
Final Report
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EXECUTIVE SUMMARY

This report details the results of the project launched in February 2003 for the Expansion, Update and Maintenance of the National Occupational Standards (NOS) for Environmental Employment. The objective of the project was to ensure that the standards continue to reflect the current and emerging environmental work performed by Canadian environmental practitioners. The project is an integral part of CCHREI’s strategy to ensure that Canada has the environmental workforce it needs for its future prosperity.

The desired outcomes of the project were:

1. An enhanced framework that reflects the current realities of environmental employment in Canada
2. Updated NOS, based on a gap analysis of the current NOS elements
3. Revised and validated sets of standards for Technician/Technologist (TT) and University-Level (UL) practitioners in each of the subsectors identified in the revised framework

A four-phased process was launched to deliver these outcomes, i.e.:

I. Review and revision of the NOS framework
II. Review and revision of the elements in the NOS
III. Detailed occupational analysis of the revised NOS
IV. Validation of the resulting subsector profiles and revised NOS framework

The process involved close to 1000 practitioners, with significant effort made to represent the scope and breadth of environmental employment across Canada. Experts and key informants in environmental practice were engaged in a web-enabled forum to discuss current trends and issues in environmental practice, and to suggest revisions to the current framework for environmental employment in Canada (Phase I). To ensure the revised environmental standards would truly reflect the needs of environmental practice in Canada today, CCHREI’s NOS were subjected to a meticulous and highly technical review and revision process by task forces of experienced practitioners (Phase II) before they were released openly to all practitioners for rating in the on-line survey (Phase III). Following the detailed occupational analysis of the survey data, the resulting profiles also underwent a rigorous validation process through focus groups and independent reviewers (Phase IV) to produce the NOS profiles submitted with this report.

In the final analysis, CCHREI’s definition of environmental employment was revised, and several changes were made to the Subsector Model of environmental employment. (See Figure 1 - Revised Subsector Model on page 7.) Sector C was renamed, three new subsectors were added, one subsector was split into two, and eleven subsectors were renamed. The only subsectors that remained unchanged in name were Human & Environmental Health & Safety, Forestry, and Agriculture. The definitions of all Sectors and Subsectors were revised as seen in Appendix A.
CCHREI’s NOS now contain 281 environmental competency statements, each describing one specific environmental task. The organization of these into 36 clusters of related competencies and 11 functions or groups of related clusters (Appendix B) will help to create a more intuitive linkage to the new subsectors of environmental employment. The NOS also contain 34 enabling competency statements, organized into 7 clusters (Appendix C).

A total of 29 sets of national occupational standards, i.e. NOS profiles, were produced and validated. These included profiles for University Level (UL) practitioners in each of the 19 subsectors, and for Technician/Technologist Level (TT) practitioners in 10 of the 19 subsectors as illustrated in Table 3 on page 12 of this report. TTs in the remaining nine subsectors will share the corresponding UL NOS profile. The revised NOS profiles for all subsectors can be viewed in Appendix D for UL practitioners and Appendix E for TT practitioners.

As a result of this project, CCHREI can now be assured that these widely validated NOS are “leading edge”, not just in Canada but also around the world. Environmental practitioners across Canada have a much greater awareness of CCHREI’s role as a leader in building a knowledgeable, highly skilled environmental workforce, and the potential benefits of partnering with CCHREI in such important areas as development of college and university level educational programs, and the recruitment of environmental practitioners. Most significantly, environmental employers and practitioners are more aware of the value of a standardized, validated national certification process for environmental practitioners.
MEMBERS OF THE NATIONAL STEERING COMMITTEE

Project for the Expansion, Update and Maintenance of the National Occupational Standards for Environmental Employment

(Alphabetical Order)

Mr. Doug Bruchet
Mr. Bob Gill
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Mr. Dave Polster
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Manitoba Hydro
University of Alberta
National Forestry Aboriginal Association
Calgary Health Region
City of St. John’s
University of Guelph
Norwest Labs
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Niagara College
Environment Canada
Canadian Land Reclamation Association (CLRA)
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1.0 BACKGROUND

1.1 Purpose of Report

This report details the results of the 2003 project for the Expansion, Update, and Maintenance of the National Occupational Standards (NOS) for Environmental Employment. The project was launched by the Canadian Council for Human Resources in the Environment Industry (CCHREI) and funded by Human Resource Development Canada (HRDC). The objective of the project was to ensure the standards continue to reflect the current and emerging employment activities of Canadian environmental practitioners. The project is an integral part of CCHREI’s strategy to ensure that Canada has the environmental workforce it needs for its future prosperity.

1.2 Context of Project

In 1994, CCHREI released its definition of environmental employment in Canada. The definition included the identification of three sectors and fifteen subsectors of environmental employment. This was a significant step forward in identifying and addressing human resources issues related to the environment industry across Canada. Following this, CCHREI developed two series of National Occupational Standards (NOS) for Environmental Employment in Canada. The first was a series of ten standards published in 1997 for technicians and technologists (TTs), i.e. practitioners with a college education. The second was a series of fifteen standards developed in 1999 for practitioners in university-level occupations (ULs), i.e. with university granted degrees.

In February 2003, CCHREI launched a project for the review and update of the NOS for Environmental Employment. This work entailed a critical review of the definition of environmental employment and a detailed review of all the competency statements. Entegrys Incorporated was contracted to carry out this research project. Entegrys Incorporated is a management-consulting firm that specializes in the development and application of competency-based human resource (HR) management systems.

1.3 Objectives

Since they were introduced in 1997, the NOS have served as the foundation for the certification of environmental practitioners in Canada. They have also served as a self-assessment tool for practitioners, as a recruitment tool for employers, and as a tool to guide the curriculum development of post-secondary environmental programs and training courses.

The primary objective of the review and update of the NOS was to ensure that the NOS continue to reflect current and emerging employment activities as performed by environmental
practitioners in Canada. However, the larger purpose was to provide a foundation for the ongoing development of competent environmental practitioners, which would position Canada favorably in the global environmental marketplace.

By reflecting current industry employment activities, CCHREI expects that the revised NOS will result in or contribute to:

- More accuracy in identifying the standards for certification of environmental practitioners.
- Increased numbers of practitioners certified through the CCEP process.
- More strategic alignment of technical and university educational programs to industry needs.
- Increase in the numbers of qualified practitioners.
- Better career planning tools, such as skills assessment questionnaires, to benefit practitioners seeking to access the job market and practitioners seeking mobility across industry sectors or geographic regions.
- A greater variety of recruitment and performance management tools for employers.
- A more accurate assessment of the training and development needs of practitioners.
- A more rigorous process for the assessment of competencies of new Canadian workers.

To meet these expectations, CCHREI articulated that the revised National Occupational Standards would:

- Support a wide range of human resource strategies.
- Be easier to understand and to use than the current NOS.
- Be in a format that could be readily integrated into a variety of HR tools.

1.4 Overview of Methodology

CCHREI established a sixteen member National Steering Committee to guide this important undertaking. The members represented the public and private sectors, academia and employers of environmental practitioners. Their role was to provide informed, expert feedback to CCHREI throughout the four phases of the review and update process.

The project engaged nearly 1000 practitioners across Canada in a four-phase consultation process that took place between March and November 2003. Appendix F provides a detailed description of the project methodology for each of these four phases. Briefly, the four phases of the consultation process were as follows:

- Phase I: Critical Review of CCHREI’s Framework for Environmental Employment (via web-enabled forums and follow-up conversations with expert advisors and key informants)
Phase II: Reorganization and Update of the Existing NOS Statements
(via task force teams of experienced practitioners and other independent expert reviewers)

Phase III: Development of NOS Profiles
(via on-line survey of environmental practitioners and rigorous detailed occupational analysis)

Phase IV: Validation of Revised Framework and NOS Profiles
(via focus group participants and independent reviewers)

Every effort was made to ensure that the feedback gathered throughout the process reflected the breadth and scope of environmental employment in Canada today as illustrated below.

Table 1: Representation by Subsector

<table>
<thead>
<tr>
<th>Subsector</th>
<th>Review</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 – Air Quality</td>
<td>0</td>
<td>6</td>
<td>3.7</td>
</tr>
<tr>
<td>A2 – Water Quality</td>
<td>2</td>
<td>13</td>
<td>10.5</td>
</tr>
<tr>
<td>A3 – Land Quality</td>
<td>0</td>
<td>10</td>
<td>4.0</td>
</tr>
<tr>
<td>A4 – Waste Management</td>
<td>1</td>
<td>42</td>
<td>5.8</td>
</tr>
<tr>
<td>A5 – Restoration &amp; Remediation</td>
<td>0</td>
<td>48</td>
<td>9.1</td>
</tr>
<tr>
<td>A6 – Human &amp; Environmental H &amp; S</td>
<td>0</td>
<td>66</td>
<td>6.3</td>
</tr>
<tr>
<td>A7 – Environmental Protection Mgmt.</td>
<td>2</td>
<td>10</td>
<td>8.1</td>
</tr>
<tr>
<td>B1 – Fisheries &amp; Wildlife</td>
<td>1</td>
<td>79</td>
<td>7.5</td>
</tr>
<tr>
<td>B2 – Forestry</td>
<td>0</td>
<td>52</td>
<td>5.0</td>
</tr>
<tr>
<td>B3 – Agriculture</td>
<td>1</td>
<td>39</td>
<td>3.7</td>
</tr>
<tr>
<td>B4 – Mining</td>
<td>0</td>
<td>24</td>
<td>2.3</td>
</tr>
<tr>
<td>B5 – Energy</td>
<td>0</td>
<td>41</td>
<td>3.9</td>
</tr>
<tr>
<td>B6 – Parks &amp; Natural Reserves</td>
<td>0</td>
<td>31</td>
<td>3.0</td>
</tr>
<tr>
<td>B7 – Natural Resources Management</td>
<td>0</td>
<td>27</td>
<td>2.6</td>
</tr>
<tr>
<td>C1 – Education</td>
<td>3</td>
<td>87</td>
<td>8.3</td>
</tr>
<tr>
<td>C2 – Research &amp; Development</td>
<td>3</td>
<td>41</td>
<td>3.9</td>
</tr>
<tr>
<td>C3 – Policy &amp; Legislation</td>
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<td>37</td>
<td>3.5</td>
</tr>
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<td>C4 – Comm. &amp; Public Awareness</td>
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<td>23</td>
<td>2.2</td>
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<tr>
<td>C5 – Sustainable Development Mgmt.</td>
<td>1</td>
<td>32</td>
<td>3.0</td>
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<td>Unknown</td>
<td>17</td>
<td>36</td>
<td>3.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td><strong>851</strong></td>
<td><strong>99.8</strong></td>
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</table>

* Several participants contributed to a review of both their primary and secondary subsectors.
Table 2: Geographic Distribution of Participants

<table>
<thead>
<tr>
<th>Review Phase</th>
<th>Activity</th>
<th>BC</th>
<th>AB</th>
<th>SK</th>
<th>MB</th>
<th>ON</th>
<th>QC</th>
<th>At.</th>
<th>Terr.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>Expert Advisors</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Phase I</td>
<td>Key Informants</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Phase II</td>
<td>Task Force &amp; Other Reviewers</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Phase III</td>
<td>Survey (Included)</td>
<td>121</td>
<td>130</td>
<td>11</td>
<td>38</td>
<td>150</td>
<td>24</td>
<td>31</td>
<td>10</td>
<td>515</td>
</tr>
<tr>
<td>Phase III</td>
<td>Survey (Excluded)</td>
<td>61</td>
<td>100</td>
<td>10</td>
<td>17</td>
<td>78</td>
<td>28</td>
<td>31</td>
<td>11</td>
<td>336</td>
</tr>
<tr>
<td>Phase IV</td>
<td>Focus Groups</td>
<td>11</td>
<td>12</td>
<td>0</td>
<td>7</td>
<td>15</td>
<td>3</td>
<td>13</td>
<td>0</td>
<td>61</td>
</tr>
<tr>
<td>Phase IV</td>
<td>Independent Reviewers</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>201</td>
<td>257</td>
<td>23</td>
<td>70</td>
<td>266</td>
<td>60</td>
<td>82</td>
<td>21</td>
<td>980</td>
</tr>
<tr>
<td>% Regional Participation</td>
<td></td>
<td>20.5</td>
<td>26.2</td>
<td>2.3</td>
<td>7.1</td>
<td>27.1</td>
<td>6.1</td>
<td>8.4</td>
<td>2.1</td>
<td>99.8</td>
</tr>
</tbody>
</table>

1.5 Benefits to Canada’s Environment Industry

As a result of the work carried out in this project to update and revise the NOS, environmental practitioners can be assured that these widely validated NOS are “leading edge”, not just in Canada but also around the world. They more accurately identify the competencies required by today’s environmental practitioners, and also address emerging fields of practice such as climate change. Some of the new statements even provide benchmarks for tasks that will become more critical for practitioners in the future.

The main components of the NOS are the 281 environmental competencies, each describing, one specific environmental task. Their revision was a detailed and highly technical process. The organization of these into 36 clusters (related competencies) and 11 functions (related clusters) will help to create a more intuitive linkage to the subsectors (areas of environmental employment).

Throughout this project, practitioners positively endorsed the revised definition of environmental employment and the revised subsector model. They agreed that these changes reflect the reality of current areas of employment and the multidisciplinary nature of environmental practice. These realities include recognition of Waste Management, Restoration and Reclamation, Policy and Legislation, and Energy as important and growing areas of practice. Other realities include the increasing integration of environmental research with the bringing to market of practical
solutions to environmental problems, the growing role of communication about environmental issues, and the increased involvement of stakeholders in making decisions about the sustainable management of environmental resources.

Feedback indicated:

- Most practitioners believe the updated subsectors will help them more accurately identify themselves within the bigger environmental picture.
- The competencies are now more user-friendly.
- The revised NOS provide clarity in distinguishing their work as an environmental practitioner from that of colleagues in related fields.
- Educators view the update as a tool to help them with curriculum development.
- Employers are looking forward to using the NOS to help them recruit employees with the right skills, to more effectively manage performance management, and to better focus their training and development programs.
- There is greater awareness of the need for and benefit of the enabling competencies, such as project management and communications. In particular, employers discussed the importance of these kinds of competencies, saying, "If you can't handle things like work ethic and responsibility, your technical skills won't matter." Of course, this new emphasis does not reduce the importance of technical abilities, but as the environment sector matures, technical competency becomes a given, and the transferable competencies bring the competitive advantage.
- The new streamlined competency statements will make the certification process much easier and less time-consuming.

Environmental practitioners across Canada now have a much greater awareness of the role of CCHREI as a leader in building a knowledgeable, highly skilled environmental workforce. They have a better understanding of the benefits of partnering with CCHREI in such important areas as development of college and university level educational programs, and the recruitment of environmental practitioners. Most significantly, practitioners have an increased understanding of the value of a standardized, validated national certification process for environmental practitioners.
2.0 SUMMARY OF REVISED FRAMEWORK AND NOS

2.1 Definition of Environmental Employment

CCHREI’s definition of environmental employment was first defined in 1994. It was revised in this project to read:

*Environmental employment is the performance of employment activities that seek to manage the use of, impact on, and enhance the sustainability of the environment. These activities, which could relate to the governance of environmental activities, the supply of environmental products and services, or the development and dissemination of environmental knowledge may be categorized in any of the following sectors:*

- a) environmental protection,
- b) conservation & preservation of natural resources, and
- c) environmental sustainability.

Because CCHREI’s definition of environmental employment is based on employment activities, any individual whose tasks are associated with those activities is considered to be engaged in environmental employment. This is true whether he or she works in private enterprise, a government department or agency, a non-profit group, or any other public or private institution or establishment. This means that environmental employment may and does exist in industries other than the environment industry and explains why CCHREI’s classification of environmental occupations contains so many jobs and occupations that may also be considered part of other industries.

2.2 Subsector Model of Environmental Employment

The subsectors within these three sectors of environmental employment, titled CCHREI’s Subsector Model, were also first defined in 1994. Several changes were made to the Subsector Model in this project. In summary, the changes were:

- Sector C was renamed to Environmental Sustainability;
- Three new subsectors were added: Waste Management, Restoration & Reclamation, and Policy & Legislation;
- One subsector was split into two: Mining and Energy; and
- Eleven subsectors were renamed. (The subsectors that remained unchanged in name were Human & Environmental Health & Safety, Forestry, and Agriculture.)

The revised Subsector Model is depicted in Figure 1 below. As illustrated by the overlapping circles, the three sectors into which environmental employment have been categorized in the revised definition continue to be independent, yet inter-related. They are independent because
each deals with a distinct environmental concern; they are inter-related because of the complex, integrated nature of the ecosystems that make up “the environment” in itself.

As also depicted in Figure 1, the three sectors are now divided into nineteen occupational subsectors. Here again, one could draw miniature, overlapping circles within each sector that would suggest that the boundaries between the occupational subsectors are also not rigid. Beyond these nineteen subsectors, there are other emerging occupational areas of significance to the environment that may qualify as subsectors in the future when there is sufficient employment activity in that occupational area.

**Figure 1: Revised Subsector Model**

The definitions of all sectors and subsectors were revised to capture the current focus of the work in each area. The revised definitions are presented in Appendix A.
2.3 National Occupational Standards (NOS)

The term “occupational standards” describes particular types of standards that focus on the specifications and/or the proficiencies of the work performed by someone in a particular occupation. They are the benchmarks against which the people in a particular occupation are measured. Occupational standards are often presented in the form of statements outlining the competencies required of an individual to be considered competent in an occupation.

Competencies are ‘the demonstrated ability to perform a task, or series of tasks, to the satisfaction of the employer or otherwise established norms’. In other words, they are the outputs or outcomes of applying relevant knowledge and skills in the performance of a task. CCHREI also refers to them as ‘the expected outcome of training and/or work experience’.

Knowledge, skills, and attributes are the enablers of the competencies, or the inputs required to perform the environmental related activities. Knowledge encompasses areas of general knowledge found widely in the environmental field, as well as specialized areas of knowledge concentrated in limited subsectors of environmental employment. Skills are the ability needed to apply knowledge, while attributes are inherent capabilities and commitment to use the skills. This concept is illustrated in Figure 2 below.

Figure 2: Graphical Definition of Competencies

![Graphical Definition of Competencies](image)

CCHREI was charged with the responsibility of developing national occupational standards that are tailored specifically for the Canadian environmental business. Traditional occupational standards typically specify the proficiency requirements of a singular, well-defined occupation (e.g. doctors, lawyers, engineers). Therefore, the scope of traditional occupational standards needs to be specific enough to cover the range of the work typically associated with a certain occupation, but general enough to be applicable across several industries.
This model must be modified for environmental employment. Given the scope and complexity of environmental employment, individuals involved in environmental employment may have different occupations, be found in many different industries, and the nature of their jobs may differ considerably. CCHREI’s research has demonstrated that environmental occupations tend to be based on “discipline-plus.” In other words, they are usually founded first on formal discipline training (e.g., biologists, chemists, geologists, etc.), and secondly on multi-disciplinary competencies that are specific to environmental work, and are developed with experience or further professional training.

Consequently, rather than pertaining to a particular occupation, CCHREI’s national occupational standards define those competencies that may be shared amongst many different occupations in the environmental sectors, but are specific to environmental work. CCHREI uses the term “discipline-plus” to describe such competencies.

In the mid nineties, data was collected to form the first set of national occupational standards for environmental practitioners. The NOS consisted of over 500 environmental competency statements, organized into 11 main groups of related competencies, and 44 subgroups.

These NOS underwent an extensive revision in this project, resulting in 281 environmental competency statements, each describing, one specific environmental task. The statements are organized into 36 clusters of related competencies and 11 functions or groups of related clusters to help create a more intuitive linkage to the revised subsectors of environmental employment. See Appendix B for a list of the environmental competency functions and clusters.

In addition to the environmental competencies, the revised NOS now include 34 enabling competencies that enhance the ability of practitioners to perform effectively in their jobs. The enabling competencies are grouped into 7 clusters. They are listed in Appendix C.

2.4 NOS Profiles

Occupational standards traditionally have been set to describe the expectations of workers at the point of entry to the labour market. However, the standards developed by CCHREI for environmental practitioners provide a description of the competencies required by practitioners with five or more years of experience within a designated subsector and occupational level.

CCHREI’s past research has indicated that employment in the environmental business generally falls into two occupational levels as described below:

1. Technician and technologist level
   These occupations typically require a diploma or certificate from a career or technology program obtained from a community college, technical institute or cégep. According to the
Canadian Council for Technicians and Technologists (CCTT), the academic training of technicians generally consists in excess of 1,200 hours of classroom instruction (1 or 2 years of post-secondary education). The academic training of technologists generally consists in excess of 2,000 hours of classroom instruction (2 or 3 years of post-secondary education).

Most technician and technologist occupations are not subject to licensure. Reserved-title certification is available through the provincial affiliates of the CCTT. Approximately 35% of the technicians and technologists who participated in CCHREI projects to date possess the CCTT certification.

2. University level occupations
These occupations typically require a minimum baccalaureate degree from a university as a prerequisite for employment. Some of these occupations are subject to licensure privileges (e.g., engineers), others have reserved-title (e.g., professional biologists, certified chemists), but most do not have any form of certification (e.g., geographers). Certification is a provincial responsibility in Canada and regulatory regimes might vary from one province to another.

CCHREI’s past research has also indicated that, while in some cases university graduates and technicians and technologists occasionally performed similar environmental work functions, they generally have distinct roles and responsibilities. Therefore, CCHREI decided to develop distinct, separate standards for the two occupational groups.

Through a rigorous survey and analysis process, CCHREI was able to define profiles of the specific NOS required by practitioners in the various subsectors of environmental employment. In 1997, CCHREI developed and published NOS profiles for technicians and technologists in ten of the original fifteen subsectors. NOS profiles were developed for university-level occupations in all fifteen subsectors. These were published in 1999, creating a current total of twenty-five distinct sets of standards, or NOS profiles, for practitioners engaged in environmental related employment activities.

In this update project, environmental practitioners from the nineteen subsectors identified in the revised Subsector Model participated in an on-line survey of the revised NOS in order to gather data for the development of revised NOS profiles. The data collected underwent rigorous analysis to identify the revisions required. The profiles developed were then submitted to a national focus group validation process. A total of 29 sets of national occupational standards, or NOS profiles, were produced and validated. These included profiles for University Level (UL) practitioners in each of the 19 subsectors, and for Technician/Technologist Level (TT) practitioners in 10 of the 19 subsectors as depicted in Table 3 below. TTs in the remaining nine subsectors will share the corresponding UL NOS profile. The revised NOS profiles for all subsectors can be viewed in Appendices D (UL) and E (TT).

Figure 3 below illustrates the linkage between the subsectors, profiles, and NOS competencies.
Table 3: NOS Profile Summary Table

<table>
<thead>
<tr>
<th>Sector A: Environmental Protection Subsectors:</th>
<th>Technician/Technologist</th>
<th>University Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Air Quality</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5. Restoration &amp; Reclamation</td>
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<td>✓</td>
</tr>
<tr>
<td>6. Human &amp; Environmental Health &amp; Safety</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>7. Environmental Protection Management</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sector B: Conservation and Preservation of Natural Resources Subsectors:</th>
<th>Technician/Technologist</th>
<th>University Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fisheries &amp; Wildlife</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. Forestry</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3. Agriculture</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4. Mining</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5. Energy</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6. Parks &amp; Natural Reserves</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>7. Natural Resources Management</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sector C: Environmental Sustainability Subsectors:</th>
<th>Technician/Technologist</th>
<th>University Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Education</td>
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<td>✓</td>
</tr>
<tr>
<td>2. Research &amp; Development</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3. Policy &amp; Legislation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4. Communications &amp; Public Awareness</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5. Sustainable Development Management</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Figure 3: Linkage Between NOS Competencies, Subsectors, and Profiles
2.5 Interpreting the Standards

Reviewers should take special note that CCHREI's national occupational standards do not imply that "all" competencies included in the profile are necessarily required (nor needed to the same degree) by any one or all environmental practitioners in that subsector and occupational level. From person to person, the requirement for and relative importance of a particular competency may vary from the subsector-wide ranking. This is because the subsector ranking reflects the average composite requirements of many different environment-related jobs, but not those of a specific job.

CCHREI purposely refrained from assigning performance levels or performance indicators to the various environmental competencies identified in the occupational standards. Given the multitude of employment contexts in which these competencies can be applied, it would have been practically impossible to satisfactorily cover all of the related performance indicators. Furthermore what should be deemed an "acceptable competency" is often susceptible to an individual's opinion or a company's preference. Therefore, CCHREI decided to simply divide the competencies into three categories based on a complex calculation of the prevalence, frequency and nature of the involvement. The three-tiered classification is defined broadly in Table 4 below.

Table 4: Definition of Environmental Competency Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE 1</td>
<td>Type 1 competencies are routinely applied and commonly shared among practitioners who carry out environmental work in this subsector. Generally, these competencies are well entail relatively high levels of autonomy and accountability.</td>
</tr>
<tr>
<td>TYPE 2</td>
<td>Type 2 competencies are not as widespread as those classified in Type 1 and, on average, are used less frequently by the practitioners who require them. Type 2 competencies are typically applied in a contributing or coordinating role within a multi-disciplined work context. They may be completed in certain cases under the supervision of another practitioner.</td>
</tr>
<tr>
<td>TYPE 3</td>
<td>Type 3 competencies are less commonplace than those classified in Type 2 and are usually associated with more specialized jobs and/or project-oriented work activities.</td>
</tr>
</tbody>
</table>

CCHREI considers that knowledge and skills are the inputs that enable competencies. However, many different combinations of specific knowledge and skills can enable the same competency, depending upon the person and the job involved. We can illustrate this concept by using the simple analogy of building a stone wall. Assume that the wall represents a competency while the stones in it represent knowledge and skills. If two individuals were asked to build walls to the same specification, you would likely find that - although the resultant structures might be equal in overall dimension - the stones comprising them would vary considerably in size, shape and placement. Because so many variations are possible, CCHREI has not correlated competencies,
knowledge and skills to each other in the occupational standards. Instead, environmental and enabling competencies are presented separately, and knowledge and skills are omitted from the revised NOS profiles.

As you review the information included in the occupational standards, please bear in mind that there is a strong working relationship in the environmental sectors between technologists, engineers, natural scientists and various other practitioners. Sometimes, this intermingled relationship makes it very difficult to distinguish between the work of each. This distinction involves not only the level at which the work is performed, but the act of assuming responsibility for the work. CCHREI further stresses that the practice of certain environmental competencies in an employment context will be further subject to, and specified in, relevant provincial, federal legislation, recognized industry guidelines and/or professional practice requirements.
DEFINITIONS OF SECTORS & SUBSECTORS

CCHREI has organized environmental employment in Canada into three sectors or related areas of employment activity, and nineteen subsectors that each represents significant amounts of employment activity.

Each of the three sectors and nineteen subsectors are defined briefly below. Please note that the information presented here is far from inclusive. Several pages would be needed per sector and subsector to document the full range of the work activities included in each subsector.

**Sector A - Environmental Protection**
This sector embodies the principles of protection of environmental quality i.e. the protection of human health, the protection of ecosystem health, and the protection of aesthetics through prevention, waste minimization, remediation, rehabilitation, and reclamation in the areas of air, water, and land. Its activities are oriented towards the measurement, maintenance, and protection of environmental quality and the restoration of environmental quality where it is impaired. It includes human health and safety where these are dependent upon environmental quality or health. The sector deals primarily with pollution prevention and related aspects of human activity on the environment and the management of this human activity through the use of integrated, environmentally responsible business management and operations practices.

**Sector B - Conservation and Preservation of Natural Resources**
This sector embodies the integration of environmental and economic decisions and the principles of stewardship in the use of natural resources. Its activities include preservation and conservation of fish and wildlife resources, forest resources, and natural resources on agricultural lands; the environmental management of mining and energy operations and parks and outdoor recreational areas; and strategic resource planning, integrated land-use planning, and the development of environmental management systems. This sector deals primarily with biological and ecological aspects of the environment such as biological communities, ecosystems, productivity, and biodiversity.

**Sector C - Environmental Sustainability**
This sector embodies all actions that can be taken to ensure the well being of the environment now and in the future for the benefit of society as a whole. Its activities are oriented around the development, dissemination, and application of knowledge in support of the other two sectors. The activities include environmental education and training, scientific and industrial research and development, and legislation or regulation to enable positive practice. This sector also deals with how to engage stakeholders to address the ethical issues that arise from activities that cause significant or long-term damage to the environment. This sector seeks to build capacity in the application of intellectual resources, innovation and creativity, communication tools, and public policy to balance human needs with sustainability of the biosphere.
Subsector A. 1 - Air Quality
Subsector A. 1 involves the supply of goods and services for indoor and outdoor air quality protection. The main functions include: research and development of air pollution control equipment, systems, and technologies, and the development of legislation/development of guidelines, regulations, and standards. They also include control method identification, air quality testing and monitoring, air emission standards development, air quality compliance monitoring, indoor air evaluation, impact assessment, remediation, modelling, and meteorological studies. Climate change related functions include predicting, measuring emissions at source, measuring impacts of climate change, reducing impacts of climate change (agriculture, forestry, mining and energy), and designing adaptations to climate change in energy conservation.

Subsector A. 2 - Water Quality
The work classified in subsector A. 2 is performed by practitioners working in the supply of goods and services for water quality protection and water pollution control (including groundwater, surface water, drinking water, and wastewater). The main functions include: water quality research and analysis, compliance monitoring, permitting, site characterization, impact assessments, remediation, and the development of legislation/development of guidelines, regulations, and standards. They also include the design and operation of water and wastewater treatment plants, and water quality protection for both human and aquatic life protection and recreational use.

Subsector A. 3 - Land Quality
The work classified in subsector A. 3 is performed by practitioners who carry out activities related to the prevention and control of land pollution and soil contamination, remediation, and the development of legislation/development of guidelines, regulations and standards. The main functional areas include environmental impact, site and risk assessments, site selection, and sampling and analytical work related to testing of soil for mechanical, biological and chemical properties, erosion control, and regulatory compliance monitoring.

Subsector A. 4 - Waste Management
The work classified in subsector A. 4 is performed by practitioners working in the management of hazardous and non-hazardous waste, including classification, tracking, reduction, reuse, recycling, collection, disposal, and end use of waste streams, and the treatment/beneficial reuse of non-hazardous/hazardous wastes, and the development of legislation/development of guidelines, regulations, and standards. Main functions include waste management planning, waste stream audits, landfill design, leachate control, methane control systems, design of collection systems, management protocols, waste handling, programs for management of hazardous and non-hazardous wastes, policies and procedures for waste management, coordination of reduction and reuse programs, life cycle assessment, and monitoring and reduction of environmental impacts directly related to waste treatment and disposal.
Subsector A. 5 - Restoration & Reclamation
The work classified in subsector A. 5 involves the actual restoration, rehabilitation, and reclamation activities of disturbed or contaminated sites. Main functions in this subsector tend to be, but are not limited to reactionary approaches to dealing with environmental issues. Activities include site and risk assessments, site decommissioning, developing site remediation and reclamation plans, conducting pilot tests and treatability studies, obtaining necessary clean-up permits and approvals, and undertaking the actual restoration, recovery, and reclamation activities.

Subsector A. 6 - Human and Environmental Health & Safety
The work classified in subsector A. 6 involves the development and implementation of policies, standards, legislation, and programs that aim to maintain and improve the quality of the environment from a health and safety perspective. Main functions include product and facility assessment; compliance monitoring; health risk assessment and the recognition, evaluation and control of occupational hazards; and industrial hygiene. They also include the development of technical standards, emergency response guidelines and worker health programs, public consultation, and communications.

Subsector A. 7 - Environmental Protection Management
Subsector A. 7 involves the protection of the environment through the use of integrated multidisciplinary planning and decision making with regard to environmentally responsible business management and operations practices. Main functions include improving environmental performance through activities such as environmental policy and objectives setting, developing and implementing emission reduction policies and procedures, implementing Environmental Management Systems, and reporting on compliance to environmental regulations.

Subsector B. 1 - Fisheries & Wildlife
The work classified in subsector B. 1 is performed by practitioners working for organizations that manage and/or are concerned with the preservation of the fish and wildlife resources. Main functions include research on fish populations; conservation and preservation of fish habitats; public education related to aquatic ecosystems; monitoring of wildlife species; conservation and preservation of wildlife; enforcement of wildlife regulations; and technical and analytical support in fishery and wildlife management.

Subsector B. 2 - Forestry
The work classified in subsector B. 2 is primarily performed by practitioners who work for forestry companies, consulting firms servicing these forestry companies, and public and non-governmental organizations concerned with the conservation and preservation of forest resources. Main functions include planning the sustainable use of forest resources; protection of forest resources and biodiversity; management of the productivity of commercial forests; and implementing forestry and habitat restorative practices.
Subsector B. 3 - Agriculture
The work classified in subsector B. 3 is performed by practitioners working in the agriculture industry for organizations concerned with sustainable agriculture and the preservation of natural resources on agricultural lands. Activities include soil and water conservation; conservation of natural habitats on or near agricultural lands; environmental use of agricultural chemicals and biotechnology; management of agricultural wastes and by-products; integrated management of agricultural resources; and environmental policies and regulations for agriculture.

Subsector B. 4 - Mining
The work classified in subsector B. 4 is performed by practitioners that work for mining companies or consulting firms servicing these companies. Main functions include pre-development environmental assessment and mitigation; environmental management for established mining operations; management of waste and environmental hazards; internal and external liaison related to environmental performance; closure planning; site reclamation; soil, water, air, and waste management; as well as technical and analytical support related to environmental management.

Subsector B. 5 - Energy
The work classified in subsector B. 5 is performed by practitioners working for either energy companies, for consulting firms servicing these companies, or for organizations concerned with the sustainable use of the natural resources implicated in energy operations. Main functions include pre-development environmental assessment and mitigation; environmental management for established energy operations; management of waste and environmental hazards; internal and external liaison related to environmental performance; site reclamation; and technical and analytical support related to environmental management of energy transmission.

Subsector B. 6 - Parks & Natural Reserves
The work classified in subsector B. 6 is performed by practitioners working for organizations that manage or are involved in the management of parks and outdoor recreational areas such as private, urban, provincial, and national parklands. Main functions include planning the establishment of infrastructure for new parks; planning and managing park operations including eco-tourism use; protection of parks’ ecosystems and conservation of their resources; compliance with park regulations; and public affairs related to park management.
Appendix A

Subsector B. 7 - Natural Resources Management
The work classified in subsector B. 7 is performed by practitioners who work for public or private sector organizations and who are involved in balancing the human needs and pressures with the conservation and preservation of natural resources. These practitioners attempt to integrate the socio-economic factors with environmental factors in such a fashion as to ensure the ecological health of the planet, thereby enabling society’s sustainable development. Main functions include strategic planning and development of environmental policies; integrated land-use planning; and the implementation of environmental management systems.

Subsector C. 1 - Education
The work classified in subsector C. 1 is performed by practitioners that develop and deliver environmental education and training. Educational programs may include content related to the traditional disciplines (e.g. chemistry, biology, engineering, geography, economics, etc.) and emerging areas (e.g. wastewater treatment technology, environmental protection technology, ethical issues related to environmental decision-making, climate change, etc.). Educational training includes on-the-job training and continuing professional education training. Main functions include assessment of the need for environmental education programs; development or review and assessment of environmental education curricula; delivery of environmental education including outreach activities for the purposes of public awareness and education; and measurement of the outcomes of environmental education.

Subsector C. 2 - Research & Development
The work classified in subsector C. 2 is performed by practitioners who support and promote scientific research and industrial research and development that advances our knowledge of the environment, assists in the prevention, improvement, or resolution of environmental problems, and facilitates the development and diffusion of environmental and enabling technologies that produce long-term economic and/or environmental benefits. Practitioners may work for private research centers, government departments and agencies, academic institutions, or private sector companies. Main functions include identification and design of environmental research projects, programs, obtaining research or development funding, conducting research and technology development and communicating findings, and the technical and analytical activities that support these. Functions also include promotion of environmental research and new technologies, and commercialization of new products and processes.
Subsector C. 3 - Policy & Legislation
The work classified in subsector C. 3 is performed by practitioners in the public, private, and non-governmental sectors. Functions include bringing forth environmental issues, information, and data related to the protection, conservation, and preservation of natural resources or environmental sustainability where the formulation of policy, legislation, regulation, standards, and enforcement would enable positive practice and results. Functions also include gathering evidence and data to assist enforcement, environmental prosecutions and defenses, and liability of officers and directors, as well as planning and advising organizations of means of complying with policies, legislation, regulations, and standards - including international ISO 9000 and 14000 - and prosecution for environmental infractions.

Subsector C. 4 - Communications & Public Awareness
The work classified in subsector C. 4 is performed by practitioners that use all forms of publication and communication, including web sites and electronic publishing, to exchange information about environmental issues, environmental responsibilities, conservation and preservation practices, and corporate environmental performance, etc. These practitioners may work in private sector industries, government departments and agencies, environmental non-government organizations, or publishing companies. Main functional areas include preparation of written, audiovisual, and electronic communications; organization and coordination of conferences and presentations on environmental matters; development of environmental awareness and action programs; and implementation of public relations and communications strategies on environmental issues.

Subsector C. 5 - Sustainable Development Management
The work classified in subsector C. 5 is the most integrative of the subsectors. Functions include "state" reporting of trends through time; development and use of sustainable development indicators, sustainable development planning at the community, corporate, municipal, provincial, regional, national, and international levels; identifying and articulating ethical and cultural concerns and guidelines; development of environmental management and other forecasting systems; and fiscal and economic activities such as ecological fiscal reform and corporate social responsibility. Integrated management for sustainable development, at the most global level, seeks to attain environmental balance while addressing related social and economic issues. At the global level, end goals would include sustainable use of natural resources through biodiversity and management of ecosystem health and integrity.
## ENVIRONMENTAL COMPETENCY FUNCTIONS AND CLUSTERS

### Function A  Environmental Assessments, Remediation, Restoration, and Reclamation
1. Conducting environmental impact assessments
2. Conducting environmental site assessment (ESA - Phase 1 and Phase 2)
3. Developing/Implementing site remediation (Phase 3) plans
4. Developing/Implementing site restoration/reclamation (Phase 3) plans

### Function B  Policy, Legislation and Regulations
5. Developing environmental policies, measures & standards
6. Interpreting/enforcing/complying with environmental regulations and standards

### Function C  Pollution Prevention, Abatement, and Control
7. Coordinating environmental aspects of facility design & operation
8. Implementing pollution prevention, abatement & control (PAC) methods
9. Mitigating climate change impacts
10. Developing/Coordinating/Implementing energy efficiency programs

### Function D  Waste Management Systems, Processes, and Procedures
11. Developing/Implementing waste management plans and programs
12. Monitoring waste application/disposal/reduction programs and activities
13. Developing/Implementing water supply and water efficiency plans and programs

### Function E  Sampling and Analytical Work Related to Environmental Activities
14. Developing environmental sampling, testing and monitoring programs
15. Collecting samples and data for environmental purposes
16. Analyzing and interpreting environmental samples and data

### Function F  Strategic Partnering, Planning, Monitoring and Reporting for Sustainability
17. Liaising and partnering with stakeholders
18. Developing sustainable development indicators, plans, and strategies
19. Implementing/monitoring sustainable development strategies and programs

### Function G  Environmental Management Systems/Risk Assessment/Health & Safety
20. Developing corporate environmental plans, policies, and procedures
21. Implementing environmental management systems
22. Conducting environmental risk assessments
23. Monitoring/addressing occupational and public health and safety
24. Managing Environmental Management Systems and practices
Function H  Natural Resources Planning and Management
25  Developing plans and programs for ecosystem and habitat preservation and/or the management of natural resources
26  Conducting studies related to ecosystem and habitat preservation and/or the management of natural resources
27  Implementing programs and practices related to ecosystem and habitat preservation and/or the management of natural resources
28  Monitoring/evaluating effectiveness of programs and practices related to ecosystem and habitat preservation and/or management of natural resources

Function I  Environmental Education and Training
29  Developing environmental curricula and programs
30  Implementing environmental education and training
31  Evaluating/Mentoring/Supervising students/practitioners

Function J  Environmental Research and Technology Development
32  Designing/developing environmental research and development proposals, programs, and projects
33  Conducting environmental research/publishing results
34  Identifying/Implementing activities pertinent to commercialization of environmental technologies, systems & equipment

Function K  Environmental Communications and Public Awareness
35  Developing/Implementing environmental communications and awareness programs
36  Presenting expert information on environmental matters

February 13, 2004
ENABLING COMPETENCIES

Cluster 1 Communicating Effectively
1. Use appropriate and respectful questioning and listening skills in interpersonal communications.
2. Use culturally sensitive verbal and body language with diverse individuals and groups.
3. Convey technical information clearly and concisely, interpreting and presenting the information in a manner that suits the target audience.
4. Use appropriate content and format in presentations to address the specific needs of target audiences.
5. Articulate one's position clearly and convincingly to persuade others to a specific point of view.

Cluster 2 Computer Proficiency
6. Use common off-the-shelf software to increase work efficiency.
7. Use advanced computer applications like modeling and statistical analysis to solve problems and manage data more effectively.
8. Develop new computer applications to expand the range and capabilities of tools available to practitioners.

Cluster 3 Critical Thinking/Judgement
9. Collect reliable information or data from all appropriate sources, including primary, secondary, and tertiary data and sources.
10. Organize information and data into appropriate classifications or categories for further evaluation and storage.
11. Analyze information and data using appropriate qualitative and quantitative methodologies, including integrating diverse inputs, putting issues into context, identifying anomalies and trends, and making projections.
12. Apply inductive and deductive reasoning in the interpretation of information and data, assessing relevance, and identifying options and appropriate solutions.
13. Choose the best option or proper course of action (from pragmatic to creative), taking into account pertinent factors, needs, and the degree of risk.
14. Take manageable risks in making decisions in the face of incomplete information, ambiguous situations or crises, using information, knowledge, instincts and intuition.
Cluster 4 Leading/Influencing Others

15 Select people with the right skills and knowledge to form collaborative working groups.
16 Build consensus and commitment to vision, goals and processes.
17 Build effective working relationships with multiple stakeholders, demonstrating respect for cultural differences and values.
18 Manage the work of others, including project teams, working groups and contractors.
19 Deal effectively with confrontational situations, demonstrating diplomacy, tact, and consideration for differing points of view.
20 Leverage working relationships and knowledge of the organization(s) to overcome political and organizational barriers.

Cluster 5 Learning and Creativity

21 Stay current on the theory and practice pertinent to the responsibilities of the job.
22 Continuously pursue opportunities for personal learning and development to address recognized limitations.
23 Develop innovative solutions and ways to address challenges and do more with less.
24 Use non-traditional approaches to develop new inventions and technologies from existing ideas, concepts, and information.

Cluster 6 Planning and Organizing Work and Projects

25 Develop systems, methods and procedures to manage work and projects effectively.
26 Develop work/project plans, identifying what needs to be accomplished and how contingencies will be addressed.
27 Coordinate resources (including financial, logistical, supplies, etc.) in implementing work/project plans to achieve desired results.
28 Manage multiple priorities through the efficient application of priority and time management principles.

Cluster 7 Work Ethic

29 Act in accordance with acceptable norms and standards even in high stress situations.
30 Demonstrate flexibility and ingenuity in the face of unusual or unexpected circumstances.
31 Cooperate willingly with others in dealing with changing situations, conditions, and expectations.
32 Follow through to meet commitments and deadlines.
33 Apply principles of quality assurance and scientific rigour in all work activities.
34 Collaborate effectively with others in groups and teams to achieve common goals.
REVISED NOS PROFILES –
UNIVERSITY LEVEL OCCUPATIONS
REVISED NOS PROFILES –
TECHNICIAN/TECHNOLOGIST LEVEL OCCUPATIONS

February 13, 2004
DETAILED METHODOLOGY

The four phases of the consultation process were as follows:

- Phase I: Critical Review of CCHREI’s Framework for Environmental Employment
- Phase II: Reorganization and Update of the Existing NOS Statements
- Phase III: Development of NOS Profiles
- Phase IV: Validation of Revised Framework and NOS Profiles

PHASE I

Phase I was completed through consultations with two groups of practitioners - first with expert advisors, then with key informants.

The role of the expert advisors was to advise on changes to the field of environmental employment and provide strategic, expert feedback regarding what an effective Canada-wide environmental employment model should look like. They were selected based on their significant contributions to “environmental” issues - regionally, nationally, or internationally - and recognition as senior level experts with professional experience in one or more environmental sectors or subsectors.

An interactive website was dedicated to disseminating information to the expert advisors and receiving feedback from them. The on-line dialogue focused on current and anticipated trends in environmental employment and resulted in the identification of limitations, gaps, and suggested changes to the framework.

Following this, key informants were selected based on their considerable, varied experience as environmental practitioners and recognition as critical thinkers within the field of environmental employment. They included CECAB board members and some of the expert advisors. The role of the key informants was to provide critical, experience-based feedback regarding the proposed revisions to the current NOS framework. The interactive website was again used to gather this second round of feedback and resulted in further revisions to the framework.

PHASE II

This review phase was initiated in March 2003 and continued throughout subsequent phases to December 2003. The three major steps in Phase II were the:

1. Initial update and reorganization of the existing NOS
2. Critical review and revision of the environmental competency statements
3. Critical review and revision of the lists of general and specialized knowledge and skills

Step 1, the initial update and reorganization of the environmental competency statements identified in 1997, was a lengthy, multi-staged process that involved:
a. A critical review of the lists of UL and TT NOS statements to eliminate obvious redundancies.
b. Integrating the UL and TT lists of statements, assigning a consistent numbering scheme, and ensuring each statement had a corresponding French translation.
c. Redefining the original functional groups and areas into which the environmental competencies were organized to produce an expanded list of functions and clusters.
d. Reorganizing the streamlined NOS into the new functions and clusters.

Step 2, the critical review and revision of the environmental competency statements, was a labour intensive process of coordinating and integrating feedback from selected practitioners across Canada. This step was conducted from mid June to mid August 2003. Thirty highly experienced practitioners contributed to the revision process. They were allocated to one of five task forces based on their areas of environmental practice, the industry they represented, and their geographic location. Two teams focused primarily on Sector A, one on Sector B, and two on Sector C.

Task force leaders facilitated the process to ensure maximum contribution of all members. Each practitioner’s primary responsibility was to review and update those competencies that pertained to the sector they identified as their primary area of expertise. To the extent they could, they also contributed to the review and update of the environmental competencies pertaining to a secondary or even tertiary sector. Their task included eliminating competencies that supported environmental work but did not require actual environmental expertise, and separating multiple competencies embedded within one statement.

The purpose of Step 3, a critical review and revision of the lists of general and specialized knowledge and skills, was to provide a clearer picture of the enabling competencies practitioners require to support the application of their environmental competencies.

The consultants analyzed three lists of enabling skills, i.e. general skills, specialized skills, and general aptitudes, then amalgamated them, revised the wording and added statements to fill the gaps. The end product consisted of 34 statements grouped within 7 clusters that were renamed “enabling competencies”. The enabling competencies were included in the on-line survey for rating by environmental practitioners.

The consultants also reviewed CCHREI’s lists of general and specialized knowledge. The correlation between subsectors and specialized knowledge is important to the academic community. However, the knowledge elements are not used in the certification process. Because the 300+ specialized knowledge statements could detract from the main focus of the survey or even deter respondents altogether, and the general knowledge categories were too generic to be of benefit to the academic community, it was decided to omit the knowledge elements from the survey.
PHASE III

The objective of this review phase was to produce updated NOS profiles for each subsector identified in the revision of the framework in Phase I of the project. An on-line survey was used to collect data from as large a number of environmental practitioners as possible for the detailed occupational analysis of the NOS requirements of each subsector and the development of the revised profiles. CCHREI’s database was used as the primary source of names for distribution of the survey.

In preparation for the release of the on-line survey, CCHREI’s database of environmental practitioners underwent extensive clean up and validation. To expand the database, CCHREI contacted environmental associations regarding the upcoming on-line NOS survey, advertised in environmental publications, and invited practitioners to pre-register for the survey. Throughout the duration of the survey, the consultants contacted several other organizations and practitioners via telephone and email to further expand the database of contacts for the survey.

The survey was distributed directly to over 2000 practitioners and 300 professional associations. Over 800 environmental practitioners responded across Canada. Launched on September 8, the bulk of the responses were received by October 24. Considerable effort was spent to increase the participation rate and to ensure geographic and industry representation for each of the subsectors for both UL and TT level practitioners. To this end, survey responses were accepted up to late November when Phase IV, validation of the NOS profiles, was taking place.

The survey was structured so that practitioners could select their primary area of environmental employment from the 19 subsectors, and then identify the environmental competencies that applied to their employment activities. For ease of review and selection, the environmental competency statements were presented in an expanding table from the new function and cluster groupings.

Respondents were asked to rate the following variables for each statement they selected, i.e.:
   1. Frequency (F) of performing the task
   2. Level (L) of involvement in the task
   3. Importance (I) of task

For each of the 34 enabling competency statements, respondents were asked to rate the level of proficiency typically required by someone working in their primary subsector.

Demographic data was collected from survey participants regarding their number of years of environment-related work experience, total years of work experience, and the level of education attained. The latter was used to classify the NOS surveys into UL or TT occupational levels.

February 13, 2004
The data collected was carefully scrutinized to determine which surveys met all the criteria for inclusion in the detailed occupational analysis. The eligible surveys were then grouped into TT and UL classifications. The table below identifies the numbers included in each subsector and occupational level.

Table 1: Distribution of On-Line Survey Participants Included in Final Data Analysis

<table>
<thead>
<tr>
<th>Sector</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td>Subsector</td>
<td>1</td>
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<tr>
<td>Technician/Technologist</td>
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<td>University Level</td>
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Each group was subjected to rigorous analysis to identify the most critical environmental competencies in each subsector, as well as the relative importance of the enabling competencies. A consistent set of criteria was applied to each statement to identify which competencies could be classified as Type 1, 2, or 3 in the NOS profile for that subsector and occupational level. The criteria took into account the weighting of each statement and the prevalence of response to that statement from all respondents in that subsector and occupational level. The weighting was calculated from a complex formula derived from the ratings assigned by respondents. Type 1 competencies had the highest weighting and prevalence, followed by Types 2 and 3. Only those statements that met the Type 1, 2, or 3 criteria were included in the NOS profile for that subsector and occupational level.

There were 15 statements in the revised NOS that did not appear as a Type 1, 2 or 3 in either the TT or UL profiles. However, a check of these statements revealed that many of them capture new and emerging environmental tasks that will undoubtedly assume a more important role in future revisions to the NOS profiles.

PHASE IV

Phase IV was a broad-based consultation process to verify the revised Subsector Model and to validate the accuracy and completeness of the NOS profiles produced in Phase III. The primary vehicle for receiving feedback during this phase was a focus groups process. Sessions were held in Winnipeg, Halifax, Toronto, Montreal, Vancouver, and Calgary from mid to late November 2003. The Montreal session was conducted in French. The other five focus sessions were conducted in English.

To participate in this process, practitioners needed to have completed the on-line survey and also required a working understanding of CCHREI’s framework for environmental employment, and the environmental and enabling competencies. Over 60 practitioners participated in the
focus groups. Of these, nine had participated in Phases I and/or II. In addition, seven practitioners (independent reviewers) who were unable to attend the focus group sessions provided independent feedback for further validation of UL and TT NOS profiles.

The following revisions were verified by focus group participants:

- The separation of Mining and Energy into two subsectors. Focus group participants supported this separation based on the evolution of Energy from an original focus on extraction of resources to a focus on energy efficiency and the impacts of energy consumption on the environment, e.g. greenhouse gas emissions.
- The maintenance of Remediation, Restoration & Reclamation (A5) as a new subsector, distinct from Land Quality (A3). The rationale for the distinction is that A3 practitioners deal primarily with remediation of adverse impacts, while A5 practitioners focus on restoration and reclamation activities and are seldom involved in remediation work.
- Recommendation to rename Remediation, Restoration & Reclamation (A5) to Restoration & Reclamation, and to include remediation as a function within the definition and profiles of Air Quality, Water Quality, and Land Quality.
- Recommendation to maintain Agriculture (B3) as a separate subsector. The uniqueness of this subsector lies in the integrated nature of the work within the context of what happens in the field and later in the production of food products.

The feedback from focus group participants and independent reviewers also resulted in the following changes to the environmental competency functions, clusters and statements:

- Renaming of Function A from Environmental Assessments, Restoration, Remediation, and Reclamation to Environmental Assessments and Reclamation.
- Renaming of Cluster A3 from Developing/Implementing site remediation (Phase 3), restoration, and reclamation plans to Developing/Implementing site remediation (Phase 3) plans.
- Inclusion of one new cluster: Developing/Implementing site restoration/reclamation (Phase 3) plans.
- Minor revisions to 46 of the 280 environmental competencies.
- Addition of one new environmental competency statement: Monitor post-remediation conditions and results to assess if targets and regulatory requirements have been met. This now brings the total number of environmental competencies to 281.

Analysis of the data derived from over 125 validations revealed a high degree of agreement with the NOS profiles established in Phase III, resulting in a relatively small number (less than 10%) of changes in types.

There was mixed opinion on whether two distinct sets of NOS profiles (UL and TT) should be maintained. Most agreed that there was a definite distinction in roles in Sector A, that there was little or none in Sector C, and were of mixed opinion on the subsectors in Sector B.
The NOS profiles now include:

- 19 University Level NOS profiles (a unique profile for each of the nineteen subsectors).
- 10 Technician/Technologist Level NOS profiles (a unique profile for ten subsectors)
- 9 Technician/Technologist Level NOS profiles in common with University Level NOS for the following subsectors: Agriculture, Mining, Energy, Natural Resources Management (Sector B); and Education, Research & Development, Policy & Legislation, Communications & Public Awareness, and Sustainable Development Management (Sector C).