PHASE I INTERIM REPORT - SURVEY PLAN

for

INVESTIGATION OF HALOGENATED SOLVENTS USE, CONTROL TECHNIQUES, AND SUBSTITUTES

Prepared for

CALIFORNIA AIR RESOURCES BOARD

by

John E. Orban, Ph.D.
and
Phillip Sticksel, Ph.D.

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BATTELLE
505 King Avenue
Columbus, Ohio 43201

INTRODUCTION

As part of its toxic air contaminant control program, the California Air Resources Board (California ARB) needs to know the potential for limiting the emissions of halogenated solvents. The information required to satisfy this need includes an inventory of the sources, how these sources use the solvents, the control techniques that can be applied, the possible substitutes for halogenated solvents, process changes that can reduce the usage of the solvents, and the potential for recycling and recovery of the solvents.

Past efforts to control emissions of halogenated solvents have been directed toward decreasing their contributions to photochemical smog. Now ARB has identified them as being toxic. The federal Clean Air Act of 1990, in addition to listing them as hazardous pollutants, has also identified them as contributing to the depletion of upper-atmospheric ozone.

In June 1989, the Valley Research Corporation prepared for ARB's Technical Support Division a report entitled "Inventory of Solvent Use and Emissions from Degreasing and Non-Architectural Surface Coating in the South Coast Air Basin." That study, which presented the findings of a survey in the South Coast Air Basin (SCAB), provided extensive information about two categories of users of halogenated solvents in the SCAB. The current Battelle project concentrates on only facilities classified as area sources (non-point sources) that do cleaning and degreasing, and expands the survey population to the entire state. The characterization of the usage of halogenated solvents by these area sources will be derived from the answers given to questionnaires by a sample of their group. The significance of the sample will be carefully documented by statistical methods.

Originally, this study was expected to include two other categories of sources besides degreasing and cleaning applications; however, in preliminary discussions ARB decided to limit the survey to one source category. Subsequently, ARB has expedited the program by using their statewide-permit-system database to estimate the number of facilities which have cleaning and degreasing operations, dividing these into 36 groups (strata), and recommending the number of members of each group that should be surveyed (sampling plan).

Battelle plans to use the ARB stratification plan but will propose refinements to the sampling plan using statistical methods. Once the Battelle sampling plan and questionnaires are approved by ARB, Battelle will conduct a pilot survey and then proceed into a mail survey, followed by a telephone survey. The data gathered from these surveys will be analyzed by Battelle and the results will be used to characterize the cleaning and degreasing sources in the State.

The remainder of this document describes the technical approach and management plan that Battelle will follow in conducting the surveys.

TECHNICAL APPROACH

The approach to this investigation is generally consistent with the project plan originally proposed by Battelle. However, as a result of the extended planning effort in which ARB and Battelle addressed a number of key technical issues, Battelle is now recommending some minor modifications to the technical approach.

Battelle proposed to conduct a self-administered mail survey of 3,000 facilities, a phone survey of 600 facilities to collect more detailed information and to assess nonresponse bias, and a task (Task II-3) to perform a source category analysis and define emission reduction options. When ARB requested that Battelle eliminate Task II-3, Battelle estimated that the funds allocated to this effort ($14,395) could be used to increase the sample size for the mail survey to approximately 4,500.

At the project kickoff meeting in March, 1992, ARB requested that Phase I be extended in order to gather additional information and exchange ideas with Battelle on possible approaches. During this time Battelle's level of effort was minimized, but we continued to assist ARB in the planning process. ARB's project officer was aware of the fact that extending Phase I would use additional resources, but it was agreed that additional planning was needed.

During the five month extension of Phase I, Battelle provided ARB with additional information including a matrix describing our current knowledge of industry groups using various cleaning and degreasing procedures (letter to Ralph Propper dated April 1, 1992). We also reviewed ARB's stratification plan and considered variations to the original project plan, including the elimination of the phone survey and the addition of a pretest and a two-stage sampling plan.

After consideration of these issues Battelle makes the following recommendations regarding the scope of the project:

(1) The mail survey should be preceded by a pretest consisting of questionnaires sent to 50 facilities. Twenty-five (25) facilities will be contacted by phone before the questionnaires are mailed. The purpose of the pretest is to ensure an adequate response rate and that the questionnaire can be properly completed.

(2) Because of the impacts on costs and schedule, as well as the minimal benefit expected, we do not recommend a two-staged sampling plan for the mail survey.

(3) For the reasons stated in our original proposal, we do not recommend the elimination of the phone survey. Most of the information about control techniques and emission reduction options will come from the phone interviews. Also, the phone survey is needed to characterize nonresponse bias in the mail survey.

(4) Battelle will not be conducting Task II-3 as originally proposed. ARB feels that it has appropriate expertise in-house to conduct this task and has requested that Battelle reallocate the proposed effort to conducting the mail and telephone surveys.

(5) Although Battelle had intended to use the funds originally allocated to Task II-3 to increase the number mail questionnaires from 3,000 to 4,500, these funds are now needed to cover the costs of the extended planning effort in Phase I and additional costs anticipated to resolve key technical issues in Phase II. Further discussion of the project budget is presented in the Management Plan.

In the remainder of this section we describe the proposed approach to key elements of the project plan. These include the study population and stratification plan, mail survey, phone survey, and statistical reporting.

Study Population and Stratification Plan

The population to be surveyed consists of the area sources which are expected to engage in cleaning and degreasing activities. Area sources are defined as those sources which emit less than 25 tons per year of pollutants to the air. The sources which emit 25 tons or more are classified as permitted point sources; that is, they have been issued an air permit by their air district and they must comply with a set of emission limitations. Data on use and emission of the halogenated solvents from point sources are already in the ARB permit data base. It is the purpose of the current survey to obtain information on the emitters of smaller amounts of solvents. The Control Technology Development Section of ARB's Stationary Source Division (SSP) will add this information to what they already have on the larger emitters and will then be able to characterize the entire population of the State's sources of halogenated solvent emissions.

To assist Battelle in defining the sampling frame (the list of facilities from which those to be surveyed will be drawn) the SSD prepared a Stratification Plan. They used the State's point

source inventory database, the BAAQMD's (Bay Area Air Quality Management District) permit database, and information from the Valley Research Study to conduct an extensive study of sources that perform cleaning and degreasing. They found that there were companies in 368 different Standard Industrial Classifications (four-digit SIC numbers) that performed these activities. They used this list of SIC numbers to query the Dun & Bradstreet Company Listing data base for California and learned that there were over 492,000 companies and installations of all sizes (i.e., point and area sources) in the State.

Next, the SSD divided the 368 SIC numbers into 37 groups categorized by the nature of the work they do and the way they are classified in ARB's area source inventory. They then reviewed the types of facilities in each group and decided to eliminate two groups from the pool to be sampled. One group that was eliminated included printing, auto body repair, and dry cleaning. Printing and graphic arts will be controlled by a regulation different from the one envisioned for most cleaning and degreasing operations. Auto body repair shops, service stations, and car dealers will be surveyed separately. Dry cleaning establishments will be subject to a special emission regulation.

The second group was eliminated by ARB because degreasing is not done at these facilities or the degreasing emissions are small. Some examples of facilities in this group are stores, construction companies, and schools.

With the elimination of these two groups the SSD presented a stratification of the population to be surveyed which was comprised of 35 groups. The Dun and Bradstreet Company Listing (Dun's) showed 223,744 facilities. A breakout of these companies by group is shown in Table 1.

The SSD also developed a sampling plan for allocating 4500 survey questionnaires among the 224,000 sources. The sampling plan is discussed further in the next section.

Some of the assumptions made in defining the target population include

(1) The 368 SIC numbers, identified as the ones in which companies doing cleaning and degreasing are located, include all the uses of halogenated solvents for cleaning and degreasing. This list was derived from review of the Valley Research Corporation's list of SIC numbers in their report, CARB's own point source inventory of cleaning and degreasing sources compiled in 1989, and judgments of whether there should be additions or deletions of SIC numbers in those two data bases.

(2) The Dun's data base proposed for use will include all the facilities that do cleaning and degreasing in the State.

While these assumptions are mostly true, several deviations can be envisioned. New industries can appear which are not rapidly categorized by an SIC number or if a number is assigned, it may not be immediately cataloged in Dun's. Under either of these possibilities some companies doing cleaning and degreasing might not be included in the sampling pool.

Another issue which affects the definition of the target population is whether we use only primary or primary and secondary SIC numbers to identify facilities that are involved in cleaning and degreasing operations. If only primary SIC numbers are used, then any facility that does not perform cleaning and degreasing for their primary business area but does perform these operations for a secondary business will not be represented in the target population. On the other hand, if we use both primary and secondary SIC numbers to identify facilities, there is not a unique way to classify them. For example, consider a facility that has a primary SIC number that is not in the sampling frame but has secondary SIC numbers in two or more strata.

According to ARB the stratification plan was developed using only primary SIC numbers. At this time we are planning to use the same approach to sample the population. However, we will also perform some additional queries of the Dun's database to determine the number of potential sources that are not represented in the population because only their primary SIC numbers were included in the stratification plan.

The Dun's company list from which the area sources are to be selected will include both area-source companies and point-source companies. Thus, a company chosen for sampling might actually be a point source. Examination of the selected sources will be done to identify any point sources. If they are chosen, they will be eliminated and area sources to replace them will be chosen.

Sampling Plan for Mail Survey

The ARB proposed a sampling plan in which 4,500 mail surveys were distributed among the 35 strata. The ARB plan (Plan A-1 in appendix A) allocated more surveys to larger groups and groups that are expected to have greater variation in total emissions among facilities. This approach will tend to produce a more precise estimate of total statewide emissions than allocating an equal number of surveys to each stratum. The ARB plan also had a minimum of 60 surveys allocated to each stratum.

Battelle recommended that alternative designs, based on precise statistical criteria, be considered. It was agreed that the primary objective is to minimize the uncertainty in the estimated total statewide emissions. However, it is also important to ensure that a minimum level of precision be achieved for estimating the total emissions from facilities within individual strata.

Battelle developed five alternative designs, two based on a total sample of 4,500 surveys and three based on 3,000 surveys. To develop these designs we first needed to obtain prior estimates of the variation in total emissions within the sampling strata. Battelle and ARB staff estimated the range of emissions (tons per year) that are expected from the majority (80%) of the facilities in each stratum. We then assumed that the distribution of emissions within each stratum was approximately normally distributed. This is not a critical assumption, especially if the distributions of emissions from stratum to stratum have similar shapes, but it provided a simple means of estimating the standard deviation (σ) of annual emissions. The standard deviation within a stratum was estimated by

$$\sigma = (\text{max} - \text{min})/2.56.$$

According to normal distribution theory, 80% of the values will fall within approximately 1.2 standard deviations of the population mean. To minimize the uncertainty (as measured by the standard error of the estimated total statewide emissions) we allocated the surveys to the sampling strata by the formula

$$n_i = n(N_i\sigma_i / \sum_{j=1}^{K} N_j\sigma_j),$$

where

- N is the total number of facilities in the target population,
- N_i is the total number of facilities in stratum i, (i=1,...,k)
- n is the total sample size (n=3,000 or 4,500),
- n_i is the number of surveys planned for stratum i, and
- σ_i is the estimated standard deviation of facility emissions within stratum i.

This approach produced sampling plans A-2 (n=4,500) and B-2 (n=3,000) presented in Appendix A. Plans A-3 and B-3 were constructed in a similar manner, except we added the constraint that a minimum of 60 surveys be allocated to each stratum. The fifth alternative plan, B-4, has a minimum of 40 surveys allocated to each stratum and a total sample size of 3,000.

For each plan we calculated the standard error of the estimated total emissions from each stratum, as well as the standard error of the estimated total statewide emissions. For example, in plan A-1 the total estimated emissions from stratum 2 is 4,299 tpy (8,598 x (0+1)/2). The standard error of this estimate is 298.2 tpy. Thus, the coefficient of variation (CV = standard error divided by the estimated total) is 6.94%. Notice that the CVs for the estimated stratum totals are all less than 10%.

Table 2 presents a comparison of the six sampling plans. In comparing the ARB plan with the "optimal" plan (A-2) based on a total sample size of 4,500, we see that the optimal plan offers a significant improvement in the precision of the estimated total statewide emissions (CV = 1.06% versus 1.44%). However, the uncertainty for estimating total emissions within individual strata is as high as 55% for plan A-2. A good compromise is plan A-3. The maximum CV for individual strata is only 10.1% while the CV for the statewide total is only slightly higher than the optimal plan.

Among the remaining three plans we notice that plans B-2 and B-4 will produce statewide estimates that are more precise than estimates based on plan A-1; even though they are based on 33% fewer surveys. Furthermore, plan B-4 produces stratum estimates that are only slightly worse than the estimates using plan A-1.

Based on this analysis, as well as the available project resources, we recommend using plan B-4. Considering the various types of comparisons that are anticipated at the statewide level, we should attempt to achieve the maximum precision possible for the statewide total while maintaining reasonable precision for individual strata.

Upon approval of the sampling plan by ARB we will access Dun's database and select the appropriate number of facilities according to their primary SIC number. Our plan is to oversample by 10% because we plan to eliminate point sources and we expect some information may be unusable.

Appendix B contains a sample data request for stratum 5, food and kindred products. The request produces a frequency distribution of facilities by local employee count. Data on

individual facilities can then be downloaded in several formats. A sample listing is provided as well as a standard data layout and glossary of relevant terms used by Duns.

Questionnaire Design

Appendix C is a draft of a questionnaire that we propose to mail out to the companies selected for this survey. The questions have been selected to provide (1) answers that can be summarized in a quantitative manner and statistically analyzed, and (2) information that will suggest to ARB the control and emission reduction methods that are being used or considered by the companies doing cleaning and degreasing with solvents.

We plan to revise the draft questionnaire in response to ARB comments and the recommendations of Survey Research Associates (SRA), our subsidiary that will conduct the survey. Objectives of the revision will be to ensure that the information gathered will provide the information ARB needs and that the data on the returned questionnaires can be efficiently summarized. To make the questionnaire user friendly, we are using many questions that can be easily answered yes or no with a check mark. We have also included an 800 telephone number for the respondents to use if they wish guidance in filling out the questionnaire. Specialists in questionnaire design at SRA will review the questionnaire to ensure that there are no ambiguous questions. They will then reformat and print the questionnaire prior to mailing.

Accompanying the questionnaire will be a letter from ARB explaining the need for the survey and providing assurances regarding the use of the data. We recommend that ARB compose the first draft of this letter, then our survey specialists at SRA will review the letter and recommend improvements, if needed.

Pre-Test of Mail Survey

During Phase I it was agreed that we will conduct a pre-test of the mail questionnaire prior to conducting the complete mail survey. The cost of this added effort is small (less than $2,000) and it will not cause more than a three week delay in the project. We recommend that the pre-test consist of mailing questionnaires to 50 facilities, ten each from five different strata. Half of the facilities will be contacted by phone to determine if the mailing list contains the correct contact person and mailing address. No phone contact will be made for the remaining 25 facilities.

The objective of the pre-test is to determine if there are any issues such as the accuracy of the mailing list, response rate, or appropriateness of the questions that may have a significant impact on the quality or completeness of the expected data. We do not expect to make changes in the subsequent mailing of 3,000 questionnaires unless we uncover a clear problem in the pre-test.

Conducting and Monitoring the Mail Survey

A database consisting of all of the records downloaded from Duns will be retained in its original form at Battelle. A mailing database, consisting of names and addresses, will be delivered to SRA for final formatting and QC review. The questionnaire along with a cover letter from ARB will be sent to the 3,000 facilities. Within one week after the initial mailing, a reminder postcard will be mailed to each of the selected companies. Throughout this process record keeping and computer tracking systems will be used to track the efforts to contact each of the selected facilities. Completed questionnaires will be processed using computerized receipt and control procedures. We anticipate that approximately one third of the 3,000 companies will return the mail questionnaires.

Interim Analysis and Selection of Companies for Phone Survey

Upon completion of the database containing results of the mail survey, Battelle will conduct an interim analysis of the mail survey results. This analysis will be a simple summary of responses. The results will be presented to ARB at the mid-project review. They will also be used to select companies for the phone survey. Of the estimated 1,000 responders to the mail survey we will select 400 for the phone survey. In addition we will contact 200 companies who did not respond so that we can assess the effects of nonresponse on the survey results.

Phone Survey

We plan to conduct the phone survey according to the protocol described in Battelle's proposal. No changes are recommended at this time.

Statistical Reporting

Until we finalize the questionnaire for the mail survey and the protocol for the telephone survey, we cannot recommend any changes to the statistical reporting plan described in Battelle's proposal. However, we have received some sample graphics and a list of information needs from ARB. This information will be used to finalize the questionnaire design. Our plans for analyzing the survey data have not changed.

MANAGEMENT PLAN

During Phase I a number of technical and management issues arose that affect Battelle's management plan. The changes are described in the following sections.

Project Organization

The key members of Battelle's project team and their role in the project are described in Figure 1. There are no changes among the task leaders. New to the project are Piyush Mehta of G_2 Environmental and John Gurklis of Battelle. Mr. Mehta will assist Dr. Shah in gathering information about Dun's database and generating the mailing lists for the survey. Dr. John Gurklis from Battelle's Environmental Technology Department has been providing technical support to Dr. Sticksel throughout Phase I and will continue to be involved in refining the questionnaire and developing the telephone protocol.

Schedule and Deliverables

A revised project schedule is presented in Figure 2. At this time the exact dates for key milestones are only approximate; however, if there no significant changes to the technical approach outlined in this report, we are confident of completing the mail survey this calendar year. The phone survey would begin in January of 1993 and the entire project would be completed by the end of July, 1993.

Staffing and Financial Plan

As of August 27, 1992 the total project costs are $35,633. This amount is approximately the total costs of Phase I. In August we worked on several Phase II activities including the development of the survey questionnaire and refinements to the sampling plan. However, the amount of effort devoted to these activities in August is approximately equal to the effort spent in September completing some Phase I activities, including this report.

The original budget proposed for Phase I was $17,937. ARB's project officer was aware of the fact that our activities during the extended Phase I would result in additional expenditures. However, it was agreed that additional effort was needed by both ARB and Battelle to define the scope of the project and to resolve technical issues.

The only significant impact on the project scope is that the $14,395 saved by not conducting Task II-3 cannot be used to expand the number of mail surveys from 3,000 to 4,500. However, as discussed in the sampling design section, a sample size of 3,000 can still provide adequate information.

To ensure that we can still conduct the project within the total budget of $184,634, we developed a revised staffing plan. The plan as it pertains to the activities of Battelle Columbus Operations (excluding Battelle/SRA) and G_2 Environmental is presented in Table 3. The staffing plan originally proposed by Battelle/SRA for conducting the mail and telephone surveys has not changed.

TABLE 1. STRATIFICATION PLAN

Group No.	Description	California Facilities
2	Research and laboratories	8,598
3	Correctional institutions 9223	500
5	Food and kindred products 20XX	1,998
6	Textile mill products 22XX, and some 31XX	519
7	Furniture and fixture mfr 25XX	5,821
8	Paper and paper products mfr 26XX	1,249
9	Misc plastics products 30XX	2,391
10	Glass product mfr 321X, 322X, 323X	927
11	Stone, clay, and concrete 32XX, excluding glass	1,484
12	Primary metal industries 33XX, smelting and refining	1,137
13	Fabricated metal products, except mach & transpo 34XX	8,135
14	Manufacturing machinery 35XX (exclud. 357X computers)	13,128
15	Mfr computer equipment 357X	5,453
16	36XX, excluding special electronic & commun. equip	2,688
17	Communications equipment 365X, 366X	2,872
18	Special electronics mfr, except 3672 and 3674	2,669
19	Transportation mfr, exclud. aerospace 371X, 373X, 375X, 379X	3,809
20	Transportation mfr aerospace 372X, 376X	1,012
21	Oil and gas extraction and production 13XX	1,554
22	Construction 17XX	31,487
23	Mfr optical and measuring devices 38XX, exclud. 3851	5,760
24	Misc. mfr industries 39XX	5,135
25	Chemical and allied products 28XX and 3069	3,075
26	Transit and trucking (operations) 41XX, 42XX	14,789
27	Air and railroad transportation oper. 451X, 458X, 40XX, 47XX	2,737
28	National security 9711	100
29	Motion picture 78XX	6,188
30	Amusement parks 7996	119
31	Wholesale distribution and durable goods 50XX, 51XX	41,524
32	Petroleum refining and distri. 291X, 295X, 517X	1,779
33	Misc repair services 76XX	30,823
34	Ophthalmic goods 3851	237
36	Printed circuit boards 3672	703
37	Semiconductors/related devices 3674	737
38	Bike, motorcycle and boat dealers 55XX, 59XX	12,557
No. Groups: 35	Totals:	223,744

TABLE 2. ALTERNATIVE SAMPLING PLANS FOR CONDUCTING A MAILSURVEY OF HALOGENATED SOLVENT USERS

Sampling Plan	Criteria	Total Sample	Stratum Minimum Sample	CV[a] of Estimated Stratum Total Min. - Max. (%)	CV of Estimated Statewide Total (%)
A-1	"CARB Plan"	4500	60	3.6 - 9.5	1.44
A-2	Min SE(Tot)	4500	2	2.7 - 55.1	1.06
A-3	Min SE(Tot), $n \geq 60$	4500	60	2.9 - 10.1	1.14
B-2	Min SE(Tot)	3000	1	3.3 - 78.1	1.31
B-3	Min SE(Tot), $n \geq 60$	3000	60	4.2 - 10.1	1.55
B-4	Min SE(Tot), $n \geq 40$	3000	40	3.6 - 12.3	1.40

[a] CV = standard error divided by the estimated total.

TABLE 3. REVISED STAFFING PLAN[a]

	Phase I Mar. 92 - Aug. 92	Survey Planning Sept. 92 - Oct. 92 Dec. 92 - Jan. 93	Data Analysis Dec. 92 - Apr. 93	Reporting and Project Meetings Sept. 92 - July 93	Total
J. Orban (BCD)	75	49	0	134	258
P. Sticksel (BCD)	132	84	0	68	284
R. Menton (BCD)	2	4	64	0	70
P. Hartford (BCD)	0	10	120	0	130
Other Tech. (BCD)	39	15	0	0	54
Secretary (BCD)	18	0	0	60	78
J. Shah (G2)	16	16	0	0	32
P. Mehta (G2)	12	80	0	0	92
Secretary (G2)	2	10	0	0	12

[a] Estimated labor hours for SRA staff to conduct the mail and phone surveys are presented in Table 3-2 of Battelle's proposal. No changes are anticipated.

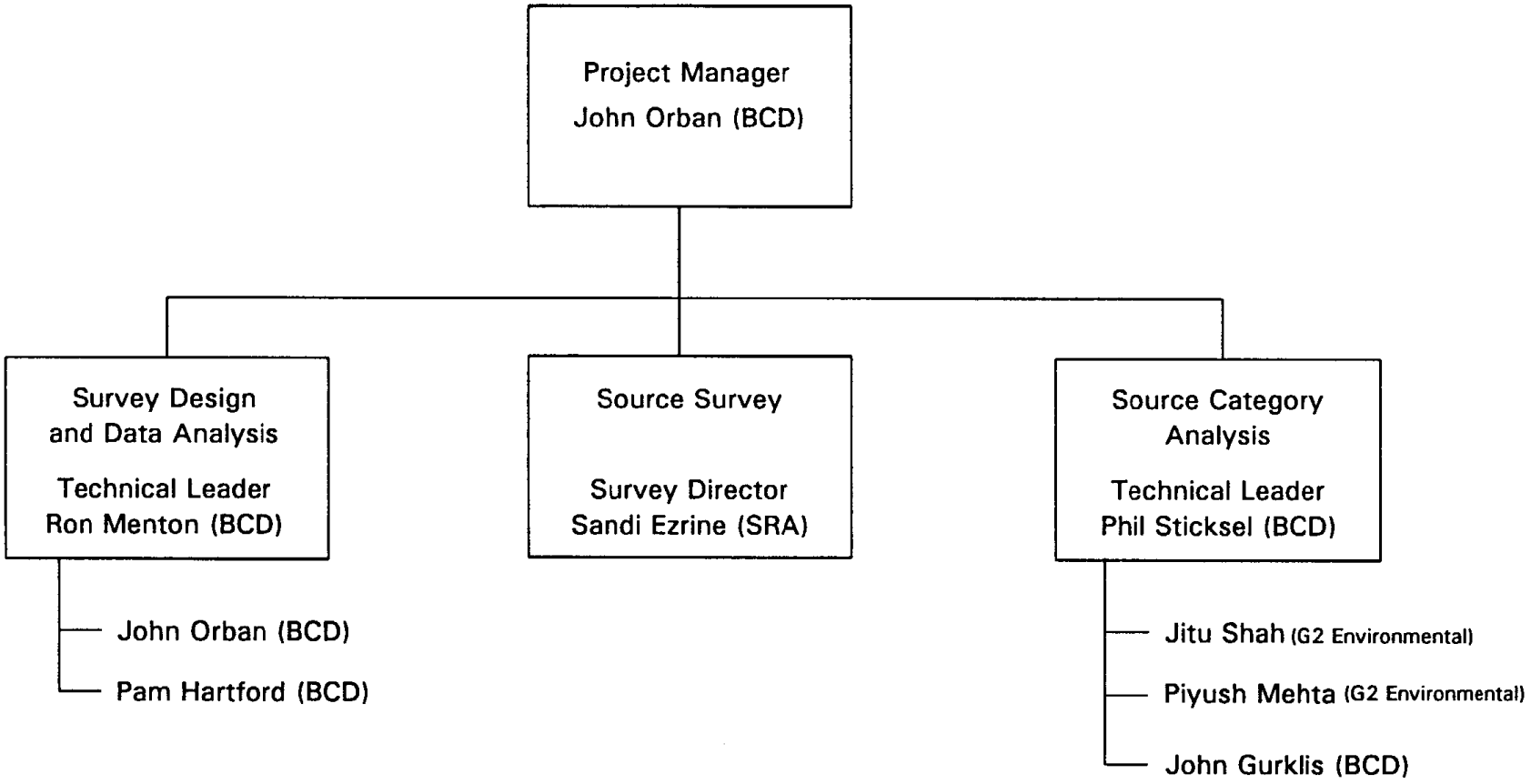

Figure 1. Project Team.

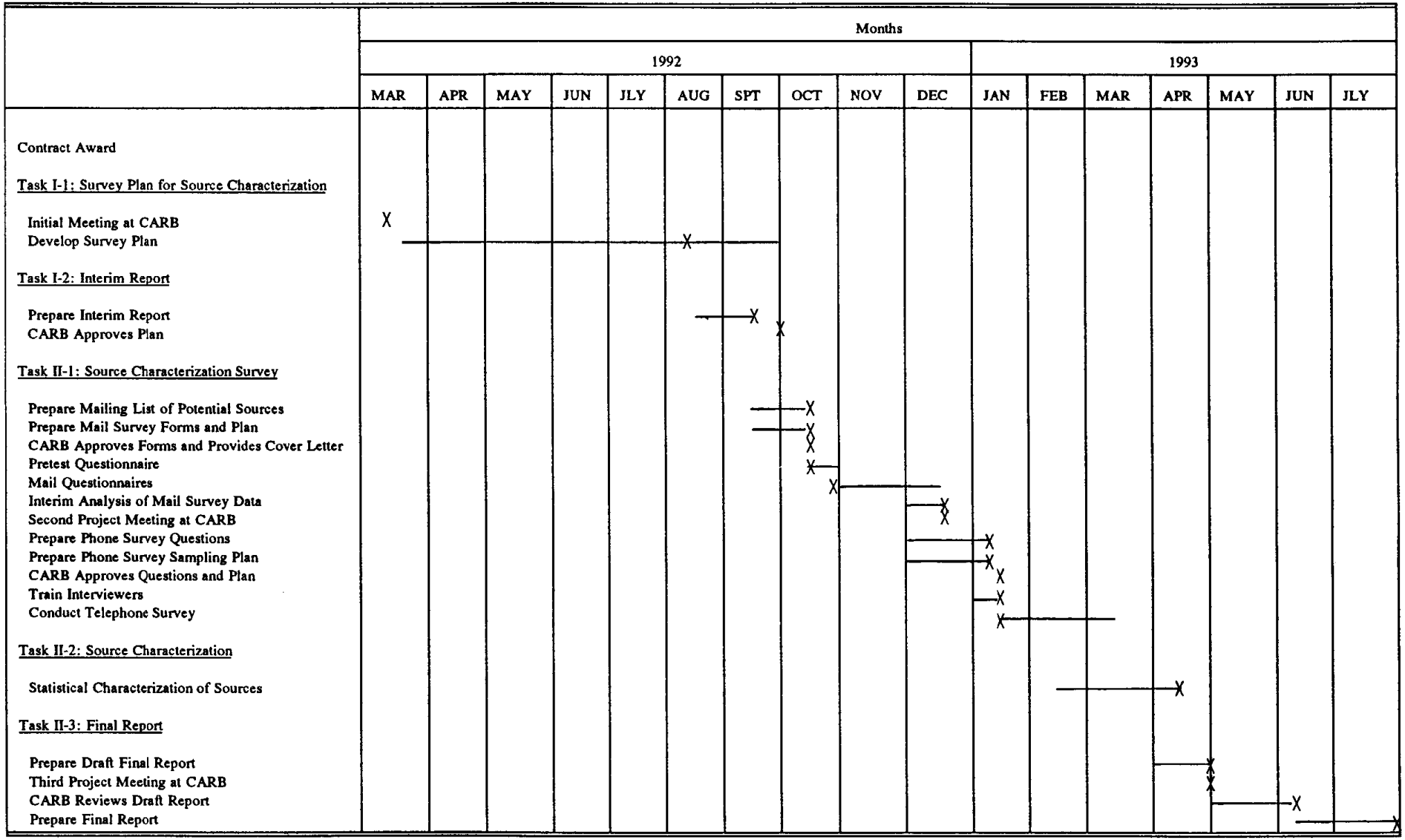

Figure 2. Project schedule.

APPENDIX A

Alternative Sampling Plans

SAMPLING PLAN A-1

"CARB" $n_{strat} \geq 60$
$n_{tot} = 4500$

Stratum	Description	Population Size	Min	Max	Total Solvent Used	Std. Dev.	Sample Size	Standard Error	Coeff.of Variation
2	LABORATORIES	8,598	0	1	4,299	0.391	125	298.2	6.94
3	CORRECTIONAL FACILITIES	500	0	1	250	0.391	60	23.7	9.46
5	FOOD PREPARATION	1,998	0	1	999	0.391	100	76.1	7.61
6	CLOTHING, RUGS, AND LEATHER	519	0	5	1,298	1.953	75	108.3	8.34
7	WOOD AND FURNITURE	5,821	0	5	14,553	1.953	150	916.2	6.30
8	PAPER PRODUCTS	1,249	0	5	3,123	1.953	100	234.0	7.49
9	PLASTIC PRODUCTS	2,391	0	5	5,978	1.953	100	457.1	7.65
10	GLASS PRODUCTS	927	0	5	2,318	1.953	75	200.4	8.65
11	MINERAL PRODUCTS	1,484	0	5	3,710	1.953	100	279.9	7.54
12	PRIMARY AND SECONDARY METALS	1,137	1	10	6,254	3.516	100	381.7	6.10
13	METAL PRODUCTS	8,135	1	10	44,743	3.516	250	1780.8	3.98
14	MACHINERY PRODUCTION	13,178	0	5	32,945	1.953	250	1612.3	4.89
15	COMPUTER MANUFACTURE	5,453	0	5	13,633	1.953	100	1055.2	7.74
16	ELECTRICAL EQUIPMENT MANUFACTURE	2,688	1	10	14,784	3.516	100	927.3	6.27
17	RADIO AND TV MANUFACTURE	2,872	0	5	7,180	1.953	100	551.1	7.68
18	ELECTRIC EQUIPMENT MANUFACTURE	2,669	0	5	6,673	1.953	100	511.4	7.66
19	TRANSPORTATION EQUIPMENT MFG.	3,809	5	15	38,090	3.906	115	1366.4	3.59
20	AIRCRAFT AND SPACE MANUFACTURE	1,012	5	20	12,650	5.859	100	562.9	4.45
21	PETROLEUM PRODUCTION AND REFINING	1,554	0	5	3,885	1.953	70	354.5	9.12
22	TRADE CONTRACTORS	31,487	0	5	78,718	1.953	200	4334.7	5.51
23	SCIENTIFIC INSTRUMENT MANUFACTURE	5,760	1	10	31,680	3.516	150	1631.7	5.15
24	TOYS, PENS, AND PINS	5,135	0	5	12,838	1.953	200	695.2	5.42
25	CHEMICALS MANUFACTURING	3,075	0	5	7,688	1.953	200	410.6	5.34
26	RAILROAD AND TRUCK OPERATIONS	15,056	0	5	37,640	1.953	250	1844.3	4.90
27	AIR TRANSPORT OPERATIONS	2,470	1	10	13,585	3.516	125	756.8	5.57
28	NATIONAL SECURITY	100	0	5	250	1.953	60	15.9	6.38
29	MOVIE AND VIDEO PRODUCTION	6,188	0	1	3,094	0.391	100	239.8	7.75
30	AMUSEMENT PARKS	119	0	5	298	1.953	60	21.1	7.10
31	WHOLESALING	41,524	0	5	103,810	1.953	300	4665.5	4.49
32	PETROLEUM REFINING AND DISTRIBUTIO	1,779	0	5	4,448	1.953	80	379.6	8.54
33	ALL REPAIR SERVICES	30,823	0	5	77,058	1.953	250	3792.0	4.92
34	OPTHALMIC GOODS	237	5	15	2,370	3.906	60	103.3	4.36
36	PRINTED CIRCUIT BOARD	703	0	5	1,758	1.953	70	155.7	8.86
37	SEMICONDUCTORS	737	0	5	1,843	1.953	75	157.5	8.55
38	SPORTS EQUIPMENT DEALERS	12,557	0	1	6,279	0.391	150	398.1	6.34

SAMPLING PLAN A-2

"Min SE(Tot)"
$n_{tot} = 4500$

Stratum	Description	Population Size	Min	Max	Total Solvent Used	Std. Dev.	Sample Size	Standard Error	Coeff.of Variation
2	LABORATORIES	8,598	0	1	4,299	0.391	35	566.5	13.18
3	CORRECTIONAL FACILITIES	500	0	1	250	0.391	2	137.8	55.13
5	FOOD PREPARATION	1,998	0	1	999	0.391	8	275.4	27.57
6	CLOTHING, RUGS, AND LEATHER	519	0	5	1,298	1.953	11	302.4	23.30
7	WOOD AND FURNITURE	5,821	0	5	14,553	1.953	118	1036.0	7.12
8	PAPER PRODUCTS	1,249	0	5	3,123	1.953	25	483.0	15.47
9	PLASTIC PRODUCTS	2,391	0	5	5,978	1.953	48	667.2	11.16
10	GLASS PRODUCTS	927	0	5	2,318	1.953	19	411.1	17.74
11	MINERAL PRODUCTS	1,484	0	5	3,710	1.953	30	523.8	14.12
12	PRIMARY AND SECONDARY METALS	1,137	1	10	6,254	3.516	41	612.9	9.80
13	METAL PRODUCTS	8,135	1	10	44,743	3.516	297	1628.9	3.64
14	MACHINERY PRODUCTION	13,178	0	5	32,945	1.953	267	1559.1	4.73
15	COMPUTER MANUFACTURE	5,453	0	5	13,633	1.953	110	1005.2	7.37
16	ELECTRICAL EQUIPMENT MANUFACTURE	2,688	1	10	14,784	3.516	98	937.0	6.34
17	RADIO AND TV MANUFACTURE	2,872	0	5	7,180	1.953	58	729.1	10.15
18	ELECTRIC EQUIPMENT MANUFACTURE	2,669	0	5	6,673	1.953	54	702.2	10.52
19	TRANSPORTATION EQUIPMENT MFG.	3,809	5	15	38,090	3.906	154	1174.5	3.08
20	AIRCRAFT AND SPACE MANUFACTURE	1,012	5	20	12,650	5.859	62	729.6	5.77
21	PETROLEUM PRODUCTION AND REFINING	1,554	0	5	3,885	1.953	31	539.7	13.89
22	TRADE CONTRACTORS	31,487	0	5	78,718	1.953	638	2409.9	3.06
23	SCIENTIFIC INSTRUMENT MANUFACTURE	5,760	1	10	31,680	3.516	210	1371.7	4.33
24	TOYS, PENS, AND PINS	5,135	0	5	12,838	1.953	104	973.4	7.58
25	CHEMICALS MANUFACTURING	3,075	0	5	7,688	1.953	62	755.0	9.82
26	RAILROAD AND TRUCK OPERATIONS	15,056	0	5	37,640	1.953	305	1666.7	4.43
27	AIR TRANSPORT OPERATIONS	2,470	1	10	13,585	3.516	90	898.5	6.61
28	NATIONAL SECURITY	100	0	5	250	1.953	2	136.7	54.69
29	MOVIE AND VIDEO PRODUCTION	6,188	0	1	3,094	0.391	25	482.5	15.59
30	AMUSEMENT PARKS	119	0	5	298	1.953	2	163.0	54.78
31	WHOLESALING	41,524	0	5	103,810	1.953	841	2768.1	2.67
32	PETROLEUM REFINING AND DISTRIBUTIO	1,779	0	5	4,448	1.953	36	573.2	12.89
33	ALL REPAIR SERVICES	30,823	0	5	77,058	1.953	625	2383.5	3.09
34	OPTHALMIC GOODS	237	5	15	2,370	3.906	10	286.5	12.09
36	PRINTED CIRCUIT BOARD	703	0	5	1,758	1.953	14	363.3	20.67
37	SEMICONDUCTORS	737	0	5	1,843	1.953	15	367.9	19.97
38	SPORTS EQUIPMENT DEALERS	12,557	0	1	6,279	0.391	51	685.5	10.92

SAMPLING PLAN A-3

"Min SE(Tot), $n_{strat} \geq 60$"
$n_{tot} = 4500$

Stratum	Description	Population Size	Min	Max	Total Solvent Used	Std. Dev.	Sample Size	Standard Error	Coeff.of Variation
2	LABORATORIES	8,598	0	1	4,299	0.391	60	432.1	10.05
3	CORRECTIONAL FACILITIES	500	0	1	250	0.391	60	23.7	9.46
5	FOOD PREPARATION	1,998	0	1	999	0.391	60	99.2	9.93
6	CLOTHING, RUGS, AND LEATHER	519	0	5	1,298	1.953	60	123.1	9.48
7	WOOD AND FURNITURE	5,821	0	5	14,553	1.953	97	1144.7	7.87
8	PAPER PRODUCTS	1,249	0	5	3,123	1.953	60	307.3	9.84
9	PLASTIC PRODUCTS	2,391	0	5	5,978	1.953	60	595.3	9.96
10	GLASS PRODUCTS	927	0	5	2,318	1.953	60	226.0	9.75
11	MINERAL PRODUCTS	1,484	0	5	3,710	1.953	60	366.5	9.88
12	PRIMARY AND SECONDARY METALS	1,137	1	10	6,254	3.516	60	502.2	8.03
13	METAL PRODUCTS	8,135	1	10	44,743	3.516	245	1799.4	4.02
14	MACHINERY PRODUCTION	13,178	0	5	32,945	1.953	220	1720.7	5.22
15	COMPUTER MANUFACTURE	5,453	0	5	13,633	1.953	91	1107.1	8.12
16	ELECTRICAL EQUIPMENT MANUFACTURE	2,688	1	10	14,784	3.516	81	1034.1	6.99
17	RADIO AND TV MANUFACTURE	2,872	0	5	7,180	1.953	60	716.6	9.98
18	ELECTRIC EQUIPMENT MANUFACTURE	2,669	0	5	6,673	1.953	60	665.4	9.97
19	TRANSPORTATION EQUIPMENT MFG.	3,809	5	15	38,090	3.906	127	1298.1	3.41
20	AIRCRAFT AND SPACE MANUFACTURE	1,012	5	20	12,650	5.859	60	742.5	5.87
21	PETROLEUM PRODUCTION AND REFINING	1,554	0	5	3,885	1.953	60	384.2	9.89
22	TRADE CONTRACTORS	31,487	0	5	78,718	1.953	526	2659.0	3.38
23	SCIENTIFIC INSTRUMENT MANUFACTURE	5,760	1	10	31,680	3.516	173	1516.3	4.79
24	TOYS, PENS, AND PINS	5,135	0	5	12,838	1.953	86	1072.4	8.35
25	CHEMICALS MANUFACTURING	3,075	0	5	7,688	1.953	60	767.8	9.99
26	RAILROAD AND TRUCK OPERATIONS	15,056	0	5	37,640	1.953	251	1840.6	4.89
27	AIR TRANSPORT OPERATIONS	2,470	1	10	13,585	3.516	74	994.2	7.32
28	NATIONAL SECURITY	100	0	5	250	1.953	60	15.9	6.38
29	MOVIE AND VIDEO PRODUCTION	6,188	0	1	3,094	0.391	60	310.5	10.04
30	AMUSEMENT PARKS	119	0	5	298	1.953	60	21.1	7.10
31	WHOLESALING	41,524	0	5	103,810	1.953	694	3052.7	2.94
32	PETROLEUM REFINING AND DISTRIBUTIO	1,779	0	5	4,448	1.953	60	440.9	9.91
33	ALL REPAIR SERVICES	30,823	0	5	77,058	1.953	515	2630.5	3.41
34	OPTHALMIC GOODS	237	5	15	2,370	3.906	60	103.3	4.36
36	PRINTED CIRCUIT BOARD	703	0	5	1,758	1.953	60	169.5	9.65
37	SEMICONDUCTORS	737	0	5	1,843	1.953	60	178.1	9.67
38	SPORTS EQUIPMENT DEALERS	12,557	0	1	6,279	0.391	60	631.7	10.06

SAMPLING PLAN B-2

"Min SE(Tot)"
n_{tot} = 3000

Stratum	Description	Size	Min	Max	Total Solvent Used	Std. Dev.	Sample Size	Standard Error	Coeff.of Variation
2	LABORATORIES	8,598	0	1	4,299	0.391	23	699.4	16.27
3	CORRECTIONAL FACILITIES	500	0	1	250	0.391	1	195.1	78.05
5	FOOD PREPARATION	1,998	0	1	999	0.391	5	348.6	34.89
6	CLOTHING, RUGS, AND LEATHER	519	0	5	1,298	1.953	7	380.5	29.33
7	WOOD AND FURNITURE	5,821	0	5	14,553	1.953	79	1270.4	8.73
8	PAPER PRODUCTS	1,249	0	5	3,123	1.953	17	587.6	18.82
9	PLASTIC PRODUCTS	2,391	0	5	5,978	1.953	32	820.0	13.72
10	GLASS PRODUCTS	927	0	5	2,318	1.953	13	498.6	21.52
11	MINERAL PRODUCTS	1,484	0	5	3,710	1.953	20	643.7	17.35
12	PRIMARY AND SECONDARY METALS	1,137	1	10	6,254	3.516	28	746.1	11.93
13	METAL PRODUCTS	8,135	1	10	44,743	3.516	198	2007.6	4.49
14	MACHINERY PRODUCTION	13,178	0	5	32,945	1.953	178	1916.1	5.82
15	COMPUTER MANUFACTURE	5,453	0	5	13,633	1.953	74	1229.7	9.02
16	ELECTRICAL EQUIPMENT MANUFACTURE	2,688	1	10	14,784	3.516	65	1157.9	7.83
17	RADIO AND TV MANUFACTURE	2,872	0	5	7,180	1.953	39	892.1	12.42
18	ELECTRIC EQUIPMENT MANUFACTURE	2,669	0	5	6,673	1.953	36	862.9	12.93
19	TRANSPORTATION EQUIPMENT MFG.	3,809	5	15	38,090	3.906	103	1446.1	3.80
20	AIRCRAFT AND SPACE MANUFACTURE	1,012	5	20	12,650	5.859	41	907.1	7.17
21	PETROLEUM PRODUCTION AND REFINING	1,554	0	5	3,885	1.953	21	657.8	16.93
22	TRADE CONTRACTORS	31,487	0	5	78,718	1.953	425	2962.9	3.76
23	SCIENTIFIC INSTRUMENT MANUFACTURE	5,760	1	10	31,680	3.516	140	1690.5	5.34
24	TOYS, PENS, AND PINS	5,135	0	5	12,838	1.953	69	1199.2	9.34
25	CHEMICALS MANUFACTURING	3,075	0	5	7,688	1.953	42	920.4	11.97
26	RAILROAD AND TRUCK OPERATIONS	15,056	0	5	37,640	1.953	203	2050.0	5.45
27	AIR TRANSPORT OPERATIONS	2,470	1	10	13,585	3.516	60	1107.3	8.15
28	NATIONAL SECURITY	100	0	5	250	1.953	1	194.3	77.73
29	MOVIE AND VIDEO PRODUCTION	6,188	0	1	3,094	0.391	17	585.4	18.92
30	AMUSEMENT PARKS	119	0	5	298	1.953	2	163.0	54.78
31	WHOLESALING	41,524	0	5	103,810	1.953	561	3400.9	3.28
32	PETROLEUM REFINING AND DISTRIBUTIO	1,779	0	5	4,448	1.953	24	704.5	15.84
33	ALL REPAIR SERVICES	30,823	0	5	77,058	1.953	416	2931.6	3.80
34	OPTHALMIC GOODS	237	5	15	2,370	3.906	6	373.1	15.74
36	PRINTED CIRCUIT BOARD	703	0	5	1,758	1.953	9	454.7	25.87
37	SEMICONDUCTORS	737	0	5	1,843	1.953	10	452.1	24.54
38	SPORTS EQUIPMENT DEALERS	12,557	0	1	6,279	0.391	34	840.1	13.38

SAMPLING PLAN B-3

"Min SE(Tot), $n_{strat} \geq 60$"
$n_{tot} = 3000$

Stratum	Description	Population Size	Min	Max	Total Solvent Used	Std. Dev.	Sample Size	Standard Error	Coeff.of Variation
2	LABORATORIES	8,598	0	1	4,299	0.391	60	432.1	10.05
3	CORRECTIONAL FACILITIES	500	0	1	250	0.391	60	23.7	9.46
5	FOOD PREPARATION	1,998	0	1	999	0.391	60	99.2	9.93
6	CLOTHING, RUGS, AND LEATHER	519	0	5	1,298	1.953	60	123.1	9.48
7	WOOD AND FURNITURE	5,821	0	5	14,553	1.953	60	1460.2	10.03
8	PAPER PRODUCTS	1,249	0	5	3,123	1.953	60	307.3	9.84
9	PLASTIC PRODUCTS	2,391	0	5	5,978	1.953	60	595.3	9.96
10	GLASS PRODUCTS	927	0	5	2,318	1.953	60	226.0	9.75
11	MINERAL PRODUCTS	1,484	0	5	3,710	1.953	60	366.5	9.88
12	PRIMARY AND SECONDARY METALS	1,137	1	10	6,254	3.516	60	502.2	8.03
13	METAL PRODUCTS	8,135	1	10	44,743	3.516	123	2559.2	5.72
14	MACHINERY PRODUCTION	13,178	0	5	32,945	1.953	110	2443.8	7.42
15	COMPUTER MANUFACTURE	5,453	0	5	13,633	1.953	60	1367.4	10.03
16	ELECTRICAL EQUIPMENT MANUFACTURE	2,688	1	10	14,784	3.516	60	1206.3	8.16
17	RADIO AND TV MANUFACTURE	2,872	0	5	7,180	1.953	60	716.6	9.98
18	ELECTRIC EQUIPMENT MANUFACTURE	2,669	0	5	6,673	1.953	60	665.4	9.97
19	TRANSPORTATION EQUIPMENT MFG.	3,809	5	15	38,090	3.906	64	1844.2	4.84
20	AIRCRAFT AND SPACE MANUFACTURE	1,012	5	20	12,650	5.859	60	742.5	5.87
21	PETROLEUM PRODUCTION AND REFINING	1,554	0	5	3,885	1.953	60	384.2	9.89
22	TRADE CONTRACTORS	31,487	0	5	78,718	1.953	264	3769.0	4.79
23	SCIENTIFIC INSTRUMENT MANUFACTURE	5,760	1	10	31,680	3.516	87	2154.6	6.80
24	TOYS, PENS, AND PINS	5,135	0	5	12,838	1.953	60	1287.2	10.03
25	CHEMICALS MANUFACTURING	3,075	0	5	7,688	1.953	60	767.8	9.99
26	RAILROAD AND TRUCK OPERATIONS	15,056	0	5	37,640	1.953	126	2608.7	6.93
27	AIR TRANSPORT OPERATIONS	2,470	1	10	13,585	3.516	60	1107.3	8.15
28	NATIONAL SECURITY	100	0	5	250	1.953	60	15.9	6.38
29	MOVIE AND VIDEO PRODUCTION	6,188	0	1	3,094	0.391	60	310.5	10.04
30	AMUSEMENT PARKS	119	0	5	298	1.953	60	21.1	7.10
31	WHOLESALING	41,524	0	5	103,810	1.953	348	4329.2	4.17
32	PETROLEUM REFINING AND DISTRIBUTIO	1,779	0	5	4,448	1.953	60	440.9	9.91
33	ALL REPAIR SERVICES	30,823	0	5	77,058	1.953	258	3732.2	4.84
34	OPTHALMIC GOODS	237	5	15	2,370	3.906	60	103.3	4.36
36	PRINTED CIRCUIT BOARD	703	0	5	1,758	1.953	60	169.5	9.65
37	SEMICONDUCTORS	737	0	5	1,843	1.953	60	178.1	9.67
38	SPORTS EQUIPMENT DEALERS	12,557	0	1	6,279	0.391	60	631.7	10.06

SAMPLING PLAN B-4

"Min SE(Tot), $n_{strat} \geq 40$"
$n_{tot} = 3000$

Stratum	Description	Population Size	Min	Max	Total Solvent Used	Std. Dev.	Sample Size	Standard Error	Coeff.of Variation
2	LABORATORIES	8,598	0	1	4,299	0.391	40	529.8	12.32
3	CORRECTIONAL FACILITIES	500	0	1	250	0.391	40	29.6	11.85
5	FOOD PREPARATION	1,998	0	1	999	0.391	40	122.2	12.23
6	CLOTHING, RUGS, AND LEATHER	519	0	5	1,298	1.953	40	154.0	11.87
7	WOOD AND FURNITURE	5,821	0	5	14,553	1.953	65	1402.3	9.64
8	PAPER PRODUCTS	1,249	0	5	3,123	1.953	40	379.5	12.15
9	PLASTIC PRODUCTS	2,391	0	5	5,978	1.953	40	732.2	12.25
10	GLASS PRODUCTS	927	0	5	2,318	1.953	40	280.0	12.08
11	MINERAL PRODUCTS	1,484	0	5	3,710	1.953	40	452.1	12.19
12	PRIMARY AND SECONDARY METALS	1,137	1	10	6,254	3.516	40	620.8	9.93
13	METAL PRODUCTS	8,135	1	10	44,743	3.516	163	2217.5	4.96
14	MACHINERY PRODUCTION	13,178	0	5	32,945	1.953	147	2111.0	6.41
15	COMPUTER MANUFACTURE	5,453	0	5	13,633	1.953	61	1356.0	9.95
16	ELECTRICAL EQUIPMENT MANUFACTURE	2,688	1	10	14,784	3.516	54	1273.0	8.61
17	RADIO AND TV MANUFACTURE	2,872	0	5	7,180	1.953	40	880.7	12.27
18	ELECTRIC EQUIPMENT MANUFACTURE	2,669	0	5	6,673	1.953	40	818.0	12.26
19	TRANSPORTATION EQUIPMENT MFG.	3,809	5	15	38,090	3.906	85	1595.7	4.19
20	AIRCRAFT AND SPACE MANUFACTURE	1,012	5	20	12,650	5.859	40	918.9	7.26
21	PETROLEUM PRODUCTION AND REFINING	1,554	0	5	3,885	1.953	40	473.7	12.19
22	TRADE CONTRACTORS	31,487	0	5	78,718	1.953	351	3264.2	4.15
23	SCIENTIFIC INSTRUMENT MANUFACTURE	5,760	1	10	31,680	3.516	115	1869.4	5.90
24	TOYS, PENS, AND PINS	5,135	0	5	12,838	1.953	57	1321.0	10.29
25	CHEMICALS MANUFACTURING	3,075	0	5	7,688	1.953	40	943.4	12.27
26	RAILROAD AND TRUCK OPERATIONS	15,056	0	5	37,640	1.953	168	2256.0	5.99
27	AIR TRANSPORT OPERATIONS	2,470	1	10	13,585	3.516	50	1215.6	8.95
28	NATIONAL SECURITY	100	0	5	250	1.953	40	23.9	9.57
29	MOVIE AND VIDEO PRODUCTION	6,188	0	1	3,094	0.391	40	381.0	12.31
30	AMUSEMENT PARKS	119	0	5	298	1.953	40	29.9	10.06
31	WHOLESALING	41,524	0	5	103,810	1.953	462	3752.1	3.61
32	PETROLEUM REFINING AND DISTRIBUTIO	1,779	0	5	4,448	1.953	40	543.2	12.21
33	ALL REPAIR SERVICES	30,823	0	5	77,058	1.953	343	3232.4	4.19
34	OPTHALMIC GOODS	237	5	15	2,370	3.906	40	133.5	5.63
36	PRINTED CIRCUIT BOARD	703	0	5	1,758	1.953	40	210.8	12.00
37	SEMICONDUCTORS	737	0	5	1,843	1.953	40	221.3	12.01
38	SPORTS EQUIPMENT DEALERS	12,557	0	1	6,279	0.391	40	774.3	12.33

APPENDIX B

- Sampling Dun's Data Request
- Sample Data
- Standard Data Format and Dun's Glossary

----- Selectors -----

DESCRIPTION "Group # 5: CARB report Table 8, page 2"
NOTE "Food Products: Primary SIC codes only"
STATE CA
SIC 2013 2022 2032 2033 2051 2062 2085 2091 2096 2099
REQUIRE PRIMARY

----- Count 9/20/92 2:41 pm -----

1,540 records 5 samples

----- End of Search Summary -----

Count breakdown by employees here

Local Employees	Interval Count	Cumulative Count	
100 - up	171	171	####
45 - 99	157	328	###+++++
25 - 44	168	496	####++++++++
15 - 24	174	670	####++++++++++++
10 - 14	163	833	####++++++++++++++++++
6 - 9	154	987	###++++++++++++++++++++++
4 - 5	170	1,157	####++++++++++++++++++++++++++
3 - 3	101	1,258	##++++++++++++++++++++++++++++++
1 - 2	201	1,459	#####++++++++++++++++++++++++++++++++++
N.A.	81	1,540	##++

9/16/92
8:12 pm

Dun's Market Identifiers
Search ID: G2_05

---------- Record: 1 --

Name: Nabisco Brands Inc
< Nabisco Foods Co >
Address: 12467 Baseline Ave
: Etiwanda, CA 91739-9522
Tel: (714) 987-1751

DUNS: 11-350-8733
Mail: P O Box 478
DMS| City: 2723 MSA: 6780
Codes| State: 09 County: 604

Business: Mfg Vinegar
SIC: 209999 Food preparations, nec

Branch Manager: Mr Paul M Leonard

Type: Branch Location Manufacturing
Employees here: 15

Hq DUNS: 03-292-4938 Hq Location: Parsippany, NJ
Ultimate DUNS: 36-061-5868

Field Description	Field Name	Field Type	Maximum Field Length	Position
D-U-N-S Number	DUNS NO	C	9	1-9
Company Name	COMPANY	C	30	10-39
Tradestyle	TRADE NAME	C	30	40-69
Street Address	ADDRESS	C	25	70-94
City	CITY	C	20	95-114
State Abbreviation	ST	C	2	115-116
Physical ZIP	ZIP	C	9	117-125
Mailing Address	MAIL ADDR	C	25	126-150
Mailing City	MAIL CITY	C	20	151-170
Mailing State Abbreviation	MAIL ST	C	2	171-172
Mailing ZIP Code	MAIL ZIP	C	9	173-181
Carrier Route Code	CARRIER RT	C	4	182-185
D&B State Code	ST CD	C	2	186-187
D&B County Code	CNTY CD	C	3	188-190
D&B City Code	CITY CD	C	4	191-194
MSA Code	MSA	C	4	195-198
Telephone Area Code	AREA	C	3	199-201
Telephone Number	PHONE	C	7	202-208
First Name	FIRST NAME	C	13	209-221
Middle Initial	MI	C	1	222
Last Name	LAST NAME	C	15	223-237

Field Description	Field Name	Field Type	Maximum Field Length	Position
Suffix	SUFFIX	C	3	238-240
Prefix	PREFIX	C	10	241-250
CEO Title	TITLE	C	30	251-280
Executive Code	EXEC CD	C	2	281-282
Annual Sales Volume	SALES	N	15	283-297
Code for Sales Est/Range	SALES CD	C	1	298
Employees Total	TOTAL EMP	N	9	299-307
Cd. for Tot. Emp. Est./Rng.	TOTAL CD	C	1	308
Employees Here	EMP HERE	N	9	309-317
Cd. for Emp. Here Est./Rng.	HERE CD	C	1	318
Year Started	STARTED	C	4	319-322
Status Indicator	STATUS	C	1	323
Subsidiary Indicator	SUB	C	1	324
Manufacturing Indicator	MFG	C	1	325
Ultimate D-U-N-S Number	ULT DUNS	C	9	326-334
Headquarter's D-U-N-S Number	HQ DUNS	C	9	335-343
Parent D-U-N-S Number	PAR DUNS	C	9	344-352
Parent or Headquarters City	PAR_HQ CTY	C	20	353-372
Parent or Hqtrs. State	PAR_HQ ST	C	2	373-374
New to File	HOT FILE	C	1	375
CEO Change	HOT CEO	C	1	376

Field Description	Field Name	Field Type	Maximum Field Length	Position
Address Change	HOT ADDR	C	1	377
Company Name Change	HOT NAME	C	1	378
Telephone Change	HOT TEL	C	1	379
New Legal Entity	HOT LEGAL	C	1	380
New to World	HOT WORLD	C	1	381
Owner Change	HOT OWNER	C	1	382
Special Indicator—FAX	FAX	C	1	383
Special Indicator—Copier	COPIER	C	1	384
Special Indicator—Cottage	COTTAGE	C	1	385
Population Code	POP CODE	C	1	386
Line of Business	BUSINESS	C	64	387-450
SIC Code 1	SIC1	C	20	451-470
SIC Code 2	SIC2	C	20	471-490
SIC Code 3	SIC3	C	20	491-510
SIC Code 4	SIC4	C	20	511-530
SIC Code 5	SIC5	C	20	531-550
SIC Code 6	SIC6	C	20	551-570

GLOSSARY

Address — The physical location of a business. (See also *Label Address* and *Mailing Address*.)

Administrative and Human Resources Executive — Executives with administrative and human resources job functions. This category also includes in-house legal counsel.

ASCII — The *A*merican *S*tandard *C*ode for *I*nformation *I*nterchange. A data communication code for computers, printers, and telecommunication devices that defines 128 standard characters including numbers, letters, and symbols.

Baud — The transmission rate of a modem. The higher the baud rate, the faster the transmission rate.

Branch — A business that reports to a headquarters. It is usually in the same type of business and carries the same business name as the headquarters.

Business Name — The legal name of a business.

Chief Executive — The senior-most person at a business location; the executive provided on the Standard DMI record.

Corporation — A business that is legally incorporated. A corporation can be a publicly or privately held company.

Criterion (plural Criteria) — A condition used to limit the records selected during a Search. A record must meet the criteria specified by the Search to qualify as a match.

Directory — The "table of contents" for a disk (typically a hard disk). The terms "directory" and "subdirectory" are often used interchangeably. You can view a directory of your Searches by selecting Directory from the *Search Library Menu*.

Division — A business that reports to a headquarters, but is usually in a different line of business and carries a different business name.

DOS — The computer's *D*isk *O*perating *S*ystem. DOS controls the flow of information within the computer, including information to and from disk drives, the modem, monitor, keyboard, printer, and RAM (Random Access Memory).

Dun's Market Identifiers (DMI) A Dun's Marketing Services record containing specific data elements that are frequently used in marketing and sales activities. DMI include such data as a business's name, address, telephone number, D-U-N-S number, SIC codes, and sales volume.

D-U-N-S Number The *D*ata *U*niversal *N*umbering *S*ystem, created by Dun & Bradstreet to organize and track millions of business establishments. A randomly assigned nine-digit number, a D-U-N-S number uniquely identifies each business establishment.

Employees Here The number of employees at a particular business establishment.

Employees Total The number of employees in a business and reporting to that business, including those located at branches, divisions, or subsidiaries.

Enhanced Dun's Market Identifiers (EDMI) An expanded Dun's Marketing Services record containing the data in a Standard DMI record. It may contain up to fifteen executives at a given company; the name, address, and D-U-N-S number of the company's bank; the company's accountant of record; the square footage of the location; and the percentage of increase or decrease in sales and number of employees for the past three and five years.

Family Search A Family Search identifies corporate family members. This includes the ultimate company; any parents and/or subsidiaries of that company; and any headquarters, branches, and divisions of that company.

Family Sort Order Records retrieved from a Family Search can be sorted by family, top down, beginning with the ultimate.

Field On a direct-entry screen in the program, a field is the space in which you enter data. On a record, a field is a space reserved for a particular data element. The length of a field on a record may be fixed (the data may or may not take up all the positions in that field) or variable (the length of the field is directly proportional to the length of the data). Record fields in *Dun's Direct Access* include such things as a company's name, address, number of employees, and SIC code.

File Format Different software programs require different file formats. A file format is the way data is arranged in the file. Two of the available formats are "ASCII Fixed Field" (in which every field in a record contains ASCII codes and is a fixed length) and "ASCII Quotes and Comma Delimited" (in which every field in a record contains ASCII codes, and fields are separated by commas).

Financial Executive Executives with financial job functions, such as treasurers or controllers.

Fixed Field A field of a specific length. If no information is available for a field, it is blank (filled with spaces). If the information within the field does not fill it, the rest of the field is blank. If the information within that field is greater than the field's length, it is truncated.

FSA Code *F*orward *S*ortation *A*rea. The first three characters of the six-character Canadian Postal Code (see Postal Code). The FSA consists of an alphabetic character, a numeric character, and an alphabetic character. You can select companies based on their FSA.

Geographic Codes Geographic locations are assigned unique Dun & Bradstreet codes that are subdivided as follows:

- D&B Country Codes: A three-digit code for countries.
- D&B State Codes: A two-digit code for states and other major political subdivisions in the United States.
- D&B County Codes: A three-digit code for counties or political subdivisions of a state.
- D&B City Codes: A four-digit code for cities within a state or province. Cities are coded in alphabetic order within a state or province.
- D&B Province Codes: A two-digit code for provinces within Canada.
- MSA Codes: Metropolitan Statistical Area Codes (see *MSA*).
- SMSA Codes: Standard Metropolitan Statistical Area Codes used only in Canada (see *SMSA*).

Headquarters	A business having at least one branch or division reporting to it.
Headquarters D-U-N-S Number	The D-U-N-S number of the headquarters location. Appears on branch and division records.
Hierarchy Code	Within a corporate family, the hierarchy code tells you how many levels down from the ultimate company a business is.
Label Address	Mailing address (where present). If there is no mailing address, the Label Address field contains the physical address.
Legal Form of a Business	Indicates whether a business is a proprietorship, a partnership, or a corporation.
Line of Business	A narrative description of the type of business performed at a business establishment.
Mailing Address	The address to which a company's mail is to be sent (often a post-office box).
Manufacturing and Engineering Executive	Executives with manufacturing and engineering job functions. This category also includes data-processing executives.
Manufacturing Indicator	Indicates whether manufacturing operations occur at a site.
Manufacturing Site	Location at which a business manufactures goods.
Marking Records	User classifies records as 1 through 10. You can choose to print or format records based upon their classification. Marking is also used to identify specific records to use in a Family Search. Once a record is marked, the mark is saved with the record for future reference.
Menu	A list of options in *Dun's Direct Access*.
MSA	*M*etropolitan *S*tatistical *A*rea. A county or group of contiguous counties that contains at least one city of 60,000 or more inhabitants. Contiguous counties are included in an MSA if they are socially and economically integrated with the central city. MSAs are used in marketing applications to select prospects geographically.

NA	"Not Available" (the information in the field is blank).
NEC	"Not Elsewhere Classified" (appears in text for the SIC codes).
NSK	"Not Specified by Kind" (appears in text for the SIC codes).
Office Intensive	A preselected file of companies predicted to use office equipment at their locations. Selections are based on the company's line of business and its size (based on number of employees and/or sales volume).
Owns Premises	Indicates that a firm owns the facility in which it conducts its business.
Output File	A file consisting of selected records that have been rearranged to conform to the formats used by another program.
Parent (Parent Company)	A company that controls another company, its subsidiary, through ownership of all or a majority of its stock.
Partnership	A business owned by two or more people that is not a corporation.
Population Code	A one-digit code that indicates the residential population size of the area in which a company is located. The following are possible codes: 0 = Under 1,000 1 = 1,000 to 2,499 2 = 2,500 to 4,999 3 = 5,000 to 9,999 4 = 10,000 to 24,999 5 = 25,000 to 49,999 6 = 50,000 to 99,999 7 = 100,000 to 249,999 8 = 250,000 to 499,999 9 = 500,000 and over

Proprietorship A business owned by only one person that is not a corporation.

Public A company whose main business and branches are publicly held and traded on a U.S. or Canadian stock exchange.

Postal Code In Canada, a six-character code relating to the street address or the mailing address of a business. The first three characters are called the Forward Sortation Area (see FSA). This has the same purpose as the U.S. ZIP code.

Range A series of consecutive numbers (such as 100 to 150 or 3 to 7). In *Dun's Direct Access*, ranges are allowed in some search criteria (such as SIC codes and ZIP codes). Typically ranges in the program are shown by typing the first number in the range (the "lower limit"), two periods, and the last number in the range (the "upper limit"). Example: 100..150. Sometimes only the numbers not in common are shown in the upper limit. For example, 10020..22 indicates the range from 10020 to 10022.

Record A collection of fields arranged in a specific manner. In a database, all records have an identical structure. In *Dun's Direct Access*, a record contains information on one business establishment. These records, as they are structured in the database, are referred to as Standard Dun's Market Identifiers. (See *Dun's Market Identifiers*.) An enhanced record, EDMI, is also available.

Reference File In a Family Search, the file in the Search Library from which you choose a record(s).

Reference Record In a Family Search, the record(s) you choose from the Reference File.

Rents Premises Indicates that a firm rents the facilities in which it conducts its business.

Sales The most recently reported gross annual sales volume for a company and all companies reporting to it.

Sales and Marketing Executive Executives with sales, marketing, advertising, and market research job functions.

Salutation A field, typically containing an appropriate prefix and an executive's last name, used in the salutation of a letter (example: Mr. Smith). If an appropriate prefix cannot be determined from the full name, the full name is used.

Search In *Dun's Direct Access*, a Search is the identification of companies in the *Dun's Direct Access* database that match specific selection criteria. The goal is to retrieve Standard DMI or Enhanced DMI records for those companies meeting the criteria.

A Search has four steps:

1. Specification of search criteria pertaining to such things as: company size, location, and industry.
2. Display of the "count," which indicates how many companies meet the search criteria.
3. Production of a small number of sample records that meet the search criteria. Sample records are downloaded when the count is run. (This is an optional step.)
4. Retrieval of records identified by the Search.

Senior Executive Executive at a senior level, such as a vice president, whose specific functional responsibility is not known.

SIC Codes *S*tandard *I*ndustrial *C*lassification codes. This coding system, developed by the United States government under the auspices of the Office of Statistical Standards, categorizes a United States business establishment based upon the type of business activity performed at its location. All fields of economic activity are included in this system, which includes both manufacturing and nonmanufacturing operations.

This system divides United States economic activity into ten major areas, identified by the first two digits of an eight-digit code. These are the major areas and their two-digit SIC codes:

Agriculture, Forestry & Fishing	01-09
Mining	10-14
Construction	15-17
Manufacturing	20-39
Transportation, Communication, Electric, Gas, and Sanitary Services	40-49
Wholesale Trade	50-51

Retail Trade	52-59
Finance, Insurance, and Real Estate	60-67
Services	70-89
Public Administration	90-98

SIC codes are assigned to each business establishment by Dun & Bradstreet personnel. The *primary SIC code* indicates the primary line of business conducted by that establishment at that location. Up to five additional SIC codes may be assigned if that business engages in more than one business activity at that location. Called *secondary SIC codes*, these additional codes are listed in the order of their relative importance (i.e., by the percentage of revenue generated by each activity).

Single Location — A business in which all operations are conducted at one physical location. It does not have branches or divisions reporting to it. It may be a parent company or a subsidiary.

SMSA — *S*tandard *M*etropolitan *S*tatistical *A*rea. In Canada, a county or group of contiguous counties that contains at least one metropolitan area. Contiguous counties are included in a SMSA if they are socially and economically integrated with the central city. SMSAs are used in marketing applications to select prospects geographically.

Status Indicator — Indicator showing the company's organizational status as a headquarters, branch, division, or single location.

Subsidiary — A company that is more than %50 owned by another company.

Total Employees — This refers to the total number of employees at a location and reporting to that location.

Tradestyle — The name used by a business for advertising and/or purchasing purposes.

Type of Location — Whether the business is a headquarters, branch, division, or single location.

Year Started — The year the business establishment was started. If a change in control has taken effect, the year started is the year it occurred. An example of change of control is a corporation becoming a

subsidiary of another corporation. ("Year Started" is never shown for a branch.)

Ultimate (Ultimate Name) — The top-most corporation in a "family-tree" group of companies.

ZIP Code — The Zone *I*mprovement *P*lan code for the United States. Relates to the street address or the mailing address of a business.

APPENDIX C

Draft Questionnaire

CALIFORNIA AIR RESOURCES BOARD
CLEANING AND DEGREASING QUESTIONNAIRE (SIXTH VERSION)

A. Facility Name _____
B. Street Address _____
C. City, State, ZIP _____, ____, _____
D. Mailing Address(if different from Question C)_____
E. Contact Person/Title/Phone _____/_____/_____
F. County_____ G. Air Basin_____
H. Air District_____ I. Air District Permit Number_____
J. Facility's SIC Number_____

Please return to: Survey Research Associates
611 Falls Road
Baltimore, MD 21209
If you have questions about this questionnaire, please call us at 1-800- - between 9:00 AM and 3:00 PM Pacific Time.

K. Does your facility use solvents for cleaning or degreasing? Yes___ or No___. If No, stop here and return Questionnaire.

L. Check here for confidentiality on Question N. Yes___

M. Business Type:
1( ) Retail
2( ) Industrial
3( ) Agency
4( ) Government
5( ) Nonprofit
Other:
6( ) _____

N. Gross Receipts (1991):
1( ) Less than $25,000
2( ) $25,000 - 50,000
3( ) $50,000 - 100,000
4( ) $100,000 - 250,000
5( ) $250,000 - 500,000
6( ) $500,000 - 2 million
7( ) Over $2 million

O. Business Status: (check one) 1( ) Independently Owned; 2( ) Part of a large company. If part of a large company, list owner _____

P. Number of Employees at your facility: Full time_____ Part Time _____
Normal Operating Schedule: Q. Hours/Day_____ R. Days/Week__ S. Weeks/Year___
T. Work load by season: Spring____% Summer____% Fall_____% Winter____%

U. Solvents Used and Emitted to Outside Air (in 1991):

	Amount Purchased (check one) __Gals. or __Lbs.	Estimated Amount Emitted Annual Total (check one) __Gals. or __Lbs.	Maximum Hourly Lbs./Hr.
1. Methylene Chloride (DCM)	_____	_____	_____
2. PERC	_____	_____	_____
3. Trichloroethylene (TCE)	_____	_____	_____
4. 1,1,1 Trichloroethane (TCA or methyl chloroform)	_____	_____	_____
5. Trichlorofluoromethane (CFC11)	_____	_____	_____
6. Trichlorotrifluoroethane (CFC113)	_____	_____	_____
7. Other CFC (name:_____	_____	_____	_____
8. Stoddard Solvent	_____	_____	_____
9. Other Solvent (name:_____	_____	_____	_____

V. If you use a mixture of solvents what is its composition?_____

W. What is the percentage of volatile components in the mixture? _____%
X. If you use any additives or diluents, please name them_____

Y. Is wipe cleaning the only type of solvent cleaning you do? Yes__ No__

Z. If you have a cleaning unit, is it:
Z-1. Cold Cleaning___, Z-2. Cold Conveyorized Cleaning___,
Z-3. Vapor Cleaning____, or Z-4. Vapor Conveyorized Cleaning___?
Z-5. Name of Manufacturer_____ Z-6. Model Number_____
Z-7. Name manufacturer calls your unit_____ Z-8. Year Installed____

Volume and Dimensions of Your Unit's Baths:

	Bath 1	Bath 2	Other Baths	
Z-9. Capacity (Gal.)	_____	_____	____	____
Evaporative Area				
Z-10. Width (ft.)	_____	_____	____	____
Z-11. Length (ft.)	_____	_____	____	____
Z-12. Freeboard Height (ft.)	_____	_____	____	____

Z-13. State the temperature of the chiller air blanket measured at the coldest point above the center of the solvent cleaner (chiller temperature) ___F

AA.Disposal of Wastes
AA-1. Total quantity of waste you generate from cleaning and degreasing (Include the weight of dirt, solvent, paint, absorbent material) _____lbs/yr
AA-2. Approximate frequency of bath dumping or replacement _____times/yr.
AA-3. Amount of solvent waste disposed of as hazardous waste _____lbs./yr.
AA-4. Amount of waste removed from your site for recycling _____lbs./yr.
AA-5. Amount of waste retained for recycling on your site _____lbs./yr.
AA-6. Composition of your solvent cleaning wastes: solids____% solvent____%

BB. Ventilation System in Your Solvent Cleaning Area
BB-1. What kind of ventilation system do you have?_____
BB-2. What is its capacity? _____cu ft/min or cu ft/hr (choose one)

CC. Solvent Substitution
CC-1. In the last 5 years have you substituted an aqueous solvent or another compound for the halogenated solvents listed in Question U? Yes____ No___
CC-2. If Yes, what solvent did you replace?_____
CC-3. And with what did you replace it?_____

DD.Control Equipment
DD-1. If you have emission control equipment, what type is it?_____
DD-2. Name of the Manufacturer_____ DD-3. Model No._____
DD-4. What is its control efficiency? _____ DD.5 Year installed_____