

May 2, 2012

Mr. Albert Sweetnam
Executive Vice President
Deep Geologic Repository Project
Ontario Power Generation
700 University Avenue
Toronto, Ontario M5G 1X6

Subject: Information Request Package #2 from the Deep Geologic Repository
Joint Review Panel

Dear Mr. Sweetnam,

In the attached documents, please find information requests from the Deep Geologic Repository Joint Review Panel (the Panel). These requests follow the Panel's consideration of proposed information requests received from the Canadian Nuclear Safety Commission ([Registry document #433](#)). The Panel has determined that responses to these information requests are required to ensure that the available information adequately responds to the Environmental Impact Statement Guidelines issued for the project.

The Panel requests that Ontario Power Generation address the information requests and provide the responses to the Panel in a complete and timely manner. To ensure a consistent approach, the responses should follow the Panel's numbering system and framework as set out in the attached documents. The evaluation of information received will include, but not be limited to, a determination of compliance with the Environmental Impact Statement Guidelines and applicable legislation, an assessment of the supporting data and analysis submitted, the clarity and completeness of the information and, where applicable, the credibility of the scientific and engineering principles applied.

If you require clarification with regard to these requests, do not hesitate to contact either of the Panel's Co-Managers. The Panel would appreciate receiving confirmation with respect to the anticipated date of your responses as soon as possible.

Yours truly,

<original signed by>

Dr. Stella Swanson
Chair, Joint Review Panel

cc. Dr. James F. Archibald, Joint Review Panel Member
Dr. Gunter Muecke, Joint Review Panel Member
Frank King, Nuclear Waste Management Organization
Allan Webster, Ontario Power Generation

/Attachments

**Attachment 1
Deep Geological Repository Project
Joint Review Panel EIS Information Requests
Package 2 – May 2, 2012**

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
EIS 02-34	<ul style="list-style-type: none"> ▪ EIS Guidelines: Section 8.3; ▪ Section 11.4.1 	<ul style="list-style-type: none"> ▪ EIS: Table 3.4.3-1, Comparison of Repository Horizon Alternatives; ▪ Section 7.2, Geology, page 7-6; ▪ Section 7.3, Hydrology and Surface Water, pages 7-29 and 7-32 	<p>Provide a discussion that considers other options for managing the waste rock excavated between the depths of 471 and 647m, including, but not limited to managing the waste rock in a different pile, or using the waste rock as backfill.</p> <p>This discussion should be informed by the potential for the generation of acid drainage posed by the chemical characteristics of the rock within this horizon.</p> <p>Provide the reference: Golder Associates Ltd. 2011. <i>Results of Geochemical Testing of Rock Samples from the Deep Geologic Repository (DGR). Technical Memorandum from C.McRae to D.Barker (NWMO).</i></p>	<p>CNSC staff reviewed the Golder Associates Ltd. 2011 geochemical investigation which analysed drill cores for total metal content, mineral proportion and leach metal concentrations. The results of this report indicated that the total content of As, Cu, Co Pb, Ni, Tl, and Zn was enriched at depth between 471 and 647 meters compared to other depths. Similarly, at the same depth, analyses of the drill cores indicated a greater proportion of Fe₂O₃ (or possibly FeS) and a lower proportion of CaO and MgO at the same depth. In addition, leach concentrations of As, Cu, Co Pb, Ni, Tl, and Zn were also higher. The potential for the generation of acidic drainage from this waste rock is higher than waste rock from other depths.</p> <p>It is difficult to predict short and long-term metal leaching from the waste rock pile based on drill core data. CNSC staff acknowledges that OPG would have treatment on site in the short-term, and that the long-term potential seepage from the waste rock pile could be addressed by installing a cover to limit rain percolation and long-term seepage of metals. Despite these proposed mitigation measures, CNSC staff expect OPG to consider other options for the waste rock excavated from the depths between 471 and 647 meters.</p>
EIS 02-35	<ul style="list-style-type: none"> ▪ EIS Guidelines: 	<ul style="list-style-type: none"> ▪ EIS: Section 6.2.7.4, 	<p>Provide a comparison of the relative ionic radii of the tracers (NaI and HTO) and the radionuclides (C-14, Nb-94, Ni-63,</p>	<p>There is much discussion in section 6.2.7.4 of the EIS about the role of anion exclusion (clogging of rock pores by major</p>

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	Section 10.1.3; <ul style="list-style-type: none"> ▪ Section 11.4.3 	Environmental Heads and Hydraulic Conductivity, Subsection on Diffusion - page 6-49	Co-60, Cs-137, Sr-90, Am-241, Pu-240) that contribute to dose in the normal evolution and disruptive scenarios in the short- to long-term.	cations such as Ca and Na for instance) but there is little discussion on the choice of the tracers (i.e. NaI and HTO). CNSC staff acknowledges that these tracers are believed to have little interaction with the rock along the diffusion path, but OPG has not provided information on how much these tracers could be slowed down by their ionic size compared to other radionuclides of smaller size. Although, it is acknowledged that other radionuclides may have higher chemical and electrostatic affinities with the rock surface, smaller radionuclide ions could have higher diffusion coefficients, possibly resulting in them reaching shallow groundwater in a shorter period of time.
EIS 02-36	<ul style="list-style-type: none"> ▪ EIS Guidelines: Section 13.4 ▪ CNSC Regulatory Guide G-320 	<ul style="list-style-type: none"> ▪ <i>EIS</i>: Section 9, Long Term Safety ▪ <i>Preliminary Safety Report</i>: Section 8, Post Closure safety assessment 	Perform a parametric analysis for the vertical fault scenario considered in the long term safety assessment. This parametric analysis should consider the effects of varying distances of the faults from the edge of the repository, for the two locations (northwest and southeast) currently assumed in the safety assessment.	The safety assessment considers the scenario where an undetected fault zones occur in the vicinity of the repository. Two cases were assessed: one with a fault 500 m to the northwest of the repository, and one with a fault 100m to the southeast. There is no discussion on the justification for these distances. Due to the limitations in non-intrusive methods to detect deep faults from the surface, the proponent should perform a parametric analysis in order to test the robustness of the system and provide increased confidence in the assessment.
EIS 02-37	<ul style="list-style-type: none"> ▪ EIS Guidelines, Section 13; ▪ Section 10.1.1; ▪ CNSC Regulatory 	<ul style="list-style-type: none"> ▪ <i>EIS</i>: Section 6.2.6, Bedrock Geology ▪ Section 9, Long Term Safety, Subsection 9.2.2.3 	Justify and validate the modelling assumptions used to establish the presence or absence of faults or structural geological features in the vicinity of the repository footprint in a geoscientific validation plan. Include a discussion of the methods and their reliability in the response.	

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	Guide G-230	<ul style="list-style-type: none"> ▪ <i>Preliminary Safety Report</i>: Section 3, Site Evaluation and Characterization and Subsection 3.4, Additional Geoscientific Investigations 		
EIS 02-38	<ul style="list-style-type: none"> ▪ EIS Guidelines, Section 13 	<ul style="list-style-type: none"> ▪ <i>Geosynthesis Report</i>: Section 2.2.6.4, Regional Faults - Timing 	<p>Provide more information to support the timing of fracturing and mineral infilling in the study area. Identify any plans for absolute age determinations of fracture minerals.</p> <p>The response should also provide information on the following:</p> <ol style="list-style-type: none"> 1. whether some near-surface brittle fractures may be younger in age (Quaternary); 2. differences in fractures with depth (using borehole information); 3. references to studies which relate surface fracture patterns to fractures encountered at depth. 	<p>Several fracture studies were summarized in the Geosynthesis report and relative chronologies established. The timing of mineral formation within brittle features that are conduits for fluid flow in the study area could be established by absolute age dating (e.g. Sandstrom et al. 2009 in Tectonophysics).</p> <p>Furthermore, hydraulic conductivity is affected by mineral precipitation in fractures.</p> <p>The composition and temperature of formation of fluid inclusions in vein-forming carbonate minerals could reduce uncertainty about the timing of fracturing and carbonate mineral precipitation, as would a comparison of stable isotope signatures in vein minerals and the host rock.</p>
EIS 02-39	<ul style="list-style-type: none"> ▪ EIS Guidelines, Section 13 	<ul style="list-style-type: none"> ▪ <i>Geosynthesis Report</i>: Table 2.5 Summary of Economic 	<p>Assess the potential for stratabound, carbonate-hosted mineralization, both regionally and locally.</p>	<p>Section 2.2.8.3 of the Geosynthesis Report discusses bedrock resources. No information or discussion is provided on the risk of inadvertent intrusion in terms of the regional metallogenic potential of the carbonate rock in the area. An</p>

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		Bedrock Units in the RSA <ul style="list-style-type: none"> ▪ Section 2.2.8.3, Bedrock Resources 		<p>example of this is the Mississippi Valley type of mineralization and how this may apply to the site.</p> <p>A preliminary search of NRCan’s publically available geoscience databases document shows occurrences of Zn, Pb, Cu, Ti, V, Ag, U in the region. Their prospectivity in the Regional Study Area has not been defined.</p> <p>The EIS does not evaluate potential, merely notes that no commercial deposits have been found in the vicinity.</p>
EIS 02-40	<ul style="list-style-type: none"> ▪ EIS Guidelines, Section 7.3: Alternative Means 	<ul style="list-style-type: none"> ▪ EIS: Section 3.2.5: Decision by OPG; ▪ Section 3.4.2: Choice of Site; ▪ Table 3.4.2-1 	Provide further information on the location, salient features, evaluation criteria used, and a summary presentation of the comparison and selection process for alternative locations considered for the DGR.	The EIS Guidelines directs the proponent to consider the siting of the DGR in a location outside the existing site as an alternative mean. A brief reference is made to this matter in Table 3.4.2-1 and in Section 3.2.5 - “...the possibility of pursuing a Greenfield site at a location other than Kincardine was considered.” No supporting information is provided as to what off-site locations were considered and to what extent.
EIS 02-41	<ul style="list-style-type: none"> ▪ EIS Guidelines. Section 7.2: Alternatives to the Project 	<ul style="list-style-type: none"> ▪ EIS: Section 3.3, Alternatives to the Project ▪ EIS: Section 4.7.8, Site Preparation and Construction Phase Program Requirements 	Provide the following references: <ul style="list-style-type: none"> ▪ OPG 2004. <i>Final report of independent assessment of long-term management options for low and intermediate level wastes at OPG’s Western Waste Facility.</i> ▪ Golder Associates Ltd. 2003. <i>Open Houses: Community Consultation Program, Long-Term Management of Low and Intermediate Level Waste Independent Assessment Study.</i> ▪ OPG 2011 Environmental Policy OPG-POL-0021 	Section 7.2 of the EIS Guidelines directs the proponent to describe functionally different ways to meet the project needs and purpose that are also within the control and/or interest of the proponent. Section 3.0 provides a summary of information on the alternatives to the project from a study of alternatives completed under the Memorandum of Understanding between the Municipality of Kincardine and OPG. Copies of these documents would assist in explaining the preferred alternative of a deep geologic repository at a depth of 680m.

IR #	EIS Guidelines Section	EIS Section or other technical document	Information Request	Context
		<ul style="list-style-type: none"> ▪ EIS: Section 4.7.8.3, Community Engagement ▪ EIS: Section 4.7.8.7, Construction ▪ EIS: Section 4.8.7.6, Environmental Protection Program 	<ul style="list-style-type: none"> ▪ OPG 2011 <i>Biodiversity Policy OPG-POL-0002</i> ▪ OPG 2011. <i>Land Assessment and Remediation Policy. OPG-POL-0016</i> ▪ OPG 2011 <i>Spills Management Policy OPG-POL-0020</i> ▪ OPG. 2011 <i>Policy for Use of Ozone Depleting Substances. OPG-POL-0015.</i> ▪ NWMO 2011. <i>Design and Construction Phase Management System (OPGs L and ILW DGR) DGR-PD-EN-0001 R000</i> ▪ NWMO 2011. <i>Community Engagement Plan DGR-PLAN-06020-0001</i> ▪ NWMO 2011. <i>Health and Safety Policy NWMO-POL-WM-0002</i> ▪ NWMO 2011. <i>Environment Policy NWMO-POL-ES-0001.</i> 	<p>The commitments to a rigorous environmental management system for the DGR must be reviewed in the context of OPG policy.</p>
EIS 02-42	<ul style="list-style-type: none"> ▪ EIS Guidelines, Section 9.3:: Valued Ecosystem Components 	<ul style="list-style-type: none"> ▪ EIS: Section 2.3.1, Saugeen Ojibway Nation Engagement 	<p>Confirm that the Jiibegmegoong burial site ceremony and monitoring protocol between the Saugeen Ojibway Nation (SON) and Ontario Hydro/OPG has been finalized. Provide a description of the measures in the protocol designed to mitigate potential effects to Aboriginal use and rights that may result from the DGR Project.</p>	<p>Given that 'traditional use of lands and resources' is identified as a VEC, the status of the Jiibegmegoong burial site ceremony and monitoring protocol is an important consideration in determining the potential impact on traditional Aboriginal use and rights associated with this site.</p>

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EIS 02-43	<ul style="list-style-type: none"> ▪ EIS Guidelines, Section 2.2: Public Participation and Public Consultation 	<ul style="list-style-type: none"> ▪ <i>EIS</i>: Section 2.3.2, Métis Nation of Ontario Engagement, Page 2-19 	<p>Confirm that the Métis Nation of Ontario (MNO) Participation Agreement has been finalized and implemented. Provide a description of MNO's planned participation in the review.</p>	<p>The EIS was submitted over a year ago, and it is important to have updated information on file regarding the status of the protocols listed in the report.</p>

Attachment 2
Deep Geological Repository Project
Joint Review Panel LPSC Information Requests
Package 2 – May 2, 2012

PIR# (Originator)	Review Area Topic	EIS Guidelines Section	Section # in OPG's LPSC Application	Information Request	Context
LPSC 02-48	Management Systems and Human Performance	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Preliminary Safety Report: 11.3 Design and Construction Phase</i> ▪ <i>Deep Geologic Repository Project Management System, 00216-CHAR-0001</i> 	Provide information describing how OPG, through its NWMO oversight activities and assessment program, intends to assess Human Performance program aspects of DGR project activities in order to ensure consistency with OPG's existing corporate program. Include a list of the elements of the human performance program to be addressed and the expected frequency of the assessment.	<p>OPG project management system identifies the application of CSA N286-05 and OPG policies, values and objectives to the DGR project. Section 1.5.2 of also states that "all DGR project personnel (OPG and NWMO) will demonstrate a commitment to safety culture through adherence to the requirements of the management system and by demonstrating the behaviours that contribute to excellence in human performance."</p> <p>Human performance is managed through such things as: training; performance expectations; procedure development and compliance; safe working strategies and practices; verification of work; problem identification and resolution including experience; control of design and design changes; promotion, assessment, and maintenance of safety culture. Related aspects that may also be required for the project are not evident in the documents (shift complement, work hour limits, reduction in human error, safety culture promotion, assessment and maintenance), while others are not linked in an integrated manner.</p> <p>CNSC staff is unclear how OPG will ensure the implementation and integration with the NWMO of the objectives of their Human Performance Program to the DGR project.</p>

PIR# (Originator)	Review Area Topic	EIS Guidelines Section	Section # in OPG's LPSC Application	Information Request	Context
LPSC 02-49	Design and Construction Management	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Preliminary Safety Report: 11.3 Design and Construction Phase</i> ▪ <i>Deep Geologic Repository Project Management System, 00216-CHAR-0001, 1.8.1 Design</i> 	Clarify how OPG will ensure the NWMO's procedures and processes comply with the corresponding applicable OPG requirements.	<p>The PSR in section 11.3 states that "DGR work is verified via verification processes and procedures. Furthermore for work conducted by contractors, project quality plans are approved and include appropriate verification procedures for deliverables including verification process documentation." In section 1.8.1 of 00216-CHAR-001, OPG documents W-PROC-EN-001 and W-PROC-WM-0047 are identified as setting out requirements for the NWMO.</p> <p>As the requirements in these documents will also apply to sub-contractors, via the NWMO's procedures, CNSC staff is uncertain how OPG will ensure that OPG's requirements have been appropriately incorporated into the requirements in similar NWMO procedures.</p>
LPSC 02-50	Management Systems and Human Performance	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Preliminary Safety Report: 11.3 Design and Construction Phase</i> ▪ <i>Deep Geologic Repository Project Management System, 00216-CHAR-0001, 1.5.2 Safety Culture</i> 	Provide information indicating the OPG program documentation that will be used as part of OPG oversight activities to assess and verify the promotion, assessment and maintenance of safety culture for DGR project activities. Identify and describe the sections of the documentation that apply to the DGR project and will be used for oversight activities. List the elements of safety culture that will be assessed and the expected frequency of the assessment.	<p>OPG's charter identifies the application of CSA N286-05 and OPG policies, values and objectives to the DGR project. Section 1.5.2 of the charter states "All DGR Project personnel (OPG and NWMO) will demonstrate a commitment to safety culture through adherence to the requirements of the management system and by demonstrating behaviours that contribute to excellence in human performance."</p> <p>CNSC staff is uncertain how OPG will be conducting oversight activities related to safety culture.</p>

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LPSC 02-51	Management Systems and Humans Performance	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Design and Construction Phase Management System</i>, DGR-PD-EN-0001, 4.1.2.3. Health and Safety Incident Reporting, 4.1.3.3 Nonconformance and Corrective and Preventative Action 	<p>Provide information describing:</p> <ul style="list-style-type: none"> • how the NWMO will determine that incident investigations completed by its contractors meet a standard acceptable to OPG and can meet CNSC requirements; and • how OPG's oversight activities will ensure such investigations meet OPG requirements. 	<p>Sections 4.1.2.3 and 4.1.3.3 of the NWMO's Design and Construction Phase Management System identifies how incidents, deficiency, malfunction and others will be reported and addressed.</p> <p>CNSC staff is uncertain how the NWMO will determine whether investigations completed by contractors are completed to a standard acceptable to OPG. Further, CNSCS staff is not clear how OPG will conduct oversight activities relating to such investigations by their contractors and sub-contractors to ensure they meet OPG's requirements</p>
LPSC 02-52	Design and Construction Management	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Preliminary Safety Report</i>, 10.9 Records and Document Control, 11.2 Regulatory Approvals Phase ▪ <i>Deep Geologic Repository Project Management System</i>, 00216- 	<p>Clarify which agreements are in place for maintaining records produced by the NWMO and its subcontractors during the Regulatory Approvals Phase, and are in place for the Design and Construction Phase.</p>	<p>In section 10.9 of the PSR, document control for the operational phase refers to OPG document management processes, while in 11.2, Regulatory Approvals Phase, document control is referred the NWMO. In OPG's charter document, where the DGR project is identified as the design, procurement and construction of the project, it states "upon completion of the DGR Project, the related project information from the NWMO will be turned over to OPG in a form compatible with OPG systems". OPG and the NWMO have procedures in place to manage records as per section 1.6 of 00216-CHAR-001 and 4.2.4 of DGR-PD-EN-0001, respectively.</p>

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			CHAR-0001, 1.6 Information Management <ul style="list-style-type: none"> ▪ <i>Design and Construction Phase Management System, DGR-PD-EN-0001, 4.2.4 DGR Project Document Management Control</i> 		It is not clear what the arrangements are between the NWMO and OPG for the maintenance, including storage, of the records produced by the NWMO and its subcontractors during both the Regulatory Approvals and the Design and Construction Phases of the project.
LPSC 02-53	Design and Construction Management Management Systems and Human Performance	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Deep Geologic Repository Project Management System, DGR-PD-EN-0001, 6. Availability of NWMO Governance and DGR Project Specific Governance</i> 	Clarify the purpose, scope, and the clauses of CSA N286-05, addressed by the following documents, that are planned for later completion: <ul style="list-style-type: none"> • Construction Quality Assurance Plan; • DGR-PLAN-01916; Field Quality Inspection Manual; • DGR-MAN-01916; Commissioning Management Plan DGR-PLAN-00920-1001; • Commissioning Change Control Procedure DGR-PROC-00920-1001; 	Table 8.2 in the NWMO's Design and Construction Management System identifies some documents that will be produced later in the Design and Construction Phase of the project. An understanding of the purpose, scope, and the clauses of CSA N286-05 that such documents are expected to address is important to governance of the project.

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				<ul style="list-style-type: none"> • Procurement and Contracts Management Plan DGR-PLAN-00800-1001; • Construction Management Plan DGR-PLAN-00180-1001; and • Training Management Plan DGR-PLAN-00180-1001. 	
LPSC 02-54	Design and Construction Management	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Deep Geologic Repository Project Management System</i>, 00216-CHAR-0001, 1.2 Statement of Commitment to Management System, Appendix B 	Demonstrate that the requirements of CSA N286-05 clauses 5.12, 6.1, and 6.2 are incorporated in the management system documents of OPG, NWMO and sub-contractors.	<p>The charter commits the management system to meeting the requirement of CSA N286-05 and Appendix B is identified as providing the correlation of the CSA N286-05 requirements to OPG's management system for oversight of the DGR Project. These documents are therefore expected to demonstrate the identified clause.</p> <p>W-PROG-EN-001 (Conduct of Engineering) and W-PROC-WM-0047 (Conduct of Safety Assessment and Licensing) in Appendix B are considered by CNSC staff to be key documents for the Regulatory Approvals and Design and Construction Phases of the project. It is not evident that these documents ensure compliance with N286-05 clauses 5.12 (changes are controlled), 6.1 (Design), and 6.2 (Safety Analysis).</p>
LPSC 02-55	Design and Construction Management	Class 1 Nuclear Facility Regulations (C1NFR) 3(d)	<ul style="list-style-type: none"> ▪ <i>Deep Geologic Repository Project Management System</i>, DGR-PD-EN-001, 3.2 Contractor's 	<p>Identify the postclosure safety functions and geological barriers that may be impacted by design changes and construction activities.</p> <p>Describe the plans and processes that will ensure information is identified and communicated to and between contractors.</p>	Project Requirements specify "the repository shall be constructed in such a way as to preserve the postclosure safety functions and the geological barriers shown to be important by the DGR safety case" and "... rock excavation techniques shall be used that minimize the excavation damage zone ...". The Design and Construction Phase Management System identifies the

PIR# (Originator)	Review Area Topic	EIS Guidelines Section	Section # in OPG's LPSC Application	Information Request	Context
			Roles and Responsibilities, 3.3 Organizational Interfaces <ul style="list-style-type: none"> ▪ <i>Project Requirements</i> DGR-PDR-00120-0001, 14.0 Periodic Inspection and Monitoring Requirements, 18.0 Constructability Requirements 		<p>NWMO as responsible for ensuring an effective interface exists between the engineering and construction teams, and for ensuring that work is completed in accordance with plans and that project requirements are achieved.”</p> <p>As the postclosure safety functions and barriers may be impacted by design changes and construction activities (the methods used and their implementation) and as the design (e.g. shaft liner, room orientation) may change based on in-situ measurements taken during excavation, the communication of information between the NWMO and the contractors involved in design changes, construction, and verification activities (supporting both the design and safety case) is important.</p> <p>It is unclear how the NWMO plans to: inform contractors of the importance of specified safety functions and barriers; ensure related information is distributed to all personnel who may impact those safety functions and barriers; and ensure that information obtained through measurements, verification activities or the observations of construction workers is communicated to those requiring it.</p>