O*NET® Work Activities Project Technical Report

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Executive Summary

This technical report describes the purpose, methodology, and results of the Work Activities Project conducted by the National Center for O*NET Development. There were two primary objectives of the project. The first objective was to update the O*NET database of detailed work activities (DWAs) to reflect the changes in the U.S. economy that have impacted industries and workforces of all types. Secondly, the purpose was to enhance the utility of the DWA database by using DWAs as a mechanism to link occupations across industries, improving their usability for career exploration and development and other important human resources functions. To achieve these objectives, the project team revised the framework of work activities and generated new activity statements to reflect that framework. Based on the work of Cunningham (1996), the revised framework more fully integrates DWAs with both lower-level task statements and higher-level generalized work activity (GWA) statements. The project team qualitatively analyzed and clustered the 19,450 tasks in the O*NET 18.0 Database and wrote new DWAs based on the themes in the resulting task clusters. This process produced 2,069 new DWAs. The DWA project team then analyzed and clustered these new DWAs to generate higher level intermediate work activity (IWA) statements. This process produced 332 IWAs. The resultant integrated and hierarchical framework enables the linkage of occupations that have shared work activities. The report concludes with a discussion of potential applications of activity statement data, such as career exploration and retraining and job placement efforts.

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Section I: Detailed Work Activities as a Common Language

The Occupational Information Network (O*NET®) program is the nation's primary source of occupational information. Central to the project is the O*NET database, containing information on hundreds of standardized and occupation-specific descriptors. The database is continually updated by surveying a broad range of workers from each occupation. Information from this database forms the heart of O*NET OnLine®, an interactive application for exploring and searching occupations, as well as career exploration and assessment instruments for workers and students looking to find or change careers.

The O*NET database, which powers many O*NET products and tools, is structured and was developed from the Standard Occupational Classification System (SOC) and the O*NET Content Model. The SOC provides an occupational taxonomy covering the world of work across the U.S. economy. The O*NET Content Model describes work using over 270 occupational descriptors. Based on the SOC, the O*NET-SOC taxonomy contains 1,110 occupations total, with 974 data-level occupations (the O*NET-SOC taxonomy has added more detailed occupations compared to the SOC). These occupations have undergone data collection from job incumbents or occupation experts and will continue to be updated on a regularly scheduled basis (see the O*NET Production Database).

The O*NET Content Model defines the information structure for occupations in terms of standardized, measurable sets of variables, called "descriptors." These descriptors are organized into six major domains that reflect characteristics of workers (e.g., abilities, values, knowledge, and licensing) and jobs (e.g., tasks, work context, and labor market information).

The O*NET Content Model also includes a number of job-oriented descriptors related to the *activities* performed on the job. These include task statements specific to occupations and generalized work activities (GWAs) that apply to a large number of occupations (see Appendix A for a complete list of the GWAs). Between these descriptors is the detailed work activity (DWA), defined as "an intermediate descriptor that allows cross-occupational matching while preserving differentiation, providing a common language for work description, and is easy to understand" (National Center for O*NET Development, 2003, p. 3).

DWAs are simple work activity statements (e.g., "design transporting processes") that have some degree of occupational context, in contrast to the broader GWAs (e.g., "thinking creatively"). However, these statements apply to the activities in multiple occupations, in contrast to task statements, which are normally specific to a single occupation.

The National Center for O*NET Development (2003) also outlines specific benefits of DWAs. DWAs:
1. Provide succinct, detailed information about occupational work activities to aid career exploration;

2. Are integrated with the O*NET Content Model via their link to GWAs;

3. Provide a structure for describing work experience that is useful for resume building;

4. Provide a more general level of functional descriptor to facilitate cross-occupational correspondence, which can help displaced workers identify new areas of work that match their capabilities;

5. Help educators, job seekers, researchers, and employers to identify transferable skills and skill gaps;

6. Provide a work-requirement profiling structure that employers can use to write job orders or position descriptions;

7. Promote the use of a *common language* describing the activities that occur across occupations as a basis for unifying industry sector skill standards.

The established set of O*NET DWAs has evolved over time and has previously undergone revision (National Center for O*NET Development, 2003). The original source was work performed several years prior to the release of the O*NET program. The state of Oregon (Dietrich, Hendrickson-Larson, Hoppe, Paige, & Rosenow, 2002) developed a set of skill statements to help individuals identify their skills and match them to occupations. These statements were developed for Occupational Employment Statistics (OES) occupations and were based on information from sources such as the Classification of Instructional Programs (Classification of Instructional Programs: 2000 edition), the OES occupations (Bureau of Labor Statistics, 2000), and the Dictionary of Occupational Titles (U.S. Department of Labor, 1991).

After the O*NET database was made publicly available, many new statements were written to cover O*NET-SOC occupations. These skill statements were released by the National Center for O*NET Development and henceforth described as DWAs. O*NET tasks were used as the basis for adding new DWA statements. In 2002, an O*NET team continued to revise the statements to enhance cross-occupational skill statement usage, ensure coverage of O*NET tasks, eliminate duplication, and edit for clarity and consistency. The effort produced 2,345 statements (National Center for O*NET Development, 2003).

This revision produced an updated but inconsistent dictionary of DWAs, prompting the National Center for O*NET Development to undertake a more thorough review and revision effort. This provided an opportunity to improve DWA data structure, statement style, and application. The team edited statements to remove redundancies and also revised or replaced statements that had more closely resembled knowledge, skill, ability, or work context elements. The effort revised 319 statements, eliminated 181 DWAs, and added one statement, resulting in a balance of 2,164 DWA statements. They also mapped the final set of DWAs onto the GWA data; that is, a team of raters assigned each DWA to a GWA.

The Need for Enhancements

The 2003 revision strengthened the DWA database, but the U.S. economy and workforce have experienced considerable change in the intervening decade. Most notable are changes occurring in the world of work as a result of new technologies, innovative business practices, and the organization of work.

As part of the O*NET program's continuous improvement effort, new and emerging industries and resultant occupations are regularly researched and added to the O*NET-SOC taxonomy. Research has shown, for example, that biotechnology, geospatial technology, and nanotechnology are being applied across a number of industries, substantially altering established work processes and requiring new and different technical worker competencies (National Center for O*NET Development, 2006). Even manufacturing is experiencing considerable technological change. Whereas traditional manufacturing experiences a slow decline in employment, advanced manufacturing techniques, such as robotics and precision fabrication, present opportunities for workers with more education and advanced technical skills.

Technology is also a catalyst in the growth of green or sustainable operations or energy production. More environmentally conscious consumer behavior and increased government support have given a boost to green-oriented industries like construction and energy production. This has led to a "greening" of the related workforces: Green technology or economic activities may increase the demand for existing occupations, significantly alter the work or worker requirements for existing occupations, or create the need for new and emerging occupations with unique job and worker characteristics (Dierdorff, Norton, Drewes, Kroustalis, Rivkin, & Lewis, 2009; Dierdorff, Norton, Gregory, Rivkin, & Lewis, 2011).

The O*NET program also receives input regarding changing tasks and work functions during data collection efforts. Feedback from industries, businesses, and professional associations indicate changes in work functions due to new technologies. Incumbent workers identify new tasks that they perform in their changing world of work.

These changes, both at the industry and occupational level, prompted the National Center for O*NET Development to update and enhance the DWA database to improve its application for career exploration, career development, and other important human resources functions. Much of the original DWA development preceded the growth of the O*NET database. In the past decade, the National Center for O*NET Development has updated the O*NET taxonomy to keep up with the changing world of work. In addition to exploring green technologies and their impact on work roles (Dierdorff et al., 2009), it has investigated 17 in-demand industry clusters that include traditional industries like construction, energy, health care, and hospitality, as well as emerging technologies, such as geospatial technology, biotechnology, and nanotechnology. This investigation resulted in the addition of over 150 new and emerging occupations to the O*NET taxonomy (National Center for O*NET Development, 2009). Given the potential of

DWAs for providing a common language for economies and workforces in transition, the National Center for O*NET Development determined that DWA enhancement could also capture these recent changes.

Overview of Project Rationale

The immediate objective of the Work Activities Project was to update the relevance of the DWAs by developing new DWAs to capture the growth and change in occupations, particularly new and emerging occupations arising from in-demand industry clusters (National Center for O*NET Development, 2009). The second objective was to enhance the utility of the DWA database by using DWAs as a mechanism to link occupations across industries. In addition, a review of existing DWAs revealed opportunities to improve specificity, formatting, and overall consistency of DWA statements. Together, these objectives led to improving DWA usability for career exploration and development and various human resources functions.

To help standardize DWA statements, the project team sought to update the complete database of DWAs. This, in turn, provided the opportunity to more fully integrate DWAs with the other activity descriptors: tasks and GWAs. The current multi-level framework of job descriptors includes 19,450 occupation-specific tasks, 41 cross-occupation GWAs, and 2,164 DWAs that fit between GWAs and tasks in terms of specificity. The team was able to enhance the current framework by developing an additional, *intermediate* level of analysis to help organize the DWA information and provide a stronger linkage among GWAs, tasks, and DWAs.

Cunningham (1996) suggested this type of expanded framework for the work activity domain. He described *area work activities* as descriptions of work activities that are common to multiple occupations and are often technology-specific. This corresponds closely with the established conception of a DWA. Cunningham (1996) also defined a higher-level descriptor: *Intermediate work activities* (IWAs). IWAs are more general activity statements, common to many occupations, and are rarely defined by technology use.

The IWA has excellent potential utility in the current labor market. As global competition has increased, particularly in manufacturing, and technologies have emerged, there have been significant shifts in the types and sizes of labor pools in the U.S. economy. This requires American workers to look for jobs or job-

Glossary
Job Family – *A group of similar occupations. The 22 Job Families used in this project are equivalent to the 22 major groups presented in the SOC. The term Job Family is used in the O*NET system rather than major group for ease of understanding by the many different types of O*NET users.*
GWA – Generalized Work Activity. *The most general activity statements. Each of the 41 GWAs links to many occupations across job families*
IWA - Intermediate Work Activity. *Most of the 332 IWAs link to a large number of tasks and occupations across multiple job families.*
DWA – Detailed Work Activity. *The most specific activity statement. Most of the 2,069 DWAs link to 4 or more tasks and 3 or more occupations within a single job family.*
Green DWA. *This is a green work activity statement derived solely from green tasks.*

training possibilities beyond the traditional boundaries of their industries or what they see as similar occupational groups. Employers and workforce specialists may also look outside their industries to identify and recruit workers with valuable skills that can be applied across industries and occupational groups, commonly referred to as *job families.* The term job families refers to occupations grouped together based upon work performed, skills, education, training, and credentials (National Center for O*NET Development, 2010). The 22 O*NET Job Families[1] used in this project are based on, and equivalent to, the 22 major groups used in the SOC system (Standard Occupational Classification Policy Committee, 2010).

DWAs serve as a useful starting point for many workforce decisions. The broader IWAs provide an extension of this information, linking occupations across job families. For this reason, the DWA project team chose to enhance the work activity database by not only improving the DWA database but also by adding the higher-level IWA data (see Figure 1). Using an inductive development method, the DWA project team enhanced the links among the levels in the work activity framework (signified by the arrows in the right–hand triangle in Figure 1). This hierarchical framework (tasks nested within DWAs nested within IWAs nested within GWAs) facilitates more flexible career and occupational exploration.

Figure 1. Current and Revised Work Activity Framework

Results Preview

A sample of new work activities data for the O*NET-SOC occupation of Electricians provides a demonstration of the nested structure of activity data. Table 1 presents four of the 13 GWAs

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[1] The 22 O*NET Job Families used in this project are based on the Occupational Major Groups in the SOC. The Standard Occupational Classification is organized into *23* major groups, including *Military Specific Occupations* (Standard Occupational Classification Policy Committee, 2010).   The O*NET project does not collect data on occupations in the *Military Specific Occupations* major group.

linked to Electricians. Nested under each GWA is one or more IWAs, such as *Estimate project development or operational costs*. Nested under each IWA is one or more DWAs, such as *Estimate construction project costs.* Finally, nested under each DWA are multiple tasks, such as *Provide preliminary sketches or cost estimates for materials or services.*

Table 1. Example of Nested Activity Data for 47-2111.00 - *Electricians*.

GWA:	**Inspecting Equipment, Structures, or Material**	
IWA:	Inspect commercial, industrial, or production systems or equipment.	
	DWA:	Inspect electrical or electronic systems for defects.
	Task:	Inspect electrical systems, equipment, or components to identify hazards, defects, or the need for adjustment or repair, and to ensure compliance with codes.
GWA:	Estimating the Quantifiable Characteristics of Products, Events, or Information	
IWA:	Estimate project development or operational costs.	
	DWA:	Estimate construction project costs.
	Task:	Provide preliminary sketches or cost estimates for materials or services.
GWA:	Thinking Creatively	
IWA:	Create visual designs or displays.	
	DWA:	Create construction or installation diagrams.
	Tasks:	Prepare sketches or follow blueprints to determine the location of wiring or equipment and to ensure conformance to building and safety codes.
		Provide preliminary sketches or cost estimates for materials or services.
GWA:	Handling and Moving Objects	
IWA:	Install commercial or production equipment.	
	DWA:	Install electrical components, equipment, or systems.
	Tasks:	Assemble, install, test, or maintain electrical or electronic wiring, equipment, appliances, apparatus, or fixtures, using hand tools or power tools.
		Connect wires to circuit breakers, transformers, or other components.
		Fasten small metal or plastic boxes to walls to house electrical switches or outlets.
		Install ground leads and connect power cables to equipment, such as motors.

Table 1 demonstrates that GWAs reflect not only the IWAs, but also the DWAs and tasks. This hierarchical or nested framework can enhance users' understanding of the range and detail of work activity information.

The hierarchical framework is especially useful as a means of linking occupations to facilitate occupational exploration. Common work activities (at either the DWA or IWA level) provide a way to compare and contrast occupations. Table 2 previews the results in a different manner. It lists the shared DWAs between two occupations and the tasks that form the basis for the common work activity profile.

Table 2. DWAs Common to 51-8091.00 *Chemical Plant and System Operators* and 51-8099.01 *Biofuels Processing Technicians*.

Chemical Plant and System Operators	Biofuels Processing Technicians
Common DWA: Collect samples of materials or products for testing.	
Draw samples of products and conduct quality control tests to monitor processing and to ensure that standards are met.	Collect biofuels samples and perform routine laboratory tests or analyses to assess biofuels quality.
Common DWA: Direct operational or production activities.	
Direct workers engaged in operating machinery that regulates the flow of materials and products.	Coordinate raw product sourcing or collection.
Supervise the cleaning of towers, strainers, or spray tips.	
Common DWA: Operate pumping systems or equipment.	
Start pumps to wash and rinse reactor vessels, to exhaust gases or vapors, to regulate the flow of oil, steam, air, or perfume to towers, or to add products to converter or blending vessels.	Operate valves, pumps, engines, or generators to control and adjust biofuels production.
Common DWA: Replace worn equipment components.	
Repair or replace damaged equipment.	Rebuild, repair, or replace biofuels processing equipment components.
Common DWA: Record operational or production data.	
Record operating data, such as process conditions, test results, or instrument readings.	Inspect biofuels plant or processing equipment regularly, recording or reporting damage and mechanical problems.
	Monitor and record biofuels processing data.
	Monitor and record flow meter performance.
Common DWA: Notify others of equipment repair or maintenance needs.	
Notify maintenance, stationary-engineering, or other auxiliary personnel to correct equipment malfunctions or to adjust power, steam, water, or air supplies.	Inspect biofuels plant or processing equipment regularly, recording or reporting damage and mechanical problems.

Section II: General Methodology

The DWA project team designed an inductive, "bottom-up" approach to DWA development, starting with the tasks listed in the O*NET 18.0 Database. The O*NET database is regularly updated by incumbent ratings of the relevance and importance of O*NET tasks. Furthermore, emerging tasks have been identified across multiple versions of the O*NET database. Thus, O*NET tasks are a robust source for work activity data. There were two challenges involved in developing more general work activity information from these task statements. The first was to extract the more general *activity* data from the specific *task* statements; this was a substantial challenge, given the 19,450 task statements in the O*NET 18.0 Database. The second challenge was organizing the extracted data into meaningful, unique content that did not replicate higher-level (GWA) or lower-level (task) data.

The DWA project team considered two approaches to extracting valuable activity data: a quantitative and a qualitative approach. The quantitative approach would attempt to deconstruct each task statement into its key linguistic components: an activity verb, an object of the verb, and a purpose. A classification system of those components would provide numerical codes for a series of cluster analyses to produce groupings of similar task statements.

The qualitative approach would involve a rational analysis of each task statement as a whole, rather than reducing each task to linguistic components. The rational method would also generate task clusters, but based on close inspection of the tasks to reveal the core theme or activity of each task. The quantitative approach would have the advantage of speed and efficiency by focusing on the parts of the task statements expected to be most informative. The qualitative approach would have the advantage of precision and accuracy; by rationally analyzing each task statement, the DWA project team could be sure to extract the most crucial activity information, no matter where it occurred in a task statement.

The DWA project team pursued the qualitative approach primarily because of the realization that task statement structure is so variable that it would be very difficult for a technical system to reliably derive the most important data from tasks. In short, human judgment was determined to be paramount in the development of a logical, meaningful, and useful system. The rational approach capitalized on rational judgment whereas the quantitative approach would have restricted it.

The resulting qualitative method (see Figure 2) began with two straightforward steps:
1) Rational analysis and clustering of tasks into groups based on similarity of activity, objects, purpose, context, and technology, and 2) Development of precisely worded activity statements –new DWAs—that reflect those common characteristics and distinguish those activities from other activity statements.

Once the DWAs were developed, several data refinements were conducted. Firstly, relevant original, or "legacy," DWAs were integrated into the DWA dataset if they filled a conceptual gap

in the set of new DWAs. Secondly, the entire set of DWAs was reviewed to identify identical or nearly identical DWAs that could be combined. Finally, tasks that contained information about multiple activities were linked to additional DWAs.

Once these refinements were complete, the project team conducted the same two-step process to develop IWA statements. DWA statements were clustered using the same rational process used for task clustering. DWA statements reflecting similar activities were grouped and activity statements were written to reflect the common activity themes in the DWA clusters.
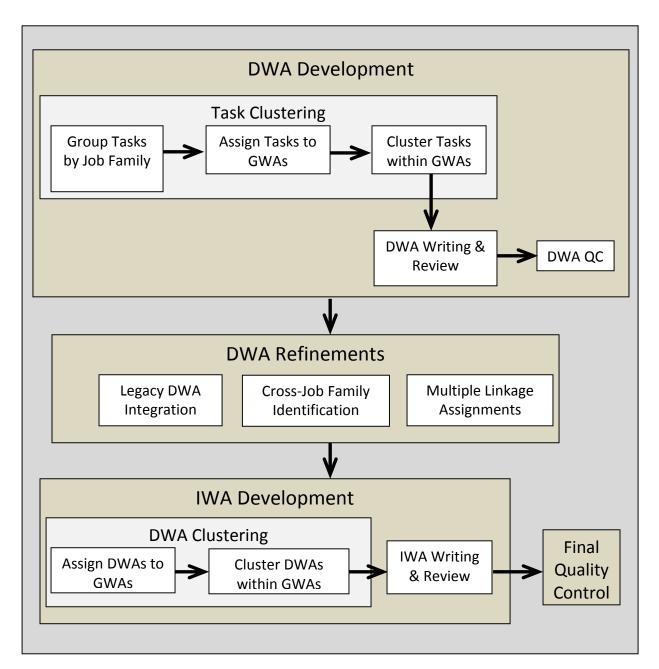
Figure 2. DWA and IWA Development Process

The following section describes in greater detail the processes for DWA and IWA development, additional refinement efforts, and quality control and content review procedures.

Section III: DWA Development

The DWA project team developed a multi-step, collaborative, team-based development procedure that employed simple, real-time technology to cluster tasks and write DWA statements.

A team-based approach was used to balance interpretations of task language. Any single analyst has certain language biases. The multiple viewpoints expressed during team collaboration can correct for idiosyncratic language interpretations and usage. Team collaboration was accomplished through an online spreadsheet application that allowed for simple, visible, real-time collaboration among team members. The DWA project team used the online spreadsheet throughout the primary DWA development steps—Task Clustering and DWA Statement Writing.

There were three to four teams (depending on the stage of development), each composed of three to four members, conducting DWA development. Each team included an experienced occupational analyst as a team leader and two or three graduate students in industrial-organizational psychology as team members. Each team was responsible for both task clustering and DWA writing for multiple subsets of task data. That is, a team was responsible for the entire development process for an assigned set of tasks.

Task Clustering

The goal of task clustering was to incrementally group similar tasks into increasingly smaller clusters until simple, specific, and unique work activity themes emerged that would reflect each of the tasks in the respective clusters. The following steps were used:

1. Group tasks according to 22 O*NET job families.
2. Assign tasks to GWAs.
3. Cluster tasks within GWAs.

Task Clustering Step 1: Sorting by Job Family

As described earlier, a primary distinction between the new DWAs and IWAs is that DWAs apply to multiple occupations within a single job family, whereas IWAs often link to occupations in multiple job families[2]. Thus, there is a theoretical basis for grouping tasks first by job family. There is also a practical reason for doing so in that job families provide a very efficient way to

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[2] A small subset of cross-family DWAs were developed. See page 26 for a discussion.

initially cluster conceptually similar tasks.   One can see that the occupations encompassed by the job families listed in Table 3 will have many similar tasks. Organizing tasks by the 22 job families helps to integrate new data with an established occupational framework[3].

This division by job family produced 22 groups of occupations, with group totals ranging from 134 tasks to 2,344 tasks. This reduction of the entire group into smaller subsets of related tasks made it easier to inspect and cluster tasks further, even in the largest job families.

Table 3. 22 O*NET Job Families

Job Family	# of occupations	# of tasks
Management	59	1294
Business and Financial Operations	51	983
Computer and Mathematical	33	690
Architecture and Engineering	71	1431
Life, Physical, and Social Sciences	60	1161
Community and Social Service	14	290
Legal	8	134
Education, Training, and Library	61	1591
Arts, Design, Entertainment, Sports, and Media	43	795
Healthcare Practitioners and Technical	86	1683
Healthcare Support	18	332
Protective Service	29	543
Food Preparation and Serving Related	17	327
Building and Grounds Cleaning and Maintenance	8	181
Personal Care and Service	32	621
Sales and Related	24	456
Office and Administrative Support	63	1125
Farming, Fishing, and Forestry	17	311
Construction and Extraction	61	1135
Installation, Maintenance, and Repair	54	1096
Production	112	2344
Transportation and Material Moving	53	927

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[3] The 22 O*NET Job Families used in this project are based on the Occupational Major Groups in the SOC. The Standard Occupational Classification is organized into *23* major groups, including *Military Specific Occupations* (Standard Occupational Classification Policy Committee, 2010).   The O*NET project does not collect data on occupations in the *Military Specific Occupations* major group. As such, the task clustering process employed the 22 groups of civilian occupations.

Task Clustering Step 2: GWA Assignment

Each job family involves many tasks—some include thousands of tasks—so it was necessary to further subdivide tasks in a logical manner.   As an intermediate step, the DWA project team chose to subdivide tasks by linking them to GWAs, which would begin to organize the tasks for further evaluation. O*NET-SOC occupations are currently linked to 41 GWAs (see Table 4 for examples and Appendix A for a complete list).

Because tasks had not been explicitly linked to GWAs, this step involved making those linkages. Teams of analysts, working within each job family, assigned each task to one of the 41 GWA "buckets," based on the similarity of the work activity in the task to the respective GWA.

Table 4. Examples of O*NET Generalized Work Activities

GWA	
Activity	**Description**
Getting Information	Observing, receiving, and otherwise obtaining information from all relevant sources.
Judging the Qualities of Things, Services, or People	Assessing the value, importance, or quality of things or people.
Organizing, Planning, and Prioritizing Work	Developing specific goals and plans to prioritize, organize, and accomplish your work.
Handling and Moving Objects	Using hands and arms in handling, installing, positioning, and moving materials, and manipulating things.
Operating Vehicles, Mechanized Devices, or Equipment	Running, maneuvering, navigating, or driving vehicles or mechanized equipment, such as forklifts, passenger vehicles, aircraft, or water craft.
Repairing and Maintaining Electronic Equipment	Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.
Assisting and Caring for Others	Providing personal assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.

Each team of three to four analysts was assigned the tasks from a subset of job families. The 22 job families were distributed evenly among the four development teams. For the tasks in a specific job family, each member assigned each task to just one of the 41 GWAs. They did this through a database form interface (see Figure 3) that presented the entire set of tasks for a job family in succession. For each task, a team member selected the GWA that best captured the primary work activity present in the task statement.
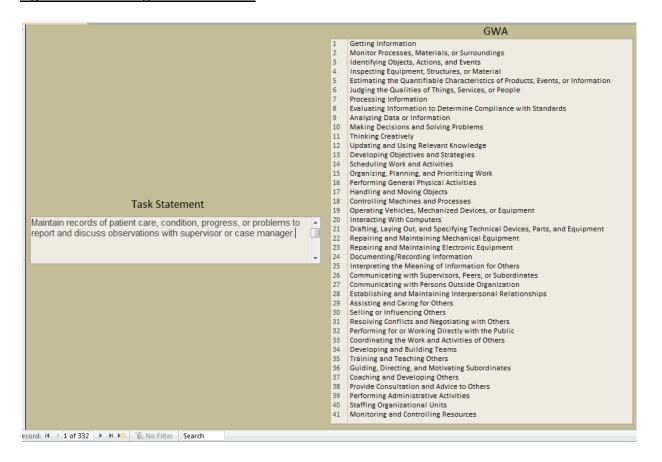
Figure 3. GWA Assignment Interface

Analysts needed to deconstruct each task statement to identify the core activity data, enabling assignment to the most appropriate GWA. Task statements provide a wealth of information, but a GWA assignment needed to be based primarily on activity data. For each task statement, analysts needed to: a) Distinguish between activity data and supplemental information, and b) Identify the *primary* activity among potentially multiple activities found in a task statement.

Although task statements vary in structure, they may include (in addition to an activity statement) purpose clauses (e.g., "to determine specifications"), tools and technology (e.g., "using hand tools or power saws"), or exemplar clauses (e.g., "such as updating records"). Although this supplemental information is informative, especially in later task clustering steps, GWA assignment is based on the commonality between task activity data and respective GWAs.

Similarly, many task statements refer to multiple activities, which take several forms: A sequence of activities on a single object (e.g., test and adjust equipment), related activities performed on different objects (e.g., position work pieces and start equipment), or contrasting methods (e.g., remove work pieces manually or operate equipment to remove work pieces). However, the GWA assignment interface allowed for a single task-GWA assignment, so analysts needed to determine the *primary* activity in a task statement and make a GWA assignment based on that activity. (Focusing on a single activity in a task statement at this stage did not preclude the utilization of the additional activity data. See Section IV for an explanation of multiple linkage identification.)

The GWA selections for all team members were recorded; thus there were three or four selections for each GWA-task assignment. These data were then imported into an online spreadsheet that would become the primary working file for the remainder of the DWA development process. Since the tasks were organized within job families, the task assignment process produced 22 working files, one for each job family.

The next step was to achieve consensus on whether the initial task-GWA assignments were the most appropriate and whether tasks within a bucket were similar. In each job family, a certain percentage of tasks had already achieved consensus—all team members independently assigned a given task to the same GWA. To resolve differences in task-GWA assignment, team members collaboratively decided where the remaining tasks belonged.

The online spreadsheets (one for each job family) were set up to facilitate the organization and achievement of consensus decision making. First, consensus tasks were separated from disagreement tasks (see Figure 4 for an example worksheet); if all but one team member agreed on a GWA-task assignment, the task was considered "in consensus." The "majority rule" was followed in this case because this was just a first pass and all tasks would be inspected very closely and reassigned as necessary in later steps.

For example, of the 1,683 tasks linked to the job family *Healthcare Practitioners and Technical*, 1,277 were assigned to a GWA by consensus or majority rule during the initial GWA-task assignment step. Each of these 1,277 tasks was then distributed to one of the 41 worksheets corresponding to the GWAs and set aside for later consideration. The remaining 406 tasks in this job family were placed in a separate worksheet for immediate attention. The team members then discussed the proper GWA assignment for each of these tasks until they reached consensus. These tasks were then moved to the appropriate GWA worksheets. At this point, all 1,683 tasks for this job family were filed in one of the 41 GWA worksheets.

The rational task clustering method is based on evaluation of the entire meaning of a given task statement (including work activity, purposes, context and technology). The tasks were grouped based on this broad meaning sense, using the existing GWAs as a framework. The most important goal was to group all tasks with similar meanings into logical clusters. Then, the

specifics of each task statement were considered to further sort the groups into similar work activities at the level of specificity needed to write informative and useful DWAs.

Figure 4. Screenshot of *Disagree* Worksheet for Job Family *Transportation and Material Moving*

	A	B	C	D	E	F	G	H	I	J	K	L
1	OccpID	O*NET-SOC Title	TaskID	Task	Task Type	Green?	R1	R2	R3	Prosp. Rev. ID	Final Rev. ID	Comments (Rd. 1)
2	53303100	Driver/Sales Workers	3162	Review lists of dealers, customers, or station drops and load trucks.	Supplemental	No	8	1	39	1	1	MH: Agree. DS: Agree.
3	53602100	Parking Lot Attendants	3197	Review motorists identification before allowing them to enter parking facilities.	Supplemental	No	8	9	3	1	1	AK: I see this as getting info (1) l DS: Same page.
4	53103100	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	8589	Review orders, production schedules, blueprints, or shipping or receiving notices to determine work sequences and material shipping dates, types, volumes, or destinations.	Core	No	8	7	39	1	1	MH: Agree. DS: Agree
5	53604100	Traffic Technicians	8635	Study factors affecting traffic conditions, such as lighting or sign and marking visibility, to assess their effectiveness.	Supplemental	No	1	3	6	3	1	MH: I think this is higher level tha DS: I prefer 1 or 9. Is it too analy
6	53604100	Traffic Technicians	8643	Study traffic delays by noting times of delays, the numbers of vehicles affected, and vehicle speed through the delay area.	Supplemental	No	1	24	9	1	1	MH: Fits with 8635. DS: Agree

Note: *OccpID*=Occupational ID. *Task Type*: All O*NET tasks are designated as either *Core* or *Supplemental* to the performance of the occupation.[4] *Green?* Identifies either newly-developed "green" tasks or tasks associated with Green Increased Demand Occupations or Green Enhanced Skills Occupations. *R1, R2, R3*=rater IDs for team members in initial GWA-task assignment teams. *Prosp. Rev. ID*= the prospective revised GWA ID proposed by primary team member for the respective task. *Final Rev. ID*=the final revised GWA ID for the task, agreed upon by all team members. *Comments (Rd. 1)* is one of up to eight comments columns team members used to discuss GWA-task assignments.

Task Clustering Step 3: Within-GWA Clustering

Dividing the hundreds to thousands of tasks within each job family among the 41 GWAs greatly simplified the development process, and some work activity themes began to emerge right away with a review of the GWA worksheets. In general, this initiated the most intellectually intensive and collaborative phase of the DWA development project for several reasons.

First, tasks within any given job family were not distributed evenly across the GWA buckets. GWAs loosely correspond to the Data-People-Things model (U.S. Department of Labor, 1991): the first 15 GWAs (4.A.1.a.1 through 4.A.2.b.6) generally lean toward *data*, the next 9 GWAs (4.A.3.a.1 through 4.A.3.b.6) deal with *things*, and the remaining 17 GWAs (4.A.4.a.1 through 4.A.4.c.3) are *people*-oriented. Many of the job families focus their activities on one of the three areas. The job family *Production* is *things*-focused—hundreds of tasks were assigned to GWAs 4.A.3.a.1 through 4.A.3.b.6. A large portion of the tasks in *Life, Physical and Social*

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[4] *Task Type* is a useful secondary variable. The DWA project team modestly prioritized "Core" tasks over "Supplemental" tasks by attempting to limit the number of core tasks identified as outliers. Conversely, supplemental tasks were allowed to be identified as outliers more frequently. For example, a cluster initially composed only of supplemental tasks was often removed or revised to include more core tasks.

Sciences ended up in the *data* GWAs, and tasks for *Sales and Related* were often assigned to *people* GWAs. This often resulted in very large clusters of tasks assigned to a given GWA, requiring extensive subdivision.

Second, the GWA framework is composed of generally defined descriptors, since they were designed to apply to multiple occupations. Thus, it was important to ensure that specific task statements were linked to the correct GWA descriptor.

Finally, rational judgment procedures are subject to evolving interpretations, or mental models. As team members spent more and more time with rich data such as GWAs and task statements, their individual mental models changed and converged. Thus, perspectives toward the end of clustering were likely to be different than they were during GWA-task assignment.

As a result, this phase involved an extensive amount of clustering, GWA reassignment, and re-clustering, among other activities. It also involved lengthy discussion to reach consensus on GWA assignments and cluster composition.

To structure the within-GWA clustering, a seven-step process was developed (see Figure 5 for a screenshot of the worksheet for GWA 4.A.3.a.2 *Handling and Moving Objects* for the job family *Transportation and Material Moving*):

1. Each team member was assigned a subset of GWA worksheets for the initial organization and clustering. For the assigned subset, the team member began by reviewing the respective task statements and deconstructing them in the same manner as in the GWA assignment step—distinguishing activity data from supplemental data and identifying the primary activity in the task statement. Focusing on the primary activity, the team member decided whether a task actually belonged in a given GWA bucket or whether it would be a better fit elsewhere. If a task was not a good fit for the GWA, the team member identified a more appropriate GWA.

2. Team members then identified task statements with multiple activities. These task statements were flagged in the working files to ensure that, in later stages, all relevant task information would be linked to DWAs. In some cases this required a task to be linked to multiple DWAs.

3. After identifying poorly fitting tasks the team member began the process of clustering the remaining valid tasks. He or she coded highly similar tasks with the same identification numbers and also described the emerging themes for those groupings (using key words or complete phrases). For example, task statements relating to assembly would be coded as "1" whereas tasks involving installation would be coded as "2," and tasks relating to disassembly would be a "3," and so on. Once the initial coding was complete, the team member sorted the tasks by codes/themes, resulting in initial clusters. The team member then refined the cluster solution and themes by splitting or

combining clusters and identifying any additional tasks that were no longer a good fit for the GWA grouping.

Figure 5. Screenshot of Task Clustering Worksheet for GWA *Handling and Moving Objects* for Job Family *Transportation and Material Moving*

	A	B	C	D	E	F	J	K	L	M	N
1	OccpID	O*NET-SOC Title	TaskID	Task	Task Type	Green?	DWA ID	Theme/Other Notes	Outlier?	Compound Task?	Comments (Rd 1)
2	53706200	Laborers and Freight, Stock, and Material Movers, Hand	10797	Set up the equipment needed to produce special lighting or sound effects during performances.	Supplemental	No	17.02	Assemble equipment			
3	53701100	Conveyor Operators and Tenders	10765	Join sections of conveyor frames at temporary working areas, and connect power units.	Supplemental	No	17.02	Assemble equipment		yes	
4	53501100	Sailors and Marine Oilers	14468	Break out, rig, and stow cargo-handling gear, stationary rigging, or running gear.	Core	No	17.02	Assemble equipment		yes	
5	53707300	Wellhead Pumpers	5017	Unload and assemble pipes and pumping equipment, using hand tools.	Core	No	17.02	Assemble equipment		yes	
6	53706400	Packers and Packagers, Hand	3218	Assemble, line, and pad cartons, crates, and containers, using hand tools.	Supplemental	No	17.02	Assemble equipment		yes	AK: Should be in 17. MH: Agree, I think. DS: Agree. 17.02?
7	53703200	Excavating and Loading Machine and Dragline Operators	30011	Create or maintain inclines or ramps.	Core	No	17.02	Assemble equipment			AK: A bad task but I think this should be in 17. MH: Agree. DS: Agree

Note: *Outlier* identifies tasks that don't belong in the respective GWA worksheet. *Comments (Rd. 1)* is one of potentially several comments columns team members used to discuss cluster assignments and composition.

4. Teams employed content criteria and cluster size criteria at this stage.

- *Cluster Homogeneity*: This was the primary content criterion. As a group, the tasks within a cluster needed to robustly demonstrate a single activity theme. It was not sufficient for each task to somewhat relate to the activity theme; such a cluster would not be "tight" enough.

- *Task-Cluster Fit*: Related to cluster homogeneity was the fit of a task with the activity theme demonstrated by the other tasks in the cluster. A task that did not fit strongly with the activity theme was moved to another cluster or identified as an "outlier."

- *Cluster Uniqueness*: Clusters within each job family needed to be conceptually distinct from one another. Conceptually overlapping clusters were subject to an array of possible changes ranging from removal of individual tasks to the combining of clusters.

- *Cluster Specificity*: The goal of DWA development was to generate activity statements that are more general than task statements but considerably more specific than GWAs. Overly specific clusters were combined with other clusters and overly general clusters were further subdivided.

- *Cluster Size*: DWA development teams were also given cluster size requirements. Clusters had to be composed of at least two tasks, but larger *target ratios* were also employed. Teams were to attempt to achieve clusters that linked to at least four tasks and at least three occupations. These target ratios were important for two reasons. First, a goal of the project was to use DWAs to link occupations through common activities; that goal cannot be fully achieved if many DWAs link to only one or two occupations. Second, the O*NET Database is a dynamic repository of task data that reflects changes in occupations and work processes, and tasks are occasionally removed, replaced, or revised to reflect those changes. As such, a critical mass of tasks is necessary to bolster a DWA against potential task removals in the future. If a cluster contained a single task, the task was moved to a different cluster or was categorized as *unassigned*.   If clusters failed to meet the target ratios, team members looked for opportunities to combine these small clusters with other clusters. Small clusters that could not be combined were evaluated and retained if they were considered important and had potential for future growth.

5. Once all team members completed steps 1-4 for their subset of GWA worksheets, the other team members were given the opportunity to comment on each other's cluster solutions and make suggestions. Team members confirmed or disputed cluster homogeneity, task-cluster fit, and cluster uniqueness and specificity. They also discussed more appropriate clusters or GWA buckets for certain poorly-fitting tasks. This was a valuable step in the methodology. It allowed team members to gauge the mental models of their teammates, and to contribute perspectives and suggestions to clustering solutions and outlier decisions. This process, through multiple iterations, generated increasingly strong shared mental models of GWAs, clusters, and task language. It also ensured that each team member looked at all the tasks and all the clusters in a given job family.

6. Once each team member had reviewed all other team members' work, a designated team leader performed the administrative step of moving the tasks designated as poor fits to more appropriate GWA worksheets. Next, another round of independent cluster refinement was conducted, followed by collaborative review and refinement.

7. Step 5 was often repeated several more times until the team decided to transfer all the cluster data from the 41 separate worksheets to a single cluster worksheet. The clusters were reviewed and refined at this point as a single grouping corresponding to a particular job family, rather than to an individual GWA. All team members inspected each cluster for homogeneity and the fit of each task within the cluster. There was also

an initial evaluation of cluster specificity and cluster overlap; these criteria were addressed more intensively after DWAs were written.

DWA Statement Writing

Once all team members were satisfied with the clusters and their composition, they wrote simple declarative statements to reflect the activities present in the linked tasks. Task clustering and DWA writing were steps in a continuous process. Thus, each team was responsible for both task clustering and DWA writing for their assigned sets of tasks.

Following the standard collaborative pattern, each team member was responsible for drafting initial DWA statements for a subset of task clusters. The finalized task clusters were distributed evenly among the team members, who wrote a single declarative activity statement for their assigned task clusters according to the DWA style guide below. Once draft DWAs were written, they were reviewed and revised collaboratively by the team, all in a single online worksheet. Comments and suggested revisions were captured in a series of *Comments* columns in each worksheet; four to six columns worth of comments were often necessary to resolve DWA revisions.

DWA writing standards were developed and included the following:

1. Use one major activity verb per DWA. Start the DWA with this verb.

2. The verb form should be third-person, present-tense plural.

3. Use as few nouns as possible while still being specific. For example, it might be necessary to refer to clients and customers (rather than just people). Use *or* rather than *and* for cases with multiple object nouns.

4. Use nouns that are specific to the job family being addressed, but neither too specific nor too general. *Equipment* is too general, *laser surgery robots* is probably too precise; *medical treatment equipment* may be just right. A noun should not refer to something used in only one specific occupation within the job family.

DWA Writing Standards, continued:

5. Use adjectives to modify nouns for occupational clarity as needed.

6. Avoid exemplar clauses (e.g., "*such as*", "*including*") except when absolutely necessary.

7. Use purpose ("to") clauses only as needed. Purpose statements can be essential qualifiers, however. Incumbents in different occupations may actually perform the same activities, but the purposes will differ. Different purposes may imply different knowledges and/or skills so that the purpose, itself, becomes relevant to the end-user.   However, there are cases where the DWA can be re-written to retain the qualifier. "Analyze legal or regulatory changes to determine impact" can be re-written as "Analyze impact of legal or regulatory changes."

8. Aim for a moderate reading level, approximating an 8th grade reading level. [5]

(See Appendix B for DWA Writing Standards).

Once a team prepared and revised DWA statements for a job family, the team conducted an internal content review to address established criteria, cluster homogeneity, task-cluster fit, DWA specificity, and DWA uniqueness. Although all four criteria were regularly addressed, the emphasis at this stage was on DWA specificity and uniqueness.   Task clusters may have been sufficiently specific and unique at the completion of clustering. However, the translation of a cluster theme into an activity statement creates new opportunities for specificity or uniqueness issues. Capturing in words the entirety of a task cluster can sometimes require more general language than desired. Thus, DWA specificity needed to be re-evaluated at this point. Likewise, word usage in a DWA statement may create more conceptual overlap among DWAs than exist in the task clusters themselves. To detect DWA conceptual overlap, teams reviewed the list of DWAs for a job family in isolation, with task and cluster data temporarily stripped from the worksheet.

The team then made more revisions if data failed these criteria. As in other stages of DWA development, this involved further cluster subdivision or cluster combination, as well as identification of poorly fitting task statements. DWA wording was also revised and fine-tuned at this stage. Once this was completed, the DWA data were submitted for quality control review.

DWA Content Review and Quality Control

The DWA project team employed a round-robin approach to DWA quality control (QC). Throughout DWA development, there were at least three development teams. This allowed rotation of one team's completed DWA data through content reviews by the two other teams.

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[5] The DWA project team evaluated the reading level of an activity statement using the SMOG index whose core variable is the number of words with three or more syllables. The SMOG value was calculated using an online readability calculator: http://www.readability-score.com/ (WordsCount, n.d.). See McLaughlin (1969) for a statistical description of the SMOG index.

After initial development was completed for a job family, the first QC team reviewed the data using procedures defined in a QC manual (see Appendix C for the Quality Control manual). If this team identified problematic data, they had the authority to revise the data without consulting the initial development team. The first QC team then reviewed their own revisions and submitted their data to a second QC team that reviewed the revised data and prepared the data for initial review by the National Center for O*NET Development. This round-robin approach allowed nearly all project team members to review DWAs and DWA-task links across the entire O*NET task database, facilitating the refinement and application of shared mental models and ensuring consistency of data and completeness of coverage.

Section IV: DWA Refinements

Once initial DWA development was complete, the DWA project team conducted several refinements and enhancements before proceeding to IWA development. The team identified DWAs that crossed job families, established multiple task-DWA linkages for compound tasks, and integrated a subset of legacy DWAs into the new DWA database. The following section describes these efforts.

Cross-Job Family DWAs

During the development process, the DWA project team observed that some identical or near-identical DWAs occurred across job families, providing an opportunity to link common activities among occupations found in different job families. This led to the development of cross-job family DWAs (see Appendix D for a presentation of Cross-Job Family DWAs).

Once the complete set of DWAs had been developed for the 22 job families, the DWAs were alphabetically sorted to identify identical and near identical DWAs. A project team member then conducted the following steps:

1. All identical DWAs were flagged.

2. Tasks linked to identical DWAs were reviewed and confirmed for cross-linking.

3. Near-identical DWAs were flagged.

4. Tasks linked to near-identical DWAs were closely reviewed to gauge the degree of overlap among tasks from different job families. If the task overlap was considered to be sufficient, the DWAs were flagged for revision.

5. The near-identical DWAs were then revised. Usually, one of the near-identical DWAs was chosen as the standard and the other DWAs were revised to duplicate the standard wording. Occasionally, all the DWAs were revised to a more general wording that fit all the linked tasks.

6. All tasks linked to the new larger, cross-family DWAs were reviewed for cluster homogeneity; the cross-family DWAs were revised as necessary.

7. Finally, confirmed revisions were entered into the DWA dataset for further development.

Multiple Linkage Identification

In an effort to capture as much activity data and produce as many DWA-task linkages as possible, tasks were evaluated to ensure that all activity data were linked to DWAs. Thus, in certain cases, tasks with multiple activities were linked to multiple DWAs. For example, the task "*Measure, cut and install tackless strips along the baseboard or wall*" could be linked to DWAs associated with: 1) Measurement, 2) Cutting materials, or 3) Material installation.

The DWA project team adjusted the development methodology for multiple linkages from the collaborative DWA development approach. As before, the work was broken up by job family: A task could be linked to as many as three DWAs, but only within a single job family. Given that DWAs were originally developed within job family, it seemed appropriate to restrict additional linkages to the original job family. Tasks with multiple activities were extracted from the larger dataset of tasks for each job family and were given to an analyst, who also had a list of all DWAs for that job family. Using the DWA list, the analyst recorded a second and, if necessary, a third DWA for each task. A first link had been established for each task during initial DWA development, based on what was determined to be the primary or most significant activity for the task. The analyst identified a second activity in the task and searched for a DWA in the reference list that adequately captured the activity. The same process was performed if the analyst identified a third activity. On occasion, the analyst determined that additional task activities would be linked to the same DWA as the primary activity, so no additional linkages were recorded.

Once the analyst completed all multiple linkages for a complete set of tasks for a job family, the file was passed on to a second analyst. This analyst reviewed all the linkages made by the first analyst. For each linkage, the second analyst could:

1. Confirm the choice of the first analyst,
2. Reject the choice of the first analyst and suggest an alternative DWA to link to, or
3. Reject the choice of the first analyst and argue for no second or third linkage

After the second analyst had completed his or her review and input, a third analyst then reviewed disagreements between the two analysts and selected the more suitable of the suggested DWA linkages. The analyst could also reject both choices, coming up with an alternative DWA linkage, or leaving the linkage cells blank. Analysts could discuss potential decisions with other analysts at any point in the process.

Legacy DWA Integration

The existing ("legacy") DWAs provided an opportunity to validate the inductive development approach and fill in gaps in the new DWA database. Because the legacy DWAs were developed using a different method, comparing the new DWAs to legacy DWAs provided a measure of external validity. The DWA project team developed a method to compare the two sets of DWAs. In short, any legacy DWAs that did not have a corresponding match among the new DWAs could be considered for appropriation as new DWAs.

Legacy DWA Integration Steps:

1. The 2,164 legacy DWAs and the 2,069 new DWAs were alphabetically sorted in a single spreadsheet.

2. For each legacy DWA, the project team searched for a match among the new DWAs. 561 legacy DWAs were identified as potential mismatches.

3. The 561 potential mismatches were then collectively reviewed by the project team. Among these, a very large majority were eliminated from consideration for the following reasons:

   a. General coverage among new DWAs, despite no 1-to-1 wording match (e.g., "access media advertising services", "analyze recipes", and "design transporting processes")

   b. Too specific (e.g., "use object-oriented computer programming techniques", and "collect money from machines")

   c. Poor wording (e.g., "work as a team member", and "use densitometer")

   d. Obsolete (e.g., "type document from machine transcription")

   e. *Many were rejected for multiple reasons.*

4. This process reduced the set of mismatches from the initial 561 to 51.

5. To adhere to an inductive approach of linking each DWA to multiple tasks, any legacy DWAs identified for inclusion with the new DWAs had to link to multiple tasks and occupations. The project team searched the O*NET task database for tasks that could be linked to these 51 legacy *candidate* DWAs. Most of these candidates could not be linked to four or more tasks and three or more occupations. In other words, most of the DWAs without matches were too specific to be used with the current data set.

6. This search resulted in a final set of 10 additional DWAs linked to a total of 46 tasks.

7. The appropriated legacy DWAs (see Table 5) were revised to conform to the project's criteria for style and structure.

8. The appropriated DWAs were given new ID numbers, and the DWA and linkage data were integrated into the main DWA database.

Table 5. Appropriated Legacy DWAs.

DWA Statement	# of tasks	# of occs
Evaluate training programs, instructors, or materials.	5	3
Draft legislation or regulations.	3	3
Estimate demand for products or services.	2	2
Cultivate micro-organisms for study, testing, or medical preparations.	3	3
Arrange childcare or educational settings to ensure physical safety of children.	3	3
Care for patients with mental illnesses.	4	3
Transcribe spoken or written information.	4	4
Adjust tuning or functioning of musical instruments.	7	2
Assemble precision electronics or optical equipment.	11	2
Braze metal parts or components.	4	3

The appropriation of so few legacy DWAs demonstrated solid external validity for the new DWA development methodology and results. That is, the new DWAs capture nearly all legacy DWA data. In addition, the process enabled the project team to fill in those few gaps on the DWA content domain. Appendix E provides a sample listing of finalized DWA statements.

Section V: IWA Development

The next phase in the Work Activities Project was to move further up the ladder of specificity. The DWA project team developed new DWAs to replace the legacy DWAs. Achieving greater specificity and a more consistent level of specificity at this level was a major goal of the project. Broadening the degree of cross-occupational linking was also a goal of the project, and the new DWA information provided an opportunity to accomplish this activity. The development of 332 IWAs expanded cross-occupational linking even further.

IWA Results Preview

This expanded cross-occupational linking can be demonstrated by previewing the resultant IWAs developed for two occupations—*Nanotechnology Engineering Technicians* and *Semiconductor Processors*—that fall under different job families (see Table 6).

Table 6. IWAs Common to 17-3029.12 *Nanotechnology Engineering Technicians* and 51-9141.00 *Semiconductor Processors*.

Nanotechnology Engineering Technicians	Semiconductor Processors
Common IWA: Inspect completed work or finished products.	
Inspect nanotechnology work products to ensure quality or adherence to specifications.	Count, sort, and weigh processed items.
Common IWA: Measure physical characteristics of materials, products, or equipment.	
Assist nanoscientists, engineers, or technologists in processing or characterizing materials according to physical or chemical properties.	Measure and weigh amounts of crystal growing materials, mix and grind materials, load materials into container, and monitor processing procedures to help identify crystal growing problems.
Measure or report toxicity of engineered nanoparticles.	Count, sort, and weigh processed items.
Produce detailed images or measurement of objects, using tools such as scanning tunneling microscopes or oscilloscopes.	Inspect materials, components, or products for surface defects and measure circuitry, using electronic test equipment, precision measuring instruments, microscope, and standard procedures.
Common IWA: Assemble equipment or components.	
Assemble components, using techniques such as interference fitting, solvent bonding, adhesive bonding, heat sealing, or ultrasonic welding.	Align photo mask pattern on photoresist layer, expose pattern to ultraviolet light, and develop pattern, using specialized equipment.
	Etch, lap, polish, or grind wafers or ingots to form circuitry and change conductive properties, using etching, lapping, polishing, or grinding equipment.
	Mount crystal ingots or wafers on blocks or plastic laminate, using special mounting devices, to facilitate their positioning in the holding fixtures of sawing, drilling, grinding or sanding equipment.
	Place semiconductor wafers in processing containers or equipment holders, using vacuum wand or tweezers.
Common IWA: Adjust equipment to ensure adequate performance.	
Calibrate nanotechnology equipment, such as weighing, testing, or production equipment.	Set, adjust, and readjust computerized or mechanical equipment controls to regulate power level, temperature, vacuum, and rotation speed of furnace, according to crystal growing specifications.
Common IWA: Maintain operational records.	
Maintain accurate record or batch-record documentation of nanoproduction.	Maintain processing, production, and inspection information and reports.

These two occupations have several—primarily technical—activities in common. The common IWA statements provide a starting point for further comparison of specific tasks, as well as knowledges, skills, abilities, and work contexts.

IWAs bridge the content distance between DWAs and GWAs and complete the hierarchical work activities framework that extends from tasks to GWAs. The IWA development process was almost functionally identical to the DWA development process: Rational clustering followed by activity statement writing. During IWA development, DWAs were clustered just as tasks were clustered, and then IWA statements were written to capture the themes of the DWA clusters. IWA development did not differ much in terms of scope of the clustering effort. A single team of four analysts worked with 2,069 DWAs as input data. DWA development teams had worked within several job families that were composed of more than 1,000 tasks.

DWA Clustering

Just as with task clustering, the goal of DWA clustering was to incrementally group similar DWAs into increasingly smaller clusters until simple and unique work activity themes emerged that would reflect each of the DWAs in the respective clusters. The overall process of DWA clustering was nearly identical to task clustering. However, there were small differences in the initial steps. There were three major steps in the task clustering process: grouping tasks by job family, the assignment of tasks to GWAs, and finally the clustering of tasks within GWAs. Because IWAs are meant to cross job family boundaries, grouping DWAs by job family was unnecessary. In addition, DWAs were not assigned to GWAs in the same way that tasks were assigned to GWAs.

DWA Clustering Step 1: GWA Assignment

The DWAs were alphabetically sorted to facilitate assignment to GWAs. Although DWAs with the same activity verb were often assigned to the same GWA, this was not always the case (e.g., *prepare* DWAs could be assigned to a number of GWA buckets, as could *maintain* or *develop*, depending on the context of the DWA statement). In addition, about 25% of activity verbs were unique. Two analysts collaborated to initially assign DWAs to one of the 41 GWA worksheets in an online spreadsheet modeled after the worksheets used during task clustering (see Figure 6).

Figure 6. Screenshot of DWA Clustering Worksheet for GWA *Thinking Creatively*.

AWA ID	AWA Statement	GWA ID	Cluster ID	Theme/Notes	Comments (Rd 1)	Comments (Rd 2)	Comments (Rd 3)
17.20.01	Develop software or computer applications.	11	11.02	Design computer applications.			
15.11.01	Design integrated computer systems.	11	11.02	Design computer applications.			
11.20.01	Develop computer or information systems.	11	11.02	Design computer applications.			
17.11.07	Design industrial processing systems.	11	11.03	Design industrial processing equipment or systems.			
17.11.05	Design control systems for mechanical or other equipment.	11	11.03	Design industrial processing equipment or systems.			
51.11.02	Design tools, fixtures, or other devices for production equipment.	11	11.03	Design industrial processing equipment or systems.			
17.11.16	Design industrial equipment.	11	11.03	Design industrial processing equipment or systems.			
17.11.06	Design environmental control systems.	11	11.03	Design industrial processing equipment or systems.		NW: Could work in either cluster 4 or 5 here DS: Agree	
49.21.01	Design systems or system components.	11	11.03	Design industrial processing equipment or systems.	MH: If we expand 11.04 to include "commercial", this could fit.	NW: Agree	
17.11.08	Design alternative energy systems.	11	11.04	Design energy production systems		DS: Maybe move these two to cluster 5.	JN: Can see the theory behind this, but while the first of these is clearly green, the second is not.
17.11.15	Design energy production or management equipment or systems.	11	11.04	Design energy production systems			JN: What if we put the first AWA in with 11.05 and the second in with 11.03?
17.11.11	Design water conservation systems.	11	11.05	Design systems to conserve resources or reduce pollution.			
17.11.09	Design systems to reduce harmful emissions.	11	11.05	Design systems to conserve resources or reduce pollution.			
17.11.10	Design energy-efficient equipment or systems.	11	11.05	Design systems to conserve resources or reduce pollution.			

DWA Clustering Step 2: Within-GWA Clustering

The GWA worksheets, each populated by DWAs, were then distributed equally among four analysts for initial clustering. The clustering of DWAs followed a similar set of steps as task clustering:

1. For each of the assigned worksheets, the analyst first confirmed or disconfirmed the initial DWA-GWA assignment. For a DWA statement considered to be a poor fit for a GWA, the analyst indicated a revised GWA assignment.

2. The analyst then clustered the remaining DWAs into groups reflecting similar work activity themes (see Figure 6). He or she coded similar DWAs with numerical identifiers and also described the emerging themes for these groups (using key words or complete phrases.) Once the initial coding was complete, the team member sorted the DWAs by codes/themes, resulting in initial clusters. The clusters were then refined through splitting or combining clusters and identifying additional poorly-fitting DWAs.

3. The DWA project team employed different cluster size criteria for DWA clusters than for task clusters. During task clustering, the project team employed both a hard minimum criterion of two tasks per cluster and a softer set of target ratios: Four tasks and three occupations per cluster. The project team retained the target ratios for DWA clustering but did not require DWA clusters to have at least two DWAs. An understandable byproduct of this hard minimum criterion in task

clustering was a number of unassigned tasks. An equivalent byproduct during DWA clustering—that is, DWAs not linked to any IWAs—would create problems for database developers and administrators integrating the DWA-IWA hierarchy into existing databases of occupational information.

In a typical relational database, linkages are stored as homogenous parent-child relationships, but these unlinked DWAs would have a GWA "grandparent" without a corresponding IWA "parent." Most existing hierarchies such as the SOC (Standard Occupational Classification Policy Committee, 2010), the North American Industry Classification System (NAICS, 2012), and the O*NET Content Model deliberately avoid this problem by making sure each child has an immediate parent. Those systems add either one-to-one parent-child relationships or residual records if necessary to create a hierarchy without gaps in the intermediate levels. Between these options, the project team chose to add one-to-one parent-child relationships (hereafter, *single-DWA IWAs*). The project team decided that introducing residual IWAs (akin to SOC "All Other" occupations) would be misleading. IWAs are not meant to be a complete taxonomy covering the spectrum of all work activities, but an "All Others" class of IWAs would give that perception, creating an additional barrier to understanding and using IWA data.

Introducing single-DWA IWAs to cover what might otherwise be "unassigned" DWAs is not without hazards. Since they reflect a single DWA, such IWAs are likely to be more specific than IWAs linked to multiple DWAs. This has the potential for diluting the value of the discrete levels of specificity in the work activity database. However, during the IWA writing phase (see below) most single-DWA IWAs were rephrased in more general language to mirror that of conventional IWAs. In addition, new and revised tasks are regularly added to the O*NET database, which provides the opportunity to develop new DWAs. These future DWAs may in turn be linked to single-DWA IWAs, thus converting them to conventional IWAs. In essence, these single-DWA IWAs serve as a placeholder to which additional information *may* be added at a later date. (See Section IX for a description of future DWA and IWA development through the addition of new tasks to the O*NET database).

4. Once team members had completed steps 1-3 for their subsets of worksheets, other team members were given the opportunity to comment on each other's clustering decisions and to make suggestions. As in the DWA development phase, this was a valuable step, as it enhanced shared mental models of clusters and DWA language.

5. Once each team member had reviewed all other team members' work, the team leader performed the administrative step of moving DWAs designated as poor fits to more appropriate GWA worksheets. This was followed by another round of independent cluster refinement and then collaborative review and refinement again.

6. Step 5 was repeated several more times until the team decided to transfer all the cluster data from the 41 separate worksheets to a single worksheet. The clusters were then reviewed according to the same content criteria used during DWA development: a) Cluster homogeneity, b) DWA-cluster fit, c) Cluster uniqueness, and d) Cluster specificity. The first three criteria were applied in an identical manner as in DWA development: DWAs needed to be clearly homogenous, each DWA needed to fit well with other DWAs and the overall cluster theme, and each cluster needed to be unique from all other clusters. DWA cluster specificity was important but there was a notable difference from task clustering. Although the project team aimed for all clusters to demonstrate an activity theme that was more specific than the GWA it fell under and more general than its component DWAs, this was not always possible given that some clusters contained a single DWA. The appropriate level of specificity for these DWA clusters was addressed in detail during IWA writing below. Problematic clusters were then refined as before, by splitting or combining clusters or removing and relocating poorly-fitting DWAs.

IWA Statement Writing

After the team reached consensus on cluster composition, the approximately 330 DWA clusters were distributed equally among the four members of the IWA development team. Each team member independently drafted IWA statements using similar criteria used for DWA statement writing. These included using a single activity verb (in the plural infinitive form), minimizing object nouns, purpose, and exemplar clauses, and aiming for an 8th grade reading level (see Appendix B for IWA Writing Standards).

DWA clusters containing a single DWA presented a special case for IWA writing. As previously mentioned, DWA clusters of any size were permitted (although not preferred) to maintain the integrity of the hierarchical database. This resulted in 19 DWA clusters with a single DWA. The hierarchical framework for the Work Activities Project generally dictates that IWAs be more generally worded than DWAs. Faced with DWA clusters with only one DWA, the team successfully rephrased some DWA wording to more general language. For example, the DWA, *Secure watercraft to docks, wharves, or other vessels* became the IWA *Tend watercraft*. However, some IWAs retained the wording of the single DWAs linked to those IWAs. For example, the DWA *Train animals* could not be phrased both more generally and meaningfully and thus the IWA carries identical wording.

After IWAs were independently drafted, team members collaboratively reviewed and revised the draft IWA statements. Again, multiple rounds of comment and revision were necessary to achieve consensus. When complete, the team performed a final content review based on the standard content criteria: a) Cluster homogeneity, b) DWA-IWA fit, c) IWA uniqueness, and d) IWA specificity. At this stage, each DWA was evaluated for how well it fit not only with the cluster of other DWAs but also the concept expressed in the wording of the IWA statement. Likewise, IWA statements were evaluated for uniqueness. Occasionally, two or more IWA statements would overlap conceptually while their corresponding DWA clusters remained

distinct; the distinction among clusters was not always so easily described. In these cases, the development team either identified more distinctive wording or combined the respective clusters. Finally, IWAs statements were reviewed to ensure that they were more specific than GWAs but more general than DWAs. As described above, single-DWA IWA statements presented a special challenge for achieving the appropriate level of specificity. A small number of these IWA statements could not be rephrased to achieve IWA-level specificity.   Throughout this content review, the team continued to split or combine clusters and identify DWAs and tasks for relocation or removal to meet the content criteria.

Final Content Review and Quality Control

Once the IWA review was complete, all available data were compiled into a master spreadsheet for a final review. The spreadsheet was formatted in a hierarchical fashion (tasks nested within DWAs nested within IWAs) to enable reviewers to make a holistic review of the data. This included the highlighting of 2nd and 3rd task-DWA linkages. Although the multiple linkages had been reviewed before, the hierarchical formatting provided the first opportunity to review task clusters complete with 1st, 2nd, and 3rd linkages (previous spreadsheet formatting had not allowed for this). Furthermore, as described in the previous section, changes continued to be made on DWAs and task clusters even at the IWA stage in the process. The 2nd and 3rd linkages needed to be re-inspected to evaluate the impact of these recent changes.

Two team members reviewed each final task cluster and each final DWA cluster. There were two emphases for this content review: 1) Ensuring that 2nd and 3rd linkages fit with the primary linkages and also maintained cluster homogeneity, and 2) Ensuring that *task-IWA* linkages were appropriate. Earlier content review efforts evaluated task-DWA links and DWA-IWA links, but not task-IWA links to this degree. Simply put, a task might perfectly fit a DWA but could poorly fit an IWA. At this stage, any task determined to be a poor fit with either a DWA or an IWA was labeled as unassigned. These tasks joined those tasks that had been identified earlier as too idiosyncratic for linking to a DWA (see Results section for the number of unassigned tasks).

To complete quality control, missing or duplicate tasks were identified, and DWA and IWA coding and grammatical errors were corrected.

Once quality control was complete, the DWA project team applied a final numerical identification system to the DWA and IWA data. To reflect the parent-child relationships within the data, a hierarchical system was employed, leveraging the numbering of GWAs in the O*NET Content Model. Each IWA identifier starts with the 9-character Content Model ID of the parent GWA, followed by a period, the letter "I," and a two-digit incrementing number that identifies the IWA within that GWA. DWA identifiers start with their parent IWA identifier, followed by a period, the letter "D," and a two-digit incrementing number.

As an example, the IWA statement, *Administer diagnostic tests to assess patient health*, carries the ID 4.A.1.b.2.I01. This identifies the GWA *Inspecting Equipment, Structures, or Material* (4.A.1.b.2) and the IWA as 01. One of the child DWAs is 4.A.1.b.2.I01.D03, *Test patient vision*

(03). The IWAs are randomly ordered within each GWA, and likewise, the DWAs are randomly ordered within each IWA. Random ordering rather than conceptual ordering allows for future IWA and DWA additions without disrupting the numbering system.

Section VI: Results

The Work Activities Project produced two new sets of activity statements that are successfully integrated into the existing O*NET job descriptor framework. The DWA project team began with the full database of 19,450 tasks in the O*NET 18.0 Database, spread across 974 occupations. Using the rational clustering method, analysts generated 2,069 new DWA statements (see Appendix E for a sample listing of DWA statements). The project team then rationally clustered the DWA statements to generate 332 IWA statements (see Appendix F for a sample listing of IWA statements).

The DWAs demonstrated reasonable cross-occupational commonality within job families. There were 10.98 task linkages per DWA, and 8.29 occupation linkages per DWA (see Table 7). There was some degree of variation in these statistics across job families (see Appendix G). Notably, the job family *Education, Training, and Library* skews high because of a very high number of identical or nearly identical tasks across many educational occupations. Otherwise, larger job families generally had higher task per DWA and occupation per DWA ratios.

To capture as much activity data from tasks as possible, the DWA project team linked some tasks to multiple DWAs. As can be seen in Table 7, primary ("1st") linkages accounted for most (81%) of the 22,714 task-DWA linkages. Six percent of tasks were not assigned to a DWA. This was in line with expectations. A modest portion of tasks are idiosyncratic and specific to a particular occupation. Others shared some commonality with other tasks, but led to weak, overly general DWA statements that were later dissolved.

Table 7. DWA Development Results

Number of occupations	974
Number of tasks	19,450
Number of DWAs	2,069
Task linkages per DWA	10.98
Occupations per DWA	8.29
No. of task-DWA linkages	22,714
Number of 1st linkages	18,291
Number of 2nd linkages	3,851
Number of 3rd linkages	572
Number of unassigned tasks	1,159

In contrast to the DWA results, IWAs naturally produced much larger task and occupation ratios (see Table 8). In effect, the 6.23 DWA-per-IWA ratio served as a multiplier. These data

demonstrate support for the goal of IWA development in making linkages among occupations. Moreover, each IWA was linked to a median of three job families (15 IWAs were linked to ten or more job families). Thus, IWA development generally achieved broad cross-occupational linkages. However, some activities are specific to job families: 53 of 332 IWAs linked to only one job family. Appendices H, I, and J illustrate different data presentations of a subset of work activities, organized by either GWA or occupation. Appendix H presents the GWA-IWA-DWA-Task linkages for GWA 4.A.4.a.7: Resolving Conflicts and Negotiating with Others. Appendix I provides the same information, presented in a hierarchical fashion. Appendix J shows a sample list of the work activities for a single occupation: Printing Press Operators.

Table 8. IWA Development Results

Number of IWAs	332
Tasks per IWA	66.36
Occupations per IWA	43.86
DWAs per IWA	6.23
Median job families per IWA	3

Finally, the DWA project team established and generally met a moderate reading level standard. The DWAs and IWAs were at an average 8th grade reading level, although three of the more technical job families produced DWAs with reading levels at the 10th grade or above. For a tabled presentation of the detailed statistics of the results, see Appendix K. Note that information about Green DWA Development can be found in Appendix L.

Section VII: Discussion

The revamped work activities database improved the DWA database on four characteristics: 1) Relevance, 2) Completeness, 3) Formatting, and 4) Specificity.

1. *Relevance.* The new DWA database is more relevant because it reflects the new and revised tasks present in an updated version of the O*NET task database. In particular, the most recent O*NET versions include tasks linked to new and emerging occupations and green occupations. The new and emerging occupations have arisen in high growth industries such as healthcare and in technical fields like geospatial technology, biotechnology, and nanotechnology. Table 9 presents some examples of new DWAs that reflect the tasks written for these new and emerging occupations. The DWA project team further enhanced green relevance by developing green DWAs through a parallel development process (see Appendix L).

Table 9. DWAs Reflecting Updated Task Content

Research human performance or health factors related to engineering or design activities.
Conduct climatological research.
Identify new applications for existing technologies.
Conduct validation tests of equipment or processes.
Calculate geographic positions from survey data.
Conduct financial or regulatory audits.
Analyze test or validation data.
Analyze logistics processes.
Analyze website or related online data to track trends or usage.
Develop emergency response plans or procedures.
Develop treatment plans that use non-medical therapies.
Develop business or financial information systems.
Establish nursing policies or standards.
Operate precision equipment to control microscopic or nanoscopic processes.
Maintain regulatory or compliance documentation.
Collaborate with healthcare professionals to plan or provide treatment.
Assist engineers or scientists with research.
Communicate health and wellness information to the public.
Administer blood or other fluids intravenously.
Treat patients using alternative medical procedures.

2. *Completeness.* The new framework is more complete for two reasons. First, the DWAs (and by extension, the IWAs) were developed from current O*NET tasks, which are among the most frequently updated data domains in the O*NET Content Model. Second, the two-level framework provides substantially more data that is both more specific and more general. It more systematically covers much of the same work activity content of the previously developed DWAs, and goes beyond. The new framework is also more fully integrated with related data in the O*NET Content Model. The old DWAs were linked only to GWAs and not to tasks. The new framework links tasks to DWAs to IWAs to GWAs. This larger framework should better facilitate occupational exploration through multiple entry points.

3. *Formatting.* The Work Activities Project greatly improved formatting. All DWAs and IWAs are now single activity statements. Clear, specific, active verbs are now universal. Verbs like *use*, *follow*, and *recognize* were avoided in favor of verbs like *operate, investigate*, and *measure*.

4. *Specificity.* The new framework produced DWAs that are consistently more specific. The vagueness found in many of the very general existing DWAs is no longer a problem.

Section VIII: Application of Revised DWA Data

The new work activities framework expands the potential applications of work activities data in two ways. First, as previously stated, the improved relevance of the revised DWAs improves access to information about high growth and emerging occupations. Second, the development of IWAs and the integration of work activity data (linking of tasks to DWAs to IWAs to GWAs) improve the overall applications of work activities data.

When DWAs were originally developed for use with O*NET, there were a number of purposes cited for their development, such as career exploration, resume-building, skills gap analysis, work requirements profiling, and unification of industry sector skill standards. The inclusion of IWAs and the integrated framework more effectively achieves these goals. For example, the integrated work activity database enables multiple points of entry in career exploration. This is especially important for displaced workers to analyze the transferability of their skill sets, as well as for resume-building.

The more detailed structure of cross-occupational correspondence also benefits employers who, like job seekers, can use the new DWAs and IWAs to analyze skill gaps and use the profile of work requirements to write job orders or position descriptions. Finally, by standardizing work activity style and structure, there is a more defined common language of cross-occupational activity that can serve as a basis for unifying industry skills.

Thus, the Work Activities Project has addressed a number of established needs. At the same time, it addressed some newer issues such as the need to represent the greening of the workforce and the need to identify ways to help in the job placement of veterans returning from active military duty. It also occurs in the context of an increasingly unstable workplace in which re-skilling can be frequent and in which various industries often change the numbers and skills of workers they need. These DWAs can address new skills and technologies that have not previously been in great demand in the workplace but for which training and skill standards are now needed.

Section IX: Future Development and Enhancements

This report asserts that occupational data need to be dynamic to encompass and adjust to dynamic conditions in industries and economies. Besides being an exhaustive repository of occupational information, the O*NET database is intended to be dynamic via regular updating and revisions. The National Center for O*NET Development conducts multiple programs to refine occupational data and to reflect the current and emerging world of work. Job incumbents and occupational experts are regularly surveyed regarding the importance and relevance of, and the frequency with which they perform the tasks listed for an O*NET-SOC occupational title. The results of these surveys determine whether the respective tasks are retained, revised, or removed from new versions of the O*NET Database.

In addition, the National Center for O*NET Development continues extensive research into the occupational implications of technological changes in a number of in-demand industry clusters, such as healthcare, green, and biotechnology. These changes will continue to affect the database of tasks that is the foundation of work activity statements. Naturally, changes to tasks may have an impact on both the DWA and IWA data. There are several potential changes that could affect these data:

1. Outdated tasks: Tasks considered by respondents to be low on importance or relevance=are removed from the database.

2. Tasks may undergo significant conceptual revisions, or compound tasks may be split into two or more new tasks.

3. New tasks are added to reflect changing technology, work processes, or contexts.

Task removal or conceptual revision are the primary reasons that the four-task criterion was established—so that DWAs do not need to be removed as a result of a task removal.

However, there may still be task changes that require a revision in DWA and IWA data. The National Center for O*NET Development will establish a standard process for cataloguing the task changes as they relate to work activities data, and for making changes—deletions, revisions, or additions--in DWA and IWA data. The process will follow these general steps:

1. After the incumbent and occupation expert surveys are completed and task change decisions have been made (but prior to publication of a new version of the O*NET database), the Work Activities Project team will review the catalogue of task changes (there are approximately 150 task changes with each new version, of which 40-60 are substantive and could have an impact on work activities data).

2. The project team will identify DWAs linked to removed or revised tasks and collaboratively determine if the changes require the removal or revision of a DWA and in some cases an IWA (or no change at all). If a revised task no longer fits with a DWA, the list of DWA statements will be reviewed to determine if the task can be linked to a different DWA. If it cannot be, it will be tentatively added to the pool of unassigned tasks.

3. The task additions will be reviewed to determine if they can be linked to existing DWAs. If they cannot be, they will likewise be tentatively added to the pool of unassigned tasks.

4. The current pool of unassigned tasks will be reviewed to determine if the task additions would help support a new DWA (multiple new task additions could even support a new DWA on their own). For example, the pool of unassigned tasks may contain two related healthcare tasks that did not have critical mass to form a DWA. One or more new

healthcare tasks, if conceptually similar, could provide the critical mass necessary for DWA status.

5. Before any new DWAs are added to the database, they will be reviewed against the standard content criteria.

6. If the new DWAs meet these criteria, the project team searches for an IWA to which to link the DWA. If no IWA encompasses the activity theme in the DWA, the DWA will be evaluated to determine if it is acceptable as a single-DWA IWA. If the activity theme is not considered important or valuable, the task cluster will be disaggregated and all tasks will be entered into the pool of unassigned tasks.

7. If the DWA is linked to an IWA or considered as a single-DWA IWA, the DWA will be given a unique ID, and corresponding task and linkage data will be recorded in the work activity and O*NET database.

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Appendix A. O*NET Generalized Work Activities

GWA ID	GWA Descriptor
4.A.1.a.1	Getting Information
4.A.1.a.2	Monitor Processes, Materials, or Surroundings
4.A.1.b.1	Identifying Objects, Actions, and Events
4.A.1.b.2	Inspecting Equipment, Structures, or Material
4.A.1.b.3	Estimating the Quantifiable Characteristics of Products, Events, or Information
4.A.2.a.1	Judging the Qualities of Things, Services, or People
4.A.2.a.2	Processing Information
4.A.2.a.3	Evaluating Information to Determine Compliance with Standards
4.A.2.a.4	Analyzing Data or Information
4.A.2.b.1	Making Decisions and Solving Problems
4.A.2.b.2	Thinking Creatively
4.A.2.b.3	Updating and Using Relevant Knowledge
4.A.2.b.4	Developing Objectives and Strategies
4.A.2.b.5	Scheduling Work and Activities
4.A.2.b.6	Organizing, Planning, and Prioritizing Work
4.A.3.a.1	Performing General Physical Activities
4.A.3.a.2	Handling and Moving Objects
4.A.3.a.3	Controlling Machines and Processes
4.A.3.a.4	Operating Vehicles, Mechanized Devices, or Equipment
4.A.3.b.1	Interacting With Computers
4.A.3.b.2	Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment
4.A.3.b.4	Repairing and Maintaining Mechanical Equipment
4.A.3.b.5	Repairing and Maintaining Electronic Equipment
4.A.3.b.6	Documenting/Recording Information
4.A.4.a.1	Interpreting the Meaning of Information for Others
4.A.4.a.2	Communicating with Supervisors, Peers, or Subordinates
4.A.4.a.3	Communicating with Persons Outside Organization
4.A.4.a.4	Establishing and Maintaining Interpersonal Relationships
4.A.4.a.5	Assisting and Caring for Others
4.A.4.a.6	Selling or Influencing Others
4.A.4.a.7	Resolving Conflicts and Negotiating with Others
4.A.4.a.8	Performing for or Working Directly with the Public
4.A.4.b.1	Coordinating the Work and Activities of Others
4.A.4.b.2	Developing and Building Teams
4.A.4.b.3	Training and Teaching Others
4.A.4.b.4	Guiding, Directing, and Motivating Subordinates
4.A.4.b.5	Coaching and Developing Others
4.A.4.b.6	Provide Consultation and Advice to Others
4.A.4.c.1	Performing Administrative Activities
4.A.4.c.2	Staffing Organizational Units
4.A.4.c.3	Monitoring and Controlling Resources

Appendix B. DWA and IWA Writing Standards

The writing standards for Detailed Work Activity (DWA) and Intermediate Work Activity (IWA) statements are very similar: Simple, declarative statements that make use of activity verbs as the primary method to distinguish among activity statements. Object nouns are important modifiers in both types of statements while adjectives and purpose statements should be used conservatively.

However, because the two types of work activity statements operate at different levels of specificity, adjectives and purpose statements are more necessary for writing DWAs. This appendix presents the writing standards for DWAs followed by those for IWAs.

Detailed Work Activity Statement Standards

Primary Characteristics

A DWA statement will:

1. Describe an activity performed by incumbents in multiple occupations within a job family.

2. Be less specific than an individual task for an individual occupation, but will still be related to the specific types of occupations in the job family being addressed (e.g., medical job families will have DWAs that are medical in nature).

3. Be very clear about the activity the incumbent is performing. You should be able to visualize what is done. "Lift patients" is clear; "Respond to emergencies" is not.

4. Apply to more than one occupation in a job family, but not necessarily (in fact, not generally) to all of them.

DWA Components

Verbs

Use one major activity verb per DWA. Start the DWA with this verb.

Verb form should be present tense, plural to imply "incumbents" (e.g. "prepare," "repair")

Nouns

Use as few nouns as possible while still being specific. For example, it might be necessary to refer to clients and customers (rather than just people). If there are occasional cases where the multiple nouns would require different verbs, this likely requires further cluster subdivision.

Use nouns that are specific to the job family being addressed, but neither too specific nor too general. "Equipment" is too general, "laser surgery robots" is probably too precise; "medical treatment equipment" may be just right. Choose nouns that are cross-occupational but still make clear the kind of work performed in the given job family. A noun should not refer to something used in only one specific occupation within the job family. When possible, use a general category noun rather than a list of related objects.

Adjectives

Adjectives will be needed to modify nouns when occupational clarity is needed. Use as few as possible to obtain the degree of precision needed to represent the tasks and occupations within the job family. Again, aim for too much specificity, rather than too little; it's easier to remove detail later than to add it.

Purpose Statements

These are "to" or "for" phrases. Repair medical equipment *to ensure proper functioning*. This is the *why* of the activity statement. Sometimes it will be implied, as in "Develop program goals or plans."

Purpose statements can be essential qualifiers and help make DWAs applicable to specific job families. Incumbents in different job families or occupations may actually perform the same activities, but the purposes will differ. Different purposes may imply different knowledges and/or skills so that the purpose, itself, becomes relevant to the end-user.   For example, there's an essential difference between "Tighten screws to secure brackets" and "Tighten screws to secure titanium knee joints." Both use screwdrivers, but the training and knowledge required for one is far greater than the other.

However, there are cases where the DWA can be re-written to retain the qualifier. "Analyze legal or regulatory changes to determine impact" can be re-written as "Analyze impact of legal or regulatory changes."

Intermediate Work Activity Statement Standards

Primary Characteristics

An IWA statement will:

1. Describe an activity performed by incumbents in multiple occupations. These occupations may be within a single job family but are commonly in multiple job families.

2. Usually be less specific than a DWA statement but more specific than a generalized work activity (GWA) descriptor. In other words, an IWA should be more generally-worded than the DWAs that are linked to it, and more specific than the GWA that it links to. In order to accommodate single-DWA IWAs (i.e., IWAs composed of a single DWA), some IWAs may be at the same level of specificity as the child DWA. However, an IWA cannot be more specific than a DWA.

3. Be very clear about the activity the incumbent is performing. You should be able to visualize what is done. "Design structures or facilities" is clear; "Apply engineering principles" is not.

IWA components:

Verbs

Use one major activity verb per IWA. Start the IWA with this verb.

Verb form should be present tense, plural to imply "incumbents" (e.g. "prepare," "repair")

Nouns

Although activity verbs are the primary means of distinguishing among IWAs, object nouns are important qualifiers for IWA statements with common verbs. For example, cleaning tools and work areas is a distinct activity from cleaning work pieces or finished products. However, use as few nouns as possible; it is preferable to use a general category noun rather than a list of multiple objects.

Adjectives

Adjectives should be used less for IWA statements than for DWA statements. Adjectives are sometimes necessary to make distinctions within job families. More broad IWA statements have a smaller need for modifiers. However, adjectives may be useful to distinguish otherwise similar or overlapping IWA statements, and to achieve maximum clarity. Nevertheless, use as few as possible to obtain the necessary degree of precision.

Purpose Statements

Again, the purpose almost always begins with a "to" or a "for," such as "Interview people *to obtain information*." Purpose statements should be used even less at the IWA level than should adjectives. Whereas adjectives are useful for distinguishing among work activity statements *and* for improving clarity of meaning, purpose statements are primarily a means to distinguish work activity statements. Because a goal of IWA development is to link occupations across job families, the greater distinction that purpose statements provide is not as necessary. Any prospective purpose statements should be evaluated closely to ensure that they are providing the necessary distinction among IWAs.

Appendix C. Content Review and Quality Control Process

Step 1: DWA Homogeneity Review (Required)

- Examine each cluster to determine its homogeneity. Tasks in each cluster should involve similar activities, levels of activity and purposes.
- Develop clusters that are very homogenous, as it will be easier to collapse clusters at the conclusion of the project if needed.
- Indicate High, Medium, or Low homogeneity for each cluster.
    - For High clusters, no further action is needed.
    - To address problematic clusters - those with either medium or low levels of homogeneity - you should:
        - Examine the DWA statements to ensure they are inclusive of all of the tasks in the cluster. If this is not the case, a task or set of tasks can be removed or the DWA can be revised to be inclusive. "Peripheral" or "Supplemental" tasks can be easily removed from clusters. Keep "Core" tasks within a cluster, when possible.
        - When a task does not fit well in terms of cluster homogeneity, conduct searches to find similar tasks or more appropriate DWAs elsewhere, particularly for tasks that are "Core" or "Green."
    - For clusters rated as Medium or Low, examine the tasks to determine if the homogeneity can be increased by the removal of a task or a set of tasks, or by splitting the cluster into smaller subclusters of tasks. If so, note suggested changes. Clusters with medium homogeneity will be retained within the final product, but efforts should be made to improve their homogeneity. If not, these Low homogeneity clusters will be reviewed again at the conclusion of the QC process. Clusters that demonstrate Low homogeneity and cannot be fixed will not be retained.

Step 2: Edit DWA Statements (Required)

- Check spelling, punctuation, and style of DWA statements, and make revisions as necessary.
    - Review statements for proper structure (verb followed by noun) or (verb followed by noun and purpose).
    - Verbs should be in the infinitive form.
    - Nouns should be in the plural form.
    - Check for verb-noun agreement.
    - Check for other grammatical errors.
    - Statements end in a period.
    - Statements start with a capitalized verb.
    - No characters such as "/" or "–" in the statements.
    - Although multiple objects are permitted, multiple verbs are not.
    - Use "or" rather than "and" when multiple objects are used.

- DWA statements should not contain exemplar clauses (e.g., "such as..." or "including...").
- Check and record the reading level of each DWA statement using the SMOG index. Consider alternate word choices to keep DWA reading level at or below the 8th grade level.

Step 3: DWA Uniqueness and Specificity Review (Required)

- DWA Uniqueness
  - Examine all DWA statements to ensure they are distinct from other DWA statements.
  - Where there are similarities, you may choose to:
    - Consider rewriting DWA statements to make them more distinct in cases where the tasks are significantly different between the clusters.
    - Where the tasks are not significantly different, consider combining the clusters into one, represented by a single DWA statement.
- DWA Specificity
  - Favor specificity over generality in composing a DWA statement.
  - Review DWA statements to ensure that they are more specific than the GWAs to which they are linked, and more general than the tasks they represent. Note potential problems.
  - Verify that the specificity "gap" between DWAs and GWAs leaves room for IWAs. Indicate where problems are suspected.

Step 4: Outlier, a Green Task and Multiple Link Reviews (Required)

- Examine outlier tasks to determine whether they can be placed into a cluster without affecting that cluster's quality. It is more important for core tasks to be placed in clusters than it is for non-core tasks. However, do not force any task into a cluster. Outliers are acceptable when there is not another alternative.
- Examine green tasks by sorting them into independent groups and evaluating whether they can be used as part of independent green clusters in addition to the standard cluster solution.
- If tasks have been identified as being linked with multiple DWAs, identify each link to ensure that it is appropriate for that task.

Step 5: Basic File Review (Required)

- Check for missing tasks. All tasks in the original file should be present in the final file.
- Count the total number of clusters and calculate average number of tasks per cluster. There should be at least four tasks per cluster; less stringent rules may be applied to green clusters.
- Count the number of occupations per cluster, and calculate the average number of occupations per cluster. There should be at least three occupations per cluster; fewer occupations may be acceptable for green clusters.
- Sort the file by task and highlight duplicates. Ensure that no duplicate tasks are assigned to different clusters.
- Ensure there is a final DWA for each cluster.

Appendix D. Cross-Family DWAs

DWA ID	DWA Statement	# of Families	Families	
4.A.1.a.1.I03.D04	Investigate legal issues.	2	13 - Business and Financial Operations	21 - Community and Social Service
4.A.1.a.1.I23.D01	Interview employees, customers, or others to collect information.	2	11 - Management	43 - Office and Administrative Support
4.A.1.a.2.I01.D05	Monitor equipment operation to ensure proper functioning.	2	43 - Office and Administrative Support	51 - Production
4.A.1.a.2.I05.D01	Monitor patient progress or responses to treatments.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
4.A.1.a.2.I11.D04	Monitor organizational compliance with regulations.	2	11 - Management	13 - Business and Financial Operations
4.A.1.b.2.I02.D01	Test green technologies or processes.	2	11 - Management	17 - Architecture and Engineering
4.A.1.b.2.I07.D08	Inspect electrical or electronic systems for defects.	2	47 - Construction and Extraction	49 - Installation, Maintenance, and Repair
4.A.1.b.2.I07.D18	Inspect equipment to ensure proper functioning.	2	19 - Life, Physical, and Social Science	39 - Personal Care and Service
4.A.1.b.2.I12.D03	Test electrical equipment or systems to ensure proper functioning.	3	47 - Construction and Extraction	49 - Installation, Maintenance, and Repair
			51 - Production	
4.A.2.a.1.I02.D06	Evaluate training programs, instructors, or materials.	2	11 - Management	13 - Business and Financial Operations
4.A.2.a.1.I04.D04	Evaluate employee performance.	3	11 - Management	33 - Protective Service
			39 - Personal Care and Service	
4.A.2.a.1.I05.D03	Evaluate quality of materials or products.	3	11 - Management	19 - Life, Physical, and Social Science
			51 - Production	
4.A.2.a.1.I09.D03	Appraise property values.	2	13 - Business and Financial Operations	41 - Sales and Related
4.A.2.a.2.I04.D01	Reconcile records of sales or other financial transactions.	2	41 - Sales and Related	43 - Office and Administrative Support

DWA ID	DWA Statement	# of Families	Families	
4.A.2.a.3.I01.D04	Review documents or materials for compliance with policies or regulations.	3	11 - Management	33 - Protective Service
			53 - Transportation and Material Moving	
4.A.2.a.4.I02.D01	Estimate demand for products or services.	2	11 - Management	13 - Business and Financial Operations
4.A.2.a.4.I02.D04	Analyze market conditions or trends.	2	13 - Business and Financial Operations	41 - Sales and Related
4.A.2.a.4.I07.D17	Analyze energy usage data.	2	13 - Business and Financial Operations	17 - Architecture and Engineering
4.A.2.b.1.I01.D07	Calculate costs of goods or services.	2	41 - Sales and Related	43 - Office and Administrative Support
4.A.2.b.1.I08.D05	Determine resource needs.	2	11 - Management	37 - Building and Grounds Cleaning and Maintenance
4.A.2.b.2.I03.D03	Develop marketing plans or strategies.	2	11 - Management	41 - Sales and Related
4.A.2.b.2.I15.D08	Develop educational programs.	2	19 - Life, Physical, and Social Science	21 - Community and Social Service
4.A.2.b.2.I27.D02	Develop organizational goals or objectives.	2	11 - Management	15 - Computer and Mathematical
4.A.2.b.3.I01.D16	Maintain professional knowledge or certifications.	3	33 - Protective Service	39 - Personal Care and Service
			53 - Transportation and Material Moving	
4.A.2.b.4.I01.D01	Develop organizational policies or programs.	2	11 - Management	43 - Office and Administrative Support
4.A.2.b.4.I02.D01	Draft legislation or regulations.	2	11 - Management	23 - Legal
4.A.2.b.5.I02.D07	Schedule operational activities.	3	17 - Architecture and Engineering	43 - Office and Administrative Support
			53 - Transportation and Material Moving	

DWA ID	DWA Statement	# of Families	Families	
4.A.2.b.5.I03.D01	Schedule appointments.	2	39 - Personal Care and Service	43 - Office and Administrative Support
4.A.2.b.5.I03.D02	Schedule patient procedures or appointments.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
4.A.3.a.1.I03.D05	Clean work areas.	3	41 - Sales and Related	49 - Installation, Maintenance, and Repair
			51 - Production	
4.A.3.a.1.I03.D19	Clean equipment or facilities.	2	45 - Farming, Fishing, and Forestry	47 - Construction and Extraction
4.A.3.a.1.I05.D07	Dispose of trash or waste materials.	2	37 - Building and Grounds Cleaning and Maintenance	51 - Production
4.A.3.a.1.I07.D01	Dig holes or trenches.	2	47 - Construction and Extraction	49 - Installation, Maintenance, and Repair
4.A.3.a.1.I10.D04	Move materials, equipment, or supplies.	2	49 - Installation, Maintenance, and Repair	53 - Transportation and Material Moving
4.A.3.a.1.I10.D05	Deliver items.	2	39 - Personal Care and Service	43 - Office and Administrative Support
4.A.3.a.1.I11.D10	Enforce rules or regulations.	2	35 - Food Preparation and Serving Related	39 - Personal Care and Service
4.A.3.a.1.I13.D02	Move patients to or from treatment areas.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
4.A.3.a.2.I01.D02	Install insulation in equipment or structures.	2	47 - Construction and Extraction	49 - Installation, Maintenance, and Repair
4.A.3.a.2.I01.D08	Assemble temporary equipment or structures.	2	47 - Construction and Extraction	51 - Production
4.A.3.a.2.I04.D04	Assemble precision electronics or optical equipment.	2	17 - Architecture and Engineering	51 - Production
4.A.3.a.2.I09.D01	Adjust tuning or functioning of musical instruments.	2	29 - Healthcare Practitioners and Technical	49 - Installation, Maintenance, and Repair
4.A.3.a.2.I09.D04	Calibrate scientific or technical equipment.	2	17 - Architecture and Engineering	19 - Life, Physical, and Social Science

DWA ID	DWA Statement	# of Families	Families	
4.A.3.a.2.I14.D02	Trim trees or other vegetation.	2	37 - Building and Grounds Cleaning and Maintenance	45 - Farming, Fishing, and Forestry
4.A.3.a.2.I18.D01	Direct vehicle traffic.	3	33 - Protective Service	47 - Construction and Extraction
			53 - Transportation and Material Moving	
4.A.3.a.2.I19.D02	Disassemble equipment for maintenance or repair.	2	49 - Installation, Maintenance, and Repair	51 - Production
4.A.3.a.2.I20.D01	Install electrical components, equipment, or systems.	2	47 - Construction and Extraction	49 - Installation, Maintenance, and Repair
4.A.3.a.2.I27.D02	Fabricate parts or components.	2	47 - Construction and Extraction	49 - Installation, Maintenance, and Repair
4.A.3.a.2.I30.D03	Drill holes in parts, equipment, or materials.	2	49 - Installation, Maintenance, and Repair	51 - Production
4.A.3.a.2.I32.D02	Arrange childcare or educational settings to ensure physical safety of children.	2	25 - Education, Training, and Library	39 - Personal Care and Service
4.A.3.a.2.I35.D04	Braze metal parts or components.	2	49 - Installation, Maintenance, and Repair	51 - Production
4.A.3.a.2.I35.D05	Operate welding equipment.	2	49 - Installation, Maintenance, and Repair	51 - Production
4.A.3.a.2.I38.D01	Collect biological specimens from patients.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
4.A.3.a.2.I47.D01	Cultivate micro-organisms for study, testing, or medical preparations.	2	19 - Life, Physical, and Social Science	29 - Healthcare Practitioners and Technical
4.A.3.a.3.I08.D03	Operate cranes, hoists, or other moving or lifting equipment.	4	47 - Construction and Extraction	49 - Installation, Maintenance, and Repair
			51 - Production	53 - Transportation and Material Moving
4.A.3.a.3.I10.D01	Operate communications equipment or systems.	2	43 - Office and Administrative Support	53 - Transportation and Material Moving

DWA ID	DWA Statement	# of Families	Families	
4.A.3.a.4.I01.D06	Operate vehicles or material-moving equipment.	2	43 - Office and Administrative Support	53 - Transportation and Material Moving
4.A.3.a.4.I01.D10	Drive trucks or truck-mounted equipment.	2	47 - Construction and Extraction	53 - Transportation and Material Moving
4.A.3.a.4.I01.D12	Drive trucks or other vehicles to or at work sites.	2	37 - Building and Grounds Cleaning and Maintenance	49 - Installation, Maintenance, and Repair
4.A.3.b.4.I02.D01	Maintain mechanical equipment.	2	17 - Architecture and Engineering	47 - Construction and Extraction
4.A.3.b.4.I09.D01	Maintain medical equipment or instruments.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
4.A.3.b.6.I01.D02	Prepare financial documents, reports, or budgets.	3	11 - Management	13 - Business and Financial Operations
			41 - Sales and Related	
4.A.3.b.6.I07.D03	Prepare proposal documents.	2	13 - Business and Financial Operations	17 - Architecture and Engineering
4.A.3.b.6.I08.D03	Record operational or production data.	3	35 - Food Preparation and Serving Related	51 - Production
			53 - Transportation and Material Moving	
4.A.3.b.6.I08.D05	Maintain operational records.	5	11 - Management	25 - Education, Training, and Library
			33 - Protective Service	43 - Office and Administrative Support
			45 - Farming, Fishing, and Forestry	
4.A.3.b.6.I08.D10	Maintain personnel records.	2	11 - Management	45 - Farming, Fishing, and Forestry
4.A.3.b.6.I08.D11	Document operational activities.	2	15 - Computer and Mathematical	49 - Installation, Maintenance, and Repair

DWA ID	DWA Statement	# of Families	Families	
4.A.3.b.6.I10.D03	Maintain financial or account records.	2	39 - Personal Care and Service	43 - Office and Administrative Support
4.A.3.b.6.I11.D05	Maintain medical records.	2	31 - Healthcare Support	43 - Office and Administrative Support
4.A.3.b.6.I14.D09	Prepare legal documents.	2	23 - Legal	43 - Office and Administrative Support
4.A.3.b.6.I15.D04	Prepare operational reports.	4	13 - Business and Financial Operations	17 - Architecture and Engineering
			19 - Life, Physical, and Social Science	47 - Construction and Extraction
4.A.4.a.1.I02.D04	Explain regulations, policies, or procedures.	5	13 - Business and Financial Operations	21 - Community and Social Service
			39 - Personal Care and Service	43 - Office and Administrative Support
			53 - Transportation and Material Moving	
4.A.4.a.2.I03.D15	Confer with coworkers to coordinate work activities.	2	43 - Office and Administrative Support	49 - Installation, Maintenance, and Repair
4.A.4.a.2.I11.D01	Communicate with government agencies.	3	11 - Management	13 - Business and Financial Operations
			19 - Life, Physical, and Social Science	
4.A.4.a.3.I01.D01	Testify at legal or legislative proceedings.	3	13 - Business and Financial Operations	19 - Life, Physical, and Social Science
			33 - Protective Service	
4.A.4.a.5.I03.D02	Administer basic health care or medical treatments.	3	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
			39 - Personal Care and Service	
4.A.4.a.5.I03.D11	Apply bandages, dressings, or splints.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support

DWA ID	DWA Statement	# of Families	Families	
4.A.4.a.5.I04.D02	Care for animals.	2	39 - Personal Care and Service	45 - Farming, Fishing, and Forestry
4.A.4.a.5.I07.D02	Administer first aid.	2	33 - Protective Service	39 - Personal Care and Service
4.A.4.a.5.I10.D02	Greet customers, patrons, or visitors.	3	39 - Personal Care and Service	41 - Sales and Related
			43 - Office and Administrative Support	
4.A.4.a.5.I12.D01	Care for patients with mental illnesses.	3	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
			39 - Personal Care and Service	
4.A.4.a.6.I02.D05	Sell products or services.	4	39 - Personal Care and Service	41 - Sales and Related
			43 - Office and Administrative Support	53 - Transportation and Material Moving
4.A.4.a.6.I03.D06	Promote educational institutions or programs.	2	21 - Community and Social Service	25 - Education, Training, and Library
4.A.4.a.6.I03.D12	Promote products, services, or programs.	3	11 - Management	39 - Personal Care and Service
			43 - Office and Administrative Support	
4.A.4.a.7.I01.D03	Mediate disputes.	2	19 - Life, Physical, and Social Science	39 - Personal Care and Service
4.A.4.a.8.I03.D05	Resolve customer complaints or problems.	2	11 - Management	39 - Personal Care and Service
4.A.4.b.4.I01.D13	Supervise employees.	3	11 - Management	13 - Business and Financial Operations
			49 - Installation, Maintenance, and Repair	
4.A.4.b.4.I04.D02	Manage agricultural or forestry operations.	2	11 - Management	19 - Life, Physical, and Social Science
4.A.4.b.4.I13.D06	Assign duties or work schedules to employees.	4	15 - Computer and Mathematical	39 - Personal Care and Service

DWA ID	DWA Statement	# of Families	Families	
			41 - Sales and Related	45 - Farming, Fishing, and Forestry
4.A.4.b.6.I02.D03	Advise customers on the use of products or services.	2	17 - Architecture and Engineering	41 - Sales and Related
4.A.4.b.6.I05.D10	Advise others on business or operational matters.	3	11 - Management	13 - Business and Financial Operations
			19 - Life, Physical, and Social Science	
4.A.4.b.6.I08.D04	Advise others on legal or regulatory compliance matters.	2	11 - Management	13 - Business and Financial Operations
4.A.4.c.1.I01.D06	Perform clerical work in medical settings.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
4.A.4.c.1.I03.D03	Process medical billing information.	2	29 - Healthcare Practitioners and Technical	31 - Healthcare Support
4.A.4.c.1.I03.D04	Execute sales or other financial transactions.	2	13 - Business and Financial Operations	43 - Office and Administrative Support
4.A.4.c.2.I01.D08	Administer personnel recruitment or hiring activities.	2	13 - Business and Financial Operations	43 - Office and Administrative Support
4.A.4.c.2.I02.D01	Perform human resources activities.	2	35 - Food Preparation and Serving Related	39 - Personal Care and Service
4.A.4.c.3.I01.D05	Maintain inventories of materials, equipment, or products.	7	17 - Architecture and Engineering	25 - Education, Training, and Library
			27 - Arts, Design, Entertainment, Sports, and Media	33 - Protective Service
			45 - Farming, Fishing, and Forestry	49 - Installation, Maintenance, and Repair
			51 - Production	
4.A.4.c.3.I04.D03	Collect payments for goods or services.	2	11 - Management	13 - Business and Financial Operations

DWA ID	DWA Statement	# of Families	Families	
4.A.4.c.3.I05.D01	Order materials, supplies, or equipment.	5	35 - Food Preparation and Serving Related	39 - Personal Care and Service
			43 - Office and Administrative Support	49 - Installation, Maintenance, and Repair
			51 - Production	
4.A.4.c.3.I05.D03	Purchase materials, equipment, or other resources.	2	11 - Management	17 - Architecture and Engineering
4.A.4.c.3.I07.D01	Monitor availability of equipment or supplies.	2	39 - Personal Care and Service	53 - Transportation and Material Moving
4.A.4.c.3.I07.D04	Monitor inventories of products or materials.	3	13 - Business and Financial Operations	41 - Sales and Related
			43 - Office and Administrative Support	

Appendix E. DWAs (Sample)

DWA ID	DWA Statement
4.A.1.a.1.I01.D01	Review art or design materials.
4.A.1.a.2.I01.D01	Monitor broadcasting operations to ensure proper functioning.
4.A.1.b.1.I01.D01	Apply identification labels or tags.
4.A.1.b.2.I01.D01	Test patient heart or lung functioning.
4.A.1.b.3.I01.D01	Measure materials to mark reference points, cutting lines, or other indicators.
4.A.2.a.1.I01.D01	Evaluate potential problems in home or work environments of clients.
4.A.2.a.2.I01.D01	Verify accuracy of records.
4.A.2.a.3.I01.D01	Examine marketing materials to ensure compliance with policies or regulations.
4.A.2.a.4.I01.D01	Locate natural resources using geospatial or other environmental data.
4.A.2.b.1.I01.D01	Estimate costs of products, services, or materials.
4.A.2.b.2.I01.D01	Develop treatment plans for patients or clients.
4.A.2.b.3.I01.D01	Review professional literature to maintain professional knowledge.
4.A.2.b.4.I01.D01	Develop organizational policies or programs.
4.A.2.b.6.I01.D01	Plan special events.
4.A.3.a.1.I01.D01	Prepare compounds or solutions to be used for repairs.
4.A.3.a.2.I01.D01	Install carpet or flooring.
4.A.3.a.3.I01.D01	Operate office equipment.
4.A.3.a.4.I01.D01	Operate ships or other watercraft.
4.A.3.b.1.I01.D01	Enter commands, instructions, or specifications into equipment.
4.A.3.b.6.I01.D01	Prepare financial documents.
4.A.4.a.1.I01.D01	Present work to clients for approval.
4.A.4.a.2.I01.D01	Communicate with the public on environmental issues.
4.A.4.a.3.I01.D01	Testify at legal or legislative proceedings.
4.A.4.a.4.I01.D01	Develop collaborative relationships between departments or with external organizations.
4.A.4.a.5.I01.D01	Refer customers to appropriate personnel.
4.A.4.a.6.I01.D01	Advocate for individual or community needs.
4.A.4.a.7.I01.D01	Resolve interpersonal conflicts.
4.A.4.a.8.I01.D01	Audition for roles.
4.A.4.b.3.I01.D01	Teach basic living or other adaptive skills to patients or caregivers.
4.A.4.b.4.I01.D01	Supervise maintenance workers.
4.A.4.b.5.I01.D01	Coach others.
4.A.4.b.6.I01.D01	Provide health and wellness advice to patients, program participants, or caregivers.
4.A.4.c.1.I01.D01	Classify materials according to standard systems.
4.A.4.c.2.I01.D01	Audition or interview potential performers or staff members.
4.A.4.c.3.I01.D01	Maintain food, beverage, or equipment inventories.

Appendix F. Intermediate Work Activities (Sample)

IWA ID	IWA Statement
4.A.1.a.1.I10	Investigate the environmental impact of industrial or development activities.
4.A.1.a.1.I21	Investigate incidents or accidents.
4.A.1.a.1.I22	Investigate organizational or operational problems.
4.A.1.a.2.I01	Monitor equipment operation.
4.A.1.b.1.I01	Mark materials or objects for identification.
4.A.1.b.2.I03	Test characteristics of materials or products.
4.A.2.a.1.I03	Assess student capabilities, needs, or performance.
4.A.2.a.2.I02	Sort materials or products.
4.A.2.a.3.I04	Follow standard healthcare safety procedures to protect patient and staff members.
4.A.2.a.4.I01	Analyze environmental or geospatial data.
4.A.2.a.4.I04	Analyze scientific or applied data using mathematical principles.
4.A.2.b.1.I05	Make legal decisions.
4.A.2.b.1.I11	Alter audio or video recordings.
4.A.2.b.2.I03	Develop business or marketing plans.
4.A.2.b.2.I11	Design structures or facilities.
4.A.2.b.2.I20	Develop sustainable organizational or business policies or practices.
4.A.2.b.4.I01	Develop organizational policies, systems, or processes.
4.A.3.a.1.I05	Dispose of waste or debris.
4.A.3.a.1.I17	Perform agricultural activities.
4.A.3.a.2.I16	Install energy or heating equipment.
4.A.3.a.2.I21	Apply hygienic or cosmetic agents to skin or hair.
4.A.3.a.2.I39	Apply materials to fill gaps or imperfections.
4.A.3.a.2.I47	Prepare specimens or materials for testing.
4.A.3.a.3.I04	Operate medical equipment.
4.A.3.a.3.I05	Operate audiovisual or related equipment.
4.A.3.b.1.I01	Program computer systems or production equipment.
4.A.3.b.4.I04	Maintain electronic, computer, or other technical equipment.
4.A.3.b.6.I01	Prepare financial documents, reports, or budgets.
4.A.3.b.6.I11	Maintain health or medical records.
4.A.4.a.1.I05	Explain medical information to patients or family members.
4.A.4.a.2.I08	Notify others of emergencies or problems.
4.A.4.a.3.I03	Provide information to guests, clients, or customers.
4.A.4.a.5.I11	Assist healthcare practitioners during medical procedures.
4.A.4.a.8.I03	Respond to customer problems or inquiries.
4.A.4.b.3.I03	Teach safety procedures or standards to others.
4.A.4.b.4.I05	Supervise activities in correctional facilities.
4.A.4.b.4.I14	Coordinate regulatory compliance activities.
4.A.4.b.6.I03	Advise others on environmental sustainability or green practices.
4.A.4.c.1.I05	Process shipments or mail.
4.A.4.c.2.I01	Perform recruiting or hiring activities.

Appendix G. Summary Statistics for 22 Job Families

Job Family ID	Job family Title	# of occs	# of tasks	# of Task-DWA Linkages	# of DWAs	Avg. Tasks/ DWAs	Avg. occs/ DWAs	# of outliers	% outliers	Avg. SMOG	# of 2nd/3rd Links
11	Management	59	1217	1608	150	10.72	8.47	77.00	6%	9.22	391
13	Business and Financial Operations	51	937	1062	124	8.56	6.14	46.00	5%	9.01	125
15	Computer and Mathematical	33	667	864	100	8.64	6.15	23.00	3%	9.15	197
17	Architecture and Engineering	71	1394	1652	154	10.73	8.37	37.00	3%	8.90	258
19	Life, Physical, and Social Science	60	999	1110	131	8.47	6.34	162.00	14%	11.63	111
21	Community and Social Service	14	261	336	59	5.69	4.46	29.00	10%	7.15	75
23	Legal	8	112	141	23	6.13	3.57	22.00	16%	9.85	29
25	Education, Training, and Library	61	1549	1970	87	22.64	18.29	42.00	3%	7.70	421
27	Arts, Design, Entertainment, Sports, and Media	43	750	813	92	8.84	5.58	45.00	6%	7.75	63
29	Healthcare Practitioners and Technical	86	1589	2064	148	13.95	10.99	94.00	6%	8.74	475
31	Healthcare Support	18	302	378	50	7.56	5.54	30.00	9%	7.86	76
33	Protective Service	29	495	618	98	6.31	4.94	48.00	9%	11.00	123
35	Food Preparation and Serving Related	17	314	373	50	7.46	5.64	13.00	4%	6.07	59
37	Building and Grounds Cleaning and Maintenance	8	163	198	38	5.21	3.08	18.00	10%	10.90	35
39	Personal Care and Service	32	569	677	98	6.91	4.88	52.00	8%	7.00	108
41	Sales and Related	24	402	506	61	8.30	5.97	54.00	12%	7.54	104
43	Office and Administrative Support	63	1036	1227	113	10.86	8.56	89.00	8%	7.84	191
45	Farming, Fishing, and Forestry	17	282	324	54	6.00	4.13	29.00	9%	8.45	42
47	Construction and Extraction	61	1108	1427	132	10.81	7.67	27.00	2%	7.90	319
49	Installation, Maintenance, and Repair	54	1046	1401	133	10.53	8.30	50.00	5%	10.95	355
51	Production	112	2240	2958	202	14.64	11.22	104.00	4%	8.00	718
53	Transportation and Material Moving	53	859	1007	115	8.76	6.46	68.00	7%	8.38	148

Note. SMOG value is a reading level indicator that is scaled according to grade level (e.g., 9.22 equates to a 9th grade reading level).

Appendix H. Data Subset: GWA 4.A.4.a.7 Resolving Conflicts and Negotiating with Others

Statistical Overview: Within GWA 4.A.4.a.7: Resolving Conflicts and Negotiating with Others, there are a total of 96 occupations, 132 task statements, 19 DWA statements, and 3 IWA statements.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D01	Resolve interpersonal conflicts.	33-1011.00	9444	Resolve problems between inmates.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D01	Resolve interpersonal conflicts.	33-1012.00	567	Investigate and resolve personnel problems within organization and charges of misconduct against staff.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D01	Resolve interpersonal conflicts.	33-3012.00	2110	Settle disputes between inmates.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D02	Arbitrate disputes between parties to resolve legal conflicts.	23-1011.00	3786	Negotiate settlements of civil disputes.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D02	Arbitrate disputes between parties to resolve legal conflicts.	23-1022.00	19807	Specialize in the negotiation and resolution of environmental conflicts involving issues such as natural resource allocation or regional development planning.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D02	Arbitrate disputes between parties to resolve legal conflicts.	23-1022.00	12994	Use mediation techniques to facilitate communication between disputants, to further parties' understanding of different perspectives, and to guide parties toward mutual agreement.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D02	Arbitrate disputes between parties to resolve legal conflicts.	23-1023.00	5660	Participate in judicial tribunals to help resolve disputes.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D02	Arbitrate disputes between parties to resolve legal conflicts.	23-1023.00	5655	Settle disputes between opposing attorneys.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D02	Arbitrate disputes between parties to resolve legal conflicts.	23-2011.00	18496	Arbitrate disputes between parties and assist in the real estate closing process, such as by reviewing title searches.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D03	Mediate disputes.	19-1031.01	9064	Conduct fact-finding or mediation sessions among government units, landowners, or other agencies to resolve disputes.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D03	Mediate disputes.	19-1031.02	7499	Mediate agreements among rangeland users and preservationists as to appropriate land use and management.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D03	Mediate disputes.	19-3032.00	7575	Participate in mediation and dispute resolution.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D03	Mediate disputes.	19-3051.00	230	Mediate community disputes or assist in developing alternative plans or recommendations for programs or projects.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D03	Mediate disputes.	39-3012.00	8021	Supervise staff and games and mediate disputes.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D03	Mediate disputes.	39-3031.00	5103	Settle seating disputes or help solve other customer concerns.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I01	Mediate disputes.	4.A.4.a.7.I01.D03	Mediate disputes.	39-9041.00	6972	Mediate interpersonal problems between residents.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-2011.00	3228	Prepare and negotiate advertising and sales contracts.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-3031.02	8895	Direct insurance negotiations, select insurance brokers or carriers, and place insurance.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-3051.00	45	Negotiate materials prices with suppliers.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-3061.00	1030	Represent companies in negotiating contracts and formulating policies with suppliers.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-3071.01	1051	Negotiate and authorize contracts with equipment and materials suppliers, and monitor contract fulfillment.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-3111.00	3289	Contract with vendors to provide employee services, such as food services, transportation, or relocation service.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-3121.00	1007	Contract with vendors to provide employee services, such as food service, transportation, or relocation service.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9013.01	12829	Negotiate contracts such as those for land leases or tree purchases.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9013.02	18812	Negotiate with buyers for the sale, storage, or shipment of crops or livestock.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9039.01	15532	Negotiate with academic units or instructors and vendors to ensure cost-effective and high-quality distance learning programs, services, or courses.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9051.00	1103	Schedule use of facilities or catering services for events such as banquets or receptions, and negotiate details of arrangements with clients.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9061.00	18836	Negotiate contracts for prearranged funeral services.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9141.00	7241	Meet with clients to negotiate management and service contracts, determine priorities, and discuss the financial and operational status of properties.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9141.00	7242	Negotiate short- and long-term loans to finance construction and ownership of structures.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D01	Negotiate sales or lease agreements for products or services.	11-9141.00	7225	Negotiate the sale, lease, or development of property and complete or review appropriate documents and forms.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1011.00	12869	Negotiate with managers, promoters, union officials, and other persons regarding clients' contractual rights and obligations.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18879	Draft contract proposals or counter-proposals for collective bargaining or other labor negotiations.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18880	Draft rules or regulations to govern collective bargaining activities in collaboration with company, government, or employee representatives.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18881	Identify alternatives to proposals of unions, employees, companies, or government agencies.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18882	Interpret contractual agreements for employers and employees engaged in collective bargaining or other labor relations processes.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18886	Negotiate collective bargaining agreements.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18889	Present the position of the company or of labor during arbitration or other labor negotiations.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18890	Propose resolutions for collective bargaining or other labor or contract negotiations.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18891	Recommend collective bargaining strategies, goals, or objectives.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18903	Select mediators or arbitrators for labor disputes or contract negotiations.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1075.00	18895	Write letters related to labor relations activities, such as letters to amend collective bargaining agreements, letters of dispute or conciliation, or letters to seek clarification of contract terms.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D02	Arrange collective bargaining agreements.	13-1141.00	3360	Negotiate collective agreements on behalf of employers or workers, and mediate labor disputes and grievances.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D03	Negotiate labor disputes.	11-3071.01	1057	Participate in union contract negotiations and settlements of grievances.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D03	Negotiate labor disputes.	11-3111.00	3280	Negotiate bargaining agreements.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D03	Negotiate labor disputes.	11-3121.00	999	Negotiate bargaining agreements and help interpret labor contracts.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D03	Negotiate labor disputes.	11-9131.00	5266	Negotiate labor disputes.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D04	Negotiate contracts for transportation, distribution, or logistics services.	11-1011.00	8829	Negotiate or approve contracts or agreements with suppliers, distributors, federal or state agencies, or other organizational entities.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D04	Negotiate contracts for transportation, distribution, or logistics services.	11-2021.00	955	Negotiate contracts with vendors or distributors to manage product distribution, establishing distribution networks or developing distribution strategies.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D04	Negotiate contracts for transportation, distribution, or logistics services.	11-3071.02	3301	Negotiate with carriers, warehouse operators, or insurance company representatives for services and preferential rates.

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4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D04	Negotiate contracts for transportation, distribution, or logistics services.	11-3071.03	15745	Negotiate transportation rates or services.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D04	Negotiate contracts for transportation, distribution, or logistics services.	11-9013.02	18812	Negotiate with buyers for the sale, storage, or shipment of crops or livestock.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D04	Negotiate contracts for transportation, distribution, or logistics services.	11-9199.04	15685	Negotiate prices and terms with suppliers, vendors, or freight forwarders.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D05	Negotiate purchases or contracts.	25-4012.00	1648	Negotiate and authorize purchase, sale, exchange, or loan of collections.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D05	Negotiate purchases or contracts.	25-4021.00	18502	Evaluate vendor products and performance, negotiate contracts, and place orders.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D05	Negotiate purchases or contracts.	25-4021.00	1682	Negotiate contracts for library services, materials, and equipment.

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4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D06	Negotiate financial arrangements.	43-3011.00	2481	Arrange for debt repayment or establish repayment schedules, based on customers' financial situations.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D06	Negotiate financial arrangements.	43-3011.00	2482	Negotiate credit extensions when necessary.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D06	Negotiate financial arrangements.	43-3011.00	2478	Persuade customers to pay amounts due on credit accounts, damage claims, or nonpayable checks, or to return merchandise.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D06	Negotiate financial arrangements.	43-4111.00	2633	Ensure payment for services by verifying benefits with the person's insurance provider or working out financing options.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D06	Negotiate financial arrangements.	43-4131.00	11308	Establish credit limits and grant extensions of credit on overdue accounts.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D06	Negotiate financial arrangements.	43-5011.00	8188	Negotiate and arrange transport of goods with shipping or freight companies.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D06	Negotiate financial arrangements.	43-5011.01	17693	Negotiate shipping rates with freight carriers.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-3031.03	17621	Agree on buying or selling prices at optimal levels for clients.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-3031.03	17623	Make bids or offers to buy or sell securities.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-3099.01	17648	Negotiate prices or contracts for energy sales or purchases.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-4011.00	11240	Negotiate prices or terms of sales or service agreements.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-4012.00	20268	Negotiate details of contracts and payments.

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4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-4012.00	8129	Negotiate with retail merchants to improve product exposure, such as shelf positioning and advertising.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-9021.00	4603	Act as an intermediary in negotiations between buyers and sellers over property prices and settlement details and during the closing of sales.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-9022.00	2445	Act as an intermediary in negotiations between buyers and sellers, generally representing one or the other.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D07	Negotiate prices or other sales terms.	41-9022.00	2440	Present purchase offers to sellers for consideration.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D08	Negotiate contracts for environmental remediation, green energy, or renewable resources.	11-3051.02	15440	Negotiate interconnection agreements with other utilities.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D08	Negotiate contracts for environmental remediation, green energy, or renewable resources.	11-3051.06	15511	Negotiate power generation contracts with other public or private utilities.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D08	Negotiate contracts for environmental remediation, green energy, or renewable resources.	11-3071.03	19988	Negotiate with suppliers or customers to improve supply chain efficiency or sustainability.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D08	Negotiate contracts for environmental remediation, green energy, or renewable resources.	11-9121.02	15617	Negotiate for water rights with communities or water facilities to meet water supply demands.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D08	Negotiate contracts for environmental remediation, green energy, or renewable resources.	11-9199.09	15814	Review, negotiate, or approve wind farm contracts.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D08	Negotiate contracts for environmental remediation, green energy, or renewable resources.	11-9199.10	15827	Lead or support negotiations involving tax agreements or abatements, power purchase agreements, land use, or interconnection agreements.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D08	Negotiate contracts for environmental remediation, green energy, or renewable resources.	11-9199.11	15844	Negotiate contracts for services or materials needed for environmental remediation.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-1031.01	5272	Investigate, evaluate and settle claims, applying technical knowledge and human relations skills to effect fair and prompt disposal of cases and to contribute to a reduced loss ratio.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-1031.02	1165	Negotiate claim settlements and recommend litigation when settlement cannot be negotiated.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-1041.03	10868	Meet with persons involved in equal opportunity complaints in order to verify case information, and to arbitrate and settle disputes.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-1051.00	90	Establish and maintain tendering process, and conduct negotiations.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-1075.00	18878	Call or meet with union, company, government, or other interested parties to discuss labor relations matters, such as contract negotiations or grievances.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-1075.00	18884	Mediate discussions between employer and employee representatives in attempt to reconcile differences.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-2071.00	18941	Negotiate with creditors on behalf of clients to arrange for payment adjustments, interest rate reductions, time extensions, or to set up payment plans.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-2071.01	7348	Contact creditors to explain clients' financial situations and to arrange for payment adjustments so that payments are feasible for clients and agreeable to creditors.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-2072.00	3420	Negotiate payment arrangements with customers who have delinquent loans.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D09	Negotiate agreements to resolve disputes.	13-2081.00	5306	Secure a taxpayer's agreement to discharge a tax assessment, or submit contested determinations to other administrative or judicial conferees for appeals hearings.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-1021.00	12879	Negotiate contracts with farmers for the production or purchase of farm products.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-1022.00	65	Negotiate prices, discount terms and transportation arrangements for merchandise.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-1023.00	1147	Negotiate, renegotiate, and administer contracts with suppliers, vendors, and other representatives.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-1041.03	10878	Consult with community representatives to develop technical assistance agreements in accordance with governmental regulations.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-1121.00	1219	Negotiate contracts with such service providers and suppliers as hotels, convention centers, and speakers.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-1151.00	108	Negotiate contracts with clients including desired training outcomes, fees, or expenses.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-1199.03	15929	Contract with freight forwarders for destination services.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-2099.03	19581	Arrange deals involving green investments in areas such as alternative energy product development, green technologies, or sustainable agriculture.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-2099.03	16034	Arrange financing of deals from sources such as financial institutions, agencies, or public or private companies.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-2099.03	16027	Coordinate due diligence processes and the negotiation or execution of purchase or sale agreements.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-2099.03	16033	Structure or negotiate deals, such as corporate mergers, sales, or acquisitions.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D10	Negotiate contracts with clients or service providers.	13-2099.04	16040	Negotiate with responsible parties to arrange for recovery of losses due to fraud.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D11	Negotiate project specifications.	11-9021.00	3314	Confer with supervisory personnel, owners, contractors, or design professionals to discuss and resolve matters, such as work procedures, complaints, or construction problems.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D11	Negotiate project specifications.	11-9021.00	20334	Prepare contracts or negotiate revisions to contractual agreements with architects, consultants, clients, suppliers, or subcontractors.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D11	Negotiate project specifications.	11-9041.00	1071	Consult or negotiate with clients to prepare project specifications.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D11	Negotiate project specifications.	11-9141.00	7244	Negotiate with government leaders, businesses, special interest representatives, and utility companies to gain support for new projects and to eliminate potential obstacles.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-1011.00	296	Negotiate with printers and estimators to determine what services will be performed.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-2012.01	3862	Negotiate contracts with artistic personnel, often in accordance with collective bargaining agreements.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-2012.01	3865	Negotiate with parties, including independent producers and the distributors and broadcasters who will be handling completed productions.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-2012.02	3889	Hold auditions for parts or negotiate contracts with actors determined suitable for specific roles, working in conjunction with producers.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-2012.04	11023	Negotiate contract agreements with performers, with agents, or between performers and agents or production companies.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-2022.00	1762	Negotiate with professional athletes or their representatives to obtain services and arrange contracts.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-2041.01	13053	Perform administrative tasks such as applying for grants, developing budgets, negotiating contracts, and designing and printing programs and other promotional materials.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I02	Negotiate contracts or agreements.	4.A.4.a.7.I02.D12	Negotiate for services.	27-3041.00	1792	Interview and hire writers and reporters or negotiate contracts, royalties, and payments for authors or freelancers.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D01	Resolve employee or contractor problems.	11-1011.00	8836	Implement corrective action plans to solve organizational or departmental problems.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D01	Resolve employee or contractor problems.	11-3021.00	975	Meet with department heads, managers, supervisors, vendors, and others, to solicit cooperation and resolve problems.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D01	Resolve employee or contractor problems.	11-3061.00	1029	Resolve vendor or contractor grievances, and claims against suppliers.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D02	Resolve operational performance problems.	17-2131.00	9008	Solve problems in a number of engineering fields, such as mechanical, chemical, electrical, civil, nuclear, and aerospace.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D02	Resolve operational performance problems.	17-2151.00	3574	Devise solutions to problems of land reclamation and water and air pollution, such as methods of storing excavated soil and returning exhausted mine sites to natural states.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D02	Resolve operational performance problems.	17-2161.00	5385	Initiate corrective actions or order plant shutdowns in emergency situations.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D02	Resolve operational performance problems.	17-2171.00	3584	Assist engineering and other personnel to solve operating problems.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D02	Resolve operational performance problems.	17-2199.02	18139	Resolve testing problems by modifying testing methods or revising test objectives and standards.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D02	Resolve operational performance problems.	17-2199.04	18177	Investigate or resolve operational problems, such as material use variances or bottlenecks.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D02	Resolve operational performance problems.	17-3023.01	3605	Identify and resolve equipment malfunctions, working with manufacturers or field representatives as necessary to procure replacement parts.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D03	Resolve personnel problems.	53-1021.00	8562	Collaborate with workers and managers to solve work-related problems.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D03	Resolve personnel problems.	53-1021.00	8574	Resolve personnel problems, complaints, or formal grievances when possible, or refer them to higher-level supervisors for resolution.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D03	Resolve personnel problems.	53-1031.00	8588	Resolve worker problems or collaborate with employees to assist in problem resolution.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D04	Resolve issues affecting transportation operations.	53-1031.00	8586	Confer with customers, supervisors, contractors, or other personnel to exchange information or to resolve problems.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D04	Resolve issues affecting transportation operations.	53-2011.00	10574	Order changes in fuel supplies, loads, routes, or schedules to ensure safety of flights.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D04	Resolve issues affecting transportation operations.	53-2012.00	10592	Order changes in fuel supplies, loads, routes, or schedules to ensure safety of flights.

GWA ID	GWA Descriptor	IWA ID	IWA Statement	DWA ID	DWA Statement	O*NET-SOC Code	Task ID	Task Statement
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D04	Resolve issues affecting transportation operations.	53-2031.00	9643	Determine special assistance needs of passengers such as small children, the elderly, or disabled persons.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D04	Resolve issues affecting transportation operations.	53-3031.00	3155	Listen to and resolve customers' complaints regarding products or services.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D04	Resolve issues affecting transportation operations.	53-5021.01	14504	Resolve questions or problems with customs officials.
4.A.4.a.7	Resolving Conflicts and Negotiating with Others	4.A.4.a.7.I03	Resolve personnel or operational problems.	4.A.4.a.7.I03.D04	Resolve issues affecting transportation operations.	53-6051.07	14578	Investigate and make recommendations on carrier requests for waiver of federal standards.

Appendix I. Hierarchical Data Subset: GWA 4.A.4.a.7 Resolving Conflicts and Negotiating with Others

Statistical Overview: Within GWA 4.A.4.a.7: Resolving Conflicts and Negotiating with Others, there are a total of 96 occupations, 132 task statements, 19 DWA statements, and 3 IWA statements.

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
4.A.4.a.7				Resolving Conflicts and Negotiating with Others	3	19	132	96		
	4.A.4.a.7.I01			Mediate disputes.		3	16	14		
		4.A.4.a.7.I01.D01		Resolve interpersonal conflicts.			3	3		
			9444	Resolve problems between inmates.					33-1011.00	First-Line Supervisors of Correctional Officers
			567	Investigate and resolve personnel problems within organization and charges of misconduct against staff.					33-1012.00	First-Line Supervisors of Police and Detectives
			2110	Settle disputes between inmates.					33-3012.00	Correctional Officers and Jailers
		4.A.4.a.7.I01.D02		Arbitrate disputes between parties to resolve legal conflicts.			6	4		
			3786	Negotiate settlements of civil disputes.					23-1011.00	Lawyers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			12994	Use mediation techniques to facilitate communication between disputants, to further parties' understanding of different perspectives, and to guide parties toward mutual agreement.					23-1022.00	Arbitrators, Mediators, and Conciliators
			19807	Specialize in the negotiation and resolution of environmental conflicts involving issues such as natural resource allocation or regional development planning.					23-1022.00	Arbitrators, Mediators, and Conciliators
			5655	Settle disputes between opposing attorneys.					23-1023.00	Judges, Magistrate Judges, and Magistrates
			5660	Participate in judicial tribunals to help resolve disputes.					23-1023.00	Judges, Magistrate Judges, and Magistrates

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			18496	Arbitrate disputes between parties and assist in the real estate closing process, such as by reviewing title searches.					23-2011.00	Paralegals and Legal Assistants
		4.A.4.a.7.I01.D03		Mediate disputes.			7	7		
			9064	Conduct fact-finding or mediation sessions among government units, landowners, or other agencies to resolve disputes.					19-1031.01	Soil and Water Conservationists
			7499	Mediate agreements among rangeland users and preservationists as to appropriate land use and management.					19-1031.02	Range Managers
			7575	Participate in mediation and dispute resolution.					19-3032.00	Industrial-Organizational Psychologists
			230	Mediate community disputes or assist in developing alternative plans or recommendations for programs or projects.					19-3051.00	Urban and Regional Planners

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			8021	Supervise staff and games and mediate disputes.					39-3012.00	Gaming and Sports Book Writers and Runners
			5103	Settle seating disputes or help solve other customer concerns.					39-3031.00	Ushers, Lobby Attendants, and Ticket Takers
			6972	Mediate interpersonal problems between residents.					39-9041.00	Residential Advisors
	4.A.4.a.7.I02			Negotiate contracts or agreements.		12	96	66		
		4.A.4.a.7.I02.D01		Negotiate sales or lease agreements for products or services.			15	13		
			3228	Prepare and negotiate advertising and sales contracts.					11-2011.00	Advertising and Promotions Managers
			8895	Direct insurance negotiations, select insurance brokers or carriers, and place insurance.					11-3031.02	Financial Managers, Branch or Department
			45	Negotiate materials prices with suppliers.					11-3051.00	Industrial Production Managers
			1030	Represent companies in negotiating contracts and formulating policies with suppliers.					11-3061.00	Purchasing Managers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			1051	Negotiate and authorize contracts with equipment and materials suppliers, and monitor contract fulfillment.					11-3071.01	Transportation Managers
			3289	Contract with vendors to provide employee services, such as food services, transportation, or relocation service.					11-3111.00	Compensation and Benefits Managers
			1007	Contract with vendors to provide employee services, such as food service, transportation, or relocation service.					11-3121.00	Human Resources Managers
			12829	Negotiate contracts such as those for land leases or tree purchases.					11-9013.01	Nursery and Greenhouse Managers
			18812	Negotiate with buyers for the sale, storage, or shipment of crops or livestock.					11-9013.02	Farm and Ranch Managers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			15532	Negotiate with academic units or instructors and vendors to ensure cost-effective and high-quality distance learning programs, services, or courses.					11-9039.01	Distance Learning Coordinators
			1103	Schedule use of facilities or catering services for events such as banquets or receptions, and negotiate details of arrangements with clients.					11-9051.00	Food Service Managers
			18836	Negotiate contracts for prearranged funeral services.					11-9061.00	Funeral Service Managers
			7225	Negotiate the sale, lease, or development of property and complete or review appropriate documents and forms.					11-9141.00	Property, Real Estate, and Community Association Managers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			7241	Meet with clients to negotiate management and service contracts, determine priorities, and discuss the financial and operational status of properties.					11-9141.00	Property, Real Estate, and Community Association Managers
			7242	Negotiate short- and long-term loans to finance construction and ownership of structures.					11-9141.00	Property, Real Estate, and Community Association Managers
		4.A.4.a.7.I02.D02		Arrange collective bargaining agreements.			12	3		
			12869	Negotiate with managers, promoters, union officials, and other persons regarding clients' contractual rights and obligations.					13-1011.00	Agents and Business Managers of Artists, Performers, and Athletes
			18879	Draft contract proposals or counter-proposals for collective bargaining or other labor negotiations.					13-1075.00	Labor Relations Specialists

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			18880	Draft rules or regulations to govern collective bargaining activities in collaboration with company, government, or employee representatives.					13-1075.00	Labor Relations Specialists
			18881	Identify alternatives to proposals of unions, employees, companies, or government agencies.					13-1075.00	Labor Relations Specialists
			18882	Interpret contractual agreements for employers and employees engaged in collective bargaining or other labor relations processes.					13-1075.00	Labor Relations Specialists
			18886	Negotiate collective bargaining agreements.					13-1075.00	Labor Relations Specialists
			18889	Present the position of the company or of labor during arbitration or other labor negotiations.					13-1075.00	Labor Relations Specialists

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			18890	Propose resolutions for collective bargaining or other labor or contract negotiations.					13-1075.00	Labor Relations Specialists
			18891	Recommend collective bargaining strategies, goals, or objectives.					13-1075.00	Labor Relations Specialists
			18895	Write letters related to labor relations activities, such as letters to amend collective bargaining agreements, letters of dispute or conciliation, or letters to seek clarification of contract terms.					13-1075.00	Labor Relations Specialists
			18903	Select mediators or arbitrators for labor disputes or contract negotiations.					13-1075.00	Labor Relations Specialists
			3360	Negotiate collective agreements on behalf of employers or workers, and mediate labor disputes and grievances.					13-1141.00	Compensation, Benefits, and Job Analysis Specialists

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
		4.A.4.a.7.I02.D03		Negotiate labor disputes.			4	4		
			1057	Participate in union contract negotiations and settlements of grievances.					11-3071.01	Transportation Managers
			3280	Negotiate bargaining agreements.					11-3111.00	Compensation and Benefits Managers
			999	Negotiate bargaining agreements and help interpret labor contracts.					11-3121.00	Human Resources Managers
			5266	Negotiate labor disputes.					11-9131.00	Postmasters and Mail Superintendents
		4.A.4.a.7.I02.D04		Negotiate contracts for transportation, distribution, or logistics services.			6	6		
			8829	Negotiate or approve contracts or agreements with suppliers, distributors, federal or state agencies, or other organizational entities.					11-1011.00	Chief Executives

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			955	Negotiate contracts with vendors or distributors to manage product distribution, establishing distribution networks or developing distribution strategies.					11-2021.00	Marketing Managers
			3301	Negotiate with carriers, warehouse operators, or insurance company representatives for services and preferential rates.					11-3071.02	Storage and Distribution Managers
			15745	Negotiate transportation rates or services.					11-3071.03	Logistics Managers
			18812	Negotiate with buyers for the sale, storage, or shipment of crops or livestock.					11-9013.02	Farm and Ranch Managers
			15685	Negotiate prices and terms with suppliers, vendors, or freight forwarders.					11-9199.04	Supply Chain Managers
		4.A.4.a.7.I02.D05		Negotiate purchases or contracts.			3	2		
			1648	Negotiate and authorize purchase, sale, exchange, or loan of collections.					25-4012.00	Curators

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			1682	Negotiate contracts for library services, materials, and equipment.					25-4021.00	Librarians
			18502	Evaluate vendor products and performance, negotiate contracts, and place orders.					25-4021.00	Librarians
		4.A.4.a.7.I02.D06		Negotiate financial arrangements.			7	5		
			2478	Persuade customers to pay amounts due on credit accounts, damage claims, or nonpayable checks, or to return merchandise.					43-3011.00	Bill and Account Collectors
			2481	Arrange for debt repayment or establish repayment schedules, based on customers' financial situations.					43-3011.00	Bill and Account Collectors
			2482	Negotiate credit extensions when necessary.					43-3011.00	Bill and Account Collectors
			2633	Ensure payment for services by verifying benefits with the person's insurance provider or working out financing options.					43-4111.00	Interviewers, Except Eligibility and Loan

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			11308	Establish credit limits and grant extensions of credit on overdue accounts.					43-4131.00	Loan Interviewers and Clerks
			8188	Negotiate and arrange transport of goods with shipping or freight companies.					43-5011.00	Cargo and Freight Agents
			17693	Negotiate shipping rates with freight carriers.					43-5011.01	Freight Forwarders
		4.A.4.a.7.I02.D07		Negotiate prices or other sales terms.			9	6		
			17621	Agree on buying or selling prices at optimal levels for clients.					41-3031.03	Securities and Commodities Traders
			17623	Make bids or offers to buy or sell securities.					41-3031.03	Securities and Commodities Traders
			17648	Negotiate prices or contracts for energy sales or purchases.					41-3099.01	Energy Brokers
			11240	Negotiate prices or terms of sales or service agreements.					41-4011.00	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			8129	Negotiate with retail merchants to improve product exposure, such as shelf positioning and advertising.					41-4012.00	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
			20268	Negotiate details of contracts and payments.					41-4012.00	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
			4603	Act as an intermediary in negotiations between buyers and sellers over property prices and settlement details and during the closing of sales.					41-9021.00	Real Estate Brokers
			2440	Present purchase offers to sellers for consideration.					41-9022.00	Real Estate Sales Agents
			2445	Act as an intermediary in negotiations between buyers and sellers, generally representing one or the other.					41-9022.00	Real Estate Sales Agents

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
		4.A.4.a.7.I02.D08		Negotiate contracts for environmental remediation, green energy, or renewable resources.			7	7		
			15440	Negotiate interconnection agreements with other utilities.					11-3051.02	Geothermal Production Managers
			15511	Negotiate power generation contracts with other public or private utilities.					11-3051.06	Hydroelectric Production Managers
			19988	Negotiate with suppliers or customers to improve supply chain efficiency or sustainability.					11-3071.03	Logistics Managers
			15617	Negotiate for water rights with communities or water facilities to meet water supply demands.					11-9121.02	Water Resource Specialists
			15814	Review, negotiate, or approve wind farm contracts.					11-9199.09	Wind Energy Operations Managers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			15827	Lead or support negotiations involving tax agreements or abatements, power purchase agreements, land use, or interconnection agreements.					11-9199.10	Wind Energy Project Managers
			15844	Negotiate contracts for services or materials needed for environmental remediation.					11-9199.11	Brownfield Redevelopment Specialists and Site Managers
		4.A.4.a.7.I02.D09		Negotiate agreements to resolve disputes.			10	9		
			5272	Investigate, evaluate and settle claims, applying technical knowledge and human relations skills to effect fair and prompt disposal of cases and to contribute to a reduced loss ratio.					13-1031.01	Claims Examiners, Property and Casualty Insurance
			1165	Negotiate claim settlements and recommend litigation when settlement cannot be negotiated.					13-1031.02	Insurance Adjusters, Examiners, and Investigators

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			10868	Meet with persons involved in equal opportunity complaints in order to verify case information, and to arbitrate and settle disputes.					13-1041.03	Equal Opportunity Representatives and Officers
			90	Establish and maintain tendering process, and conduct negotiations.					13-1051.00	Cost Estimators
			18878	Call or meet with union, company, government, or other interested parties to discuss labor relations matters, such as contract negotiations or grievances.					13-1075.00	Labor Relations Specialists
			18884	Mediate discussions between employer and employee representatives in attempt to reconcile differences.					13-1075.00	Labor Relations Specialists
			18941	Negotiate with creditors on behalf of clients to arrange for payment adjustments, interest rate reductions, time extensions, or to set up payment plans.					13-2071.00	Credit Counselors

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			7348	Contact creditors to explain clients' financial situations and to arrange for payment adjustments so that payments are feasible for clients and agreeable to creditors.					13-2071.01	Loan Counselors
			3420	Negotiate payment arrangements with customers who have delinquent loans.					13-2072.00	Loan Officers
			5306	Secure a taxpayer's agreement to discharge a tax assessment, or submit contested determinations to other administrative or judicial conferees for appeals hearings.					13-2081.00	Tax Examiners and Collectors, and Revenue Agents
		4.A.4.a.7.I02.D10		Negotiate contracts with clients or service providers.			12	9		
			12879	Negotiate contracts with farmers for the production or purchase of farm products.					13-1021.00	Buyers and Purchasing Agents, Farm Products

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			65	Negotiate prices, discount terms and transportation arrangements for merchandise.					13-1022.00	Wholesale and Retail Buyers, Except Farm Products
			1147	Negotiate, renegotiate, and administer contracts with suppliers, vendors, and other representatives.					13-1023.00	Purchasing Agents, Except Wholesale, Retail, and Farm Products
			10878	Consult with community representatives to develop technical assistance agreements in accordance with governmental regulations.					13-1041.03	Equal Opportunity Representatives and Officers
			1219	Negotiate contracts with such service providers and suppliers as hotels, convention centers, and speakers.					13-1121.00	Meeting, Convention, and Event Planners
			108	Negotiate contracts with clients including desired training outcomes, fees, or expenses.					13-1151.00	Training and Development Specialists
			15929	Contract with freight forwarders for destination services.					13-1199.03	Customs Brokers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			16027	Coordinate due diligence processes and the negotiation or execution of purchase or sale agreements.					13-2099.03	Investment Underwriters
			16033	Structure or negotiate deals, such as corporate mergers, sales, or acquisitions.					13-2099.03	Investment Underwriters
			16034	Arrange financing of deals from sources such as financial institutions, agencies, or public or private companies.					13-2099.03	Investment Underwriters
			19581	Arrange deals involving green investments in areas such as alternative energy product development, green technologies, or sustainable agriculture.					13-2099.03	Investment Underwriters
			16040	Negotiate with responsible parties to arrange for recovery of losses due to fraud.					13-2099.04	Fraud Examiners, Investigators and Analysts
		4.A.4.a.7.I02.D11		Negotiate project specifications.			4	3		

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			3314	Confer with supervisory personnel, owners, contractors, or design professionals to discuss and resolve matters, such as work procedures, complaints, or construction problems.					11-9021.00	Construction Managers
			20334	Prepare contracts or negotiate revisions to contractual agreements with architects, consultants, clients, suppliers, or subcontractors.					11-9021.00	Construction Managers
			1071	Consult or negotiate with clients to prepare project specifications.					11-9041.00	Architectural and Engineering Managers
			7244	Negotiate with government leaders, businesses, special interest representatives, and utility companies to gain support for new projects and to eliminate potential obstacles.					11-9141.00	Property, Real Estate, and Community Association Managers
		4.A.4.a.7.I02.D12		Negotiate for services.			8	7		

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			296	Negotiate with printers and estimators to determine what services will be performed.					27-1011.00	Art Directors
			3862	Negotiate contracts with artistic personnel, often in accordance with collective bargaining agreements.					27-2012.01	Producers
			3865	Negotiate with parties, including independent producers and the distributors and broadcasters who will be handling completed productions.					27-2012.01	Producers
			3889	Hold auditions for parts or negotiate contracts with actors determined suitable for specific roles, working in conjunction with producers.					27-2012.02	Directors- Stage, Motion Pictures, Television, and Radio
			11023	Negotiate contract agreements with performers, with agents, or between performers and agents or production companies.					27-2012.04	Talent Directors

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			1762	Negotiate with professional athletes or their representatives to obtain services and arrange contracts.					27-2022.00	Coaches and Scouts
			13053	Perform administrative tasks such as applying for grants, developing budgets, negotiating contracts, and designing and printing programs and other promotional materials.					27-2041.01	Music Directors
			1792	Interview and hire writers and reporters or negotiate contracts, royalties, and payments for authors or freelancers.					27-3041.00	Editors
	4.A.4.a.7.I03			Resolve personnel or operational problems.		4	20	18		
		4.A.4.a.7.I03.D01		Resolve employee or contractor problems.			3	3		
			8836	Implement corrective action plans to solve organizational or departmental problems.					11-1011.00	Chief Executives

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			975	Meet with department heads, managers, supervisors, vendors, and others, to solicit cooperation and resolve problems.					11-3021.00	Computer and Information Systems Managers
			1029	Resolve vendor or contractor grievances, and claims against suppliers.					11-3061.00	Purchasing Managers
		4.A.4.a.7.I03.D02		Resolve operational performance problems.			7	7		
			9008	Solve problems in a number of engineering fields, such as mechanical, chemical, electrical, civil, nuclear, and aerospace.					17-2131.00	Materials Engineers
			3574	Devise solutions to problems of land reclamation and water and air pollution, such as methods of storing excavated soil and returning exhausted mine sites to natural states.					17-2151.00	Mining and Geological Engineers, Including Mining Safety Engineers
			5385	Initiate corrective actions or order plant shutdowns in emergency situations.					17-2161.00	Nuclear Engineers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			3584	Assist engineering and other personnel to solve operating problems.					17-2171.00	Petroleum Engineers
			18139	Resolve testing problems by modifying testing methods or revising test objectives and standards.					17-2199.02	Validation Engineers
			18177	Investigate or resolve operational problems, such as material use variances or bottlenecks.					17-2199.04	Manufacturing Engineers
			3605	Identify and resolve equipment malfunctions, working with manufacturers or field representatives as necessary to procure replacement parts.					17-3023.01	Electronics Engineering Technicians
		4.A.4.a.7.I03.D03		Resolve personnel problems.			3	2		
			8562	Collaborate with workers and managers to solve work-related problems.					53-1021.00	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			8574	Resolve personnel problems, complaints, or formal grievances when possible, or refer them to higher-level supervisors for resolution.					53-1021.00	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand
			8588	Resolve worker problems or collaborate with employees to assist in problem resolution.					53-1031.00	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators
		4.A.4.a.7.I03.D04		Resolve issues affecting transportation operations.			7	7		
			8586	Confer with customers, supervisors, contractors, or other personnel to exchange information or to resolve problems.					53-1031.00	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators
			10574	Order changes in fuel supplies, loads, routes, or schedules to ensure safety of flights.					53-2011.00	Airline Pilots, Copilots, and Flight Engineers

GWA ID	IWA ID	DWA ID	Task ID	Descriptor/Statement	IWAs	DWAs	Tasks	Occs	O*NET-SOC Code	O*NET-SOC Title
			10592	Order changes in fuel supplies, loads, routes, or schedules to ensure safety of flights.					53-2012.00	Commercial Pilots
			9643	Determine special assistance needs of passengers such as small children, the elderly, or disabled persons.					53-2031.00	Flight Attendants
			3155	Listen to and resolve customers' complaints regarding products or services.					53-3031.00	Driver/Sales Workers
			14504	Resolve questions or problems with customs officials.					53-5021.01	Ship and Boat Captains
			14578	Investigate and make recommendations on carrier requests for waiver of federal standards.					53-6051.07	Transportation Vehicle, Equipment and Systems Inspectors, Except Aviation

Appendix J. Printing Press Operators (Example)

Work Activities

Controlling Machines and Processes (GWA)
Operate cutting or grinding equipment. (IWA)
> Operate cutting equipment. (DWA)

Operate industrial processing or production equipment. (IWA)
> Operate photographic developing or print production equipment. (DWA)

Documenting/Recording Information
Maintain operational records.
> Record operational or production data.

Getting Information
Read documents or materials to inform work processes.
> Read work orders or other instructions to determine product specifications or materials requirements.
> Review blueprints or other instructions to determine operational methods or sequences.

Guiding, Directing, and Motivating Subordinates
Direct organizational operations, activities, or procedures.
> Direct operational or production activities.

Handling and Moving Objects
Adjust equipment to ensure adequate performance.
> Adjust equipment controls to regulate flow of production materials or products.

Collect samples of products or materials.
> Collect samples of materials or products for testing.

Position workpieces or materials on equipment.
> Feed materials or products into or through equipment.
> Mount materials or workpieces onto production equipment.

Set up equipment.
> Install mechanical components in production equipment.

Inspecting Equipment, Structures, or Material
Inspect completed work or finished products.
> Inspected printed materials or other images to verify quality.

Interacting With Computers
Process digital or online data.
> Download data.

Program computer systems or production equipment.

  Enter commands, instructions, or specifications into equipment.

  Program equipment to perform production tasks.

Judging the Qualities of Things, Services, or People

 Evaluate production inputs or outputs.

  Evaluate quality of materials or products.

Monitor Processes, Materials, or Surroundings

 Monitor equipment operation.

  Monitor equipment operation to ensure proper functioning.

Monitoring and Controlling Resources

 Purchase goods or services.

  Order materials, supplies, or equipment.

 Replenish inventories of materials, equipment, or products.

  Maintain inventories of materials, equipment, or products.

Performing General Physical Activities

 Clean tools, equipment, facilities, or work areas.

  Clean production equipment.

 Load products, materials, or equipment for transportation or further processing.

  Load materials into production equipment.

 Prepare mixtures or solutions.

  Mix ingredients to create specific finishes.

Repairing and Maintaining Mechanical Equipment

 Maintain tools or equipment.

  Lubricate production equipment.

Appendix K. Detailed Statistics

GWA Statistics (37)					
IWAs per GWA		**DWAs per GWA**		**Tasks per GWA**	
Average	8.97	Average	55.92	Average	575.19
Minimum	1	Minimum	5	Minimum	43
Quartiles		Quartiles		Quartiles	
First	3	First	19	First	152
Second	6	Second	34	Second	371
Third	12	Third	74	Third	749
Fourth	47	Fourth	263	Fourth	2714
GWAs 4.A.3.b.2, 4.A.3.b.5, 4.A.4.b.1, and 4.A.4.b.2 do not have any linked IWAs, DWAs, or tasks.					

DWA Statistics (2,069)			
Tasks per DWA		**Occs per DWA**	
Average	10.98	Average	8.29
Minimum	2	Minimum	1
Quartiles		Quartiles	
First	5	First	4
Second	8	Second	6
Third	13	Third	10
Fourth	119	Fourth	92

Green DWA Statistics (174)					
Tasks per Green DWA		**Occs per Green DWA**		**Green DWAs per GWA**	
Average	7.51	Average	5.53	Average	5.12
Minimum	2	Minimum	1	Minimum	1
Quartiles		Quartiles		Quartiles	
First	4	First	3	First	2
Second	6	Second	5	Second	3
Third	9	Third	7	Third	6
Fourth	28	Fourth	22	Fourth	23
GWAs 4.A.3.a.1, 4.A.3.b.5, 4.A.4.a.1, 4.A.4.a.5, 4.A.4.b.2, 4.A.4.b.5, and 4.A.4.c.2 do not have any linked Green DWAs.					

Occupation Statistics (974)		
GWAs per Occ	**IWAs per Occ**	**DWAs per Occ**
Average 10.13	Average 14.95	Average 17.62
Minimum 2	Minimum 3	Minimum 3
Quartiles	Quartiles	Quartiles
First 8	First 11	First 13
Second 10	Second 15	Second 17
Third 13	Third 19	Third 22
Fourth 21	Fourth 31	Fourth 41

IWA Statistics (332)		
Tasks per IWA	**Occs per IWA**	**DWAs per IWA**
Average 66.36	Average 43.86	Average 6.23
Minimum 3	Minimum 2	Minimum 1
Quartiles	Quartiles	Quartiles
First 27	First 16	First 3
Second 49.5	Second 33	Second 5
Third 81	Third 54	Third 8
Fourth 528	Fourth 418	Fourth 39

Appendix L. Green DWA Development

Over the past several years, the National Center for O*NET Development has developed a range of new job descriptors to reflect the expanding green economy and workforce. Naturally, it made sense to also update the database of DWAs to reflect the impact of green technology. However, the job family-based DWA development method had the potential to dilute green activity data. As can be seen in Table 10, there are only 5 job families composed of more than 10% green-related tasks. In these job families, there were not enough green tasks to form green-focused DWAs. Even among the job families with higher percentages of green tasks (e.g., *Architecture and Engineering, Construction and Extraction*), those tasks were more often clustered with conventional tasks and did not form specifically green DWAs. In short, the green activity data were washed out by the preponderance of conventional activity data.

Table 10. Percentage of Green Tasks by Job Family

Job Family	% green tasks
Management	21
Business and Financial Operations	9
Computer and Mathematical	1
Architecture and Engineering	24
Life, Physical, and Social Science	20
Community and Social Service	0
Legal	1
Education, Training, and Library	0
Arts, Design, Entertainment, Sports, and Media	1
Healthcare Practitioners and Technical	1
Healthcare Support	0
Protective Service	0
Food Preparation and Serving Related	0
Building and Grounds Cleaning and Maintenance	0
Personal Care and Service	0
Sales and Related	8
Office and Administrative Support	1
Farming, Fishing, and Forestry	0
Construction and Extraction	13
Installation, Maintenance, and Repair	6
Production	5
Transportation and Material Moving	6

To account for green task data, the DWA project team developed a parallel green DWA development process. All green tasks in the O*NET 18.0 Database were extracted into one dataset, and the previously described rational clustering and DWA writing methodologies were applied. In essence, these 1,373 green tasks were treated as a separate green "job family."

Following the established methodology, a team of analysts rationally clustered the green tasks. They first collaboratively assigned the tasks to GWA buckets and then clustered the tasks within the GWAs. They then wrote green DWAs based on activity themes present in the task clusters.

However, the green job family provided a distinct challenge. As the National Center for O*NET Development has identified green occupations and developed green tasks in recent years, it has become clear that a key component to this identification is the development of new technologies. Indeed, the green economy has been defined as *the economic activity related to reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy* (Dierdorff et al., 2009). For tasks related to most of these activities, technologies or technological processes are key components.

Whereas conventional tasks are naturally clustered based on activity themes (e.g., build, repair, monitor), green tasks cluster more easily on the technology involved. The activity-based cluster solution for the green tasks was not as clear or coherent as with the conventional job families. In response, the DWA project team conducted a second round of green DWA development, this time clustering tasks based primarily on technology components.

This effort produced a stronger set of green DWAs (see Table 11 for examples). There was considerably less overlap among the DWAs and the tasks linked to them. They were also more specific because there was no need to encompass multiple types of technology within a task cluster (which happens when clustering on activities).

Table 11. Example Green DWAs

Green DWA Statement
Collect data about green practices or programs.
Monitor sustainability indicators or other measures of green program effectiveness.
Identify opportunities for implementation of green processes or technologies.
Test materials or sites for environmental contaminants.
Research alternative energy systems or processes.
Research energy market issues.
Develop environmental restoration project plans.
Service vehicles equipped with green technology.
Complete green activity documentation.
Manage installation of green energy technology.
Advise others on management of water resources or water treatment.
Trade green financial products.

The DWA project team treated green tasks differently than conventional tasks in this phase of the DWA project, and that has resulted in a different type of DWA. Most of the DWAs are nested within job families—DWAs link occupations within a single job family. Green DWAs link occupations across the O*NET database. In this way, they have something in common with IWAs. Given that there is no one "green" job family, this makes intuitive sense.

The DWA project team applied a similar numbering system to the green DWAs as with the conventional DWAs and IWAs. Using a parent-and-child hierarchy, the first nine characters represent the GWA ID, followed by a period, the letter "G," and two digits reflecting the incrementing number for each green DWA. Because the green DWAs are not indexed to IWAs, there is only one group following the GWA identifier. For example, the green DWA *Determine environmental remediation methods* is assigned the ID 4.A.2.b.1.G02, with a GWA Content Model ID of 4.A.2.b.1 (*Making Decisions and Solving Problems*) and 02 as the DWA incrementing number. As with the conventional DWAs, green DWAs are randomly ordered within GWAs.

Results

The green DWA development effort resulted in 174 green DWAs, which link to an average of 7.51 tasks and 5.53 occupations (see Appendix M for a complete list of all Green DWAs). These are lower ratios than for conventional DWAs. This was not surprising given the idiosyncrasies of green technology, the main driver of green task clustering, and the breadth of industry and occupational areas that contain green occupations.

Appendix M. Green DWAs

Green DWA ID	Green DWA Statement
4.A.1.a.1.G01	Collect geographic information systems (GIS) data.
4.A.1.a.1.G02	Collect geological data.
4.A.1.a.1.G03	Collect data about green practices or programs.
4.A.1.a.1.G04	Collect energy use data.
4.A.1.a.1.G05	Collect product or environmental samples for testing.
4.A.1.a.2.G01	Monitor sustainability indicators or other measures of green program effectiveness.
4.A.1.a.2.G02	Monitor trends in green regulatory or market activity.
4.A.1.a.2.G03	Monitor equipment used in green production processes.
4.A.1.a.2.G04	Monitor conditions at alternative energy production facilities.
4.A.1.a.2.G05	Monitor demand for resources.
4.A.1.b.1.G01	Identify opportunities for implementation of green processes or technologies.
4.A.1.b.1.G02	Identify potential environmental or health impacts of technologies or processes.
4.A.1.b.1.G03	Identify green investment strategies.
4.A.1.b.2.G01	Test vehicle emissions.
4.A.1.b.2.G02	Inspect facilities or workplaces to ensure health, safety, or environmental standards are met.
4.A.1.b.2.G03	Inspect heating, ventilation and air conditioning (HVAC) systems.
4.A.1.b.2.G04	Inspect green energy installations to ensure proper operation.
4.A.1.b.2.G05	Inspect motor vehicles.
4.A.1.b.2.G06	Test alternative energy production equipment.
4.A.1.b.2.G07	Inspect alternative energy production facilities.
4.A.1.b.2.G08	Test new green automotive technologies or components.
4.A.1.b.2.G09	Test materials or sites for environmental contaminants.
4.A.1.b.3.G01	Estimate costs or resource requirements for green projects or processes.
4.A.2.a.1.G01	Determine green installation specifications.
4.A.2.a.1.G02	Evaluate sites for potential green installations.
4.A.2.a.2.G01	Calculate energy consumption or loss.
4.A.2.a.2.G02	Calculate emissions of hazardous or potentially hazardous substances.
4.A.2.a.2.G03	Measure biofuels feedstock.
4.A.2.a.2.G04	Compute expenses or savings associated with green products, processes or technologies.
4.A.2.a.3.G01	Evaluate materials to assess quality or ensure compliance with standards.
4.A.2.a.3.G02	Review technical documentation to ensure compliance with regulations or standards.
4.A.2.a.3.G03	Evaluate operational activities for safety or compliance with environmental standards.
4.A.2.a.3.G04	Conduct environmental audits.
4.A.2.a.3.G05	Investigate violations or potential violations of environmental regulations.
4.A.2.a.3.G06	Monitor green project construction.

Green DWA ID	Green DWA Statement
4.A.2.a.4.G01	Evaluate the functionality of alternative energy production facilities.
4.A.2.a.4.G02	Research alternative energy systems or processes.
4.A.2.a.4.G03	Research green automotive technologies.
4.A.2.a.4.G04	Investigate accidents affecting the environment.
4.A.2.a.4.G05	Research energy market issues.
4.A.2.a.4.G06	Create models of green processes or systems.
4.A.2.a.4.G07	Research green processes.
4.A.2.a.4.G08	Conduct cost-benefit studies related to green processes, projects or products.
4.A.2.a.4.G09	Evaluate the environmental impact of projects or processes.
4.A.2.a.4.G10	Review proposals or bids.
4.A.2.a.4.G11	Evaluate green products, technologies or applications.
4.A.2.a.4.G12	Review project designs to ensure they meet regulations and technical requirements.
4.A.2.a.4.G13	Analyze data related to environmental conditions and restoration needs.
4.A.2.a.4.G14	Research agricultural issues.
4.A.2.a.4.G15	Analyze geospatial data.
4.A.2.a.4.G16	Model potential outcomes of green activities or processes.
4.A.2.a.4.G17	Analyze contaminant or pollutant data.
4.A.2.a.4.G18	Analyze equipment test data.
4.A.2.a.4.G19	Investigate the relationship between the environment and large-scale systems or processes.
4.A.2.a.4.G20	Analyze climate data.
4.A.2.a.4.G21	Assess the effectiveness of green projects or programs.
4.A.2.a.4.G22	Analyze logistics activities to determine areas for improvement.
4.A.2.a.4.G23	Analyze shipping routes or methods to determine the most environmentally friendly options.
4.A.2.b.1.G01	Analyze energy pricing.
4.A.2.b.1.G02	Determine environmental remediation methods.
4.A.2.b.1.G03	Diagnose causes of malfunctions or failures.
4.A.2.b.1.G04	Analyze feasibility of green projects or products.
4.A.2.b.1.G05	Select logistics technologies or processes.
4.A.2.b.1.G06	Determine waste management methods.
4.A.2.b.1.G07	Determine methods of dealing with water issues.
4.A.2.b.1.G08	Select materials for use in green applications or production.
4.A.2.b.1.G09	Initiate responses to violations of environmental regulations or procedures.
4.A.2.b.1.G10	Determine design or equipment specifications for green projects.
4.A.2.b.2.G01	Design methods of measuring or analyzing green data.
4.A.2.b.2.G02	Design nanotechnology applications.
4.A.2.b.2.G03	Design green agricultural technologies.
4.A.2.b.2.G04	Develop green logistics processes.
4.A.2.b.2.G05	Design water or wastewater treatment facilities.
4.A.2.b.2.G06	Design energy efficient systems or components.
4.A.2.b.2.G07	Design alternative energy systems.

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4.A.2.b.2.G08	Design green automotive systems or components.
4.A.2.b.2.G09	Design systems for water management, distribution or conservation.
4.A.2.b.2.G10	Design sustainable industrial processes or technologies.
4.A.2.b.2.G11	Design electromechanical systems for green applications.
4.A.2.b.2.G12	Develop green energy production processes.
4.A.2.b.2.G13	Design pollution reduction or remediation systems.
4.A.2.b.2.G14	Design biological or chemical processes with green applications.
4.A.2.b.2.G15	Design green facilities or structures.
4.A.2.b.2.G16	Design green electrical or electronics technologies.
4.A.2.b.2.G17	Develop testing or monitoring procedures related to green projects or technologies.
4.A.2.b.3.G01	Update professional knowledge.
4.A.2.b.4.G01	Plan green energy projects.
4.A.2.b.4.G02	Develop environmental restoration project plans.
4.A.2.b.4.G03	Plan environmental resource conservation or protection programs.
4.A.2.b.4.G04	Plan ways to limit the environmental impact of projects.
4.A.2.b.4.G05	Plan green research projects.
4.A.2.b.4.G06	Plan recycling or waste disposal programs.
4.A.2.b.5.G01	Schedule activities related to green projects.
4.A.2.b.6.G01	Adhere to practices and procedures designed to protect the environment.
4.A.2.b.6.G02	Adjust logistics schedules to improve efficiency or decrease environmental impact.
4.A.2.b.6.G03	Schedule activities at alternative energy production facilities.
4.A.3.a.2.G01	Perform general labor on green projects.
4.A.3.a.2.G02	Install heating, ventilation and air conditioning (HVAC) systems or components.
4.A.3.a.2.G03	Assemble metal parts or components.
4.A.3.a.2.G04	Install insulation or weather stripping.
4.A.3.a.2.G05	Install testing or monitoring equipment.
4.A.3.a.2.G06	Assemble green transportation technologies.
4.A.3.a.2.G07	Clean materials in preparation for recycling.
4.A.3.a.2.G08	Apply protective coatings.
4.A.3.a.2.G09	Assemble electrical or electronic components for green technologies.
4.A.3.a.2.G10	Process feedstock for biological production activities.
4.A.3.a.2.G11	Sort recyclable materials.
4.A.3.a.2.G12	Install alternative energy systems or components.
4.A.3.a.2.G13	Clean work areas.
4.A.3.a.2.G14	Coordinate movement of hazardous waste.
4.A.3.a.2.G15	Remove contaminants, hazardous materials or other potentially dangerous substances.
4.A.3.a.2.G16	Install plumbing or piping systems or components.
4.A.3.a.3.G01	Operate cranes, hoists or forklifts to move materials.
4.A.3.a.3.G02	Operate alternative energy production equipment or components.
4.A.3.a.3.G03	Operate recycling processing equipment.
4.A.3.a.3.G04	Operate robotic or automated equipment.

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4.A.3.a.3.G05	Operate pollution capture equipment.
4.A.3.a.4.G01	Operate refuse collection equipment.
4.A.3.a.4.G02	Operate trucks or other heavy equipment.
4.A.3.b.1.G01	Maintain databases of green information.
4.A.3.b.2.G01	Prepare diagrams or drawings for green projects.
4.A.3.b.2.G02	Develop specifications for green materials, equipment or systems.
4.A.3.b.4.G01	Repair alternative energy generation equipment.
4.A.3.b.4.G02	Maintain operational equipment used in green activities.
4.A.3.b.4.G03	Service vehicles equipped with green technology.
4.A.3.b.6.G01	Write reports to communicate environmental information.
4.A.3.b.6.G02	Prepare grant applications or funding proposals for green projects.
4.A.3.b.6.G03	Document test results.
4.A.3.b.6.G04	Prepare environmental reports or documentation.
4.A.3.b.6.G05	Record operational data for green facilities or activities.
4.A.3.b.6.G06	Prepare work requests or proposals.
4.A.3.b.6.G07	Prepare research reports on green projects, products or technologies.
4.A.3.b.6.G08	Document details of green products or operations.
4.A.3.b.6.G09	Complete green activity documentation.
4.A.3.b.6.G10	Document operational instructions for green equipment or processes.
4.A.4.a.2.G01	Communicate operating information to other personnel.
4.A.4.a.3.G01	Provide customers with financial information.
4.A.4.a.3.G02	Consult with other professionals on green issues.
4.A.4.a.3.G03	Provide green product or service information to customers.
4.A.4.a.4.G01	Develop relationships with federal, state or local agencies.
4.A.4.a.6.G01	Create marketing or informational materials.
4.A.4.a.6.G02	Identify potential customers for green products or technologies.
4.A.4.a.6.G03	Sell green products or services.
4.A.4.a.6.G04	Promote green activities or initiatives.
4.A.4.a.6.G05	Develop marketing plans.
4.A.4.a.7.G01	Negotiate contracts.
4.A.4.a.7.G02	Resolve problems or disputes related to environmental or resource issues.
4.A.4.a.8.G01	Make presentations on green issues or projects.
4.A.4.b.1.G01	Direct transportation or logistics activities.
4.A.4.b.1.G02	Manage green technology maintenance activities.
4.A.4.b.1.G03	Manage environmental programs.
4.A.4.b.1.G04	Manage installation of green energy technology.
4.A.4.b.1.G05	Direct testing activities.
4.A.4.b.1.G06	Manage alternative energy production.
4.A.4.b.1.G07	Manage compliance activities.
4.A.4.b.1.G08	Develop environmentally related training or outreach programs.
4.A.4.b.1.G09	Manage engineering or construction activities.
4.A.4.b.3.G01	Demonstrate solar system operation to owners.

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4.A.4.b.3.G02	Train staff.
4.A.4.b.4.G01	Supervise workers on green projects.
4.A.4.b.4.G02	Supervise energy production employees.
4.A.4.b.6.G01	Advise others on management of water resources or water treatment.
4.A.4.b.6.G02	Recommend green solutions.
4.A.4.b.6.G03	Advise others on policies, standards, or compliance activities.
4.A.4.b.6.G04	Provide advice related to agricultural issues.
4.A.4.b.6.G05	Advise others on green engineering or design issues.
4.A.4.b.6.G06	Advise others on green investments.
4.A.4.b.6.G07	Advise others on environmental remediation or restoration procedures.
4.A.4.b.6.G08	Provide technical guidance on green projects.
4.A.4.c.1.G01	Obtain permits.
4.A.4.c.3.G01	Manage budgets or budgeting activities.
4.A.4.c.3.G02	Order supplies, equipment or other resources for green activities.
4.A.4.c.3.G03	Manage inventories.
4.A.4.c.3.G04	Trade green financial products.