

Supporting Statement for Paperwork Reduction Act Submission:

Coral Reef Valuation Study

OMB CONTROL No. 0648-xxxx

**U.S. Department of Commerce
National Ocean and Atmospheric Administration
National Ocean Service
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B. COLLECTIONS OF INFORMATION EMPLOYING STATISTICAL METHODS

1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection method to be used. Data on the number of entities (e.g., establishments, State and local governmental units, households, or persons) in the universe and the corresponding sample are to be provided in tabular form. The tabulation must also include expected response rates for the collection as a whole. If the collection has been conducted before, provide the actual response rate achieved.

This application is for the cognitive one-on-one interviews, a second pretest, and the main survey only.

Cognitive one-on-one interviews

For the cognitive one-on-one interviews, we will recruit up to 32 panelists in Washington, D.C. and Denver, CO from KN's established Web-panel.¹ These recruits will be invited to a facility to take the questionnaire online and to participate in a discussion with one of the Stratus Consulting or NOAA researchers. The purpose of the discussion is to help the researchers test how well respondents understood the information presented to them and to debrief on any other issues the respondents had (e.g., wording issues).

Pretest survey implementation

For the pretest survey, we will interview a random sample of 385 panelists from KN's established Web-panel. Due to the nature of the ANES and SRBI panels, we cannot conduct the pretest on these panels. The first pretest we conducted in 2006 resulted in a 65% completion rate, which is higher than what KN typically gets. KN typically expects a 65% completion rate, and we expect a similar completion rate for the second pretest. Based on this assumption, we expect that we will have to send out 385 surveys in order to get 250 completed interviews ($385 \times 0.65 = 250$). This sample size is feasible within the project's budget, given the selected implementation mode, and will provide enough observations for conducting simple summary statistical analyses of the data (means, medians, standard deviations, maximums, and minimums) and for evaluating the effectiveness and appropriateness of the experimental design for the main study.

Main survey implementation

The KN and Abt SRBI Panel samples will include the civilian, non-institutionalized population age 18 or over, as defined by the universe of U.S. households that can be contacted by telephone (106 million households in 2000).

The main survey will be administered to a sample that will be sufficient to produce completed surveys from approximately 2,691 respondents. The main study will be administered to the 2,000 ANES Panel members and 990 MRI Panel members. Due to expected panel response rates, the

1. We believe that 32 cognitive one-on-one interviews will be enough to help us understand and resolve any wording issues and to test respondents' understanding of the material.

expected number of completes is 2,691 ($2,000 \times 0.90$ plus 990×0.90). This sample size is feasible within the project's budget, given the selected implementation mode, and will provide sufficiently large numbers of observations for conducting simple summary statistical analyses of the data (means, medians, standard deviations, maximums, and minimums) and the more sophisticated econometric analyses need to arrive at total value estimates.

We anticipate an overall response rate of about 20% for the ANES Panel. This is based on an expected 31% panel recruitment response rate (AAPOR Rate No. 3), 75% connection rate (agree to join the panel and completed the first online demographic survey), and 85% survey participation rate. The low overall response rate is due to the multistage construction of the KN Panel.

For the in-person recruited MRI Panel, we anticipate an overall response rate of about 63%. This is based on a 90% participation rate.

These estimates are based on the recruitment rates reported on other KN RDD and Abt SRBI in-person surveys and from participation rates reported in the industry (see the answer to Question 2 of this Supporting Statement).

2. Describe the procedures for the collection, including: the statistical methodology for stratification and sample selection; the estimation procedure; the degree of accuracy needed for the purpose described in the justification; any unusual problems requiring specialized sampling procedures; and any use of periodic (less frequent than annual) data collection cycles to reduce burden.

Following are descriptions of the sample frame, the sample selection process, and the process for selecting the sample size that will be followed in the pretest and the main survey implementation.

Sample frame and sample selection

Pretest survey

The KN's established Web panel sample is selected using directory-listed, RDD telephone method, providing a probability-based starting sample of U.S. telephone households (96% of population). The Web-enabled panel comprises both Internet and non-Internet households; KN supplies the non-Internet households with an Internet appliance and Internet connection.

Main survey

The main survey sample frame is the U.S. civilian noninstitutionalized population age 18 or over, as defined by the universe of U.S. households that can be contacted by telephone (106 million households in 2000).

KN will select the ANES Panel sample using RDD telephone methodology, providing a probability-based sample of U.S. telephone households (96% of population). Abt SRBI will select the MRI Panel sample by using in-person recruiting methods, providing a multistage probability sample of residential mailing addresses, described in detail later in this question. The

KN and Abt SRBI Web-enabled panels comprise both Internet and non-Internet households. For non-Internet households, KN will install MSN TV 2 devices using professional installers; Abt SRBI will provide these households with a laptop and broadband Internet access.

Data will be collected from the Abt SRBI and KN Panels. In both samples, each household will have an equal probability of entering the sample (except for households without working telephones, which will have a zero probability of entering the telephone sample).

KN Panel sampling design for the main survey

The sample universe of the ANES Panel is the U.S. citizen population 18 and over as of November 4, 2008. Teenagers who turned 18 prior to or on November 4, 2008 will be included in the sample. KN will utilize list-assisted RDD sampling techniques on the sample frame consisting of the entire U.S. residential telephone population. Only those banks of telephone numbers (consisting of 100 telephone numbers) that have zero directory-listed phone numbers will be excluded. The ANES Panel sample will be a stratified RDD sample of all residential phone numbers in the U.S. where only two strata are necessary. The strata will be defined by whether or not KN can find an address for the telephone number using a service that provides the highest match rate available. Telephone numbers for which KN is able to recover a valid postal address is about 70%. KN will select the sample of phone numbers with equal probability within the two pre-identified strata. Stratum 1 includes all phone numbers that can be matched with postal addresses. Stratum 2 are the remaining phone numbers that cannot be matched beforehand to postal addresses. All numbers drawn from Strata 1 will be kept in the sample. One half of the numbers, randomly selected from Stratum 2, will be kept in the sample.

Approximately 10 days prior to calling sampled phone numbers, the address-matched telephone numbers are sent an advance mailing informing them that they have been selected to participate in the Monthly Special Topics Study. The Stanford University Principal Investigator will sign the advance letters. The respondents are told that the study is being created on behalf of Stanford University, with collaboration from the University of Michigan and funding from the NSF. The advance mailing will include a \$2 cash incentive. The advance mailing will describe that their participation in the study, will explain that there are a wide range of studies about which they will have an opportunity to represent many people like themselves, and will cite their burden as one survey per month. The advance letter describes that study participation is voluntary and includes answers to frequently asked questions that respondents might have.

KN expects about 40% of the sampled phone numbers will be ineligible (not a household, non-working phone number, non-residential phone number, non-English speaking, non-Citizen, etc.), and that some households will initially refuse. Extra follow-up will be done with the initial-refusal households, including use of a special refusal conversion package. The refusal package will contain a refusal letter tailored to the reason for refusal. A monetary incentive of \$5 will be enclosed. However, we anticipate some final refusals even with conversion efforts and have provided for framed 8"x10" framed Certificates of Appreciation to be sent to the respondents selected for the study. A special 1-800 number specific to the study will also be available for the households to call that have questions and for households who wish to authenticate the legitimacy of the study.

A short interview (10 minutes) will be conducted with eligible, cooperating households. The interview will include selected questions from national surveys to measure the attitudes of study respondents and will include identifying and contact information needed by KN, such as survey questions that collect information on all adults in the household. The interview will be conducted with a randomly selected person age 18 as of November 4, 2008. If the selected study member is a minor, then parental consent to interview the minor is obtained on the phone from a parent or legal guardian. The telephone interviewer administering the recruitment survey instrument will document the consent.

ANES Web Panel recruitment response rate statistics

Recruitment interviews were completed at 2,371 of the 12,809 sampled telephone numbers. Completion of a recruitment interview is the operational definition of joining the panel. All sample cases fall into one of four categories: complete interviews (2,371), eligible nonresponse (808), unknown eligibility (5,601), and not eligible (4,029). Completed interviews are broken down into three categories: those completed through the standard telephone interview (2,222), those who initially refused but were converted to a completed interview (85), and those who completed the interview through the internet (64).

- ▶ Response rate (AAPOR RR3): 31%
- ▶ Refusal rate (estimated): 38%
- ▶ Cooperation rate (estimated): 34%
- ▶ Contact rate (estimated): 92%

Table B.1 summarizes the disposition of the ANES Panel recruitment sample.

Table B.1. Final case-level disposition of ANES Panel Study recruitment sample

Disposition	Number
Total sampled telephone numbers	12,809
Complete interviews	2,371
Standard telephone interview	2,222
Refusal conversion interview	85
Internet-only recruitment interview	64
Eligible non response	808
Eligible non-contacts	0
Eligible contacts not complete	808
Refusals, post-selection	558
Language barrier, post-selection	16
Physical or mental impairment, post-selection	25
MSN TV setup not possible, post-selection	19
Respondent never available, post-selection	190

Table B.1. Final case-level disposition of ANES Panel Study recruitment sample (cont.)

Disposition	Number
Unknown eligibility	5,601
Contacts	4,063
Refusals, pre-selection	2,376
Informant pre-selection contact, but never available	1,288
Language barrier, pre-selection	291
Physical or mental impairment, pre-selection	93
MSN TV setup not possible, pre-selection	15
Non-contacts	1,538
Computer/fax tone (on all attempts)	241
No answer (on all attempts)	198
Information never available, non-contact, pre-selection	1,099
Not eligible	4,029
Disconnected phone	3,457
Non-residential/business/government	518
Number changed	11
No age-eligible U.S. citizen in household	43

Source: ANES staff analysis is of the 2008-09 ANES Panel Study sample file.

Abt SRBI Panel sampling design for the main survey

Abt SRBI will draw a multistage probability sample of residential mailing addresses. A sampling frame based on USPS mailing addresses will allow for the selection and enrollment of a sample of eligible households in the panel. This address frame will be referred to as the Delivery Sequence File (DSF). The target population will cover the 48 contiguous states and Washington, DC.

Research on the use of the DSF as an address-sampling frame for area probability samples has focused on the relative merits of using U.S. Census Bureau Census administrative units (blocks, block groups, tracts, counties) or USPS units (ZIP codes, carrier routes). For example, at the 2007 Joint Statistical Meetings, papers on the use of the DSF focused on geo-coding errors associated with assigning DSF addresses to Census Bureau geographic units such as Block Groups. The use of USPS Zip Code carrier routes does not suffer from this problem, but it is more difficult to apply the half-open interval in the field to add missed housing units to the sample.

The basic design involves self-weighting, stratification, probability proportional to size sampling, and multiple stages. Abt SRBI will use four stages of sampling. In the first stage, they will elect 60 3-digit ZIP Code areas from a sampling frame of all 3-digit ZIP Code areas in the

48 continuous states and DC. Principal sampling units (PSUs) will be sorted by geography (nine Census Divisions), metropolitan status, and total number of residential addresses. A systematic sampling scheme will be applied to sorted file with probabilities of selection being proportional to the total number of residential addresses in the 3-digit ZIP Code area. Some 3-digit ZIP Code areas may be sufficiently large to have more than one selection.

In the second stage, they will sample two 5-digit ZIP Codes per 3-digit ZIP Code area for 120 in total. Abt SRBI will do this by preparing a complete list of 5-digit ZIP Codes in each PSU, sorting them in numerical sequence (which reflects geography), and selecting two ZIP Codes systematically using probabilities proportional to the total number of residential addresses in each ZIP Code.

In Stage 3, Abt SRBI will sample two carrier routes per ZIP Code for a total of 240. They will prepare a complete list of carrier routes in each ZIP Code, sorting them in numerical sequence to reflect geography. Select two carrier routes systematically using probabilities proportional to the total number of residential addresses in each carrier route.

In Stage 4, the final stage, Abt SRBI will obtain a complete list of all residential addresses in each of the 240 carrier routes. A systematic sample of addresses will be drawn from each carrier route. The target number of completed household interviews, the expected response rate, and the expected vacancy rate have determined the sample size of addresses per carrier route. The initial sample size of residential addresses is likely to be in the range of 1,300 to 1,400 housing units.

The target sample size for the study is approximately 990 completed household interviews. The sample will be limited to households, with group quarters being excluded from the eligible target population.

Sample size

Cognitive interviews

We intend to interview up to 32 KN Panel members in Washington, D.C. and Denver, Colorado. This number is sufficient in order to test wording issues and respondents' understanding of the survey material.

Pretest survey

The expected number of completed surveys for the pretest survey will be approximately 250. This number is sufficient in order to refine, if necessary, the experimental design.

Main survey

The intended number of completed surveys for the main survey will be approximately 2,691 (1,800 for the KN Panel and 891 for the Abt SRBI Panel). This sample size will be feasible within the project's budget, given the selected implementation mode, and will provide sufficiently large numbers of observations for conducting statistical analyses.

In the analysis of stated choice data, the question of how large the sample size should be to get statistically significant results is common, but often difficult to answer. The question itself raises a number of important issues (Orme, 1998):

- ▶ What is being measured (e.g., preferences for a product versus differences in preferences across people)?
- ▶ What level of confidence is important for the conclusions to be meaningful?
- ▶ What methodology do you intend to use?

This particular study also presents a number of potential issues to consider when developing the specific alternatives for the choice questions, especially issues relating to the limited number of alternative scenarios to be valued.²

Determining the minimum sample size needed is partially based on statistics, but may also be largely based on heuristics and experience. The available statistical literature on stated choice sample sizes is quite limited (W. Adamowicz, University of Alberta, personal communication, 12/30/2004). For example, in Louviere et al.'s (2000) 400-page book, *Stated Choice Methods: Analysis and Application*, only about 10 pages are devoted to sample size.

Both Orme (1998) and Louviere et al. (2000) demonstrate that, for estimating the probability of the respondent choosing some alternative, the minimum sample size for a given level of precision is a function of the choice probability itself, making the computation tautological and circular. They also show mathematically that the optimal or minimum sample size is decreasing in the number of replications or tasks (that is, choice questions) for each respondent. Orme (1998) also shows mathematically that the sample size is a decreasing function of the number of alternatives presented in each choice question, but increasing in the number of levels of the choice-question attributes (e.g., dummy variables that take on one of two values require a sample size smaller than a study with a variable taking on 10 values). Furthermore, if preference heterogeneity exists in the sample (i.e., there are different kinds of people who care differently about characteristics), a larger sample size will be needed because more sets of preference parameters must be estimated (Orme, 1998; Louviere et al., 2000).

Rules of thumb for selecting sample size exist. For example, Sawtooth Software, a developer of software popular for designing choice sets, recommends the following formula for choice-based methods to obtain the minimum sample size:

$$(n \times t \times a)/c \geq 500.$$

Where:

- n = minimum number of respondents
- t = number of tasks or "replications"

2. Not including the cost characteristic, there are eight scenarios to be valued, because three attributes are dummy variables, and each takes on one of only two levels ($2 \times 2 \times 2 = 8$).

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- a = number of alternatives per task (not including “none” or the “status quo”)
 - c = number of “analysis cells.”

When considering main effects, c is equal to the largest number of levels for any *one* attribute. If considering all two-way interactions, c is equal to the largest product of levels of any two attributes (Orme, 1998).

For the main survey, this calculation would be:

$$(2,691 \times 3 \times 2)/4 = 4,036$$

which is more than eight times the target level of 500, indicating that we have sufficient sample size for a study of our design.

3. Describe the methods used to maximize response rates and to deal with nonresponse. The accuracy and reliability of the information collected must be shown to be adequate for the intended uses. For collections based on sampling, a special justification must be provided if they will not yield “reliable” data that can be generalized to the universe studied.

Numerous steps have been and will be taken to maximize response rates and deal with nonresponse behavior for the main survey. Descriptions of these efforts follow.

Maximizing response rates

The first step in achieving a high response rate is to develop an appealing questionnaire that is easy for respondents to complete. We spent significant effort on developing an effective survey instrument during Phase I. We hired experts on economic survey design and stated preference techniques to assist in the design and testing of this survey. The survey instrument developed in Phase I benefited from input on earlier versions from several focus groups and cognitive interviews, and from peer review by experts in survey design and nonmarket valuation and scientists who study coral reefs. In the Phase I focus groups and cognitive interviews, the information presented was tested to ensure key concepts and terms were understood, figures and graphics were tested for proper comprehension and appearance, and key economic and design issues were evaluated. After testing the instrument with focus groups and cognitive interviews, the survey was pretested using the KN’s Web-based Panel.³ The result is a professional, high-quality survey instrument. Since Phase I, we have made additional changes to the survey instrument that will also be tested using cognitive one-on-one interviews and a second pretest before implementing the main survey.

For both of the Web-based panels, KN and Abt SRBI will employ the practices for the Coral Reef Valuation Study main survey that have been employed successfully on other projects that have required OMB approval:

3. KN’s Web Panel is different from the ANES Panel that KN created to conduct the main survey from Phase II.

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- ▶ Field period of one month for the main survey
 - ▶ Use of the federal agency name in the email invitation
 - ▶ Email reminders⁴
 - ▶ Telephone reminder calls to nonrespondents.⁵
 - ▶ Both survey-specific and nonsurvey-specific incentives (as described in response to Part A, Question 9) will be used to improve response rates.

These measures will provide a survey completion rate of 90% for the KN and Abt SRBI Panels. Overall response rates are expected to be approximately 20% and 63% respectively.

Nonrespondents

Specific steps will be employed to assess the presence and extent of nonresponse bias. The purpose of this exercise is not to adjust the estimates of economic value based on nonresponse bias, but rather to test for differences between the two Web-based panels and for differences between the U.S. Census and the two panels. Some of the steps involved to test for nonresponse bias include the following:

- ▶ Data from the screening interview for the ANES and MRI Panels will be compared to each other and to Census figures to identify any systematic differences. The characteristics of people who completed the interview and agreed to participate on panels can also be compared with those who completed the interview but refused to participate on panels.
- ▶ A parallel type of comparison will be made with respect to answers to the attitudinal questions asked of respondents and non-respondents during the initial panel recruitment surveys. The distribution of responses to this question by respondents and nonrespondents will be evaluated for the two groups (respondents and nonrespondents) and compared with the GSS survey results. The demographic and attitudinal question comparisons will enable us to assess how similar respondents and nonrespondents are to each other and to the general population (except for the non-GSS attitudinal questions).
- ▶ Another step that will be taken to evaluate the potential for nonresponse bias will be the analysis of estimated values from the preference function as a function of time/sample size. This approach essentially seeks to assess whether the estimated economic values stabilize as additional sample is added over time.

4. For the ANES Panel, members will receive a pre-announcement email, an invitation email, and as many reminder emails as is necessary. MRI Panel members will receive one prenotification email, one announcement email, and then 4 email reminders.

5. For telephone reminder calls, Abt SRBI will call up to 15 times over the course of two weeks for any particular wave. If they have a home and cell phone number listed, they will try both in any one call attempt.

After taking these steps, we will evaluate the potential magnitude of nonresponse bias on the valuation results.

4. Describe any tests of procedures or methods to be undertaken. Tests are encouraged as effective means to refine collections, but if ten or more test respondents are involved, OMB must give prior approval.

The methodological advance developed in this application is the direct comparison of the sample representativeness, and potential difference in nonmarket valuation estimates, developed from an RDD-recruited (ANES) and an in-person recruited (SRBI) sample concurrently administered using an Internet mode. This study design has held the majority of survey design and administration variables constant across the two sample recruitment methods. Results of this comparisons will add to the currently available information on the effectiveness of using data collected from an RDD-recruited Internet mode survey.

5. Provide the name and telephone number of individuals consulted on the statistical aspects of the design, and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

Stratus Consulting Inc. of Boulder, Colorado, was selected by NOAA to conduct the study through a competitive contract procedure. Mr. David Chapman of Stratus Consulting serves as the Project Manager, and Dr. Robert Rowe of Stratus Consulting serves as Project Technical Advisor. Both Dr. Rowe and Mr. Chapman have extensive experience in applied environmental and natural resource economics involving the use of statistical methods. Contact information follows:

Mr. David Chapman: 303-381-8289

Dr. Robert Rowe: 303-381-8000

Stratus Consulting hired Professor Emeritus Richard Bishop of the University of Wisconsin, Department of Agricultural and Applied Economics, to serve as Principal Investigator. Professor Bishop is a well-known environmental and natural resource economist and has conducted many applied projects involving the use of statistical methods. Contact information follows:

Professor Richard Bishop: 608-238-7473

Stratus Consulting hired Dr. Roger Tourangeau, Director of the University of Maryland Survey Research Center, to advise on sampling design issues, including statistical issues in sample design. Contact information follows:

Dr. Roger Tourangeau: 301-314-7984

Stratus Consulting hired Dr. Barbara Kanninen, to advise on experimental design issues. Contact information follows:

Dr. Barbara Kanninen: 703-536-6949

The rest of the research team includes Norman Meade, Vernon (Bob) Leeworthy, Tony Penn, and Steve Thur from NOAA.

Peer review team:

Richard Carson, University of California at San Diego
Stanley Presser, University of Maryland

In addition, the team has relied extensively on federal, state, and university coral reef researchers and managers to develop foundation information for the survey and to check specific facts about coral reef health and effects of protection mechanisms:

Alan Friedlander, PhD
Fisheries Ecologist, Oceanic Institute, Waimanalo, Hawaii
Representing NOAA's National Centers for Coastal and Ocean Science

Steven O. Rohmann, PhD
Coral Mapping
NOAA/NOS/Special Projects

Richard Grigg, PhD
Professor of Oceanography
University of Hawaii

Charles Birkeland, PhD
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University of Hawaii

Paul Jokiel, PhD
Biologist/Coral Ecologist
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Kim Holland, PhD
Biologist/Coral Ecologist
University of Hawaii

Mike Hamnett, PhD
Director, Hawaii Coral Reef Initiative Research Program
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Stratus Consulting has already entered a contract with KN to recruit for the cognitive one-on-one interviews and to conduct the pretest and the main survey.

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