0.0755	0.0002	0.0377	2.0008	0.0048	1.0000	1.0497	0.0025	0.5246	2.4191	0.0058	1.2091
1538	401	0.0714	0.0002	0.0351	2.0366	0.0051	1.0000	1.1969	0.0030	0.5877	2.6023	0.0065	1.2778
1539	394	0.0615	0.0002	0.0304	2.0215	0.0051	1.0000	0.9469	0.0024	0.4684	2.4158	0.0061	1.1951
1540	416	0.0876	0.0002	0.0435	2.0119	0.0048	1.0000	0.9898	0.0024	0.4920	2.1279	0.0051	1.0577
1541	421	0.0850	0.0002	0.0394	2.1598	0.0051	1.0000	1.0261	0.0024	0.4751	2.5771	0.0061	1.1932

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
2532	398	0.1055	0.0003	0.0518	2.0371	0.0051	1.0000	1.2882	0.0032	0.6324	2.2609	0.0057	1.1099
2533	415	0.1056	0.0003	0.0546	1.9351	0.0047	1.0000	1.0242	0.0025	0.5293	2.2821	0.0055	1.1793
2534	410	0.0872	0.0002	0.0425	2.0521	0.0050	1.0000	1.0818	0.0026	0.5272	2.5271	0.0062	1.2315
2535x NP	278	0.0747	0.0003	0.0363	2.0588	0.0074	1.0000	1.1300	0.0041	0.5489	2.6629	0.0096	1.2934
2536	374	0.0741	0.0002	0.0375	1.9764	0.0053	1.0000	1.0038	0.0027	0.5079	2.2126	0.0059	1.1195
2537	414	0.0911	0.0002	0.0426	2.1369	0.0052	1.0000	1.0441	0.0025	0.4886	2.3039	0.0056	1.0782
2538	406	0.0923	0.0002	0.0473	1.9525	0.0048	1.0000	1.1005	0.0027	0.5636	2.5186	0.0062	1.2899
2539	403	0.1037	0.0003	0.0516	2.0100	0.0050	1.0000	1.0553	0.0026	0.5250	2.5161	0.0062	1.2518
2540	426	0.1269	0.0003	0.0636	1.9945	0.0047	1.0000	1.1561	0.0027	0.5796	2.2991	0.0054	1.1527
2541	401	0.0836	0.0002	0.0405	2.0623	0.0051	1.0000	1.1044	0.0028	0.5355	2.3544	0.0059	1.1416

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

NP=NOT PREGNANT x=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3532	386	0.0773	0.0002	0.0396	1.9538	0.0051	1.0000	1.0467	0.0027	0.5357	3.2749	0.0085	1.6762
3533	427	0.0914	0.0002	0.0480	1.9030	0.0045	1.0000	0.9996	0.0023	0.5253	2.2068	0.0052	1.1596
3534	453	0.0781	0.0002	0.0375	2.0832	0.0046	1.0000	1.2010	0.0026	0.5765	2.4314	0.0054	1.1671
3535	389	0.0939	0.0002	0.0451	2.0840	0.0054	1.0000	1.0959	0.0028	0.5259	2.5687	0.0066	1.2326
3536	393	0.1058	0.0003	0.0511	2.0719	0.0053	1.0000	1.0364	0.0026	0.5002	2.4991	0.0064	1.2062
3537	394	0.0805	0.0002	0.0384	2.0981	0.0053	1.0000	1.1370	0.0029	0.5419	2.3095	0.0059	1.1008
3538	386	0.0827	0.0002	0.0415	1.9941	0.0052	1.0000	0.9684	0.0025	0.4856	2.1519	0.0056	1.0791
3539	339	0.0921	0.0003	0.0437	2.1084	0.0062	1.0000	1.0243	0.0030	0.4858	2.5194	0.0074	1.1949
3540	444	0.0771	0.0002	0.0365	2.1110	0.0048	1.0000	1.1904	0.0027	0.5639	2.5240	0.0057	1.1956
3541	428	0.0894	0.0002	0.0420	2.1262	0.0050	1.0000	1.1319	0.0026	0.5324	2.2129	0.0052	1.0408

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	ADRENALS			BRAIN			HEART			KIDNEYS		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4532	405	0.0823	0.0002	0.0429	1.9162	0.0047	1.0000	1.1036	0.0027	0.5759	2.2413	0.0055	1.1697
4533	425	0.0916	0.0002	0.0470	1.9506	0.0046	1.0000	1.0023	0.0024	0.5138	2.2917	0.0054	1.1749
4534	385	0.0716	0.0002	0.0368	1.9460	0.0051	1.0000	1.0157	0.0026	0.5219	2.1656	0.0056	1.1128
4535	350	0.0706	0.0002	0.0350	2.0174	0.0058	1.0000	1.0003	0.0029	0.4958	3.2124	0.0092	1.5923
4536	344	0.0782	0.0002	0.0404	1.9364	0.0056	1.0000	1.0582	0.0031	0.5465	2.7042	0.0079	1.3965
4537	397	0.1154	0.0003	0.0573	2.0126	0.0051	1.0000	1.2327	0.0031	0.6125	2.3577	0.0059	1.1715
4538	381	0.0921	0.0002	0.0448	2.0581	0.0054	1.0000	0.9990	0.0026	0.4854	2.1485	0.0056	1.0439
4539	419	0.1402	0.0003	0.0711	1.9709	0.0047	1.0000	1.1940	0.0028	0.6058	2.4317	0.0058	1.2338
4540	404	0.0855	0.0002	0.0419	2.0385	0.0051	1.0000	1.1230	0.0028	0.5509	2.3003	0.0057	1.1284
4541	435	0.1019	0.0002	0.0503	2.0267	0.0047	1.0000	1.1737	0.0027	0.5791	2.4871	0.0057	1.2272

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 1 0 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight	%FBW	%Brain	Weight	%FBW	%Brain	Weight	%FBW	%Brain	Weight	%FBW	%Brain
		g			g			g			g		
1532	431	19.5915	0.0455	9.9147	1.7589	0.0041	0.8901	0.0071	0.0000	0.0036	0.7936	0.0018	0.4016
1533	393	16.4331	0.0418	7.9383	1.3717	0.0035	0.6626	0.0113	0.0000	0.0055	0.7194	0.0018	0.3475
1534	403	18.9403	0.0470	9.0489	1.5722	0.0039	0.7511	0.0123	0.0000	0.0059	0.6445	0.0016	0.3079
1535	371	18.8221	0.0508	9.2044	1.5836	0.0043	0.7744	0.0110	0.0000	0.0054	0.6541	0.0018	0.3199
1536	379	16.7815	0.0443	8.1901	1.5234	0.0040	0.7435	0.0124	0.0000	0.0061	0.5498	0.0015	0.2683
1537	419	17.2751	0.0413	8.6341	1.5065	0.0036	0.7529	0.0131	0.0000	0.0065	0.7201	0.0017	0.3599
1538	401	20.2858	0.0506	9.9606	1.4395	0.0036	0.7068	0.0193	0.0000	0.0095	0.8315	0.0021	0.4083
1539	394	17.2750	0.0438	8.5456	1.7060	0.0043	0.8439	0.0123	0.0000	0.0061	0.7912	0.0020	0.3914
1540	416	18.0116	0.0433	8.9525	1.5914	0.0038	0.7910	0.0153	0.0000	0.0076	0.7440	0.0018	0.3698
1541	421	17.2992	0.0411	8.0096	2.0762	0.0049	0.9613	0.0119	0.0000	0.0055	0.6616	0.0016	0.3063

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 2 100 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight	%FBW	%Brain	Weight	%FBW	%Brain	Weight	%FBW	%Brain	Weight	%FBW	%Brain
		g			g			g			g		
2532	398	17.3406	0.0436	8.5124	1.5808	0.0040	0.7760	0.0072	0.0000	0.0035	0.6721	0.0017	0.3299
2533	415	16.6999	0.0403	8.6300	1.5139	0.0036	0.7823	0.0099	0.0000	0.0051	0.8248	0.0020	0.4262
2534	410	17.4088	0.0425	8.4834	1.5056	0.0037	0.7337	0.0140	0.0000	0.0068	0.8258	0.0020	0.4024
2535x NP	278	13.8793	0.0500	6.7415	1.6462	0.0059	0.7996	0.0148	0.0001	0.0072	0.7016	0.0025	0.3408
2536	374	15.0764	0.0403	7.6282	1.5174	0.0041	0.7678	0.0114	0.0000	0.0058	0.5037	0.0013	0.2549
2537	414	17.4354	0.0421	8.1592	1.3695	0.0033	0.6409	0.0105	0.0000	0.0049	0.8072	0.0020	0.3777
2538	406	17.8739	0.0441	9.1544	1.6597	0.0041	0.8500	0.0156	0.0000	0.0080	0.5649	0.0014	0.2893
2539	403	19.0292	0.0472	9.4673	1.6225	0.0040	0.8072	0.0112	0.0000	0.0056	0.8079	0.0020	0.4019
2540	426	18.6830	0.0438	9.3673	2.0277	0.0048	1.0166	0.0165	0.0000	0.0083	0.8766	0.0021	0.4395
2541	401	18.0064	0.0449	8.7312	1.7113	0.0043	0.8298	0.0124	0.0000	0.0060	0.5936	0.0015	0.2878

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

NP=NOT PREGNANT x=EXCLUDED FROM MEAN

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 3 1000 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
3532	386	16.2025	0.0419	8.2928	1.5314	0.0040	0.7838	0.0132	0.0000	0.0068	0.6290	0.0016	0.3219
3533	427	17.7216	0.0415	9.3125	1.8433	0.0043	0.9686	0.0095	0.0000	0.0050	0.7374	0.0017	0.3875
3534	453	18.6918	0.0412	8.9726	1.5277	0.0034	0.7333	0.0158	0.0000	0.0076	0.6528	0.0014	0.3134
3535	389	18.3339	0.0472	8.7975	1.5012	0.0039	0.7203	0.0186	0.0000	0.0089	0.7715	0.0020	0.3702
3536	393	16.1527	0.0411	7.7961	1.5140	0.0039	0.7307	0.0146	0.0000	0.0070	0.8251	0.0021	0.3982
3537	394	17.1157	0.0434	8.1577	1.6332	0.0041	0.7784	0.0165	0.0000	0.0079	0.7836	0.0020	0.3735
3538	386	16.7330	0.0433	8.3913	1.6567	0.0043	0.8308	0.0138	0.0000	0.0069	0.6901	0.0018	0.3461
3539	339	15.3748	0.0453	7.2922	1.6702	0.0049	0.7922	0.0153	0.0000	0.0073	0.6154	0.0018	0.2919
3540	444	19.3410	0.0436	9.1620	1.6330	0.0037	0.7736	0.0142	0.0000	0.0067	0.9395	0.0021	0.4450
3541	428	18.2318	0.0426	8.5748	1.6561	0.0039	0.7789	0.0111	0.0000	0.0052	0.8177	0.0019	0.3846

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 4 10000 PPM

Animal Number	FINAL BODY WEIGHT g	LIVER			LUNGS			PITUITARY			SPLEEN		
		Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain	Weight g	%FBW	%Brain
4532	405	21.6458	0.0535	11.2962	1.5775	0.0039	0.8232	0.0154	0.0000	0.0080	0.7602	0.0019	0.3967
4533	425	17.1226	0.0403	8.7781	1.6551	0.0039	0.8485	0.0100	0.0000	0.0051	0.7162	0.0017	0.3672
4534	385	14.7968	0.0384	7.6037	1.4185	0.0037	0.7289	EX			0.5773	0.0015	0.2967
4535	350	15.5379	0.0444	7.7019	1.4368	0.0041	0.7122	0.0110	0.0000	0.0055	0.6578	0.0019	0.3261
4536	344	14.9205	0.0434	7.7053	1.3580	0.0039	0.7013	0.0128	0.0000	0.0066	0.7305	0.0021	0.3772
4537	397	17.4798	0.0440	8.6852	1.6712	0.0042	0.8304	0.0120	0.0000	0.0060	0.7512	0.0019	0.3732
4538	381	16.6520	0.0437	8.0910	1.6765	0.0044	0.8146	0.0130	0.0000	0.0063	0.8610	0.0023	0.4183
4539	419	18.4855	0.0441	9.3792	1.8562	0.0044	0.9418	0.0147	0.0000	0.0075	0.8491	0.0020	0.4308
4540	404	15.4364	0.0382	7.5724	1.7853	0.0044	0.8758	0.0210	0.0001	0.0103	0.7240	0.0018	0.3552
4541	435	18.3718	0.0423	9.0649	1.6199	0.0037	0.7993	0.0135	0.0000	0.0067	0.8537	0.0020	0.4212

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

EX = Excluded

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ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 1 0 PPM

THYMUS				
Animal Number	FINAL BODY WEIGHT g	Weight g	%FBW	%Brain
1532	431	0.4674	0.0011	0.2365
1533	393	0.4575	0.0012	0.2210
1534	403	0.5417	0.0013	0.2588
1535	371	0.4565	0.0012	0.2232
1536	379	0.4680	0.0012	0.2284
1537	419	0.3747	0.0009	0.1873
1538	401	0.5375	0.0013	0.2639
1539	394	0.5593	0.0014	0.2767
1540	416	0.5088	0.0012	0.2529
1541	421	0.5445	0.0013	0.2521

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 2 100 PPM

----- THYMUS -----				
Animal Number	FINAL BODY WEIGHT g	Weight g	%FBW	%Brain
2532	398	0.4412	0.0011	0.2166
2533	415	0.4272	0.0010	0.2208
2534	410	0.3072	0.0007	0.1497
2535x NP	278	0.6962	0.0025	0.3382
2536	374	0.3492	0.0009	0.1767
2537	414	0.2901	0.0007	0.1358
2538	406	0.4281	0.0011	0.2193
2539	403	0.5484	0.0014	0.2728
2540	426	0.4490	0.0011	0.2251
2541	401	0.3797	0.0009	0.1841

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

NP=NOT PREGNANT X=EXCLUDED FROM MEAN

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 3 1000 PPM

THYMUS				

Animal	FINAL BODY	-----		
Number	WEIGHT	Weight	%FBW	%Brain
	g	g		

3532	386	0.6148	0.0016	0.3147
3533	427	0.5627	0.0013	0.2957
3534	453	0.5756	0.0013	0.2763
3535	389	0.5100	0.0013	0.2447
3536	393	0.5064	0.0013	0.2444
3537	394	0.3911	0.0010	0.1864
3538	386	0.4955	0.0013	0.2485
3539	339	0.5485	0.0016	0.2601
3540	444	0.3866	0.0009	0.1831
3541	428	0.3162	0.0007	0.1487

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

ORGAN AND FINAL BODY WEIGHTS

FEMALES GROUP 4 10000 PPM

THYMUS				

Animal	FINAL BODY	-----		
Number	WEIGHT	Weight	%FBW	%Brain
	g	g		

4532	405	0.3820	0.0009	0.1994
4533	425	0.4960	0.0012	0.2543
4534	385	0.3755	0.0010	0.1930
4535	350	0.3836	0.0011	0.1901
4536	344	0.7928	0.0023	0.4094
4537	397	0.4790	0.0012	0.2380
4538	381	0.6191	0.0016	0.3008
4539	419	0.5016	0.0012	0.2545
4540	404	0.5814	0.0014	0.2852
4541	435	0.3439	0.0008	0.1697

%FBW = ORGAN WEIGHT/BODY WEIGHT %Brain = ORGAN WEIGHT/BRAIN WEIGHT				

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 1 0 PPM

ANIMAL#	ORGAN	OBSERVATION
1032		NO REMARKABLE OBSERVATIONS
1033		NO REMARKABLE OBSERVATIONS
1034		NO REMARKABLE OBSERVATIONS
1035		NO REMARKABLE OBSERVATIONS
1036		NO REMARKABLE OBSERVATIONS
1037	KIDNEY	CYSTIC KIDNEY; SLIGHT; RIGHT CLEAR FLUID
1038		NO REMARKABLE OBSERVATIONS
1039		NO REMARKABLE OBSERVATIONS
1040		NO REMARKABLE OBSERVATIONS
1041		NO REMARKABLE OBSERVATIONS

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 2 100 PPM

ANIMAL#	ORGAN	OBSERVATION
2032		NO REMARKABLE OBSERVATIONS
2033		NO REMARKABLE OBSERVATIONS
2034		NO REMARKABLE OBSERVATIONS
2035	EXTERNAL EXAM	SCABS ON TOP OF HEAD EXTERNAL FINDING CONFIRMED TISSUE SAVED
	EXTERNAL EXAM	ALOPECIA GENERAL EXTERNAL FINDING NOT CONFIRMED
2036		NO REMARKABLE OBSERVATIONS
2037		NO REMARKABLE OBSERVATIONS
2038		NO REMARKABLE OBSERVATIONS
2039	KIDNEY	DILATED RENAL PELVIS; MODERATE; RIGHT
2040		NO REMARKABLE OBSERVATIONS

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TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 3 1000 PPM

ANIMAL#	ORGAN	OBSERVATION
3032		NO REMARKABLE OBSERVATIONS
3033		NO REMARKABLE OBSERVATIONS
3034		NO REMARKABLE OBSERVATIONS
3035		NO REMARKABLE OBSERVATIONS
3036		NO REMARKABLE OBSERVATIONS
3037		NO REMARKABLE OBSERVATIONS
3038		NO REMARKABLE OBSERVATIONS
3039		NO REMARKABLE OBSERVATIONS
3040		NO REMARKABLE OBSERVATIONS
3041	GROSS EXAM	CONGENITAL ANOMALY ENLARGED THORACIC VERTEBRAL ARCH - 2ND, 0.7CM.

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APPENDIX H

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURE

INDIVIDUAL NECROPSY OBSERVATIONS

GROUP 4 10000 PPM

ANIMAL#	ORGAN	OBSERVATION
4032		NO REMARKABLE OBSERVATIONS
4033		NO REMARKABLE OBSERVATIONS
4034		NO REMARKABLE OBSERVATIONS
4035	GROSS EXAM	EXAMINATION NOT COMPLETE
4036		NO REMARKABLE OBSERVATIONS
4037		NO REMARKABLE OBSERVATIONS
4038		NO REMARKABLE OBSERVATIONS
4039		NO REMARKABLE OBSERVATIONS
4040		NO REMARKABLE OBSERVATIONS
4041		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 1 0 PPM

ANIMAL#	ORGAN	OBSERVATION
1532		NO REMARKABLE OBSERVATIONS
1533		NO REMARKABLE OBSERVATIONS
1534		NO REMARKABLE OBSERVATIONS
1535		NO REMARKABLE OBSERVATIONS
1536		NO REMARKABLE OBSERVATIONS
1537		NO REMARKABLE OBSERVATIONS
1538		NO REMARKABLE OBSERVATIONS
1539		NO REMARKABLE OBSERVATIONS
1540		NO REMARKABLE OBSERVATIONS
1541		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 2 100 PPM

ANIMAL#	ORGAN	OBSERVATION
2532		NO REMARKABLE OBSERVATIONS
2533		NO REMARKABLE OBSERVATIONS
2534		NO REMARKABLE OBSERVATIONS
2535 NP		NO REMARKABLE OBSERVATIONS
2536		NO REMARKABLE OBSERVATIONS
2537		NO REMARKABLE OBSERVATIONS
2538		NO REMARKABLE OBSERVATIONS
2539		NO REMARKABLE OBSERVATIONS
2540		NO REMARKABLE OBSERVATIONS
2541		NO REMARKABLE OBSERVATIONS

NP=NOT PREGNANT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 3 1000 PPM

ANIMAL#	ORGAN	OBSERVATION
3532		NO REMARKABLE OBSERVATIONS
3533		NO REMARKABLE OBSERVATIONS
3534	EXTERNAL EXAM	ALOPECIA-EXTREMITIES/SNOUT EXTERNAL FINDING NOT CONFIRMED
3535		NO REMARKABLE OBSERVATIONS
3536		NO REMARKABLE OBSERVATIONS
3537		NO REMARKABLE OBSERVATIONS
3538		NO REMARKABLE OBSERVATIONS
3539		NO REMARKABLE OBSERVATIONS
3540		NO REMARKABLE OBSERVATIONS
3541		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL MATERNAL NECROPSY OBSERVATIONS

GROUP 4 10000 PPM

ANIMAL#	ORGAN	OBSERVATION
4532		NO REMARKABLE OBSERVATIONS
4533	KIDNEY EXTERNAL EXAM	DILATED RENAL PELVIS; EXTREME; RIGHT NASAL DISCHARGE-RED EXTERNAL FINDINGS CONFIRMED
4534		NO REMARKABLE OBSERVATIONS
4535		NO REMARKABLE OBSERVATIONS
4536		NO REMARKABLE OBSERVATIONS
4537		NO REMARKABLE OBSERVATIONS
4538		NO REMARKABLE OBSERVATIONS
4539		NO REMARKABLE OBSERVATIONS
4540		NO REMARKABLE OBSERVATIONS
4541		NO REMARKABLE OBSERVATIONS

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 1 0 PPM

[illegible]

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APPENDIX I

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FEMALE REPRODUCTION DATA AND MEAN FETAL WEIGHTS (GRAMS)

GROUP 2 100 PPM

ANIMAL#	CORPORA LUTEA	%PREIMPL. LOSS	IMPLANT SITES	FETUSES			RESORPTIONS				SEX		AVERAGE FETAL BODY WEIGHT		
				LIVE	DEAD		EARLY	LATE	TOTAL		MALE	FEMALE	MALES	FEMALES	LITTER
				(n)		%			(n)	%					
2532	14	0.0	14	14	0	0.0	0	0	0	0.0	7	7	3.8	3.9	3.9
2533	15	6.7	14	14	0	0.0	0	0	0	0.0	6	8	4.2	4.0	4.1
2534	16	0.0	16	16	0	0.0	0	0	0	0.0	9	7	4.2	3.8	4.0
2535	NP														
2536	12	0.0	12	12	0	0.0	0	0	0	0.0	5	7	4.2	4.1	4.2
2537	18	16.7	15	15	0	0.0	0	0	0	0.0	7	8	3.9	3.7	3.8
2538	18	0.0	18	17	0	0.0	1	0	1	5.6	11	6	4.2	4.1	4.2
2539	12	0.0	12	12	0	0.0	0	0	0	0.0	6	6	4.5	4.4	4.5
2540	17	5.9	16	16	0	0.0	0	0	0	0.0	6	10	4.3	4.1	4.2
2541	11	18.2	9	9	0	0.0	0	0	0	0.0	5	4	4.6	4.3	4.4
MEAN	14.8	5.3	14.0	13.9	0.0	0.0	0.1	0.0	0.1	0.6	6.9	7.0	4.2	4.0	4.1
S.D.	2.68	7.40	2.69	2.52	0.00	0.00	0.33	0.00	0.33	1.85	1.96	1.66	0.24	0.23	0.23
N	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

NP=NOT PREGNANT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 3 1000 PPM

[illegible]

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 4 10000 PPM

ANIMAL#	CORPORA	%PREIMPL.	IMPLANT	FETUSES			RESORPTIONS				SEX		AVERAGE FETAL BODY WEIGHT		
	LUTEA	LOSS	SITES	LIVE	DEAD	%	EARLY	LATE	TOTAL		MALE	FEMALE	MALES	FEMALES	LITTER
				(n)					(n)	%					
4532	14	0.0	14	14	0	0.0	0	0	0	0.0	6	8	4.1	3.7	3.8
4533	15	0.0	15	14	0	0.0	1	0	1	6.7	9	5	4.4	4.0	4.3
4534	13	7.7	12	12	0	0.0	0	0	0	0.0	4	8	4.2	4.0	4.1
4535	13	0.0	13	13	0	0.0	0	0	0	0.0	8	5	4.0	3.7	3.9
4536	6	83.3	1	1	0	0.0	0	0	0	0.0	0	1	-	4.7	4.7
4537	16	6.3	15	14	0	0.0	1	0	1	6.7	13	1	4.1	3.7	4.1
4538	14	7.1	13	12	0	0.0	1	0	1	7.7	5	7	4.5	4.1	4.3
4539	15	0.0	15	15	0	0.0	0	0	0	0.0	9	6	4.4	4.1	4.3
4540	14	7.1	13	13	0	0.0	0	0	0	0.0	10	3	4.4	4.2	4.3
4541	17	5.9	16	15	0	0.0	1	0	1	6.3	8	7	4.5	4.3	4.4
MEAN	13.7	11.7	12.7	12.3	0.0	0.0	0.4	0.0	0.4	2.7	7.2	5.1	4.3	4.0	4.2
S.D.	2.98	25.39	4.30	4.11	0.00	0.00	0.52	0.00	0.52	3.54	3.61	2.64	0.20	0.31	0.25
N	10	10	10	10	10	10	10	10	10	10	10	10	9	10	10

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 1 0 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
1532	85	345	65	150
1533	92	301	24	116
1534	88	315	32	120
1535	76	295	41	117
1536	97	282	33	129
1537	94	325	26	119
1538	57	343	70	127
1539	81	313	42	123
1540	91	325	42	133
1541	92	329	47	139
MEAN	85.	317.	42.	127.
S.D.	11.6	20.3	15.2	10.8
N	10	10	10	10

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 2 100 PPM INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
2532	84	313	42	126
2533	90	325	51	141
2534	97	313	29	127
2535x NP	2	276	35	37
2536	76	298	47	122
2537	89	325	31	119
2538	107	298	27	135
2539	81	322	50	132
2540	100	326	46	146
2541	62	338	50	113
MEAN	87.	318.	42.	129.
S.D.	13.6	13.4	9.7	10.6
N	9	9	9	9

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

NP=NOT PREGNANT

X=EXCLUDED FROM MEAN

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 3 1000 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
3532	75	311	52	127
3533	89	338	53	142
3534	101	352	56	157
3535	73	316	60	133
3536	88	305	40	128
3537	86	308	39	125
3538	83	303	41	124
3539	33	306	43	76
3540	91	353	60	151
3541	103	325	36	139
MEAN	82.	322.	48.	130.
S.D.	19.7	19.4	9.3	22.0
N	10	10	10	10

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL GRAVID UTERINE WEIGHT AND NET BODY WEIGHT CHANGE (GRAMS)

GROUP 4 10000 PPM

ANIMAL#	UTERUS WEIGHT	ADJUSTED WEIGHT	NET WEIGHT CHANGE FROM DAY 6	WEIGHT CHANGE FROM DAY 6
4532	85	320	41	125
4533	94	332	45	138
4534	74	311	37	111
4535	79	271	22	101
4536	10	334	66	76
4537	89	309	43	132
4538	78	304	50	128
4539	99	320	42	142
4540	87	317	44	130
4541	100	334	46	147
MEAN	79.	315.	44.	123.
S.D.	25.9	18.9	10.9	21.4
N	10	10	10	10

ADJUSTED WEIGHT = TERMINAL BODY WEIGHT MINUS GRAVID UTERINE WEIGHT

NET WEIGHT CHANGE FROM DAY 6 = TERMINAL CORRECTED BODY WEIGHT MINUS DAY 6 BODY WEIGHT

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APPENDIX K

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 1		0 PPM																			INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																		
FEMALE#	MEAN	FETUS#																																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19																			
1532	4.5	4.5	4.9	4.8	4.6/	4.8	4.6	4.5	4.2	4.6	4.5	4.2	4.1																										
1533	3.8	3.4	3.8	3.3	4.0	4.1/	3.8	3.7	3.5	4.0	3.8	4.1	3.9	4.1	4.0	3.6	3.3																						
1534	3.9	4.1	3.9	4.1	3.9	3.7	3.7/	4.1	4.1	3.8	3.9	4.0	4.0	3.6	3.9																								
1535	3.8	3.8	3.9	4.1	3.9	3.8	3.6/	3.8	E	3.8	4.0	E	E	4.1	3.5	3.7																							
1536	4.2	4.5	4.1	4.2	3.8	4.1	4.1	4.4	4.1	4.3	4.3/	4.6	4.2	4.0	4.1	4.2																							
1537	3.5	3.3	3.4	3.7	3.5	3.5	3.5	3.5	3.3	3.8	3.4/	3.7	3.4	3.6	3.5	3.6	2.7	3.4																					
1538	4.6	4.7	4.9	4.7/	4.4	4.5	4.6	4.4	4.1																														
1539	4.3	4.2	4.3	4.6	4.3	4.2	4.0	4.2/	4.6	E	4.3	4.5	4.3	E	3.9																								
1540	4.3	4.0	4.6	4.5	4.5	4.3	4.1	4.3/	3.9	4.8	4.5	4.2	4.1	4.3	4.2																								
1541	4.3	4.2	4.5	4.5	4.7	4.3	3.7	4.4	4.3/	4.8	4.2	4.3	4.6	3.9	4.2																								
MEAN	4.1																																						
S.D.	0.36																																						
N	10																																						

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

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APPENDIX K

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 2		100 PPM																		
		INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																		
FEMALE#	MEAN	FETUS#																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2532	3.9	3.6	3.9	3.9	3.9	3.8	4.1	3.7	3.9/	4.0	3.9	3.9	3.7	3.9	4.0					
2533	4.1	3.7	4.4	4.4	4.2	4.4	4.7/	4.6	3.9	4.0	4.0	3.6	4.0	4.2	3.3					
2534	4.0	4.2	4.4	4.0	4.3	3.9	3.8	4.3/	3.8	4.3	4.1	3.8	3.8	4.0	3.5	4.1	3.8			
2535	NP																			
2536	4.2	3.8	4.0	4.8	4.0	4.1/	4.2	4.0	4.3	4.5	3.9	4.0	4.3							
2537	3.8	3.5	4.0	3.7	3.8	3.7	3.9	3.7	3.7	3.7	3.9	3.9/	3.8	4.0	3.9	3.5				
2538	4.2	4.0	4.3	4.3	4.2	4.1	4.4	3.5	E	4.0	4.1	4.2/	4.5	4.6	4.0	4.2	4.2	4.2	4.2	
2539	4.5	4.5	4.6	4.5	4.1	4.5	4.5/	4.5	4.4	4.7	4.3	4.5	4.4							
2540	4.2	4.1	3.6	4.2	4.1	4.2	4.3	4.1/	4.4	4.2	4.4	4.1	4.1	4.1	4.2	4.2	4.1			
2541	4.4	4.4	4.4	4.0	4.4	4.6	4.7	4.6	4.5/	4.3										
MEAN	4.1																			
S.D.	0.23																			
N	9																			

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

NP=NOT PREGNANT

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APPENDIX K

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 3		1000 PPM																			INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																		
FEMALE#	MEAN	FETUS#																																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19																			
3532	4.2	4.3	4.0	4.1	4.2	4.2	4.5	3.9	4.3/	4.4	4.2	4.1	4.4																										
3533	4.1	4.0	4.0	4.3	4.1	4.2	4.4	3.8	4.4	4.3/	3.8	4.0	E	4.1	4.1	3.6																							
3534	4.0	3.8	3.8	3.9	4.3	3.8	4.1	4.0/	4.5	4.3	4.0	E	E	3.6	4.0	4.0	3.9	4.0	4.1																				
3535	3.8	3.8	3.7	4.0	4.0	4.2/	3.8	3.8	4.2	3.9	3.5	3.7	3.7																										
3536	4.3	4.1	4.2	4.3	4.4	4.3/	4.6	4.4	4.6	4.3	4.1	4.5	4.1	4.7																									
3537	4.4	4.2	4.3	4.3	4.7	4.4	4.6/	4.7	4.1	4.2	4.3	4.5	4.1																										
3538	3.8	3.9	3.8	4.0	3.7	3.5	3.8	3.7	3.4	4.0/	3.7	3.9	3.5	3.8	3.9																								
3539	4.0	4.4	3.7	4.6	E	4.2	E	3.3/	E	E																													
3540	4.3	4.0	4.4	4.4	4.4	4.1	4.3	3.9	4.2/	4.7	4.4	4.7	4.2	4.3	3.9																								
3541	4.2	4.5	4.2	3.9	4.3	3.9	4.5	4.5/	4.2	4.0	4.0	4.2	4.2	4.2	4.2	4.5	4.1																						
MEAN	4.1																																						
S.D.	0.20																																						
N	10																																						

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

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APPENDIX K

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 4		10000 PPM																	
FEMALE#	MEAN	INDIVIDUAL FETAL BODY WEIGHTS (GRAMS)																	
		FETUS#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4532	3.8	3.4	4.1	4.1	4.4	3.6	3.7/	4.0	3.7	4.0	4.0	4.0	4.0	2.9	3.8	4.0			
4533	4.3	4.6	4.1	4.4	4.6	4.4	4.0	4.6	4.3	4.0/	4.2	4.2	4.2	4.2	3.7	E	4.3		
4534	4.1	4.1	4.3	3.9	3.5	4.2	4.0	4.2	4.3/	4.0	4.2	4.4	3.7						
4535	3.9	3.7	3.7	3.9	4.0	3.9	4.0	3.8	3.7	4.3/	3.7	4.1	4.1	3.5					
4536	4.7 /	4.7																	
4537	4.1	3.9	4.2	4.1	E	4.0	4.3	3.7	4.0	4.2	4.1	4.0/	4.2	4.5	4.2	4.2			
4538	4.3	4.1	4.2	4.5	4.8	4.5	4.3	4.0	4.0	4.1	3.3/	4.6	4.6	E					
4539	4.3	4.4	4.1	4.3	4.1	4.2	4.5	4.4	4.4/	4.5	4.7	4.3	4.3	4.4	4.3	3.4			
4540	4.3	4.4	4.7	4.9	4.4/	4.7	4.1	4.2	4.2	4.3	4.1	4.4	3.7	4.2					
4541	4.4	4.4	5.0	E	4.4	4.1	4.5	4.1	4.5/	4.3	4.5	4.3	4.6	4.4	4.4	4.3	4.4		
MEAN	4.2																		
S.D.	0.25																		
N	10																		

A-Alive E-Early resorption L-Late resorption B-Abortion site I-Implantation site D-Dead fetus P-Delivered fetus
/-Denotes position of cervix

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1532	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
1533	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
1534	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1534	(CONTINUED)		
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1535	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
1536	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

GROUP 1		0 PPM		INDIVIDUAL FETAL EXTERNAL OBSERVATIONS	
FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION	

1536 (CONTINUED)					
	11 F			WITHIN NORMAL LIMITS	
	12 F			WITHIN NORMAL LIMITS	
	13 M			WITHIN NORMAL LIMITS	
	14 F			WITHIN NORMAL LIMITS	
	15 F			WITHIN NORMAL LIMITS	
1537					
	1 M			WITHIN NORMAL LIMITS	
	2 F			WITHIN NORMAL LIMITS	
	3 M			WITHIN NORMAL LIMITS	
	4 M			WITHIN NORMAL LIMITS	
	5 F			WITHIN NORMAL LIMITS	
	6 F			WITHIN NORMAL LIMITS	
	7 M			WITHIN NORMAL LIMITS	
	8 F			WITHIN NORMAL LIMITS	
	9 M			WITHIN NORMAL LIMITS	
	10 M			WITHIN NORMAL LIMITS	
	11 F			WITHIN NORMAL LIMITS	
	12 F			WITHIN NORMAL LIMITS	
	13 F			WITHIN NORMAL LIMITS	
	14 F			WITHIN NORMAL LIMITS	
	15 F			WITHIN NORMAL LIMITS	
	16 F			WITHIN NORMAL LIMITS	
	17 F			WITHIN NORMAL LIMITS	
1538					
	1 F			WITHIN NORMAL LIMITS	
	2 M			WITHIN NORMAL LIMITS	
	3 F			WITHIN NORMAL LIMITS	
	4 F			WITHIN NORMAL LIMITS	
	5 M			WITHIN NORMAL LIMITS	
	6 M			WITHIN NORMAL LIMITS	
	7 F			WITHIN NORMAL LIMITS	
	8 F			WITHIN NORMAL LIMITS	

SEX CODES: M=Male, F=Female, U=Undetermined					
CLASS CODES: M=Malformation V=Variation I=Incidental					

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1539	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1540	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
1541	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS

SEX CODES: M-Male, F-Female, U-Undetermined

CLASS CODES: M-Malformation V-Variation I-Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 1 0 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
1541	(CONTINUED)		
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL PETAL EXTERNAL OBSERVATIONS

GROUP 2: 100 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2532	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
2533	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
2534	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS

SEX CODES: M-Male, F-Female, U-Undetermined

CLASS CODES: M-Malformation V-Variation I-Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 100 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2534	(CONTINUED)		
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
2536	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
2537	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURESGROUP 2 100 PPM
INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2537	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
2538	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	17 M		WITHIN NORMAL LIMITS
	18 M		WITHIN NORMAL LIMITS
2539	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 2 100 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
2539	(CONTINUED)		
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
2540	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS
2541	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3532	1 M		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
3533	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
3534	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS

SEX CODES: M-Male, F-Female, U-Undetermined

CLASS CODES: M-Malformation V-Variation I-Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3534	(CONTINUED)		
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
	16 M		WITHIN NORMAL LIMITS
	17 F		WITHIN NORMAL LIMITS
	18 F		WITHIN NORMAL LIMITS
3535	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F E		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
3536	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

FETAL STATUS CODES: E=early resorption

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3536	(CONTINUED)		
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
3537	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
3538	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3539	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	7 F	GROSS EXAM	M EDEMATOUS; EXTREME WHOLE BODY
3540	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
3541	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation Y=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 3 1000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
3541	(CONTINUED)		
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4532	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
4533	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 F		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4534	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined
CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURES

INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

GROUP 4 10000 PPM

FEMALE#	FETUS#/SEX	ORGAN	CLASS	OBSERVATION
4534	(CONTINUED)			
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 F			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 F			WITHIN NORMAL LIMITS
4535	1 F			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	4 M			WITHIN NORMAL LIMITS
	5 F			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 M			WITHIN NORMAL LIMITS
	8 F			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 F			WITHIN NORMAL LIMITS
	11 M			WITHIN NORMAL LIMITS
	12 M			WITHIN NORMAL LIMITS
	13 F			WITHIN NORMAL LIMITS
4536	1 F			WITHIN NORMAL LIMITS
4537	1 M			WITHIN NORMAL LIMITS
	2 M			WITHIN NORMAL LIMITS
	3 M			WITHIN NORMAL LIMITS
	5 M			WITHIN NORMAL LIMITS
	6 M			WITHIN NORMAL LIMITS
	7 F			WITHIN NORMAL LIMITS
	8 M			WITHIN NORMAL LIMITS
	9 M			WITHIN NORMAL LIMITS
	10 M			WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURESGROUP 4 10000 PPM
INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4537	(CONTINUED)		
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 M		WITHIN NORMAL LIMITS
4538	1 F		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 F		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
4539	1 F		WITHIN NORMAL LIMITS
	2 F		WITHIN NORMAL LIMITS
	3 F		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 M		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 F		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

18-MAR-2009 18:00

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APPENDIX L

LIQUIFIED PETROLEUM GAS: A 2-WEEK RANGE-FINDING INHALATION
TOXICITY STUDY IN THE RAT VIA WHOLE-BODY EXPOSURESGROUP 4 10000 PPM
INDIVIDUAL FETAL EXTERNAL OBSERVATIONS

FEMALE#	FETUS#/SEX	ORGAN	CLASS OBSERVATION
4540	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	3 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 M		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 M		WITHIN NORMAL LIMITS
	9 M		WITHIN NORMAL LIMITS
	10 F		WITHIN NORMAL LIMITS
	11 M		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 F		WITHIN NORMAL LIMITS
4541	1 M		WITHIN NORMAL LIMITS
	2 M		WITHIN NORMAL LIMITS
	4 M		WITHIN NORMAL LIMITS
	5 F		WITHIN NORMAL LIMITS
	6 M		WITHIN NORMAL LIMITS
	7 F		WITHIN NORMAL LIMITS
	8 F		WITHIN NORMAL LIMITS
	9 F		WITHIN NORMAL LIMITS
	10 M		WITHIN NORMAL LIMITS
	11 F		WITHIN NORMAL LIMITS
	12 M		WITHIN NORMAL LIMITS
	13 M		WITHIN NORMAL LIMITS
	14 M		WITHIN NORMAL LIMITS
	15 F		WITHIN NORMAL LIMITS
	16 F		WITHIN NORMAL LIMITS

SEX CODES: M=Male, F=Female, U=Undetermined

CLASS CODES: M=Malformation V=Variation I=Incidental

	Equipment List	Appendix M

Exposure Chamber

1000-Liter glass and stainless steel chamber (Wahmann).

Compound Generator

Liquified Petroleum Gas Cylinder (Chevron).

Flowmeters

Top TrakTM Mass Flow Meter, sizes 0-100 sccm, 0 – 1 and 0 – 20 Lpm,
Model 821-1 (Sierra Instruments).

Flowmeter, size 0 – 20 and 0 - 40 Lpm (Dwyer[®]).

Pressure/Vacuum Gauges

Matheson backpressure gauge, PN 63-3142.

Union Carbide vacuum gauge, Model SG-6310.

GAST vacuum gauge, Model NA.

Regulator

MG Industries, Series 325.

Valve

Metering Valve, Model 31RS4 and 316 (Whitey).

Tubing

Teflon[®] size 1/8" and 1/4".

Plastic, size 1/4" and 1/2" (Norton, Baxter).

Stainless steel, size 1/2".

Quick-disconnect with toggle valve (REGO[®]).

Copper tubing coil, size 1/8".

Vacuum Pump

Thomas Industries Inc., Model 707CM 50.

Air Analyzer

MIRAN[®] 1A-CVF Ambient Air Analyzer (Wilks) with a Cole Parmer Strip Chart Recorder, Model 201, and a Micronta[®] LCD Benchtop Digital Multimeter No. 22-195.

Balston[®] MicrofibreTM Disposable Filter Unit, Grade DQ, was attached in-line.

	Equipment List	Appendix M

Particle Sizer

TSI Aerodynamic Particle Sizer, Model 331001 and a DELL computer, Model 486P/25, equipped with an Epson LQ-570+ Dot matrix printer, Model P630B.

Environmental Monitoring

VWR Temperature and Humidity Gauge, tested prestudy with a Traceable Big Digit Hygrometer/Thermometer.

Oxygen/Gas Analyzer, Model 1214S (Gastech).

Digital Sound Level Meter, Model 840029 (SPER Scientific).

Photometer 1 Light Meter (Quantum Instruments).

Chamber Air Flow

Dwyer® Magnehelic® gauge, calibrated prestudy with Side Trak™ III, with Digital Meter, Model 831-N2 (Sierra Instruments Inc.) and on study with a Dry Gas Meter, Model 2M (Singer)

Chamber Static Pressure

Dwyer® Magnehelic® gauge (Dwyer® Instruments Inc.); calibrated prestudy with a Dwyer® Mark II Manometer, Model 25 (Dwyer® Instruments Inc.).

Miscellaneous

Water bath.

Thermomix 1420.

Precision thermometer, range 0-260°C (ERTCO).

Precision thermometer, range 0-150°C (USA).

Syringes, size 0 – 10 and 0 - 100 mL (Precision, Hamilton).

Groups 1-3	MIRAN® Calibration	Appendix N

Methodology for Liquefied Petroleum Gas

Miran No. 05 (Groups 1-3)

Settings: The instrument settings for the unit are summarized below:

Wavelength, microns	10.9
Pathlength, dial setting	14.00
Slit width, mm	1
Range, absorbance	1A
Response, seconds	1
Gain	High
Chart speed, cm/min	1
Chart volts	1

Calibrations: The MIRAN® was turned on and allowed to warm up for approximately 10 minutes. The cell was flushed with room air for approximately one minute. The loop was closed, the unit was zeroed and the calibration series was performed as shown below. The resultant data were plotted to obtain a calibration curve. Each observer used a separate syringe for calibration.

Injection Volume (μ L)	Calculated Concentration ¹ (ppm)	Absorbance		
		Operator 1 (volts)	Operator 2 (volts)	Average (volts)
420	74.5	0.0192	0.0194	0.0193
560	99.3	0.0248	0.0264	0.0256
3000	532	0.1301	0.1299	0.1300
6000	1064	0.2603	0.2645	0.2624
7000	1241	0.297	0.305	0.3010

$$^1\text{Calculated Conc. (ppm)} = \frac{\text{Volume injected } (\mu\text{L})}{5.64\text{L}}$$

where: 5.64L = volume of MIRAN® closed-loop

Groups 1-3	MIRAN® Calibration	Appendix N

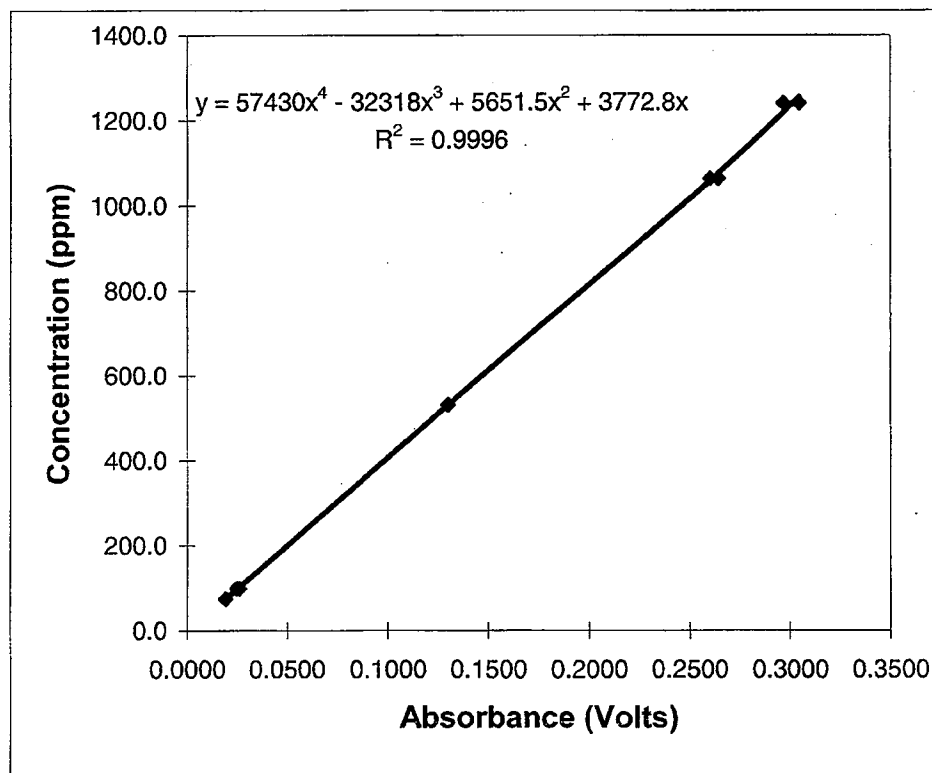
Calibration Checks: A two-point calibration check of the MIRAN® was performed prior to each exposure. The parameters are shown below:

Injection Volume (µL)	Calculated Concentration (ppm)	Expected Absorbance Reading (volts)	Acceptable Absorbance Range (volts)
560	99.3	0.0256	0.0218 – 0.0294
6000	1064	0.2624	0.2230 – 0.302

The absorbance was recorded after each injection. The absorbance was considered satisfactory if it was within 15% of the original calibration series. If the absorbance value fell outside the 15% range, the injection was rechecked as follows. The volume for the value that was out of range was reinjected twice. The closer pair of the three injections were averaged and the results were compared to the original curve. If the average of the pair was within the 15% range, the original was accepted. If the value of the average was outside the 15% range, the Study Director decided if a new graph was to be prepared.

Groups 1-3	MIRAN® Calibration	Appendix N

Calibration Curve for Liquified Petroleum Gas



Group 4	MIRAN® Calibration	Appendix N

Methodology for Liquefied Petroleum Gas

Miran No. 2225 (Group 4)

Settings: The instrument settings for the unit are summarized below:

Wavelength, microns	10.9
Pathlength, dial setting	4.65
Slit width, mm	1
Range, absorbance	1A
Response, seconds	1
Gain	High
Chart speed, cm/min	1
Chart volts	1

Calibrations: The MIRAN® was turned on and allowed to warm up for approximately 10 minutes. The cell was flushed with room air for approximately one minute. The loop was closed, the unit was zeroed and the calibration series was performed as shown below. The resultant data were plotted to obtain a calibration curve. Each observer used a separate syringe for calibration.

Injection Volume (µL)	Calculated Concentration ¹ (ppm)	Absorbance		
		Operator 1 (volts)	Operator 2 (volts)	Average (volts)
28000	4965	0.350	0.353	0.352
45000	7979	0.544	0.535	0.540
56000	9929	0.646	0.651	0.649
68000	12057	0.770	0.779	0.775

$$^1\text{Calculated Conc. (ppm)} = \frac{\text{Volume injected (}\mu\text{L)}}{5.64\text{L}}$$

where: 5.64L = volume of MIRAN® closed-loop

Group 4	MIRAN® Calibration	Appendix N

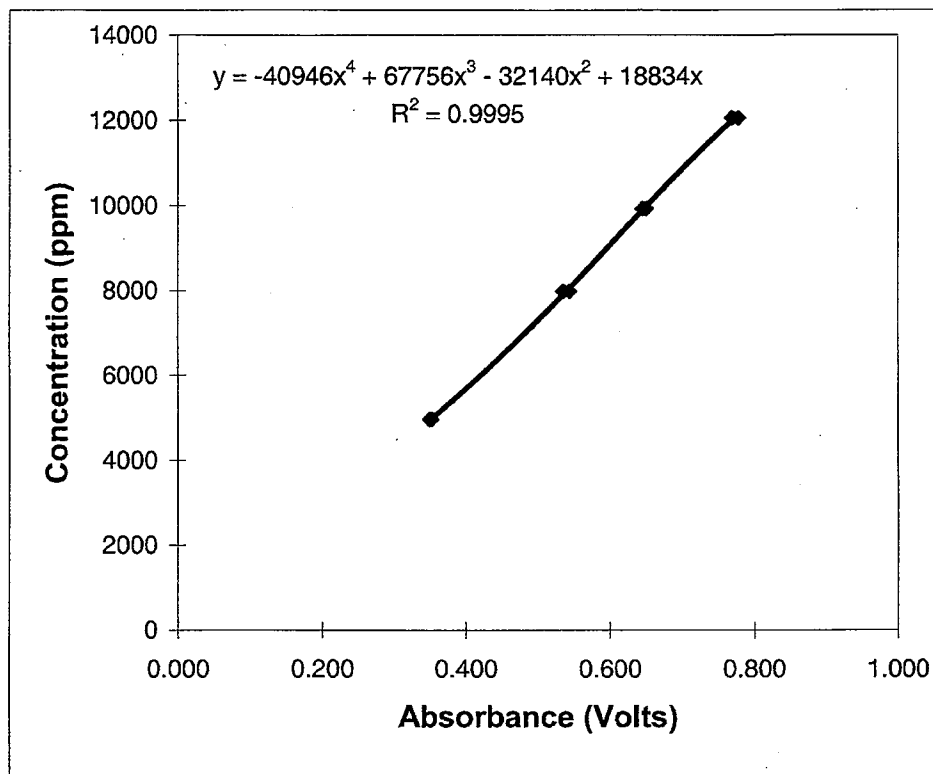
Calibration Checks: A one-point calibration check of the MIRAN® was performed prior to each exposure. The parameters are shown below:

Injection Volume (µL)	Calculated Concentration (ppm)	Expected Absorbance Reading (volts)	Acceptable Absorbance Range (volts)
56,000	9929	0.649	0.552 – 0.746

The absorbance was recorded after each injection. The absorbance was considered satisfactory if it was within 15% of the original calibration series. If the absorbance value fell outside the 15% range, the injection was rechecked as follows. The volume for the value that was out of range was reinjected twice. The closer pair of the three injections were averaged and the results were compared to the original curve. If the average of the pair was within the 15% range, the original was accepted. If the value of the average was outside the 15% range, the Study Director decided if a new graph was to be prepared.

Group 4	MIRAN® Calibration	Appendix N

Calibration Curve for Liquified Petroleum Gas



	Chamber Distribution Results (Pretest)	Appendix O

<u>Group (target)</u>	<u>Date</u>	<u>Port</u>	<u>IR Conc (ppm)</u>	<u>Ratio to H-1</u>
2 (100 ppm)	18 Oct 2004	H-1	90	1.00
		H-2	85	0.94
		H-7	88	0.98
		H-1	95	1.00
		H-8	92	0.97
3 (1000 ppm)	18 Oct 2004	H-1	1100	1.00
		H-2	1100	1.00
		H-7	1200	1.09
		H-1	900	1.00
		H-8	960	1.07
4 (10000 ppm)	15 Oct 2004	H-1	8900	1.00
		H-2	9100	1.02
	18 Oct 2004	H-1	10000	1.00
		H-2	10000	1.00
		H-1	10000	1.00
		H-7	9800	0.98
		H-8	9800	0.98

	Chamber and Exposure Room Environmental Monitoring	Appendix P

Interval	Location	Test Substance (ppm) ^a	Light (Ft Candles)	Noise (dB)	Oxygen (%)	Particle Sizing (mg/m ³) ^b
Pretest	Front Room	0	36	68.2	NM	NM
	Back Room	0	37	67.4	NM	NM
	Group 1	0	NM	NM	21	3.46 x 10 ⁻⁴
	Group 2	108	NM	NM	21	3.58 x 10 ⁻⁴
	Group 3	977	NM	NM	21	3.01 x 10 ⁻⁴
	Group 4	9830	NM	NM	21	1.04 x 10 ⁻³
Exposure 1	Front Room	0	35	67.6	NM	
	Back Room	0	35	64.0	NM	
	Group 1	0	NM	NM	21	
	Group 2	83.0	NM	NM	21	
	Group 3	1060	NM	NM	21	
	Group 4	10300	NM	NM	21	
Exposure 8	Front Room	0	33.4	66.3	NM	
	Back Room	0	34.6	62.8	NM	
	Group 1	0	NM	NM	21	
	Group 2	106	NM	NM	21	
	Group 3	938	NM	NM	21	
	Group 4	9780	NM	NM	21	
Exposure 13	Front Room	0	33.5	66.9	NM	
	Back Room	0	33.7	64.5	NM	
	Group 1	0	NM	NM	21	
	Group 2	103	NM	NM	21	
	Group 3	1120	NM	NM	21	
	Group 4	10000	NM	NM	21	

NM = Not measured

^aValues presented are the daily average for the chamber samples and a single time point for the room air samples.^bPretest results presented. For on-test results, see CMR (Appendix A).

	Analytical Report	Appendix Q

STUDY TITLE**Analytical Report For:**

**Liquified Petroleum Gas:
A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Whole-Body Exposure**

AUTHOR**REPORT DATE****9 February 2010****STUDY NUMBER****03-6140**

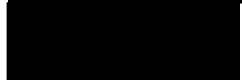
Huntingdon Life Sciences

03-6140

	Analytical Report	Appendix Q

SIGNATURES

Written by:

Formulation Chemistry Services

09 Feb 10
Date

Reviewed by:



Formulation Chemistry Services

09 Feb 10
Date

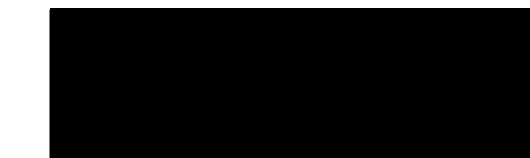
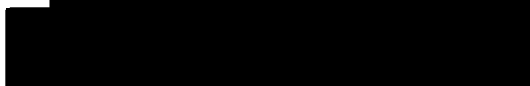
Reviewed by:



Formulation Chemistry Services

9 Feb 10
Date

Approved by:

Analytical Services

9 Feb 10
Date

	Analytical Report	Appendix Q

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	Analytical Report	Appendix Q

1. Summary

The Liquified Petroleum Gas (LPG) chamber samples were analyzed to determine the purity and stability of the test substance by comparison to the Liquid Petroleum Gas (LPG) test substance. The analytical method (HLS-012-04) was validated at Huntingdon Life Sciences (HLS). The analytical method involved gas bag sampling of the test substance and quantification using Gas Chromatography with Flame Ionization Detection (FID).

2. Experimental Procedures

The analytical method (HLS-012-04) was validated by Formulation Chemistry at HLS. Details of the analytical method is maintained in this study file.

Gas bag sampling of the test substance and the analytical standard was performed in the Inhalation Department at HLS. The test substance and the analytical standard were analyzed using a Gas Chromatograph equipped with a HP Plot Q (30 m x 0.32 mm, 20 µm) column and Flame Ionization Detector (FID) to determine the purity of LPG test substance. An HP 3396A integrator was used for data collection and Excel was used for processing the data.

Date of sample analysis is listed as follows:

Interval	Date Analyzed
Pretest/Trials	19 Oct 04
Exposure 2	21 Oct 04
Exposure 9	28 Oct 04

3. Results and Discussion

The Liquified Petroleum Gas (LPG) chambers were analyzed prior to the initiation of the study and at two intervals during the study to determine the purity and stability of the test substance. The results of the characterization of the pretest/trials and exposures are presented in Table I and Tables II-A&B, respectively. Typical chromatograms of Liquified Petroleum Gas (LPG) chamber samples (Groups 1 to 4) are presented in Figures I-IV.

	Analytical Report	Appendix Q

Table I: LPG Characterization ("Pre-Study/Trial")

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.22	6.30	85.93	1.73	4.29	99.47
LPG-2	1.21	6.42	85.99	1.81	4.25	99.68
LPG-3	1.22	6.41	86.29	1.73	4.29	99.94
Group-1A	ND	ND	<LOQ	ND	ND	0.00
Group-1B	ND	ND	<LOQ	ND	ND	0.00
Group-2A	ND	6.79	92.31	ND	ND	99.10
Group-2B	0.82	6.27	85.70	1.90	5.21	99.90
Group-3A	0.89	7.21	87.61	ND	4.29	100.00
Group-3B	1.33	6.38	85.32	1.61	4.99	99.63
Group-4A	0.86	6.15	85.91	1.95	5.14	100.01
Group-4B	0.85	6.04	85.74	2.08	5.18	99.89

LPG = Liquefied Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

	Analytical Report	Appendix Q

Table II-A: LPG Characterization ("Exposure 2")

Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.01	6.35	85.74	1.97	4.86	99.93
LPG-2	1.01	6.50	85.17	1.95	4.81	99.44
LPG-3	0.99	6.28	85.55	1.83	4.79	99.44
Group-1	ND	<LOQ	<LOQ	ND	ND	0.00
Group-2	2.29	6.52	91.20	ND	ND	100.01
Group-3	1.62	6.47	85.55	1.74	4.22	99.60
Group-4	0.83	6.35	85.35	1.94	5.09	99.56

LPG = Liquefied Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

Table II-B: LPG Characterization ("Exposure 9")

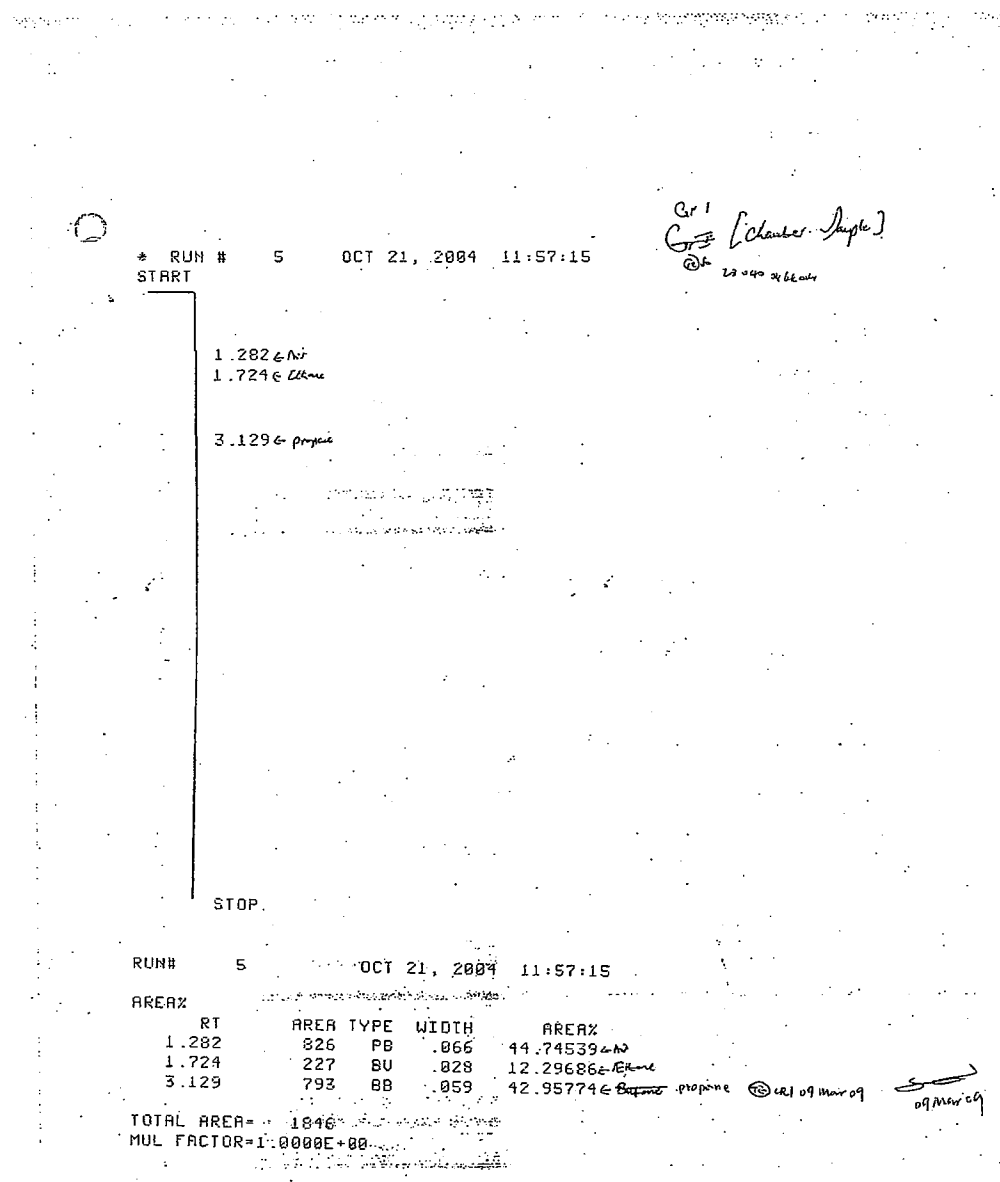
Sample ID	Area % of Ethane	Area % of Propylene	Area % of Propane	Area % of Isobutane	Area % of Butane	Total Area %
LPG-1	1.40	6.63	85.86	1.68	4.36	99.93
LPG-2	1.41	6.30	85.88	1.68	4.38	99.65
LPG-3	1.41	6.12	86.17	1.81	4.40	99.91
Group-1	<LOQ	ND	<LOQ	ND	ND	0.00
Group-2	0.95	4.72	89.84	ND	ND	95.51
Group-3	1.40	4.83	89.01	ND	4.44	99.68
Group-4	1.03	6.82	87.99	1.31	2.83	99.98

LPG = Liquefied Petroleum Gas

ND = None Detected

<LOQ = Less than the limit of quantification = Less than 25% of the area count of the component in the test substance

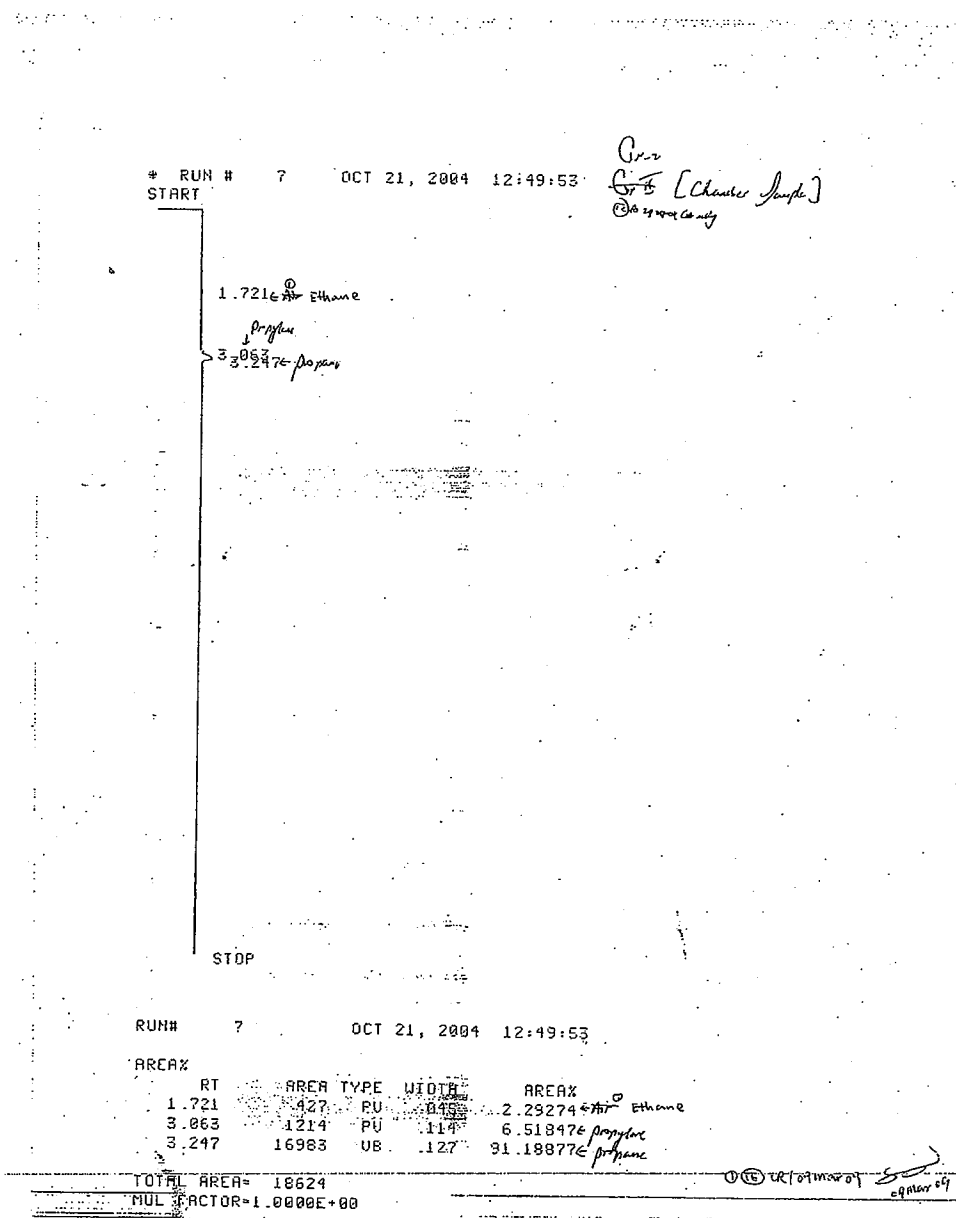
	Analytical Report	Appendix Q

Figure I. A Typical Gas Chromatogram of Group 1 (Air Control) Chamber Sample

Response (mV) vs Time (minutes)

	Analytical Report	Appendix Q

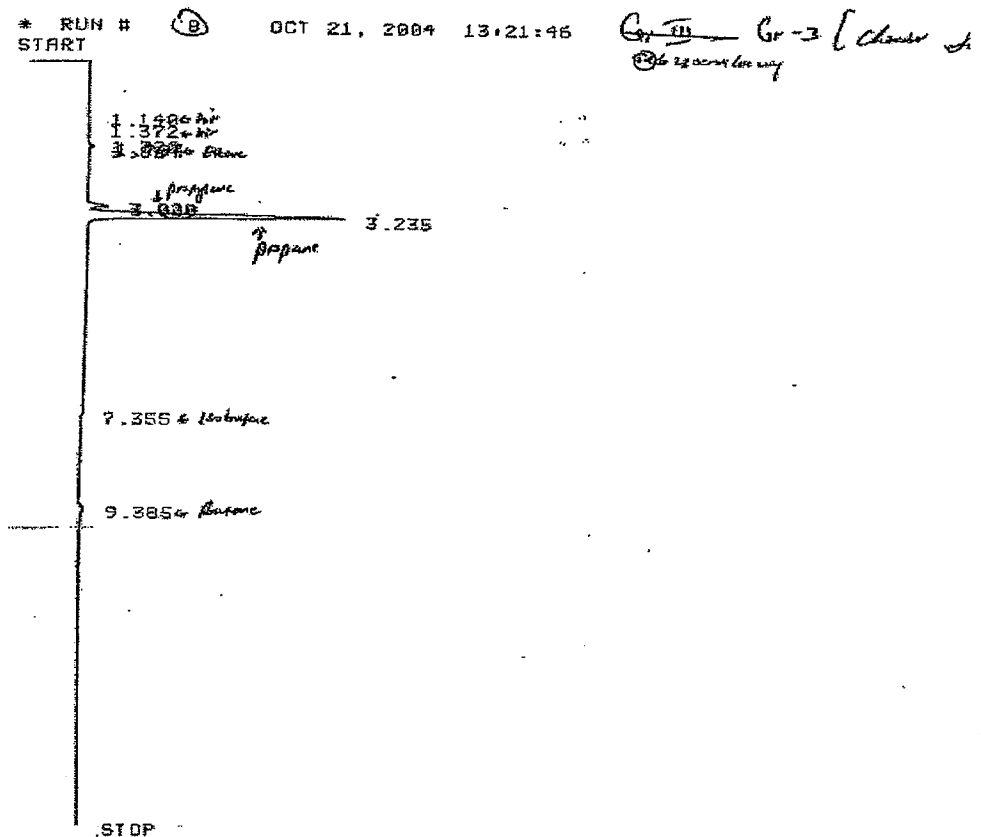
Figure II. A Typical Gas Chromatogram of Group 2 (LPG) Chamber Sample



Response (mV) vs Time (minutes)

	Analytical Report	Appendix Q

Figure III. A Typical Gas Chromatogram of Group 3 (LPG) Chamber Sample



RUN# 8 OCT 21, 2004 13:21:46

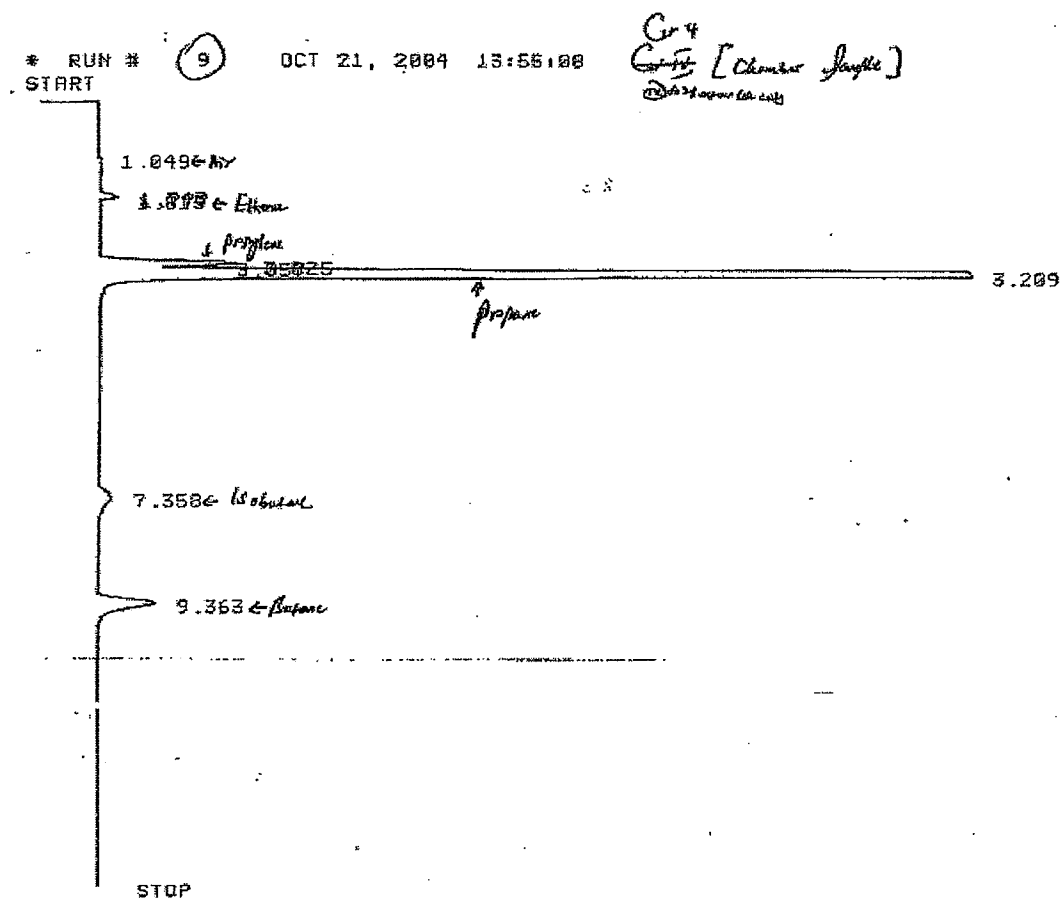
AREA#	RT	AREA	TYPE	WIDTH	AREAX
	1.140	166	PD	.016	.068558
	1.372	792	PU	.103	.32718
	1.720	942	PU	.036	.3478
	1.767	1686	UU	.034	.69658
	1.794	1107	UU	.021	.45731
	1.824	278	US	.018	.11484
	3.020	8431	PU	.047	3.48291
	3.040	7244	UU	.038	2.99255
	3.235	207083	UB	.091	85.54745
	7.355	4217	BU	.364	1.74207
	9.385	10222	BB	.208	4.22278

TOTAL AREA= 242068
MUL FACTOR=1.0000E+00

Response (mV) vs Time (minutes)

	Analytical Report	Appendix Q

Figure IV. A Typical Gas Chromatogram of Group 4 (LPG) Chamber Sample



RUN# 9 OCT 21, 2004 13:55:08

AREAX

RT	AREA	TYPE	WIDTH	AREAX
1.049	194	SB	.018	.000766 Air
1.745	8994	UU	.059	.406112
1.777	6466	UU	.038	.29196 Ethane: 0.23
1.815	2798	UB	.020	.12634
3.025	112362	PU	.091	5.07548 Propane: 4.35
3.057	28285	UU	.028	1.27715
3.209	1890284	UB	.124	85.35210 Propane
7.358	43014	PU	.355	1.94221 Isobutane
9.363	112773	PB	.222	5.09204 Butane
27.056	9520	UU	.840	.42986

TOTAL AREA=2214690
MUL FACTOR=1.0000E+00

Response (mV) vs Time (minutes)

ChevronTexaco Energy Research
& Technology Company
Integrated Lab Technologies
100 Chevron Way
P.O.Box 1627
Richmond, CA 94802-0627
Tel 510-242-4993



July 23, 2003

ChevronTexaco



American Petroleum Institute
1220 L Street, Northwest
Washington, DC 20005-4070

Dear :

Enclosed are the analytical results for each of the five 100 gallon cylinders of liquefied petroleum gas that have been prepared for HPV light gases task group and are being stored at our facility. I have included individual analyses of each of the tanks plus two duplicates. Additionally since the five cylinders were filled from the same truck, should theoretically have the same composition, and in fact calculate to have very similar compositions, I summed the chromatographic signals of all seven analyses and calculated the average results for the LPG based on the summed signal. This technique reduces signal to noise and provides a more precise measurement of the smaller concentration constituents.

Liquid samples were injected at 100 psig using a liquid sampling loop. The coefficient of variation of the seven total sample areas was 12.8%, and the average total sample area had a 95% confidence limit of +/- 11.8 %, reflecting the difficulty of injecting truly repeatable amounts of such a volatile material.

Results were quantified by normalizing the total area counts to the average area counts for all seven analyses and then calculating the concentration of ethane, n-butane, isobutene, and isopentane by comparing peak areas with the average areas of a certified LPG master standard from Scott Specialty gases, run in triplicate. The concentrations of all other compounds heavier than propane were determined by applying weight response factors and ratioing adjusted peak areas to the n-butane adjusted peak area. The concentration of methane was treated similarly but ratioed to ethane. We were unfortunately unable to separate propane and propylene, given the high concentration of the propane. The two compounds were quantified by difference from 100.0 percent to account for detector overload, and were reported as a sum.

Neither benzene nor 1,3-butadiene were detected in any of the samples. The instrument detection limit for 1,3-butadiene was <10 ppm for all samples except LPG1 duplicate. In that sample the baseline was noisier than usual in the region where 1,3-butadiene elutes, necessitating an instrument detection limit of <20 ppm.

July 22, 2003
Page 2

ChevronTexaco

If you have any questions concerning this report please feel free to contact me.

Sincerely,

A solid black rectangular box used to redact a signature.A solid black rectangular box used to redact a signature.

Sample Name: LPG 1, tank V64452

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.015	0.025
ethane	2.048	1.947	2.262
propane + propylene	93.263	92.176	92.688
n-butane	2.857	3.607	3.167
n-pentane	0.068	0.079	0.061
isoparaffins			
isobutane	1.264	1.538	1.301
neopentane	0.003	0.004	0.003
isopentane	0.392	0.523	0.396
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.036	0.045	0.042
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.011	0.010
c-2-butene	0.009	0.010	0.010
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.011	0.012	0.010
2-methyl-1-butene	0.004	0.005	0.004
t-2-pentene	0.006	0.007	0.006
c-2-pentene	0.004	0.005	0.004
2-methyl-2-butene	0.010	0.011	0.009
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: LPG 1, tank V64452, duplicate injection

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.007	0.009	0.014
ethane	1.652	1.647	1.915
propane + propylene	93.647	92.178	92.778
n-butane	2.867	3.794	3.335
n-pentane	0.062	0.076	0.058
isoparaffins			
isobutane	1.262	1.610	1.363
neopentane	0.002	0.003	0.002
isopentane	0.393	0.549	0.416
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.040	0.051	0.048
1,3-butadiene	nd<0.002	nd<0.002	nd<0.002
t-2-butene	0.008	0.010	0.010
c-2-butene	0.009	0.011	0.011
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.019	0.023	0.018
2-methyl-1-butene	0.010	0.011	0.009
t-2-pentene	0.012	0.014	0.011
c-2-pentene	0.002	0.002	0.002
2-methyl-2-butene	0.006	0.007	0.006
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EO 7/23/03

Sample Name: LPG 2, tank V641461

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.014	0.016	0.026
ethane	2.175	1.914	2.223
propane + propylene	92.887	92.362	92.856
n-butane	2.999	3.503	3.075
n-pentane	0.066	0.071	0.054
isoparaffins			
isobutane	1.358	1.529	1.293
neopentane	0.002	0.002	0.001
isopentane	0.404	0.499	0.377
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.042	0.047	0.044
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.008	0.008
c-2-butene	0.011	0.012	0.011
3-methyl-1-butene	0.003	0.003	0.003
1-pentene	0.010	0.011	0.009
2-methyl-1-butene	0.006	0.007	0.005
t-2-pentene	0.005	0.005	0.004
c-2-pentene	0.003	0.003	0.003
2-methyl-2-butene	0.007	0.007	0.006
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: LPG 3, tank V641455

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.020	0.027	0.044
ethane	2.076	2.108	2.448
propane + propylene	93.650	92.169	92.625
n-butane	2.633	3.550	3.115
n-pentane	0.059	0.074	0.056
isoparaffins			
isobutane	1.123	1.458	1.233
neopentane	0.003	0.004	0.003
isopentane	0.351	0.501	0.378
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.036	0.047	0.044
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.009	0.009
c-2-butene	0.009	0.011	0.011
3-methyl-1-butene	nd<0.001	nd<0.001	nd<0.001
1-pentene	0.011	0.013	0.011
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.006	0.008	0.006
c-2-pentene	0.005	0.006	0.005
2-methyl-2-butene	0.004	0.005	0.004
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: LPG 3, tank V641455, duplicate injection

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.016	0.027
ethane	1.809	1.849	2.150
propane + propylene	93.517	91.854	92.436
n-butane	2.854	3.872	3.402
n-pentane	0.064	0.080	0.061
isoparaffins			
isobutane	1.246	1.629	1.380
neopentane	0.003	0.004	0.003
isopentane	0.404	0.579	0.438
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.038	0.050	0.047
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.012	0.011
c-2-butene	0.007	0.008	0.008
3-methyl-1-butene	0.004	0.004	0.003
1-pentene	0.014	0.017	0.014
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.005	0.006	0.005
c-2-pentene	0.004	0.005	0.004
2-methyl-2-butene	0.006	0.007	0.005
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

END 7/23/03

Sample Name: LPG 4, tank V641456

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.016	0.019	0.031
ethane	2.264	2.027	2.355
propane + propylene	92.619	91.935	92.455
n-butane	3.111	3.698	3.247
n-pentane	0.072	0.079	0.060
isoparaffins			
isobutane	1.357	1.554	1.315
neopentane	0.003	0.003	0.002
isopentane	0.443	0.557	0.421
2,3-dimethylbutane	0.008	0.008	0.005
cycloparaffins			
cyclopentane	0.003	0.003	0.003
olefins, dienes			
isobutene	0.042	0.048	0.045
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.010	0.011	0.011
c-2-butene	0.009	0.010	0.010
3-methyl-1-butene	0.003	0.004	0.003
1-pentene	0.015	0.017	0.013
2-methyl-1-butene	0.007	0.008	0.006
t-2-pentene	0.005	0.005	0.004
c-2-pentene	0.005	0.005	0.004
2-methyl-2-butene	0.009	0.009	0.007
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EQ# 7/23/03

Sample Name: LPG 5, tank V641437

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.014	0.022	0.036
ethane	1.816	2.100	2.439
propane + propylene	94.328	92.023	92.509
n-butane	2.332	3.581	3.143
n-pentane	0.057	0.080	0.061
isoparaffins			
isobutane	1.027	1.520	1.286
neopentane	0.004	0.006	0.004
isopentane	0.330	0.535	0.405
2,3-dimethylbutane	nd<0.001	nd<0.001	nd<0.001
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.032	0.048	0.045
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.007	0.011	0.010
c-2-butene	0.008	0.012	0.012
3-methyl-1-butene	0.003	0.004	0.003
1-pentene	0.014	0.020	0.016
2-methyl-1-butene	0.010	0.014	0.011
t-2-pentene	0.005	0.007	0.006
c-2-pentene	0.005	0.007	0.006
2-methyl-2-butene	0.007	0.009	0.008
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

EW 7/23/03

Sample Name: Average Signal

Integration of the summed chromatographic signal of all samples and duplicates to gain improved signal to noise

Method: GC-FID using a liquid sampling valve, manual calculation based on a certified LPG standard

	weight %	volume %	mole %
normal paraffins			
methane	0.012	0.016	0.027
ethane	1.809	1.849	2.150
propane + propylene	93.513	91.851	92.434
n-butane	2.854	3.872	3.402
n-pentane	0.064	0.080	0.061
isoparaffins			
isobutane	1.246	1.629	1.380
neopentane	0.003	0.004	0.003
isopentane	0.404	0.579	0.438
2,3-dimethylbutane	0.006	0.007	0.005
cycloparaffins			
cyclopentane	nd<0.001	nd<0.001	nd<0.001
olefins, dienes			
isobutene	0.038	0.050	0.047
1,3-butadiene	nd<0.001	nd<0.001	nd<0.001
t-2-butene	0.009	0.012	0.011
c-2-butene	0.007	0.008	0.008
3-methyl-1-butene	0.004	0.004	0.003
1-pentene	0.014	0.017	0.014
2-methyl-1-butene	0.005	0.006	0.005
t-2-pentene	0.003	0.003	0.003
c-2-pentene	0.003	0.004	0.003
2-methyl-2-butene	0.005	0.006	0.005
aromatics			
benzene	nd<0.001	nd<0.001	nd<0.001

END 7/23/03

API LPG Comparative Analysis -- August 23, 2004

Cylinder Serial Number	K634083	K634086	K634106	V641453	12/19/2001	
33# Cylinder Number				420#	Trap Target	
Filling Sequence	42	20	1	Cylinder 5	Wagon Spec's	
	wt %	wt %	wt %	wt %	wt %	vol %
methane	0.00	0.00	0.00	0.00	0.02	
ethylene	0.00	0.00	0.00	0.00		
ethane	0.56	1.10	1.14	1.32	2.48	
propylene	0.00	0.00	0.00	0.00		10
propane	88.84	91.60	91.00	91.12	87.32	85
isobutane	2.44	1.85	1.94	1.88	1.21	
1-butene + isobutene	0.09	0.06	0.07	0.06	0.04	2
butane	6.52	4.52	4.82	4.65	7.5	5
trans-2-butene	0.02	0.02	0.02	0.00	0.01	
2,2-dimethylpropane	0.02	0.01	0.01	0.02		
cis-2-butene	0.02	0.01	0.01	0.01	0.39	
3-methyl-1-butene	0.01	0.00	0.00	0.01		
isopentane	1.23	0.68	0.80	0.76		
1-pentene	0.04	0.02	0.02	0.03		
2-methyl-1-butene	0.01	0.01	0.01	0.01		
pentane	0.18	0.10	0.11	0.11		0.5
isoprene	0.02	0.00	0.01	0.01		
trans-2-pentene	0.00	0.00	0.03	0.00		
cis-2-pentene	0.02	0.01	0.01	0.01		



August 23, 2004

file: P:API LPG

Sample ID: K634083, 33# Cyl, 3rd sample

	wt %
methane	0.00
ethylene	0.00
ethane	0.56
propylene	0.00
propane	88.84
isobutane	2.44
1-butene + isobutene	0.09
butane	6.52
trans-2-butene	0.02
2,2-dimethylpropane	0.02
cis-2-butene	0.02
3-methyl-1-butene	0.01
isopentane	1.23
1-pentene	0.04
2-methyl-1-butene	0.01
pentane	0.18
isoprene	0.02
trans-2-pentene	0.00
cis-2-pentene	0.02

K634086.AIA

	wt %
methane	0.00
ethylene	0.00
ethane	1.10
propylene	0.00
propane	91.60
isobutane	1.85
1-butene + isobutene	0.06
butane	4.52
trans-2-butene	0.02
2,2-dimethylpropane	0.01
cis-2-butene	0.01
3-methyl-1-butene	0.00
isopentane	0.68
1-pentene	0.02
2-methyl-1-butene	0.01
pentane	0.10
isoprene	0.00
trans-2-pentene	0.00
cis-2-pentene	0.01

K634106

	wt %	
methane	0.00	0
ethylene	0.00	0
ethane	1.14	1.14
propylene	0.00	0
propane	91.00	91
isobutane	1.94	1.94
1-butene + isobutene	0.07	0.07
butane	4.82	4.82
trans-2-butene	0.02	0.02
2,2-dimethylpropane	0.01	0.01
cis-2-butene	0.01	
3-methyl-1-butene	0.00	
isopentane	0.80	
1-pentene	0.02	
2-methyl-1-butene	0.01	
pentane	0.11	
isoprene	0.01	
trans-2-pentene	0.03	
cis-2-pentene	0.01	

V641453

	wt %
methane	0.00
ethylene	0.00
ethane	1.32
propylene	0.00
propane	91.12
isobutane	1.88
1-butene + isobutene	0.06
butane	4.65
trans-2-butene	0.00
2,2-dimethylpropane	0.02
cis-2-butene	0.01
3-methyl-1-butene	0.01
isopentane	0.76
1-pentene	0.03
2-methyl-1-butene	0.01
pentane	0.11
isoprene	0.01
trans-2-pentene	0.00
cis-2-pentene	0.01

Appendix S

PROTOCOL
LIQUIFIED PETROLEUM GAS
A 2-WEEK RANGE-FINDING INHALATION TOXICITY STUDY
IN THE RAT VIA WHOLE-BODY EXPOSURES

CONFIDENTIAL

HLS Study No.:
Protocol No.:
Date:

03-6140
Final
5 October 2004

PROTOCOL SIGNATURES / PREFACE

(Confidential Information - to be distributed on a need-to-know basis)

Study Title: Liquified Petroleum Gas: A 2-Week Range-Finding
 Inhalation Toxicity Study in the Rat via Whole-Body
 Exposures

HLS Study No.: 03-6140

This is the Final Protocol. It has been reviewed and approved by:

[Redacted Signature]

8 Oct 04
Date

Huntingdon Life Sciences (HLS)
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 East Millstone, NJ 08875-2360
Phone No.: 732-873-2550 x2920
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10/7/04
Date

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 Washington, D.C. 20005-4070
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Huntingdon Life Sciences
Study No. 03-6140

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Final Protocol

1. INTRODUCTION

HLS Study No.	03-6140
Protocol	Final
Study Title	Liquified Petroleum Gas: A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Whole-Body Exposures
Testing Facility	Huntingdon Life Sciences 100 Mettlers Road East Millstone, NJ 08875-2360
Purpose	This study is designed to provide a preliminary assessment of the toxicity of the test substance when administered via whole-body inhalation to rats for 2 weeks in order to determine appropriate exposure levels for a subsequent 13 Week Inhalation Study 03-6141 and a Developmental Inhalation Study 03-4253. The studies are intended to be used by the Petroleum HPV Testing Group in the EPA HPV Challenge Program.

2. STUDY PERSONNEL

Study Director
Alternate Contact

[REDACTED]

Tel.: [REDACTED]

Email: [REDACTED]

Additional personnel will be documented in the study file and presented in the final report.

Huntingdon Life Sciences
Study No. 03-6140

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Final Protocol

3. PROPOSED STUDY DATES

Study Initiation	Date Study Director signs protocol
Receipt of Test Animals	7 October 2004 (males) (Experimental Initiation)* 15&18 October 2004 (time-mated females)
First Day of Treatment	20 October 2004 (males) 20 October 2004 (females) (Experimental Initiation)**
Last Day of Treatment	3 November 2004 (males) 4 November 2004 (females)
Necropsy - Termination	3-4 November 2004 (males) 3-5 November 2004 (females)
Experimental Termination	5 November 2004 (Date of last data collection)
Submission of Audited Draft Report	13 January 2005
Study Completion	Date final report is signed by Study Director

*as per OECD GLPs; ** as per EPA GLPs

Huntingdon Life Sciences

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Final Protocol

4. EXPERIMENTAL DESIGN**4.1. STUDY SUMMARY**

Group	Test Substance	Exposure Level ^a	Number of Animals			
			Initial		Necropsy ^b	
		ppm	M	F	M	F
1	Air Control	0	10	10	10	10
2	Liquified Petroleum Gas	100	10	10	10	10
3	Liquified Petroleum Gas	1000	10	10	10	10
4	Liquified Petroleum Gas	10000	10	10	10	10

^aExposures will be 6 hours per day for 7 consecutive days per week for 2 weeks for a total of exactly 14 exposures. Exposure levels are expressed as ppm of test substance. The exposures will be conducted via whole-body exposure.

^bComplete postmortem evaluations will also be performed on animals which are found dead or euthanized in a moribund condition during the course of the study.

M = male; F = female (these animals will be timed-mated and will be exposed from Gestation Days 6-19).

The first day of exposures will be defined as Day 0 of the study.

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4.2. JUSTIFICATION FOR ROUTE, DURATION AND FREQUENCY

The inhalation route is one of the potential routes of human exposure to this test substance. The duration of the study and frequency of exposures are considered to be the minimum necessary for determining exposure levels for a subsequent 13-week inhalation study 03-6141 and a developmental inhalation study 03-4253.

4.3. JUSTIFICATION FOR TEST ANIMAL SELECTION

The rat is an animal model commonly utilized in toxicity studies as recommended in OECD and EPA guidelines and will be used in the subsequent subchronic toxicity study 03-6141. The female rats will be time-mated because this study will also serve as a range-find study for a developmental toxicity study 03-4253. In addition, a historical database is available for comparative evaluation.

4.4. JUSTIFICATION FOR NUMBER OF ANIMALS

The number of animals in the protocol is considered to be the minimum necessary for scientific and statistical reasons in order to evaluate the data with sufficient confidence levels.

4.5. JUSTIFICATION FOR EXPOSURE LEVEL SELECTION

The exposure levels were selected based on establishing (for safety reasons) the high exposure level as no more than 50% of the lower explosion limit ($LEL = 2.1\% = 21000 \text{ ppm}$) for the test substance.

5. TEST SUBSTANCE

5.1. TEST SUBSTANCE: LIQUIFIED PETROLEUM GAS

Test Substance Category: industrial gas

Description, lot number, storage, expiration date (if available) and handling procedures, as well as other pertinent information will be documented in the study data. The test substance will be stored (ambient conditions) in an outside solvent shed except when in use in the inhalation laboratory. The test substance will be handled as a flammable gas.

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5.2. IDENTIFICATION OF TEST SUBSTANCE

Unless otherwise noted, the identity, strength, purity, composition, stability and method of synthesis, fabrication and/or derivation of each batch of the test substance will be documented by the Sponsor before its use in the study. This documentation will be maintained by the Sponsor at the address indicated on the signature page of this protocol.

5.3. ARCHIVAL SAMPLES

Sponsor will arrange for storage of an archival sample at a contract archival facility (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA 20166).

5.4. ADMINISTRATION OF TEST SUBSTANCE

The test substance will be administered by whole-body inhalation exposure. The test substance will be administered as a gas (depending on the physical properties of the test substance) in the breathing air of the animals. The test atmosphere will be generated by an appropriate procedure determined during pre-study trials. The trials will be performed (at least two 6-hour periods) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the target exposure levels. The method will be described in the raw data of the study and in the report.

The whole-body exposure chambers will each have a volume of approximately 1000 liters. Each chamber will be operated at a minimum flow rate of 200 liters per minute. The final airflow will be set to provide at least one air change in 5.0 minutes (12 air changes/hour) and a T_{99} equilibrium time of at most 23 minutes. This chamber size and air flowrate is considered adequate to maintain the animal-loading factor below 5% and the oxygen level at 19% or higher. At the end of the exposure, all animals will remain in the chamber for a minimum of the T_{99} equilibrium time. During this time, the chamber will be operated at approximately the same flow rate using clean air only.

5.5. EXPOSURE CONCENTRATION DETERMINATION

A nominal exposure concentration will be calculated daily, if possible. The flow of air through the chamber will be monitored using appropriate calibrated equipment. The test substance consumed during the exposure will be divided by the total volume of air passing through the chamber

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(volumetric flow rate times total exposure time) to give the nominal concentration.

During each exposure, measurements of airborne concentrations of test substance will be performed at least four times using an appropriate sampling procedure and infrared spectrophotometric analytical procedure. Also, one sample (gas tight syringe) per chamber per week will be analyzed by gas chromatography (GC) to characterize at least 5 major components (comprising at least 90% by weight of the test substance) to show test substance stability and comparison between the neat test substance and the test atmospheres.

If more than the normal amount of trial time is required because of test substance generation or monitoring problems (80 technician hours), the Sponsor will be consulted prior to additional trials (additional cost).

5.6. PARTICLE SIZE DISTRIBUTION ANALYSIS:

During each exposure, particle size determinations will be performed using a TSI Aerodynamic Particle Sizer to demonstrate the absence of any condensation aerosol.

5.7. CHAMBER AND EXPOSURE ROOM ENVIRONMENT:

Chamber temperature, humidity, airflow rate and static pressure will be monitored continuously and recorded every 30 minutes during exposure. Chamber temperature and relative humidity will be maintained, to the maximum extent possible, between 20 to 24°C and 40 to 60%, respectively. Chamber oxygen levels (maintained at least 19%) will be measured pretest and at the beginning, middle and end of the study.

Air samples will be taken in the vapor generation area pretest and at the beginning, middle and end of the study. Light (maintained approximately 30-40 foot-candles at 1.0 meter above the floor) and noise levels (maintained below 85 decibels) in the exposure room will be measured pretest and at the beginning, middle and end of the study.

5.8. SUMMARY OF CHAMBER ACTIVITY:

The minimum frequency of chamber activity is summarized below.

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Activity	Frequency/chamber
Measured Test Substance Concentration	4X/day
Particle Size	1X/day
Temperature	13X/day
Relative Humidity	13X/day
Airflow Rate	13X/day
Nominal Test Substance Concentration	1X/day
Rotation Pattern of Exposure Cages	1X/day
Loading/Unloading Verification	1X/day

5.9. FREQUENCY AND DURATION OF ADMINISTRATION

The test substance will be administered for 6 hours per day for 7 consecutive days per week for 2 weeks for a total of exactly 14 exposures. Test substance administration will continue through the day prior to necropsy.

5.10. UNUSED TEST SUBSTANCE

Following completion of the final report for the final study with this test substance, the Testing Facility will inform the Sponsor of the volume of remaining test substance as well as the number of test substance containers. The Sponsor will then instruct the Testing Facility whether to dispose of the remaining test substance and containers or to ship the test substance and containers to another location.

6. TEST ANIMALS

6.1. SPECIES

Albino Rats (Outbred) Vaf/Plus®
Sprague-Dawley - derived (CD®)
Crl: CD (SD) IGS BR

6.2. SUPPLIER

Charles River Laboratories

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Documentation of the specific breeding facility will be maintained in the study file.

6.3. ANIMAL REQUIREMENTS/SPECIFICATIONS

6.3.1. NUMBER OF ANIMALS ON STUDY

<u>Total</u>	<u>Males</u>	<u>Females</u>
80	40	40

6.3.2. AGE

Young adult male animals (approximately 6 weeks at receipt; approximately 8 weeks (and no more than 9 weeks) at initiation of exposures. Female animals will be mature, timed-mated, approximately 75 to 85 days in age at receipt and at gestation day 6 at initiation of exposures.

6.3.3. WEIGHT

Approximately 200 to 300 grams at first exposure of male animals. Female animals will weigh approximately 210 to 270 grams on Day 0 of gestation, based on the Supplier's documentation (non-GLP). Animals outside of this range may be used at the discretion of the Study Director.

6.4. ACCLIMATION PERIOD

Approximately 2 weeks for male animals. Female animals will be received on Days 0, 1, 2 or 3 of gestation and will be quarantined until start of exposures on Gestation Day 6. All animals will be checked for viability twice daily. Prior to assignment to study, all animals will be examined to ascertain suitability for study.

6.5. ANIMAL CARE AND HUSBANDRY

6.5.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY

Currently acceptable practices of good animal husbandry will be followed, e.g., *Guide for the Care and Use of Laboratory Animals*; National Academy Press, 1996. Huntingdon Life Sciences Inc. is fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC).

6.5.2. VETERINARY CARE

Animals will be monitored by the technical staff for any conditions requiring possible veterinary care. If any such conditions are identified, a staff veterinarian will be notified for an examination and evaluation. Animals will be treated as outlined in the Animal Welfare Act Compliance section of this protocol.

6.5.3. ENVIRONMENTAL CONDITIONS

Light/Dark Cycle

Twelve hour light/dark cycle provided via automatic timer.

Temperature

Temperature will be monitored in accordance with Testing Facility SOPs to ensure that the desired range of 18 to 26°C is maintained to the maximum extent possible.

Humidity

Humidity will be monitored in accordance with Testing Facility SOPs to ensure that the desired range of 30 to 70% is maintained to the maximum extent possible.

6.5.4. HOUSING

Male animals will be individually housed in suspended, stainless steel wire mesh cages during the acclimation and during the remainder of the study. Female animals will be individually housed in suspended, stainless steel wire mesh cages during the acclimation and during the remainder of the study.

6.5.5. FEED

Certified Rodent Diet, No. 5002; (Meal) (PMI Nutrition International, St. Louis, MO) *ad libitum*.

6.5.6. WATER

Elizabethtown Water Company, Westfield, NJ; *ad libitum*, via automated watering system.

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6.5.7. FEED ANALYSIS

Analytical certification of batches of feed provided by the manufacturer will be maintained on file by the Testing Facility. There are no known contaminants in the feed which are expected to interfere with the objectives of this study.

6.5.8. WATER ANALYSIS

Water analyses are conducted by Elizabethtown Water Company to assure that water meets standards specified under the EPA Federal Safe Drinking Water Act Regulations (40 CFR Part 141). Water analysis, provided by the supplier, will be maintained on file at the Testing Facility. In addition, chemical and microbiological analyses are conducted biannually (by a Subcontractor) on water samples collected from representative rooms in this facility. Results are maintained on file. There are no known contaminants which are expected to interfere with the objectives of this study.

6.5.9. ANIMAL ASSIGNMENT

More male animals than required for the study will be purchased and acclimated. Male animals considered suitable for study on the basis of pretest physical examinations, body weight data and any other pretest evaluations, will be randomly assigned to control or treated groups in an attempt to equalize mean group body weights. Female animals considered suitable for study on the basis of pretest physical examinations will be randomized into groups on the day of receipt using a method that ranks the Gestation Day 4 body weights and randomly assigns each female animal within the block into groups. Female animals may be replaced based on physical examinations and/or body weight change up to Gestation Day 6, as necessary. Individual weights of animals placed on test shall be within $\pm 20\%$ of the mean weight for each sex. Disposition of all animals not utilized in the study will be maintained in the study file.

6.5.10. IDENTIFICATION

Each animal will be assigned a temporary identification number upon receipt. After selection for study, each animal will be ear-tagged with a number assigned by the Testing Facility. This

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number plus the study number will comprise the unique animal number for each animal. If the tag is lost, it will be replaced. Each cage will be provided with a cage card which will be color coded for exposure level identification and will contain the study number and animal number.

6.5.11. ANIMAL HUSBANDRY/EXPOSURE

Housing:	Individually in cages.
Food:	None.
Water:	None.

7. IN-LIFE EVALUATIONS

7.1. CLINICAL OBSERVATIONS

7.1.1. VIABILITY CHECKS (CAGE-SIDE)

Observations for mortality and general condition will be made at least twice daily (once in the morning and once in the afternoon). Animals in poor health or in a possible moribund condition will be identified for further monitoring and possible euthanasia.

7.1.2. PHYSICAL EXAMINATIONS

In-Chamber: All animals will be observed as a group at least once during each exposure.

Out-of-Chamber: Each animal will be removed from its cage and examined at least once pretest and during each week of the study period. Examinations will include observations of general condition, skin and fur, eyes, nose, oral cavity, abdomen and external genitalia, occurrence of secretions and excretions, and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Changes in gait, posture and response to handling as well as the presence of clonic or tonic movements, stereotypy (e.g., excessive grooming, repetitive circling) or bizarre behavior (e.g., self-mutilation, walking backward) will be recorded.

7.2. BODY WEIGHTS

Non-fasted body weights for animals will be recorded at least once pretest (on GD 4 for the females) and once per week (on GD 6, 13, 20 for

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the females) during the study period. Fasted weights will be obtained prior to necropsy (males only).

7.3. FEED CONSUMPTION

Feed consumption will be measured (weighed) during the week prior to treatment initiation and once per week during the study period. Feed will be available without restriction 7 days/week except during exposures. Animals will be presented with weighed feeders at the scheduled intervals. After at least 2 days (pre-test) or 5 days (on-test), the feeders will be reweighed and the resulting weight subtracted from the initial feeder weight to obtain the grams of feed consumed per animal per day. The grams consumed per kilogram of body weight per day will then be calculated for each animal.

8. POSTMORTEM EVALUATIONS

8.1. MACROSCOPIC PATHOLOGY

A complete macroscopic examination will be performed on all animals, including animals euthanized in a moribund condition or for humane reasons or found dead; all abnormal observations will be recorded. The necropsy will consist of an external examination, including identification of all clinically recorded lesions, as well as a detailed internal examination.

8.1.1. MORIBUND ANIMALS

Animals showing signs of severe debility, particularly if death appears imminent, will be euthanized to prevent loss of tissues through autolysis.

8.1.2. TERMINAL NECROPSY

Necropsy will be performed on all surviving animals after 14 days of exposure. Necropsy schedules will be established in order to assure that approximately equal numbers of males and females from each group will be examined at similar times of the day of necropsy.

8.2. METHOD OF EUTHANASIA

All adults will be euthanized by an overdose of carbon dioxide inhalation. All live fetuses will be euthanized by an intraperitoneal overdose of sodium pentobarbital.

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8.3. ORGAN WEIGHTS

Organs indicated below will be taken from all survivors at the scheduled necropsies, weighed, recorded and organ/body and organ/brain weight ratios calculated. Organs will not be weighed for animals found dead or euthanized in a moribund condition during the course of the study. Prior to weighing, all organs will be carefully dissected and properly trimmed to remove fat and other contiguous tissues in a uniform manner. Organs will be weighed as soon as possible after dissection to avoid drying. Paired organs will be weighed together.

adrenals	kidneys	seminal vesicles
brain	liver	spleen
epididymides	lungs	testes
heart	pituitary	thymus

8.4. TISSUE PRESERVATION

Tissues listed in Appendix A will be obtained at necropsy and preserved for all male animals. The female animals will only have the adrenals, brain, heart, kidneys, liver, lungs, pituitary, spleen, thymus, gross lesions and target organs (as designated by the Study Director, Pathologist and/or Sponsor based on experimental findings) as well as the uterus with ovaries (but without placenta) preserved.

Eyes and testes and epididymides – modified Davidson's solution initially and then 10% neutral buffered formalin

All other tissues - 10% neutral buffered formalin

Note: Lungs (gravity method) and urinary bladder will be infused with formalin to ensure fixation.

8.5. EVALUATION OF DAMS AND PUPS

A macroscopic postmortem examination will be performed on all the dams, including those dying spontaneously or euthanized in either a moribund condition or after prematurely delivering a litter. Females that are not pregnant or found dead or sacrificed prior to schedule termination will have implantation data (*ie* number of fetuses and early/late embryo-fetal deaths) determined at necropsy (Salewski's test). Corpora lutea will not be counted for these animals.

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Dams showing signs of premature delivery will be euthanized on the day such evidence is observed. Reproductive tracts will be examined for implantation data (implantation sites, live/dead fetuses and early/late embryo-fetal deaths). Fetuses obtained earlier than Gestation Day (GD) 20 will be evaluated for external malformations, euthanized and discarded.

Any dams initiating delivery on GD 20 will be immediately euthanized and the fetuses processed with the other GD 20 fetuses. Dams surviving on GD 20 will have the following examinations of their pregnancies:

The intact uteri (ovaries attached) will be removed from the abdominal cavity and weighed intact. Corpora lutea will be counted (without dissection) and the number per ovary recorded. The number of the following will be recorded:

- live fetuses
- dead fetuses (no significant degeneration)
- late embryo-fetal deaths (recognizable dead fetus undergoing degeneration, regardless of size)
- early embryonic deaths (evidence of implantation but no recognizable fetus)

The maternal carcass will then be discarded.

All live fetuses will be weighed as a litter (males and females separately). Each (live and dead) fetus will be given a macroscopic external examination for defects including observation of the palate. The sex will be determined by external examination only. Fetuses with obvious external malformations will be preserved (10% neutral buffered formalin) for possible future examination. All other fetuses, and intra-uterine deaths, will be discarded.

8.6. MICROSCOPIC PATHOLOGY EVALUATIONS

No examinations are required. Authorization will be obtained from the Sponsor prior to performing any examinations.

9. ARCHIVING OF RECORDS AND SPECIMENS

All data documenting experimental details and study procedures and observations will be recorded and maintained as raw data. At the completion of the study, all reports, raw data and retained samples will be maintained in the Testing Facility's Archives for a period of 1 year after submission of the signed final report.

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The Sponsor will be contacted in order to determine the final disposition of these materials. The Sponsor is responsible for all cost associated with the storage of these materials beyond one year from the issuance of the final report and for any costs associated with the shipment of these materials to the Sponsor or to any other facility designated by the Sponsor.

10. STATISTICAL ANALYSIS

10.1. ITEMS TO BE ANALYZED

The following will be compared for control and test substance-treated groups.

mean body weight values

mean feed consumption values

mean terminal organ weights, organ/body and organ/brain weight ratios

Number of implantation sites and corpora lutea

Pre- and post-implantation loss

Number of pups per litter

Number of male and female pups per litter

Average pup weight per litter as a composite for both sexes

Total litter weight

10.2. PROCEDURES

Evaluation of equality of group means will be made by the appropriate statistical method, followed by a multiple comparison test if needed. Bartlett's test (Bartlett, 1937; Sokal and Rohlf, 1995; Snedecor and Cochran, 1967) will be performed to determine if groups have equal variances. For all parameters except organ weights, if the variances are equal, parametric procedures will be used; if not, nonparametric procedures will be used. Organ weight data will be analyzed only by parametric methods. The parametric method will be the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance (Dunlap and Duffy, 1975). If significant differences among the means are indicated, additional tests will be used to determine which means are significantly different from the control: Dunnett's (Dunlap et al., 1981; Dunnett, 1955, 1964) or Cochran and Cox's modified t-test (Cochran and Cox, 1959). The nonparametric method will be the Kruskal-Wallis test (Kruskal and Wallis, 1952, 1953) and if differences are indicated or Pairwise Comparison with Bonferroni Correction (Games and Howell, 1976) will be used to determine which means differ from control. Bartlett's test for equality of variance will be conducted at the 1% significance level; all other statistical tests will be conducted at the 5% and 1% significance levels.

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References for these procedures are:

Bartlett, M.S. 1937. Properties of sufficiency and statistical tests. *Proceedings of the Royal Society, Series A*, 160: 268-282; Cochran, W.G. and Cox, G.M. 1959. *Experimental Designs*, New York: John Wiley, pp. 100-102; Dunlap, W.P. and Duffy, J.A. 1975. Fortran IV Functions for Calculating Exact Probabilities Associated with Z, Chi-Square, T and F Values. *Behav. Res. Methods and Instrumentations* 7:59-60; Dunlap, W.P., Marx, M.S. and Agamy, G.G. 1981. Fortran IV functions for calculating probabilities associated with Dunnett's test. *Behav. Res. Methods and Instrumentation* 13: 363-366; Dunnett, C.W. 1955. A multiple comparison procedure for comparing several treatments with a control. *Journal of the American Statistical Association* 50: 1096-1121; Dunnett, C.W. 1964. New tables for multiple comparisons with a control. *Biometrics* 20-3: 482-491; Games, P.A. and Howell, J.F. 1976. Pairwise multiple comparison procedures with unequal n's and/or variances: a monte-carlo study. *Journal of Educational Statistics* 1: 113-125; Kruskal, W.H. and Wallis, W.A. 1952. Use of Ranks in one-criterion variance analysis. *Journal of the American Statistical Association* 47: 583-621; Kruskal, W.H. and Wallis, W.A. 1953. Errata for Kruskal-Wallis (1952) *Journal of the American Statistical Association* 48: 907-911; Snedecor, G.W. and Cochran, W.G. 1967. *Statistical Methods*. 6th edition. Ames: Iowa State University Press; Sokal, R.R. and Rohlf, F.J. 1995. *Biometry*. 3rd Edition. San Francisco: W.H. Freeman pp. 369-371.

11. REPORTING

11.1. STATUS REPORTS

Periodic written (weekly) updates on study progress will be provided by the Study Director.

11.2. FINAL REPORT

One unbound hard copy and one electronic copy of an audited draft report will be submitted following termination of the study. After receipt and review of the Sponsor's comments, appropriate changes will be made and two hard copies and one electronic copy of a signed, final report will be issued. (Additional copies will be provided at additional cost). The report will minimally include:

Compliance Statement (including Sponsor signature line)
Quality Assurance Statement
Summary

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Introduction
Experimental Design
Materials and Methods
Discussion of Study Results
Conclusion (including NOAEL statement, if applicable)
Tables of Exposure Data
Mortality Data
Individual animal termination history
Summary of daily animal observations (as appropriate)
Summary of weekly physical examination data
Tables of mean and individual body weights
Tables of mean and individual feed consumption
Tables of mean and individual organ weights, organ/brain
and organ/body weight ratios
Individual and summary tables of macroscopic pathology findings
Individual and summary tables of number of implantation sites
Individual and summary tables of number of corpora lutea
Individual and summary tables of pre- and post-implantation loss
Individual and summary tables of number of pups per litter
Individual and summary tables of number of male and female pups
Individual and summary tables of litter mean pup weight
Appendix of analytical results
References for experimental methodology
Senior personnel participating in the study
Copy of study protocol and associated amendments

12. REGULATORY REFERENCES

12.1. TESTING GUIDELINES

This study is not designed to meet regulatory requirements. It is designed to assess the toxicity of the test substance in order to determine appropriate exposure levels for a subsequent 13-Week Inhalation Study 03-6141 and a Developmental Inhalation Study 03-4253. The studies are intended to be used by the Petroleum HPV Testing Group in the EPA HPV Challenge Program.

12.2. GOOD LABORATORY PRACTICES

This study will be conducted in compliance with Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17 and EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

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12.3. ANIMAL WELFARE ACT COMPLIANCE

This study will comply with all appropriate parts of the Animal Welfare Act Regulations: 9 CFR Parts 1 and 2 Final Rules, Federal Register, Volume 54, No. 168, August 31, 1989, pp. 36112-36163 effective October 30, 1989 and 9 CFR Part 3 Animal Welfare Standards; Final Rule, Federal Register, Volume 56, No. 32, February 15, 1991, pp. 6426-6505 effective March 18, 1991. The Sponsor should make particular note of the following:

1. The Sponsor's signature on this protocol documents that, for the study described, there are no generally accepted non-animal alternatives and the study does not unnecessarily duplicate previous experiments in regard to species, test substance, route of administration or duration of treatment.
2. All procedures used in this study have been designed to avoid discomfort, distress and pain to the animals. All methods are described in this study protocol or written laboratory standard operating procedures.
3. Any procedures outlined in this study which cause more than momentary or slight pain or distress to the animals will be performed with appropriate sedatives, analgesics or anesthetics unless the withholding of these agents is justified for scientific reasons, in writing by the Sponsor and the Study Director, in which case the procedure will continue for the minimum time necessary. Documentation of the justification for withholding treatment for pain or distress and IACUC approval of the procedures will be made prior to study initiation on the IACUC Protocol Review Form.
4. Animals experiencing more than momentary or slight pain or distress due to test substance or injury or illness will be treated by the Testing Facility's veterinary staff with approved analgesics or agents to relieve pain after consultation with the Study Director and Sponsor. However, in emergency situations, the veterinary staff is authorized to administer emergency treatment as necessary. Any subsequent treatment or euthanasia will be administered after consultation with the Study Director. The Sponsor will be advised by the Study Director of all emergency situations in as timely a manner as possible.
5. Methods of euthanasia used during this study are in conformance with the above-referenced regulations.

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12.4. INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

The IACUC Protocol Review Subcommittee has reviewed this protocol and found it to be in compliance with all appropriate regulations.

13. QUALITY ASSURANCE MONITORING

The Huntingdon Life Sciences Quality Assurance Unit will monitor the facilities, equipment, personnel, methods, practices, records and controls used in this study to assure that they are in conformance with this protocol, company SOPs, and the appropriate Good Laboratory Practice requirements.

14. ALTERATION IN STUDY DESIGN

Alterations of this protocol may be made as the study progresses. No changes in the protocol will be made without the consent of the Sponsor. In the event that the Sponsor authorizes a protocol change verbally, such changes will be honored by the Testing Facility and will be followed by a written verification. All protocol modifications will be signed by the Study Director and a Sponsor representative. Any modifications potentially affecting animal welfare will also be signed by 2 members of the Institutional Animal Care and Use Committee prior to the modification's implementation.

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APPENDIX A Tissues Preserved for Males

Tissue	Preserved
adrenal gland	X
aorta (thoracic)	X
bone (sternum/femur)	X
bone marrow (rib) ^a	X
brain (medulla/pons, cerebrum and cerebellum)	X
epididymides	X
esophagus	X
eyes (with optic nerves)	X
heart	X
kidneys	X
large intestine (cecum, colon, and rectum)	X
lacrimal gland	X
larynx	X
liver	X
lungs (with mainstem bronchi)	X
lymph nodes (mediastinal and mesenteric)	X
mammary gland	X
muscle (biceps femoris)	X
nasopharyngeal tissue	X
nerve (sciatic)	X
pancreas	X
pituitary	X

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Tissue	Preserved
prostate	X
salivary gland with submandibular lymph node	X
seminal vesicles	X
skin	X
small intestine (duodenum, jejunum, ileum)	X
spinal cord (cervical, thoracic, lumbar)	X
spleen	X
stomach	X
testes	X
thymic region	X
thyroid (with parathyroids)	X
trachea	X
urinary bladder	X
Zymbal's gland	X
gross lesions	X
target organs ^b	X

^aBone marrow smears will be prepared. They will only be evaluated (Sponsor approval, additional cost) if needed.

^bTarget organs will be designated by the Study Director, Pathologist and/or Sponsor based on experimental findings.

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Protocol Amendment No. 1

Study Title: Liquified Petroleum Gas: A 2-Week Range-Finding Inhalation
Toxicity Study in the Rat via Whole-Body Exposures

Changes

1. Study Summary, page 3:

Revise: The first day of exposures will be defined as Day 0 of the study (**males**). **The first day of gestation will be defined as Day 0 of the study (females).**

2. Administration of Test Substance, page 5:

Revise: The test substance will be administered as a gas/**vapor** (depending on the physical properties of the test substance) in the breathing air of the animals.....

3. Administration of Test Substance, page 5:

Revise: Each chamber will be operated at a minimum flow rate of **180** 200 liters per minute. The final airflow will be set to provide at least one air change in **5.6** 5-9 minutes (**11** 12 air changes/hour) and a T₉₉ equilibrium time of at most **26** 23 minutes.....

4. Exposure Concentration Determination, page 6:

Revise: Also, one sample (gas tight syringe) per chamber per week (**and pretest**) will be analyzed by gas chromatography (GC) to characterize at least 5 major components (comprising at least 90% by weight of the test substance) to show test substance stability and comparison between the neat test substance and the test atmospheres.

5. Animal Assignment, page 10:

Revise: Female animals considered suitable for study on the basis of pretest physical examinations will be randomized into groups **on Gestation Day 4** ~~on the day of receipt~~ using a method that ranks the Gestation Day 4 body weights and randomly assigns each female animal within the block into groups.....

6. Evaluation of Dams and Pups, page 14:

Revise: All live fetuses will be weighed as a litter (males and females **individually separately**).....

Reasons for Changes

1. Clarification of the procedure for scheduling the males and the females on test.
2. Clarification of the physical property of the test substance.

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3. Clarification of the chamber operating conditions to reflect the recalibration of the airflows during the study.
4. Clarification that a GC assay was also conduct pretest.
5. Clarification of the day of randomization of the test animals.
6. Clarification that the individual pups were weighed.

Amendment approved by:

[Redacted Signature]

[Redacted Signature]

[Redacted Signature]

8/2/09
Date

9/2/2009
Date

	Testing Facility Personnel	Appendix T

TITLE/DEPARTMENT	NAME/DEGREE
SENIOR VICE PRESIDENT, SAFETY ASSESSMENT	
DIRECTOR REPRODUCTIVE AND DEVELOPMENTAL TOXICOLOGY	
DIRECTOR, ANALYTICAL SERVICES	
DIRECTOR, TOXICOLOGY OPERATIONS	
DIRECTOR, QUALITY ASSURANCE	
STUDY DIRECTOR	
STUDY MONITOR	
VETERINARIAN	
MANAGER/SUPERVISOR	
Rodent and Reproductive Toxicology Inhalation Toxicology Pharmacy Analytical Services Necropsy and Fetal Pathology	

	Report Amendments	Appendix U

There are no amendments for this report at this time.

	Report Amendments	Appendix V

There are no amendments for this report at this time.