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Methods Review

Westside Solutions Online Wastewater Treatment & Resource Recovery SiteSpeak Survey

This paper evaluates the Westside Solutions Online Wastewater Treatment & Resource Recovery SiteSpeak Survey against stated research goals and accepted scientific research standards. This review provides readers with an assessment of the relative strengths and weakness of the survey and a risk assessment associated with use of survey results.

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Why obtain stakeholder input?

Well done stakeholder engagement leads to more effective and efficient decisions.

Modern management requires custodians and managers of public and private organizations to make evidence-based decisions. Accordingly, incorporating stakeholder input has become formalized in a wide range of management practices including the Project Management Profession, ISO certification, Accreditation, and Continuous Improvement practices. Stakeholder feedback is often embedded as a business metric in performance management dashboards and Balanced Score Cards.

This paper evaluates the online Wastewater Treatment & Resource Recovery SiteSpeak Survey against its stated engagement goal and accepted scientific research criteria for primary research.[1] All scientific research has three characteristics: 1) Research is designed to make descriptive or explanatory inferences on the basis of input from a subset of a population. 2) Research procedures are public and use explicit, structured and public methods. 3) Research conclusions are always uncertain – uncertainty is a central aspect of all research and conclusions without uncertainty estimates are not science.

Finally, what is being studied does not determine if the research is scientific or not. Science is a set of methods and rules, not the subject matter. The rules of science can be used to study virtually anything including stakeholder opinions about Wastewater Treatment & Resource Recovery site selection and functionality.

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[1] Qualitative and quantitative methods.

SiteSpeak Public Engagement Goal

Project documents state that "critical to the success of this project is meaningful[2] public engagement in developing the solution".

Professional project management methodology uses stakeholder engagement as a way of managing risk. Most project management methodologies identify three types of risk: 1) market risk; 2) technical risk; and, 3) financial risk.

1. Market Risk – Do people want it?
2. Technical Risk – Can it be built?
3. Financial Risk – Are people willing to pay for it?

The SiteSpeak survey results and related engagement information are being used as an objective process to summarize and incorporate stakeholder input into the Committee's method of reducing options associated with a wastewater treatment solution. This method should result in reduced *market risk* by helping determine what stakeholders want and insight into what functionality stakeholders are most willing to paying for (*financial risk*).

Our review of the SiteSpeak survey and supporting documentation results in the following understanding of the Committee's expectations for this research. The research results will:

- Provide insight into ranking stakeholder preference for 21 site locations.
- Provide insight into site suitability based on 3 site characteristics: 1) land use fit with surrounding areas and future plans for the community; 2) potential for use of reclaimed water and energy recovery; 3) proximity to existing sewer trunk and trunk routes.
- Provide insight into the criteria stakeholders use when judging 3 site characteristics.
- Provide insight into conditions most important for stakeholders to consider a site as suitable.

Results for the SiteSpeak survey are being integrated with other public engagement activities including 3 roundtables, 6 open house information sessions with an associated westside solutions survey (December 12, 2014 to February 01, 2015). Informal and ad-hoc public feedback is also being obtained through in-person convers

SiteSpeak's Research Goal

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An important goal for stakeholder input is ensuring it is a valid reflection of reality. This is a challenging goal when stakeholder groups are hard to reach, large in number, and expected to give input into technical and complex topics. The best way to realize this goal is to use scientifically defensible methods. Qualitative and quantitative research methods are the methods of choice to realize this goal.

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[2] Meaningful is not defined by the committee. Our interpretation is that meaningful means people had an opportunity to learn about the project and mechanisms to provide input.

ations and write-in commentary.

Producing defensible survey research results

Overall we find that SiteSpeak Survey meets the basic criteria for providing scientifically defensible research results.

Scientific Criteria	Comment
Research was designed to make descriptive or explanatory inferences on the basis of input from a small subset of a population.	Yes, SiteSpeak results are being incorporated with other engagement data to make inferences about public site preferences and plan functionality.
Research procedures are public and use explicit, structured and public methods.	Yes, SiteSpeak procedures are publicly available. The committee has provided public access to all methods and interpretations of its results, including the limitations of the research.
Research conclusions will be uncertain – uncertainty is a central aspect of all research and conclusions without uncertainty estimates are not science.	Yes, SiteSpeak doesn't make any claim to provide conclusive evidence on public opinion for prospective sites or functionality of treatment plants. SiteSpeak is correct not to report results using statistical estimates of confidence and margin of error.

Poor survey results typically stem from a biased sample, poorly worded questions, incorrect interpretations of results or any combination of these three things. Following survey research rules is essential in obtaining unbiased information. When the rules for sampling and question design are violated or ignored the survey's validity and reliability can be suspect – there is a risk that results will not accurately reflect the views of the overall stakeholder population. The following sections review SiteSpeak sampling and instrumentation.

Sampling

The target population is the approximately 65,835 citizens living in 5 communities.

Table 1: Population distribution of targeted stakeholder groups

Stakeholders/Citizens	2011 Census Population.	Percent Of all Stakeholder Groups
Colwood	16,093	24%
Esquimalt	16,840	26%
Langford	22,459	34%
View Royal	8,768	13%
Esquimalt Nation		
Songhees Nation	1,675	2%
Total:	65,835	100%

This may be an over/under estimate for the total number of stakeholders depending on population growth since the 2011 Census. Of note is that the count for Songhees Nation includes citizens living both on- and off-reserve so there is likely some double counting.

The importance of these counts is that they give the relative proportion of each group for all targeted stakeholders. When random sampling methods are used the sample will resemble the target population. Consequently the first test of how well the SiteSpeak survey resembles the target population is how similar its sample is to the Census population distribution.

When the characteristics of the sample are similar to the target population there can be a greater confidence in the generalizability of the sample survey results.

SiteSpeak Sample methodology

SiteSpeack does not use random sampling methodology to solicit survey respondents. This is to be expected and acceptable given that the Committee's goal is to give all stakeholders the opportunity to participate in meaningful public engagement. By definition, the use of sampling methodology would exclude a majority of the stakeholders population from having an opportunity to provide input.

Random sampling methodology is not necessary to produce scientifically defensible data. Many research studies published in peer-reviewed scientific journals do not use random sampling to obtain their study population. The lack of random sampling methods does not preclude valid and defensible results. Without random sampling methods, however, inferences about the preferences of all citizens – beyond the study population – is not appropriate and not scientifically defensible. For example, suggesting that 50% of residents in Langford support Site 1 because 50% of survey respondents support Site 1 would be a critical error in the interpretation and application of survey results given the sampling methodology used in the survey.

SiteSpeak Sample Selection

There is no perfect sample so all survey research needs to be transparent about how sampling methods might introduce selection bias. Like all surveys, the results from the SiteSpeak survey are <u>most</u> valid for a population that is similar to the survey's respondents.

Non-random sampling methods[3] and self-selection are common reasons for survey results to be different from the target stakeholder group. Self-selection happens whenever individuals volunteer to participate in a survey. Consequently, this section looks at how SiteSpeak methods might systematically produce results for a non-representative set of the stakeholders population.

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[3] Simple Random Sampling (SRS) was not used nor does SiteSpeak claim to use probability based inferences for results (i.e. Confidence Interval or Standard Error estimate). Most telephone surveys do not meet the standards for being SRS because the supplier simply make calls until they obtain the number of completes they want.

A properly drawn small SRS sample will resemble the population from which it is drawn including the relative distribution of sub-groups within the target population. Interestingly, the SiteSpeak sample approximates the Census distribution with exceptions of Langford and View Royal. Langford is under-represented while View Royal is over-represented. A probability sample of n=279 is expected to produce the same number of respondents for each community ± 6%.   Only the Langford and View Royal samples fall outside this margin of error. Consequently we can say the SiteSpeak sample over represents stakeholders from View Royal and under represents stakeholders from Langford.

Table 2: Population distribution of targeted stakeholder groups

Stakeholders/Citizens	2011 Pop.	Percent	Survey1	Percent	SiteSpeak[4]	Percent
Colwood	16,093	24%	60	24% (0)	77	28% (+4)
Esquimalt	16,840	26%	93	38% (+12)	90	32% (+6)
Langford	22,459	34%	40	16% (-18)	36	13% (-21)
View Royal	8,768	14%	54	22% (+8)	74	26% (+12%)
Esquimalt Nation						
Songhees Nation	1,675	2%	Unknown	Unknown	2	1% (-1%)
	65,835	100%	247	100%	279	100%

Selection bias can also happen from the choice of data collection methods (Telephone, Internet, Mail). The SiteSpeak Survey used the internet as its data collection "site". StatCan's Canadian Internet Use Survey suggests that 86.5% of BC households have internet access. Internet access drops to 76% for people in the lowest income quintile and to 40% for individuals 65 years of age or older. The survey also requires a respondent to be literate at approximately level 3. Thus it is unlikely that stakeholders at the lowest literacy levels 1 (14%) and level 2 (21%) participated in this survey. Over 70% of seniors have low literacy rates (below level 3).

Based on the above information and survey research experience we suggest that the results from the SiteSpeak survey are <u>most</u> valid for the following population:

- Respondents living in View Royal and least likely of those living in Langford
- Less likely to represent senior population
- Less likely to represent individuals or households in lower income quintile
- More likely to have home based internet access and computer literacy skills
- Respondents with higher than average literacy rates
- Engaged Citizens (age, income, literacy and technology use are associated with voter participation and community engagement. Also, SiteSpeak respondents needed to be aware of project and motivated to participate)

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[4] As of July 20, 2015 A grand total of 532 respondents but 279 from target stakeholder groups. A SRS of n=279 will produce results that are same as having done the survey with everyone ± 5.9%

The Westside Solutions Survey

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Compared to the SiteSpeak survey, the Westside Solutions Survey obtained relatively similar coverage from participating communities. The distribution of survey respondents shows over representation of residents from Esquimalt (+12%) and View Royal (+8%). Langford has lowest participation with 18% fewer respondents then expected in a random sample. No data is available to determine the survey's representation of the Songhees Nation community.

SiteSpeak Survey Questions

In designing survey questionnaires it is critical to understand that the phrasing of the question and the choice of language can greatly affect the results obtained. We evaluated that SiteSpeak survey questions against the following types of validity.

Type Validity[5]	Description
Face validity	Non-statistical type of validly that is an estimate of whether a survey appears to measure what it is supposed to measure
Content validity	Non-statistical type of validity that involves feedback from content experts and pre-tests to estimate how well survey questions cover the research content of interest
External validity	The extent to which the results of a survey can be held to be true for other cases, for example to different people, places or times. External validity is about whether findings can be validly generalized. If the same research study was conducted in those other cases, would it get the same results?
Predictive validity	Refers to the degree to which the result can predict (or correlate with) a measure taken at some time in the future. (i.e. referendum, election)

The validity of a survey is considered to be the degree to which it measures what it claims to measure. The SiteSpeak survey questions are intended to give insight into Stakeholder expectations and specifications for a solution. Specifically, does this survey contain questions that provide results that

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[5] Most public opinion surveys use only face and content validity. The exception is surveys predicting voter results. The recent poor performance of these types of surveys are well researched and attributed primarily to the use of non-probability sampling methods.

are a valid representation of stakeholders relative ranking of site locations and importance of solution attributes?

Type Validity	SiteSpeak Survey
Face validity	SiteSpeak meets the criteria to have face validity. All probable site locations are included in survey and stakeholders are provided with questions related to solution attributes.
Content validity	Content experts (technical and elected) reviewed the survey for its content validity. The survey was not pre-tested and may not include questions that stakeholders deem important for adequate coverage of solution attributes. The SiteSpeak Survey does contain open-ended questions that will give insight into what solution attributes are not asked about but are important to stakeholders. This content will improve content validly of any future survey.
External validity	While the questions have face and content validity the responses to the survey are likely coming from people who do not accurately represent all stakeholders living in the communities of interest. The degree to which the SiteSpeak results are valid representation of all community stakeholders can only be estimated using sampling methodology.
Predictive validity	While most surveys gauge opinion at one point-in-time, stakeholder engagement surveys gauge opinion over a longer period of time. The very act of conducting engagement activities and surveys can change stakeholder opinions. Scientists have to be wary of the observer effect, i.e. the very act of observation changes what you are attempting to measure. This phenomena is also true of surveys and engagement as the information that is shared in the activities and through the survey questions asked can influence future opinions

Additionally, we noted that site options where not randomized for presentation to respondents. Given the number of site options in the survey it is possible that sites presented first were given greater consideration than site options provided last.

Risk Assessment

No single question or survey can capture the full depth of public opinion on a complex issue such as finding the optimal Wastewater Treatment & Resource Recovery solution. Given this and our comments above the following provides a risk assessment and recommendations.

Research Goal	Risk Assessment
Provide a ranking of stakeholder	The results are limited in their ability to accurately rank all

Research Goal	Risk Assessment
preference for 21 site locations	sites given the addition of new site locations after the survey began. All respondents did not rank all site locations.
Provide insight into site suitability based on 3 site characteristics.	The results of these questions provide meaningful insight into the relative importance of the characteristics tested. The late addition of a site does not negate how respondents rated site characteristics. The greatest risk is that the new site would have prompted respondents to think of characteristics not listed for evaluation.
Provide insight into the criteria stakeholders use when judging 3 site characteristics.	The results of the open-ended questions provide meaningful insight into the reasons stakeholders gave for their rating of listed site characteristics and provide an opportunity for stakeholders to mention other characteristics of importance to them. The greatest risk is that the new site would have prompted respondents to think of characteristics not listed for evaluation.
Provide insight into conditions most important for stakeholders to consider a site as suitable	The results provide meaningful insight into conditions most important for stakeholders to consider for a site to be considered suitable. The greatest risk is that the new site would have prompted respondents to think of conditions they would not otherwise have considered.

Overall, we recommend that the SiteSpeak results be treated as representative of a subset of all targeted stakeholders. The SiteSpeak respondents are likely opinion leaders/influencers within their personal and community networks thus represent an important subset of all stakeholders. This subset is likely more engaged in community issues compared to those that did not participate and most resembles the following population.

- Respondents living in View Royal and least likely of those living in Langford
- Less likely to represent senior population
- Less likely to represent individuals or households in lower income quintile
- More likely to have home based internet access and computer literacy skills
- Respondents with higher than average literacy rates
- Engaged Citizens

Additionally, the result are invaluable for improving the validity and reliability of any probability based survey:

- When incorporated with other public input, engineering and financial consideration the SiteSpeak results can help reduce the number of sites used in a simple random sample study.

- When incorporated with other public input, engineering and financial consideration the SiteSpeak results can help identify what solution functionality is used in a simple random sample study (solution attributes and conditions important to stakeholders).

Sampling Recommendations

Respondents to the SiteSpeak survey are likely more aware than other non-responding stakeholders that the sewage treatment project is happening and are interested enough to participate. This is not necessarily a bad thing as these respondents likely share some of the same attitudes and opinions as other stakeholders in the community. If the research goal is to extrapolate survey results to all target stakeholders, however, a simple random sample methodology is required.

A representative sample is a critically important thing. Getting a representative sample is a challenging task, however. A poor sample is just that, a poor sample. No supercomputer or fancy formula is going to rescue the validity of results from a poor sample. A good sample is representative of the larger population of interest and care is taken to limit selection bias. When a good sample is obtained results can resemble what would have been obtained had every single person in the target population responded to the survey. We would suggest using the street address file as the sample frame of a good sample, given issues associated with telephone and internet-based surveys. Additionally, deploying a multi-mode data collection process (Telephone, Internet, Mail and face to face) can maximize response rate and minimize selection bias. Also, given that the issues being considered are about site selection in a multi-municipality region, sampling will have to critically consider the number of respondents in each community to have the perception of fairness and avoid biasing results.

Question Design Recommendations

While future surveys are important – is it fair to say that the SiteSpeak survey gives valuable insight into what opinion makers and influencers in communities think is important. For any future survey it is important to use language and terminology familiar to all citizens in the target population. To that end we suggest using cognitive interviews with those people we identified a least likely to have participated in current engagement process. Ordering of questions and answer options is of importance as well and options should be randomly presented. The assessment of the SiteSpeak survey we have done here will prove valuable to any prospective survey work considered.

Appendix - About the document Authors.

Doug Balson BA has over 25 years of practical experience managing complex research projects in healthcare and business contexts including envisioning, planning and managing all phases of the research project life cycle. He has designed and managed research projects requiring adherence to international scientific protocols. Doug is highly experienced in using technology for various research, analysis and communication needs; including: SPSS, MS Office365 full suite, MS SharePoint, survey software (e.g. Fluid Surveys, Survey Gizmo), databases, and Microsoft Business Intelligence tools. Doug has an honours BA with a focus on applied research design. Doug is a certified customer experience professional (CXPA), Six-Sigma Yelllow Belt, who provides research services that address various organizational challenges including client satisfaction, customer experience and program effectiveness.

David Hay PhD works with clients in creating good information for good decision-making. David supports organizations, institutions and governments in connecting the knowledge generated in research settings with program design, policy-making and the implementation, practice and delivery of policies and programs at the community level. David is a gifted writer, editor and highly skilled researcher with over 25 years of experience. David's education (BA, MSc and PhD) is in psychology, sociology, community health and social policy. David has produced a large body of work with a particular focus on the contribution of information systems and information management to the social development, health and well-being of children, youth and families. He is occasional reviewer of scholarly articles for Statistics Canada, Health Canada, various academic journals.