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NATIONAL OCCUPATIONAL RESEARCH AGENDA (NORA)

NATIONAL OIL AND GAS EXTRACTION AGENDA

For Occupational Safety and Health Research and Practice in the U.S. Oil and Gas Extraction Industry

October 18, 2011

Developed by the NORA Oil and Gas Extraction Council

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The U.S. Oil and Gas Extraction Sector

The oil and gas extraction industry includes operations involved in the drilling and extraction of crude oil and natural gas, comprising the largest part of the U.S. mining industry. During 2003-2008, 648 oil and gas extraction workers were fatally injured on the job, resulting in an occupational fatality rate of 29.1 deaths per 100,000 workers – eight times higher than the rate for all U.S. workers. Nearly half of all fatal events in the oil and gas extraction industry resulted from highway crashes (29%) and workers struck by objects and equipment (20%). Fatality data were compiled from the U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries *Industry by Event or Exposure* tables found on http://www.bls.gov/iif/oshcfoi1.htm for each year 2003-8. All links in this section were accessed on July 28, 2010.

NORA uses the North American Industry Classification System (NAICS, http://www.census.gov/eos/www/naics/) and identifies three types of establishments in this industry, each with a unique NAICS code (http://www.cdc.gov/niosh/nora/sector.html): oil and gas operators (211), which own the rights to drill for oil and gas; drilling contractors (213111), which drill oil and gas wells; and service companies (213112), which service oil and gas wells. In 2008, the Bureau of Labor Statistics estimated that 476,000 workers were employed in this industry [U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages, http://www.bls.gov/cew/ew08table2.pdf]. Nearly half of all workers were employed by service companies (47%), followed by operators (34%), and drilling contractors (20%). NIOSH research has found that the risk of fatal injury was highest among oil and gas extraction workers employed by small companies (fewer than 20 employees) and among workers employed by drilling contractors [Hill R, Conway G, Somervell P. *Injury Risk among Oil and Gas Extraction Workers by Company Type and Size.* Society of Petroleum Engineers (SPE) paper 121056-MS, March 2009. Available at: http://www.onepetro.org/mslib/app/search.do].

The NORA Oil and Gas Extraction Council

The NORA Oil and Gas Extraction Council convened in July 2008 and held additional meetings in February and September 2009, and January 2010. During the first meeting, the council examined injury surveillance data on oil and gas extraction workers, primarily for the years 2003-2006 [See Hill, et al., referenced above]. The data examined were limited to occupational fatalities, mainly because these are the most reliable data available for this industry. Significant gaps exist in the availability of non-fatal occupational injuries and illnesses data for the oil and gas extraction industry. In addition to the surveillance data, council members described their experiences in the industry, and their primary occupational safety and health concerns. During this meeting, the council began to develop a list of key safety and health issues in the industry. This list was later organized into four topical areas that included: workforce issues, industry operations, surveillance, and education and training. Workgroups were formed for each area.

During subsequent meetings, the council discussed current research and prevention activities, identified occupational safety and health research gaps, and drafted strategic-level goals for research in this industry. Between September 2009 and January 2010, the workgroup's draft goals were consolidated and revised. They were reviewed again by the council during its May 2010 meeting, and made available for public comment in August 2010. The council has now

finalized the goals. Comments on the agenda should be sent to the NIOSH Docket, or sent to the NORA Coordinator at: noracoordinator@cdc.gov.

NORA Oil and Gas Extraction Council Members

NORA O&G Co-Chairs:

Mike Thompson	George A. Conway
BP America	NIOSH

NORA O&G Coordinator:

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NIOSH	NIOSH
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Exponent	Safety Management Systems	Bureau of Labor Statistics
Jason Sandel	Philip Somervell	Tony Spencer
Aztec Well Servicing Co.	NIOSH	Liberty Mutual

Anthony Zacniewski
Bandera Drilling Co. Inc.

Types of Goals

<u>Strategic goal</u>: a top-level goal that states desired improvement of measureable outcomes.

<u>Intermediate goal</u>: Secondary level goals that states a step or activity that partner organizations and individuals can complete using outputs from the activity/output-level goals.

<u>Activity/Output goal</u>:

> <u>Research goal</u>: Identifies the information gap and research mechanism required for achievement of a higher-level intermediate goal.

> <u>Surveillance goal</u>: Identifies specific activities related to developing, enhancing, or utilizing surveillance data to measure the burden of injury/illness, or guide the planning, implementation and evaluation of research activities.

> <u>Translation goal</u>: Use of new or existing knowledge to develop effective communications targeted specifically for application by workers, supervisors and owners in order to reduce injury and illness risks.

> <u>Dissemination goal</u>: Partner activities that are needed to ensure effective communication materials reach the work place and their content is recognized as authoritative.

The intermediate and the activity/output-level goals in this document are organized according to the four workgroups that were established by the council, and appear in the following order: 1. Workforce Issues; 2. Industry Operations; 3. Surveillance; and 4. Education and Training.

NORA Oil and Gas Extraction Goals

Strategic Goal 1: By 2020, reduce the occupational fatality rate in the oil and gas extraction industry by 50 percent.

I. Workforce Issues

Intermediate Goal 1.1: Increase the implementation of recommended industry work practices to reduce occupational fatalities.

> Research Goal 1.1.1: Identify the best practices in the oil and gas extraction industry and other industries to gain knowledge of the current topics and approaches to reducing occupational fatalities.

> Research Goal 1.1.2: Develop interventions specific to identified workforce sub-groups based on needs assessments, industry best practices, and preferred method of obtaining training.

> Translation Goal 1.1.3: Develop unique dissemination plans for interventions and/or training designed for segmented groups in the oil and gas extraction industry, focusing on identified at-risk populations.

> Surveillance Goal 1.1.4: Evaluate interventions and/or training for effectiveness related to identified at-risk populations.

Intermediate Goal 1.2: Employers will incorporate effective interventions to prevent occupational fatalities associated with fatigue.

> Research Goal 1.2.1: Identify risk factors for occupational fatalities associated with fatigue among oil and gas extraction workers.

> Dissemination Goal 1.2.2: Develop and coordinate partnerships to disseminate information on methods to prevent occupational fatalities associated with fatigue.

> Dissemination Goal 1.2.3: Implement and promote effective interventions to reduce risk factors for occupational fatalities associated with fatigue.

> Surveillance Goal 1.2.4: Evaluate interventions to reduce risk factors for occupational fatalities associated with fatigue.

II. Operations

Intermediate Goal 1.3: Industry stakeholders will increase the implementation of recommended work practices for oil and gas operations.

> Research Goal 1.3.1: Review existing health, safety, and environment contracts and addendums to identify and describe recommended work practices.

Translation Goal 1.3.2: Determine the most effective methods to communicate these practices to the oil and gas extraction industry.

Research Goal 1.3.3: Develop a business case for pursuing technology-based solutions to improve the safety performance in the oil and gas extraction industry.

Dissemination Goal 1.3.4: Disseminate findings widely throughout the oil and gas extraction industry through websites, articles, presentations, and national/regional/local safety conferences, symposiums and public meetings.

III. Surveillance

Intermediate Goal 1.4: The oil and gas extraction industry will use surveillance to identify work practices, technologies, and engineering controls to reduce occupational fatalities.

Surveillance Goal 1.4.1: Form partnerships with successful industry groups and associations to develop industry-relevant data sets for the oil and gas extraction industry.

Surveillance Goal 1.4.2: Research the methods used in the oil and gas extraction industry to gain knowledge about approaches to tracking occupational fatalities.

Surveillance Goal 1.4.3: Identify gaps and develop standardized data collection processes for businesses within the oil and gas extraction industry, with a focus on occupational fatalities.

Surveillance Goal 1.4.4: Analyze occupational injury surveillance data, industry, and medical records to identify incident patterns such as age, occupation, job activity, company size, substance abuse, extreme environmental conditions, distractions, speed, fatigue, and emerging issues.

IV. Education & Training

Intermediate Goal 1.5: Develop training materials to reduce occupational fatalities in the oil and gas extraction industry.

Research Goal 1.5.1: Identify training materials developed for, or applicable to, the oil and gas extraction industry, and identify existing training gaps and needs.

Research Goal 1.5.2: Determine, through evaluation, the most appropriate content to include in training materials for oil and gas extraction workers (such as primary language, reading level, cultural considerations), including variations by geographic location.

Translation Goal 1.5.3: Develop, test, and implement training materials designed to reduce occupational fatalities in the oil and gas extraction industry.

Translation Goal 1.5.4: Identify the barriers to adopting the training materials developed for the oil and gas extraction industry.

Research Goal 1.5.5: Evaluate the effectiveness of the training materials in improving the knowledge, attitudes, and practices of oil and gas extraction workers.

Intermediate Goal 1.6: Research the effectiveness of the methods used to disseminate training materials to workers in the oil and gas extraction industry.

Research Goal 1.6.1: Determine, through evaluation, the most effective methods (such as classroom, on-line, worksite, etc.) for delivering training materials to oil and gas extraction workers.

Dissemination Goal 1.6.2: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Dissemination Goal 1.6.3: Identify the barriers to utilizing the dissemination methods identified.

Intermediate Goal 1.7: Develop and implement pre-vocational (apprenticeship programs, high school, etc.) safety training in order to reduce occupational fatalities in the oil and gas extraction industry.

Research Goal 1.7.1: Develop, evaluate, implement training, training accessibility, and improvement models for pre-vocational students that address the safety of the oil and gas extraction industry, with a focus on occupational fatalities.

Surveillance Goal 1.7.2: Identify and utilize surveillance data to track the impact of pre-vocational safety training on occupational fatalities in the oil and gas industry.

Translation Goal 1.7.3: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Strategic Goal 2: By 2020, reduce the occupational motor vehicle fatality rate in the oil and gas extraction industry by 50 percent.

I. Workforce Issues

Intermediate Goal 2.1: Increase the implementation of recommended work practices to reduce occupational motor vehicle fatalities.

Surveillance Goal 2.1.1: Analyze occupational motor vehicle surveillance data, industry and medical records to identify incident patterns attributable to such factors as age, national origin, substance abuse, extreme environmental conditions, or fatigue.

Research Goal 2.1.2: Identify the best practices in the oil and gas extraction industry and other industries to gain knowledge of current topics and approaches to training or communications campaigns related to occupational motor vehicle incidents.

Research Goal 2.1.3: Develop recommended interventions specific to identified workforce sub-groups based on needs assessments, industry best practices, and preferred method of obtaining training.

Dissemination Goal 2.1.4: Develop unique dissemination plans for interventions and/or training designed for segmented groups in the oil and gas extraction workforce, such as small companies, national origin, age, work location, etc.

II. Operations

Intermediate Goal 2.2: Industry stakeholders will increase the implementation of recommended practices in motor vehicle safety within the oil and gas extraction industry.

Research Goal 2.2.1: Collect detailed information from oil and gas extraction companies describing the elements of their motor vehicle safety programs.

Research Goal 2.2.2: Identify the best practices in motor vehicle safety by analyzing the information collected from the oil and gas extraction industry.

Translation Goal 2.2.3: Promote the adoption of motor vehicle safety best practices in the oil and gas extraction industry.

Dissemination Goal 2.2.4: Disseminate information on the best practices in motor vehicle safety throughout the oil and gas extraction industry through websites, articles, presentations, information booths, and national/regional/local safety conferences, symposiums and public meetings.

Research Goal 2.2.5: Conduct research to describe the business case to oil and gas extraction companies of adopting the best practices in motor vehicle safety.

Intermediate Goal 2.3: Industry will increase the implementation of recommended pre-job requirements to reduce occupational motor vehicle fatalities in the oil and gas extraction industry.

Research Goal 2.3.1: Partner with DOT and other local, state, and federal agencies to evaluate and recommend modifications to current fitness for duty standards that may reduce occupational motor vehicle fatalities.

Research Goal 2.3.2: Evaluate and recommend modifications to current pre-job requirements for transportation positions that may reduce occupational motor vehicle fatalities.

Research Goal 2.3.3: Identify the barriers to implementing recommended pre-job requirements in the oil and gas extraction industry.

Surveillance Goal 2.3.4: Identify and analyze available surveillance data in order to evaluate the compliance with existing fitness for duty standards and their impact on work-related motor vehicle fatalities in the oil and gas extraction industry.

Dissemination Goal 2.3.5: Disseminate recommendations on fitness for duty widely throughout the oil and gas extraction industry through websites, articles, presentations, information booths, and national/regional/local safety conferences, symposiums and public meetings.

III. Surveillance

Intermediate Goal 2.4: The oil and gas extraction industry will develop and use surveillance to identify practices, technologies, and engineering controls that can reduce occupational motor vehicle fatalities.

Surveillance Goal 2.4.1: Form partnerships with successful industry groups and associations to develop industry-relevant data sets for the oil and gas extraction industry.

Surveillance Goal 2.4.2: Research the methods used in the oil and gas extraction industry to gain knowledge about approaches to tracking motor vehicle incidents.

Surveillance Goal 2.4.3: Identify gaps and develop standardized data collection processes for industry businesses within the oil and gas extraction industry, with a focus on data related to motor vehicle fatalities.

Surveillance Goal 2.4.4: Analyze occupational motor vehicle incident/fatality surveillance data, industry, and medical records to identify incident patterns such as age, job types, job activity, company size, substance abuse, extreme environmental conditions, distractions, speed, fatigue, and emerging issues.

IV. Education & Training

Intermediate Goal 2.5: Develop training materials to reduce occupational motor vehicle fatalities in the oil and gas extraction industry.

Research Goal 2.5.1: Identify training materials developed for, or applicable to, the oil and gas extraction industry, and identify existing training gaps and needs.

Research Goal 2.5.2: Create and implement training materials designed to reduce occupational motor vehicle fatalities in the oil and gas extraction industry.

Dissemination Goal 2.5.3: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Research Goal 2.5.4: Evaluate the effectiveness of the training materials and the dissemination methods used.

Intermediate Goal 2.6: Develop and implement pre-vocational (apprenticeship programs, high school, etc.) safety training in order to reduce occupational motor vehicle fatalities in the oil and gas extraction industry.

Research Goal 2.6.1: Develop, evaluate, implement training, training accessibility, and improvement models for workers that address the safety of the oil and gas extraction industry, with a focus on occupational motor vehicle fatalities.

Surveillance Goal 2.6.2: Identify and utilize surveillance data to track the impact of pre-vocational safety training on occupational motor vehicle fatalities in the oil and gas industry.

Translation Goal 2.6.3: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Strategic Goal 3: By 2020, reduce the fatality rate due to contact injuries in the oil and gas extraction industry by 50 percent.

I. Workforce Issues:

Intermediate Goal 3.1: Increase the implementation of recommended work practices to reduce fatal occupational contact injuries.

Surveillance Goal 3.1.1: Analyze surveillance data to identify the groups of workers with elevated fatality rates resulting from contact injuries. Workforce groups may include age groups, workers from different cultures, workers impaired by alcohol or drugs, inexperienced workers, fatigued workers, obese workers, conditions related to environmental hazards, or hazards related to different types of equipment.

Surveillance Goal 3.1.2: Identify underlying causes of fatalities for identified workforce groups, including issues such as language barriers, occupational culture, lack of engineering controls, inexperience, environmental hazards, improper use of PPE, or physical impairment.

Research Goal 3.1.3: Conduct studies to gather safe practice wisdom from experienced workers to facilitate knowledge transfer from experienced to new, inexperienced workers.

Research Goal 3.1.4: Develop interventions based on results of data analyses of contact injury surveillance, industry and medical data, and areas identified by experienced workers. Interventions will include recommendations and/or training programs relevant to each identified segment of the workforce.

Dissemination Goal 3.1.5: Disseminate and evaluate recommended interventions and/or training for the oil and gas extraction industry using best practices for health communications campaigns.

II. Operations

Intermediate Goal 3.2: Industry will investigate the operations, locations, and equipment associated with contact injuries in order to identify prevention opportunities.

Surveillance Goal 3.2.1: Form partnerships and establish agreements with stakeholders to access or develop data sets in order to identify risk factors for contact injuries.

Surveillance Goal 3.2.2: Identify existing surveillance data for elucidating the operations, locations, and equipment involved in contact injuries in the oil and gas extraction industry.

Research Goal 3.2.3: Develop, implement, and evaluate methods to prevent contact injuries in the oil and gas extraction industry.

Dissemination Goal 3.2.4: Disseminate findings widely throughout the oil and gas extraction industry through websites, articles, presentations, and national/regional/local safety conferences, symposiums and public meetings.

Intermediate Goal 3.3: Industry and government agencies will identify and promote the use of automated technology in order to reduce contact injuries in the oil and gas extraction industry.

Dissemination Goal 3.3.1: Form partnerships with successful industry groups, associations, and experts to identify and implement awareness and utilization of state-of-the-art automated equipment.

Research Goal 3.3.2: Evaluate the use of automated technology within the oil and gas extraction industry in order to reduce contact injuries.

Dissemination Goal 3.3.3: Identify and publicize existing automated technology and their impact on reducing contact injuries in the oil and gas extraction industry.

Research Goal 3.3.4: Conduct research to describe the business case to oil and gas extraction companies of adopting automated technology.

Research Goal 3.3.5: Develop management of change models to address operational modifications related to risk of injury (process changes, safety meetings, equipment changes, etc.).

Dissemination Goal 3.3.6: Disseminate findings widely throughout the oil and gas extraction industry through presentations, information booths, and national/regional/local safety conferences, symposiums and public meetings.

III. Surveillance

Intermediate Goal 3.4: The oil and gas extraction industry will develop and use surveillance to create recommendations to prevent contact injuries and fatalities, taking into account workforce issues such as generational differences, inexperience, substance abuse, cultural barriers, rig type, work activity, and/or fatigue.

Surveillance Goal 3.4.1: Form partnerships with successful industry groups and associations to develop industry-relevant data sets for the oil and gas extraction industry.

Surveillance Goal 3.4.2: Research the methods used in the oil and gas extraction industry to gain knowledge about approaches to tracking fatal contact injuries.

Surveillance Goal 3.4.3: Identify gaps and develop standardized data collection processes for businesses within the oil and gas extraction industry, with a focus on industry data related to contact injuries.

Surveillance Goal 3.4.4: Analyze industry surveillance data to identify injury rates disproportionately high for different age groups, workers from different cultures, workers impaired by alcohol or drugs, inexperienced workers, fatigued workers, or conditions related to environmental hazards, or different types of equipment or work activities.

Research Goal 3.4.5: Identify root causes of incidents for identified workforce groups, including issues such as language barriers, occupational culture, lack of engineering controls, inexperience, environmental hazards, improper use of PPE, emerging issues, or physical impairment.

Dissemination Goal 3.4.6: Disseminate findings widely throughout the oil and gas extraction industry through websites, articles, presentations, and national/regional/local safety conferences, symposiums and public meetings.

IV. Education & Training

Intermediate Goal 3.5: Develop training materials to reduce occupational contact injuries in the oil and gas extraction industry.

Research Goal 3.5.1: Identify training materials developed for, or applicable to, the oil and gas extraction industry, and identify existing training gaps and needs.

Research Goal 3.5.2: Create and implement training materials designed to reduce occupational contact injuries in the oil and gas extraction industry.

Research Goal 3.5.3: Gather wisdom from experienced workers. Thematic analysis of data will provide insight on the "wisdom topics" that will be used as a primary resource for transferring knowledge of safe work practices from experienced to inexperienced workers.

Dissemination Goal 3.5.4: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Research Goal 3.5.5: Evaluate the effectiveness of the training materials and the dissemination methods used.

Intermediate Goal 3.6: Develop and implement pre-vocational (apprenticeship programs, high school, etc.) safety training in order to reduce occupational contact injuries in the oil and gas extraction industry.

Research Goal 3.6.1: Develop, evaluate, implement training, training accessibility, and improvement models for pre-vocational students that address the safety of the oil and gas extraction industry, with a focus on occupational contact injuries.

Surveillance Goal 3.6.2: Identify and utilize surveillance data to track the impact of pre-vocational safety training on occupational contact injuries in the oil and gas extraction industry.

Dissemination Goal 3.6.3: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Strategic Goal 4: By 2020, reduce the rate of non-fatal occupational injuries in the oil and gas extraction industry by 50 percent.

I. Workforce Issues:

Intermediate Goal 4.1: Increase the implementation of recommended work practices to reduce non-fatal occupational injuries.

Surveillance Goal 4.1.1: Analyze non-fatal occupational surveillance data, industry data, and medical records to identify the sub-groups of workers that may be at increased risk of injury.

Research Goal 4.1.2: Identify the best practices in the oil and gas extraction industry and other industries to gain knowledge of current topics and approaches to training or communications campaigns related to non-fatal occupational injuries.

Research Goal 4.1.3: Develop recommended interventions specific to identified workforce sub-groups based on needs assessments, industry best practices, and preferred method of obtaining training.

Dissemination Goal 4.1.4: Develop unique dissemination plans for interventions and/or training designed for segmented groups in the oil and gas extraction workforce, focusing on identified at-risk populations.

Research Goal 4.1.5: Evaluate interventions and/or training for effectiveness related to identified at-risk populations.

II. Operations

Intermediate Goal 4.2: Increase the implementation of effective fall protection procedures and equipment in order to reduce fall-related injuries in the oil and gas extraction industry.

Research Goal 4.2.1: Identify risk factors for non-fatal fall injuries to oil and gas extraction workers.

Research Goal 4.2.2: Identify and evaluate current fall protection interventions within the oil and gas extraction industry in order to identify and recommend best practices.

Dissemination Goal 4.2.3: Form partnerships with successful industry groups, associations and experts to promote and implement effective fall protection strategies.

Dissemination Goal 4.2.4: Disseminate findings widely throughout the oil and gas extraction industry through presentations, information booths, and national/regional/local safety conferences, symposiums and public meetings.

III. Surveillance

Intermediate Goal 4.3: The oil and gas extraction industry will perform surveillance to identify practices, technologies, and engineering controls that can prevent non-fatal occupational injuries.

Surveillance Goal 4.3.1: Form partnerships with successful industry groups and associations to develop industry-relevant data sets for the oil and gas extraction industry.

Surveillance Goal 4.3.2: Research the methods used in the oil and gas extraction industry to gain knowledge about approaches to tracking non-fatal occupational injuries.

Surveillance Goal 4.3.3: Identify gaps and develop standardized data collection processes for businesses within the oil and gas extraction industry, with a focus on non-fatal occupational injuries.

Surveillance Goal 4.3.4: Analyze non-fatal occupational injury surveillance data, industry, and medical records to identify incident patterns such as age, job types, job activity, company size, substance abuse, extreme environmental conditions, distractions, speed, fatigue, and emerging issues.

IV. Education & Training

Intermediate Goal 4.4: Develop training materials to reduce non-fatal occupational injuries in the oil and gas extraction industry.

Research Goal 4.4.1: Identify training materials developed for, or applicable to, the oil and gas extraction industry, and identify existing training gaps and needs.

Research Goal 4.4.2: Create and implement training materials designed to reduce non-fatal occupational injuries in the oil and gas extraction industry.

Dissemination Goal 4.4.3: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Research Goal 4.4.4: Evaluate the effectiveness of the training materials and the dissemination methods used.

Intermediate Goal 4.5: Develop and implement pre-vocational (apprenticeship programs, high school, etc.) safety training in order to reduce non-fatal occupational injuries in the oil and gas extraction industry.

> Research Goal 4.5.1: Develop, evaluate, implement training, training accessibility, and improvement models for pre-vocational students that address the safety of the oil and gas extraction industry, with a focus on non-fatal occupational injuries.

> Surveillance Goal 4.5.2: Identify and utilize surveillance data to track the impact of pre-vocational safety training on non-fatal occupational injuries in the oil and gas extraction industry.

> Dissemination Goal 4.5.3: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Strategic Goal 5: By 2020, identify hazards, characterize risk, and prevent chemical exposures, which could lead to occupational illness in workers in the oil and gas extraction industry.

I. Workforce Issues:

Intermediate Goal 5.1: Increase the implementation of recommended work practices to reduce chemical and environmental exposures, and prevent occupational illness among workers.

> Surveillance Goal 5.1.1: Analyze occupational exposure and illness surveillance data, as well as data from industry and medical records, to determine differing patterns of occurrence attributable to such things as generational differences, work culture, specific job duties and exposures, national origin, fitness for work, etc.

> Research Goal 5.1.2: Identify underlying causes of occupational illnesses and over-exposures for identified work groups, including such things as engineering controls, environmental hazards, PPE, lack of appropriate training, etc.

> Research Goal 5.1.3: Develop interventions for identified work groups in the form of targeted training, hazard barriers, engineering controls, or other appropriate measures to reduce exposures that lead to occupational illness.

> Research Goal 5.1.4: Develop, implement, and evaluate targeted health communications and social marketing campaigns to increase the adoption of interventions and training for over-exposures and occupational illness.

II. Operations

Intermediate Goal 5.2: Industry will analyze known and potential hazards in order to reduce the potential of occupational illness, including chemical exposures, to workers in the oil and gas extraction industry.

Translation Goal 5.2.1: Form partnerships with established industry groups, associations, and experts to identify industrial hygiene issues impacting the health of oil and gas extraction workers.

Research Goal 5.2.2: Develop and evaluate potential and known industrial hygiene issues impacting occupational illness, including chemical exposures, to workers in the oil and gas extraction industry.

Surveillance Goal 5.2.3: Identify existing and potential exposure threats and their impact on occupational illness, including chemical exposures, to workers in the oil and gas extraction industry. Use and organize existing databases, surveillance systems and other information.

Dissemination Goal 5.2.4: Disseminate findings widely throughout the oil and gas extraction industry through websites, articles, presentations, information booths, and national/regional/local safety conferences, symposiums and public meetings.

III. Surveillance

Intermediate Goal 5.3: The oil and gas extraction industry will perform surveillance to identify work practices and engineering controls to prevent chemical exposures which could lead to occupational illness among workers.

Surveillance Goal 5.3.1: Gather and analyze occupational exposure and illness surveillance data and medical records to identify patterns of disease occurrence attributable to specific job duties, materials, processes and work practices, generational differences, work culture, national origin, etc.

Surveillance Goal 5.3.2: Research the methods used in the oil and gas extraction industry to gain knowledge about approaches to track occupational chemical and environmental exposures.

Research Goal 5.3.3: Identify possible health hazards of new products and technologies used by the oil and gas extraction industry.

Research Goal 5.3.4: Perform data analyses of exposures and illnesses, aimed at developing interventions. Interventions may include recommendations for engineering controls, new technologies, PPE, and training programs relevant to each identified segment of the workforce.

IV. Education & Training

Intermediate Goal 5.4: Develop and raise awareness of existing training materials related to the risks in the transportation, use, and handling of hazardous chemicals and materials to reduce occupational non-fatal injuries and illnesses among oil and gas extraction workers.

Research Goal 5.4.1: Identify training materials developed for, or applicable to, the oil and gas extraction industry, and identify existing training gaps and needs.

Research Goal 5.4.2: Create and implement training materials designed to reduce non-fatal occupational injuries and illnesses in the oil and gas extraction industry.

Dissemination Goal 5.4.3: Disseminate findings throughout the oil and gas extraction industry through means such as websites, articles, presentations, information booths, safety conferences, symposiums and public meetings.

Research Goal 5.4.4: Evaluate the effectiveness of the training materials and the dissemination methods used.

Appendix. Organization of Goals

The table below presents a description of the activity/output goals found in the subsequent tables.

Activity/Output Goals	Description of Goal
Identify surveillance data	Development, modification, or use of surveillance data for problem identification, monitoring trends, or evaluation.
Analyze available information	Analysis of surveillance data or other information related to the intermediate goal.
Define the problem	Use of available data to better define a safety or health problem or identify sub-groups of workers at risk.
Identify research gaps	Identification of gaps in activities or knowledge related to the intermediate goal.
Identify best practices	Identification of industry-specific practices that demonstrate effectiveness in controlling or mitigating occupational hazards.
Establish partnerships/ collaboration	Establishing partnerships or collaboration with individuals or organizations that can contribute to accomplishing the goal.
Develop/implement effective interventions	Activities related to the development and implementation of known effective interventions that will contribute to the intermediate goal.
Develop training materials	Developing industry-specific training materials to increase knowledge or improve workplace practices.
Evaluate interventions	Evaluation of the effectiveness of interventions to reduce occupational injuries or improve occupational health.
Disseminate information/ recommendations	Disseminating information or recommendations to improve occupational safety and health.
Market the intervention/ information	Marketing occupational safety and health interventions to the target audience.
Other activities	Any research activity not included in the activity list above.

The tables found on the following pages of this document present a matrix of intermediate and activity/output goals for each strategic goal. The first row of each table includes the intermediate goals, while the first column includes the activity/output goals. Each box in the table with an "X" assigned indicates that an activity/output goal has been developed that will contribute to the corresponding intermediate goal.

Strategic Goal 1: By 2020, reduce the occupational fatality rate in the oil and gas extraction industry by 50 percent.

Intermediate Goal Number

Activity/Output Goals	1.1 Implement recommended industry work practices	1.2 Incorporate effective interventions to prevent fatigue	1.3 Increase the use of recommended work practices	1.4 Use surveillance to reduce fatalities	1.5 Develop training materials to reduce fatalities	1.6 Identify the methods used to disseminate training materials to workers	1.7 Develop and implement training to reduce fatalities
Identify surveillance data				X			
Analyze available information				X			
Define the problem		X		X			
Identify research gaps				X			
Identify best practices	X		X	X	X	X	X
Establish partnerships/collaboration							
Develop/implement effective interventions	X	X					
Develop training materials							
Evaluate interventions	X	X			X	X	X
Disseminate information/recommendations	X	X	X		X	X	X
Market the intervention/information							
Other activities			1.3.1, 1.3.3.		1.5.4		

Strategic Goal # 2: By 2020, reduce the occupational motor vehicle fatality rate in the oil and gas extraction industry by 50 percent.

Intermediate Goal Number

Activity/Output Goals	2.1 Implement recommended industry work practices	2.2 Increase the implementation of recommended practices	2.3 Increase the implementation of recommended pre-job requirements	2.4 Use surveillance to reduce motor vehicle fatalities	2.5 Develop training materials to reduce motor vehicle fatalities	2.6 Develop and implement safety training in order to reduce motor vehicle fatalities
Identify surveillance data		X	X	X		X
Analyze available information	X	X	X	X		X
Define the problem				X		
Identify research gaps			X	X	X	
Identify best practices	X	X				
Establish partnerships/collaboration						
Develop/implement effective interventions	X		X			
Develop training materials						
Evaluate interventions					X	
Disseminate information/recommendations	X	X			X	X
Market the intervention/information		X				
Other		2.2.5-Business Case				

Strategic Goal # 3: By 2020, reduce the fatality rate due to contact injuries in the oil and gas extraction industry by 50 percent.

Activity/Output Goals	Intermediate Goal Number					
	3.1 Implement recommended work practices to reduce contact injuries	**3.2** Investigate the activities associated with contact injuries	**3.3** Promote the use of automated technology in order to reduce contact injuries	**3.4** Use surveillance to prevent contact injuries	**3.5** Develop training materials to reduce contact injuries	**3.6** Develop and implement safety training to reduce contact injuries
Identify surveillance data	X	X		X		X
Analyze available information	X			X		X
Define the problem	X			X		
Identify research gaps				X	X	
Identify best practices			X			
Establish partnerships/collaboration		X	X	X		
Develop/implement effective interventions	X	X				
Develop training materials					X	X
Evaluate interventions			X		X	X
Disseminate information/recommendations	X	X	X	X	X	X
Market the intervention/information			X			
Other activities	3.1.3		3.3.4 Business Case 3.3.5 Models		3.5.3	

Strategic Goal # 4: By 2020, reduce the rate of non-fatal occupational injuries in the oil and gas extraction industry by 50 percent.

Intermediate Goal Number

Activity/Output Goals	4.1 Implement recommended work practices to reduce non-fatal injuries	4.2 Implement effective fall protection procedures	4.3 Perform surveillance to identify practices that prevent non-fatal injuries	4.4 Develop training materials to reduce non-fatal injuries	4.5 Implement safety training to reduce non-fatal injures
Identify surveillance data			X		
Analyze available information	X		X		
Define the problem	X	X	X		
Identify research gaps			X	X	
Identify best practices	X	X			
Establish partnerships/collaboration		X	X		
Develop/implement effective interventions	X				X
Develop training materials				X	X
Evaluate interventions	X			X	X
Disseminate information/recommendations	X	X		X	X
Market the intervention/information					
Other activities					

Strategic Goal # 5: By 2020, identify hazards, characterize risk, and prevent chemical exposures, which could lead to occupational illness in workers in the oil and gas and extraction industry.

	Intermediate Goal Number			
Activity/Output Goals	**5.1** Implement work practices to reduce chemical and environmental exposures	**5.2** Analyze known and potential hazards to reduce the potential of illness, including chemical exposures	**5.3** Perform surveillance to identify practices to prevent chemical exposures which could lead to illness	**5.4** Raise awareness of existing training materials related to risks in the handling of hazardous chemicals and materials
Identify surveillance data			X	
Analyze available information		X		
Define the problem		X	X	
Identify research gaps				
Identify best practices	X			X
Establish partnerships/collaboration				
Develop/implement effective interventions	X	X		
Develop training materials				
Evaluate interventions	X		X	X
Disseminate information/recommendations				X
Market the intervention/information				
Other activities				