

Identification and Evaluation of Chemical Ranking Systems

Final Report

January 2008

Prepared for:

Office of the Assistant Deputy Under Secretary of Defense for
Environment, Safety and Occupational Health
Emerging Contaminants Directorate

Under Contract to:

Air Force Institute for Operational Health
Contract FA8900-06-D-9001-0009

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REPORT DOCUMENTATION PAGE

*Form Approved
OMB No. 0704-0188*

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1. REPORT DATE (DD-MM-YYYY) 08-01-2008		2. REPORT TYPE Technical		3. DATES COVERED (From - To) Oct 2007 to Dec 2008	
4. TITLE AND SUBTITLE Identification and Evaluation of Chemical Ranking Systems				5a. CONTRACT NUMBER FA8900-06-D-9001-0009	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Whitney W. Glaccum Steven K. Gibb				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Noblis, 3150 Fairview Park Dr. South Falls Church, VA 22042 USA				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of the Assistant Deputy Under Secretary of Defense for Environment, Safety and Occupational Health Emerging Contaminants Directorate				10. SPONSOR/MONITOR'S ACRONYM(S) ODUSD(I&E)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Unlimited					
13. SUPPLEMENTARY NOTES None					
14. ABSTRACT The review of chemical ranking systems is part of an effort to comply with White House Executive Order (EO) 13423 to reduce the environmental and energy impacts of federal activities and use lower-risk chemicals. Existing chemical ranking systems developed by industry, government agencies and non-profit organizations were surveyed for application within the DoD. A number of DoD and non-DoD chemical substitution tools are evaluated for use in DoD weapons development, acquisition and operations and maintenance (O&M) activities. Seven chemical ranking systems were selected for detailed consideration based on accessibility, cost, flexibility, database quality and potential for wider applicability. The existing systems do not meet all of the needs likely to exist within the DoD. DoD compliance with EO 13423 could be advanced by adopting both existing and customized chemical ranking systems to accommodate ECs that may attract regulatory attention and thereby minimize future environmental, health and cost impacts.					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Unlimited	18. NUMBER OF PAGES 65	19a. NAME OF RESPONSIBLE PERSON Dr. Carole Leblanc, ODUSD(I&E)
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U			19b. TELEPHONE NUMBER (Include area code) 703-604-1934

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Executive Summary

To gain insight into how to improve the management of emerging contaminants (EC) within the Department of Defense (DoD), the EC Directorate within the Office of the Assistant Deputy Under Secretary of Defense for Environment, Safety and Occupational Health worked through the Air Force Institute for Operational Health to gather and evaluate information on chemical ranking and substitution systems.

The review of chemical ranking systems is part of an effort to comply with White House Executive Order (EO) 13423 to reduce the environmental and energy impacts of federal activities and use lower-risk chemicals. Existing chemical ranking systems developed by industry, government agencies and non-profit organizations were surveyed for application within the DoD.

A number of DoD and non-DoD chemical substitution tools are evaluated for use in DoD weapons development, acquisition and operations and maintenance (O&M) activities. Seven chemical ranking systems were selected for detailed consideration based on accessibility, cost, flexibility, database quality and potential for wider applicability. The existing systems do not meet all of the needs likely to exist within the DoD.

The adoption of a single uniform chemical ranking system across the DoD is contraindicated given the current gains being made within the DoD by different tools that fit particular program needs and priorities. However, supporting a broad set of tools for weapons development and acquisition functions and another set for O&M, could optimize DoD compliance with EO 13423 and lead to significant gains. Likewise, different ranking systems may be of greater utility to design engineers and scientists than to implementers and downstream users. Linking a directory of web-based tools to a centralized, frequently-updated database of environmental profile information may eliminate redundancies involved with maintaining separate databases for each application. DoD compliance with EO 13423 could be advanced by adopting both existing and customized chemical ranking systems to accommodate ECs that may attract regulatory attention and thereby minimize future environmental, health and cost impacts.

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1 Introduction

Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy and Transportation Management* sets goals in the areas of energy efficiency, acquisition, renewable energy, toxics reductions, recycling, renewable energy, sustainable buildings, electronics stewardship, fleets and water conservation.¹ In response to this EO, the Department of Defense (DoD) seeks to characterize, quantify and mitigate risks associated with current and legacy environmental costs. New statutory requirements for accounting standards mandate that DoD environmental liabilities be reflected on balance sheets and be auditable by 2011. The DoD seeks to move beyond compliance and be a leader and innovator in environmental stewardship efforts among public agencies.

In an effort to gain insight into how to improve the management of emerging contaminants (EC) within the DoD, the EC Directorate (ECD) within the Office of the Assistant Deputy Under Secretary of Defense for Environment, Safety and Occupational Health (OADUSD[ESOH]) worked through the Air Force Institute for Operational Health (AFIOH) to task Noblis to gather and evaluate information on chemical ranking systems. The specific focus of the task is on the use of chemical ranking systems within the systems acquisitions life-cycle. While information regarding facilities maintenance (e.g., building cleaners) was also identified, this was not of specific interest.

The purpose of this report is to identify the range of attributes of existing viable chemical ranking and substitution tools to inform decisions about pursuing new and/or existing programs within the DoD for weapons systems development, acquisition and operations and maintenance (O&M). While the elimination of hazardous materials may not be completely possible, the goal is to identify safer, viable alternatives that meet or exceed performance criteria. Cost may also be a criterion but should be evaluated in a life-cycle context, where the full range of environmental safety, occupational health (ESOH), remediation, risk mitigation and other costs and liabilities to which the DoD is exposed are considered. Selecting initially higher-priced but lower-risk chemicals may have significantly lower total costs when examined in a life-cycle context.

The ECD requested a review and analysis of chemical ranking systems that are used to examine toxicity, evaluate potential substitutes, or restrict the use of specific chemicals. The review encompassed chemical ranking systems used by the DoD, industry, other federal and municipal agencies and non-profit organizations. “Green” or environmentally-friendly labeling programs were also included to identify potentially useful attributes.

This report presents the findings from a review of chemical ranking systems used for weapon systems development, acquisition and O&M. In discussing critical issues and attributes of the reviewed systems, the report identifies recommendations for the development or wider adoption of chemical ranking and evaluation systems by the DoD. Section 2, Background, describes the external and internal drivers within the DoD for establishing chemical ranking efforts. Section 3, Methodology, presents the approach used to identify, review and evaluate the chemical ranking tools. Section 4, Findings, discusses the results of the review and provides information on the chemical ranking and evaluation systems that were chosen for more detailed evaluation. Section 5, Discussion and Analysis, presents the evaluation of key attributes of the candidate systems for DoD consideration. Section 6, Recommendations, identifies forward-looking options for the selection and implementation of chemical ranking tools within the DoD.

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2 Background

The primary driver for this effort is the goal of promoting environmentally-friendly and efficient choices with respect to the use of chemicals within the DoD. There are a number of chemical evaluation and substitution systems currently in use across various weapons and other institutional programs. For example, the Defense Logistics Agency (DLA) and other programs have initiated “Green” acquisition efforts. In addition, some weapons-specific programs have effectively focused on evaluating and selecting lower-risk Hazardous materials in engineering and producing military aircraft.

Multiple internal and external drivers attracted the attention of OADUSD(ESOH) to examine the efficiency and cost effectiveness of various systems employed by DoD organizations. These drivers have prompted an information gathering exercise about existing and proposed chemical evaluation and substitution systems to learn about their potentially high-value attributes and features. This information is being collected to inform future decisions about what types of system(s) to make more broadly available to DoD weapons development, acquisition and O&M personnel. In addition, reviewing attributes or processes that could contribute to ongoing innovation and higher compliance rates among potential users is of interest because of the environmental, health and cost-reduction gains this could bring about.

A critical issue for both existing and emerging tools is their ability to address emerging but unregulated contaminants. The ability to anticipate and consider potential regulatory restrictions on chemicals that would be costly and cumbersome to comply with is key. Early identification of potentially risky chemicals and substituting them with alternatives less prone to result both in harm and regulatory action is likely to have significant benefits. Incorporating ECs into such chemical evaluation and substitution systems would result in greater force functionality and protection and lower health and environmental legacy costs—without sacrificing performance.

Chemical ranking/evaluation and labeling systems are defined in this report as follows:

Chemical ranking systems assist users in the evaluation of the human health and ecological impacts of a range of viable chemicals to determine which have the best environmental health profiles for particular applications while meeting or exceeding performance criteria. In general, working to eliminate or reduce the use of chemicals on a list of banned or restricted compounds is not a chemical evaluation and substitution system. A chemical ranking system allows comparisons based on peer-reviewed environmental health, toxicity, fate and transport information in making risk-based decisions for specific applications. Labeling programs are defined as systems that provide certifications that a product or material meets certain environmental criteria established by the authoring organization. Labeling programs were considered as part of this project because they often rely on chemical ranking systems for making determinations on whether a product is approved for a specific type of label.

While chemical ranking systems may take into account factors other than environmental health, toxicity, fate and transport factors, the focus of this effort is on systems that rank chemicals based primarily on environmental health factors.

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3 Methodology

A three-part strategy was employed for the identification and evaluation of chemical ranking systems. The first part involved identifying chemical ranking systems used within and outside of the DoD. The second part included a screening of the numerous systems identified to narrow the total number of systems down to a manageable cohort. During this second part, systems that were clearly not applicable were removed from further consideration. The third part of the effort involved the evaluation of seven chemical ranking systems (three DoD and four non-DoD) using specific criteria identified by OADUSD(ESOH). Finally, the key attributes, positive and negative, of each evaluated chemical ranking system are analyzed to yield recommendations for implementing such systems within the DoD.

3.1 Identification of Chemical Ranking Systems

Noblis was tasked with identifying and collecting information on chemical ranking and substitution systems from industry, non-profit, other federal and municipal agencies and DoD organizations. Labeling programs were also surveyed to scan for useful attributes and features. Information from numerous sources within and outside of the DoD was solicited. Also, additional information on viable chemical evaluation, ranking and substitution tools was researched through internet searches, review of published journal articles and discussions with DoD experts and those from academic and industry organizations.

This project was intended to survey existing chemical ranking tools for all attributes, rather than first listing desirable attributes in order to find the system that fits a pre-conceived ideal. This approach is likely to reveal potentially valuable attributes that may have been missed otherwise. Decision-makers may still opt to retain an original set of key attributes and functions when selecting systems, but the awareness of other innovative attributes may help anticipate emerging features and inform these selections.

Briefings on the project were provided to the DoD Acquisition ESOH Integrated Product Team, the EC Steering Group and the Materials of Emerging Regulatory Interest Team (MERIT) with the intent of soliciting information on various chemical ranking systems used within the DoD.

3.2 Selection of Chemical Ranking Systems for Evaluation

Working with OADUSD(ESOH) and the AFIOH, a large set of chemical ranking systems were identified for further evaluation. Facility maintenance systems were noted but dropped from further consideration. Of those selected for evaluation, the following criteria guided the process of review and analysis.

3.3 Evaluation Criteria

The evaluation criteria for the chemical ranking systems included a consideration of the following aspects:

- Accessibility by DoD personnel including use restrictions, costs/fees
- Different needs of many potential DoD user communities
- Quality of the chemical ranking system
- Frequency of updates

- Range of chemicals included
- Breadth/extent and level of detail considered
- Current uses of the system
- Applicability for DoD-wide use

The chemical ranking systems were evaluated for possible adoption directly by the DoD, or as a benchmark or set of valuable attributes for creating a DoD-specific system. For DoD programs moving towards adopting such a system, this data may help inform their decisions. Based on the inventory of all DoD tools identified, three robust examples were selected for further analysis.

After identifying and screening numerous systems (see Appendix A, Tables 1 and 2 for a list of all identified systems), one non-DoD chemical ranking/evaluation tool was also chosen from the following four categories: (1) industry; (2) other federal and municipal agencies; (3) non-profit organizations and (4) standard-setting/labeling programs.

4 Findings

The findings and conclusions that follow stem from research based on reviews of the ranking systems, web sites, interviews with chemical ranking system developers and users and from journal articles. This section conveys findings related to the individual chemical ranking systems identified for further evaluation in the report. A review and evaluation of cross-system attributes, likely users, applicability and other key issues appears in Section 5 and final recommendations regarding a path forward are made in Section 6. After DoD ranking systems are discussed, information on ranking and substitution tools generated within the industry, government and non-profit sectors is discussed in Section 4.2 to provide data on noteworthy approaches in each sector.

4.1 Department of Defense Chemical Ranking Systems Survey Results

All of the DoD systems identified are arrayed in Appendix A, Table 1, which provides links and points of contact for further information. The descriptions of selected DoD tools are included in the subsections below the Table. Later sections present the rationale for how these systems were selected for discussion and recommendation based on the evaluation criteria above.

4.1.1 *Naval Sea Systems Command (NAVSEA) Prohibited and Controlled Chemicals List (PCCL)*

The NAVSEA tool was selected because of its extensive database, planned incorporation of ECs and transparency and broad availability. The PCCL is based on the Emergency Planning and Community Right to Know Act (EPCRA) “List of Lists,” which includes chemicals regulated by the U.S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA) and other authorities. However, it currently does not include unregulated chemicals or ECs. Updates periodically planned for the PCCL are slated to incorporate the chemicals on the EC Watch and Action Lists. The PCCL focuses on pollution prevention and ESOH, but does not encompass cleanup efforts. However, cleanup actions are not subject to chemical substitution so this is not a weakness.

The NAVSEA system uses the EPCRA List of Lists and categorizes the chemicals into three tiers: (1) Prohibited; (2) Controlled and (3) Chemicals of Concern (COCs). The database includes 1,327 chemicals by Chemical Abstract Service (CAS) number. The relative rank of each chemical is computed by assigning weight factors to various regulatory categories. NAVSEA includes a prohibited list of 123 “highest risk” chemicals and a controlled list of 108 “moderate risk” chemicals.

The current system used by NAVSEA, is controlled by three people who can manipulate the database as “primary users.” Updates are scheduled every five years and follow new additions to the EPA List of Lists at an estimated cost of \$100K. Rankings are based on a comprehensive regulatory assessment. Because it is transparent, well-documented and well-distributed within the Navy, it has a track record that shows strong potential for wider DoD application.

4.1.2 *Army Aviation and Missile Life-cycle Management Command (AMCOM) Rate/Rank Tool*

The AMCOM system is a well developed system with an extensive database that is focused on ranking chemicals for multiple applications and may have broad availability to other parts of the

DoD. It was developed to aid in the evaluation of potential substitutes for Hazardous materials used in maintenance and repair operations. Based on ESOH regulatory guidelines, it includes all chemicals identified in the EPCRA List of Lists as of May 2006 and other chemicals. The priority order of the rankings is based on regulatory requirements and ESOH impacts. An Excel-based ranking tool includes an automated process for product or material evaluation.

The 1,751 chemicals in the database are ranked with extensive detail for each chemical provided. The Product Evaluation List allows for user interaction. The primary focus of the system is to evaluate the risk posed by hazardous materials usage.

The genesis of the AMCOM system was the Army Hazardous Materials Evaluation via Regulatory Impact/Priority Order Ranking System for Hazardous Product Substitution.² The system is used by program managers to evaluate products and decisions on chemical substitutions and is distributed to depots through technical manuals. However, the system is not being used by O&M personnel at the depot level.

The cost to operate and maintain the tool is minimal; it is based on 3–4 days labor for annual updates to capture regulatory changes. The tool is currently used by all with access to the AMCOM G4 computer server. The tool uses numerical rankings of compounds, whereas NAVSEA uses three bins that are based on lists of prohibited, controlled, or COCs. The system includes a Product Evaluation List that can be manipulated by program managers who face various options about the regulatory impact of products being used for maintenance and repair operations. The Product Evaluation List does not account for the proportion of mixtures, the use of the product and the amount or frequency of application(s). The tool is not a replacement for professional judgment that may hinge on these mixture and exposure considerations. The system's numerical rankings of chemicals must also be viewed with professional judgment, particularly when one chemical is ranked only slightly higher or lower than another.

The AMCOM chemical ranking system should be applicable to weapons design processes. DoD personnel may need to determine the appropriate chemical to use for particular operations, so AMCOM, like other systems, would need to include chemicals that may be used in the future.

A key attribute is the ability of a system to incorporate ECs. AMCOM managers would need to communicate with the ECD to incorporate this capability. The system has good potential for wider DoD applications.

4.1.3 Air Force F-22 Raptor

The Hazardous materials Program for the F-22 began in 1991. This system, although not a ranking system, was selected as it was the first to incorporate controls on some materials from the engineering design phase all the way through to the manufacturing process. The first, straightforward steps taken by the Air Force and Lockheed Martin (LM) Corporation involved generating a list of materials to be eliminated and banned from the aircraft. The targeted list of highest priority chemicals included asbestos, carcinogens and other categories of chemicals, such as ozone depleting compounds. A second group of chemicals, including cyanide and beryllium, was identified for reduction and elimination. The effort focused on materials on the F-22 list and customer/contractor operations. Three different companies involved in the weapons system had different priorities and reevaluated the list with some divergences.

Later in the 1990s, LM Aeronautics created the more sophisticated hazardous materials Elimination List (HMEL), which is not specific to a particular weapon system. But the F-22 had already gone through the majority of its design decisions by the time that system was developed (see below).

Even though its early steps were modest, the F-22 program was one of the first weapon systems to incorporate a hazardous materials program from engineering through manufacturing. Minimizations were driven by a set of judgments, without cost numbers to back them up. Product performance was the primary criteria. The system does not rank by risk in the way that NAVSEA PCCL does, rather the system focuses on areas of concern for hazardous materials reduction. A split may exist between what weapon systems design engineers/scientists value in terms of sophisticated chemical ranking and substitution systems and those charged with implementing decisions. Most implementers and subcontractors working on particular weapon systems want a focused list, not an overly extensive decision-logic, to provide ready options and selections. Many of them partner with large numbers of subcontractors, so they need to be pragmatic and prioritize.³

Its current use remains limited to the F-22 application. It may be applicable somewhat more broadly across the DoD for very similar aircraft or missile-based weapons systems but perhaps not beyond that. The purpose of F-22 Hazardous materials program is different from other chemical ranking systems as it is limited to only chemicals used on the F-22.

The Program Management Plan may provide more information about this tool. The plan was not provided by the F-22 Program Office but may warrant closer study if it can be obtained.

The elements of the F-22 program could be incorporated into requirements for other systems through changes in requirements for programmatic environmental, safety and health evaluations.

4.1.4 Navy, Air Force, Marines F-35 Joint Strike Fighter

The system used by the F-35 program was selected in part because one of its key attributes is shifting the “burden of proof” onto subcontractors and developers for why an alternative, lower-risk chemical cannot be used. It uses LM Aeronautics Company’s HMEL and costs less to implement than the F-22 program because it’s more loosely integrated into the production process. The HMEL is widely-available on the contractor’s web site but is not required and written into contracts, as it was with the hazardous materials reduction efforts for the F-22. The banned list of chemicals is based on materials the contractor could eliminate from use in the F-35. For example, cadmium and/or chromium are commonplace in the weapons system because of a determination that there is little or no exposure potential.

The contractor maintains a restricted list for substances that require approval before being used in any new design or application. This mandates a demonstration of the technical and economic infeasibility of using the alternative. For this restricted list, the contractor shifted the “burden of proof” onto subcontractors to demonstrate why they could not use a substitute. New F-35 aircraft and components (e.g., degreasers and deoxidizers) all required Hazardous Materials Management Program (HMMP) approval. Some proposed materials were approved, whereas some prompted the use of alternatives.

For F-16 applications, the designs were “grandfathered,” or not required to abide by HMEL requirements, although the contractor tried to get alternatives even for ongoing F-16 production.

The F-35 references the contractor's HMEL. The list is updated on an "as needed," basis which is defined by the contractor, mostly to clarify the notes. An update is planned for winter 2007. One shortcoming out of the contractor's control is the use of government-furnished equipment where all the materials contained in products are not necessarily known.⁴

The F-35 effort was also aided by the EPA's Design for the Environment (DfE) process (see below) resulting in reductions in hazardous materials usage from the concept demonstration (competition) phase through system development, production and O&M of the aircraft's life-cycle. Banned and restricted hazardous materials were designed out of the F-35 and its air support system to the maximum extent technically feasible and the remaining materials are controlled through a product data management system. Part of the F-35's low life-cycle sustaining cost has been attained through the DfE process.

4.2 Industry, Government and Non-Profit Systems

The following describes the top chemical ranking systems identified outside of the DoD. A comprehensive list of the non-DoD systems identified is presented in Appendix B. Table 1 summarizes other federal and municipal agency tools. Table 2 describes industry efforts and Table 3 summarizes key approaches developed by non-profit organizations. The selection of the top four systems was made according to the evaluation criteria outlined in Section 3.3. Descriptions of selected non-DoD systems are presented in the subsections below.

4.2.1 Industry Chemical Ranking System

S.C. Johnson Greenlist™ was selected from the industry category from among three top systems, including Dolphin Safe Source and McDonough Braungart Design Chemistry, LLC (MBDC) in part because of its incentives for continuous improvements in chemical formulation and ability to anticipate emerging areas of regulatory concern such as endocrine disrupting chemicals (EDCs).

Greenlist™ establishes comparative criteria that measure the environmental and health impact of potential and current raw ingredients although S.C. Johnson developed this system to focus on the company's own product streams. The system includes ingredients contained in surfactants, solvents, propellants, insecticides, resins and packaging.

Each ingredient is classified and rated according to the following categories: Restricted Use Material = 0, Acceptable = 1, Better = 2 and Best = 3. Product managers are challenged to increase the product score during reformulations and the company has consistently reported annual increases in scores across its product line. The tool also takes into account "endocrine" action in ranking chemicals which is an example of a forward-looking feature. EDCs are currently unregulated at the federal level but could attract state and/or federal regulatory action in the future.

Greenlist™ is a patented environmental classification system that is available royalty-free to outside organizations provided they adopt the system and publicly report performance data annually. A determination would have to be made about whether the DoD is willing to commit to these terms, which otherwise would limit access for DoD personnel. It was developed in 2001 and now includes 16 categories of raw materials. The focus is limited to raw materials used in S.C. Johnson products. Detailed information is not available at this juncture, but S.C. Johnson has shared Greenlist™ with the EPA and other groups. The system's focus on commercial

products may include a narrower portfolio of chemistries in comparison with the diversity of DoD chemicals used in weapons system development, acquisition and other areas.

Greenlist™ has similarities with NAVSEA, although it is not as transparent. For example, it is unclear how S.C. Johnson treats cancer vs. non-cancer toxicity rankings in their ranking criteria, although this poses challenges for any system given the distinct manner in which EPA risk policies treat these two categories. Like the AMCOM Product Evaluation List, Greenlist™ allows comparisons of potential ingredients in making reformulation decisions. The S.C. Johnson Greenlist™ received the 2006 Presidential Green Chemistry Challenge Award and has attracted media attention.⁵

4.2.2 Government Chemical Ranking System

The EPA's DfE Formulator Initiative was selected among the other federal and municipal agency category as being the best option because of the broad experience the EPA has with the tool and its use of a respected third-party for checks on its component processes. The EPA's DfE program is focused on designing products that have more positive environmental profiles. The tool screens product ingredients to ensure that only those that pose the least concern are used. The tool relies on a CleanGredients™ database which was developed for the cleaning product industry in collaboration with GreenBlue. Thus, its focus is on consumer products such as cleaners, industrial coatings and fertilizer alternatives.

The EPA partnered with GreenBlue to develop the CleanGredients™ database, which was developed by the Lauren Heine Group, LLC. CleanGredients™ is accessed by subscription, with fees ranging from \$100s to \$1,000s annually based on the user's revenue. Current uses are limited to surfactants for hard surfaces, carpet cleaning, laundry applications and hand dish soap. Data for aquatic toxicity, biodegradability and the ingredient formulations are reviewed by a technically credible third party—NSF International—using the DfE Screen for surfactants. Therefore the applicability of the system could be limited again due to the subscriber constraints and the current focus on institutional and industrial cleaning products. A partnership with GreenBlue to develop a DoD-specific system may be based on previous work between the EPA and GreenBlue.

It may be worth considering adopting this tool for potential uses other than the weapons system development, acquisition and O&M arena. Potential users include civil engineers, technicians and other personnel who manage the utilities and maintenance for on-base housing. Supply officers who run military barracks are another group. The EPA DfE approach is a valuable option for determining constituent chemicals for use in particular applications.

The DfE includes two parts, the Alternative Assessment method and the Formulator Initiative, which are focused on replacement of existing chemicals and development of new products. A subject matter expert⁶ familiar with the EPA's Alternatives Assessment method under the DfE program reports that it may be more broadly applicable to the DoD than the Formulator Initiative approach:

- The first step in the process of identifying safer alternatives is to define the functional use which is followed by a determination of the necessary performance characteristics. The third step is to identify specific environmental/human health endpoints such as aquatic

toxicity, focusing on critical issues. The DfE Screen determines which alternatives are best.

- The tool generates and identifies viable chemicals and aligns them on a continuum. Users then decide what compounds to select.
- The performance of the alternatives analysis component is more efficient than the one formerly used by the EPA in the program.
- Continuous improvement is built into the process. An initial screen is conducted and has to be updated periodically to account for changes. The database is not updated on a regular basis.
- Uses experts in a particular field to determine toxicological endpoints of concern.

4.2.3 Non-Profit Chemical Ranking Systems

The Zero Waste Alliance's (ZWA's) Chemical Assessment and Ranking System (CARS) was selected from the non-profit category from among three top systems, including Clean Production Action's (CPA's) Green Screen for Safer Chemicals and Earthster.org's Life Cycle Assessment (LCA) tool because of its open design, flexibility and exceptionally broad coverage of chemicals. CARS is a decision support tool that uses publicly available information on potential chemical hazards related to human health and safety, ecological health and ecosystem-wide impacts to assess and rank chemicals and to set goals for substituting or eliminating problematic materials. This open-access system may provide a highly flexible and broadly-based option for DoD adoption as part of a suite of tools. The system includes publicly-available information and is open to public criticism, which allows the DoD to access current thinking and possible innovations in chemical ranking and substitution efforts through use of the tool.

The CARS includes:

- Inventory of product chemical components by CAS number
- Assessment capability (screens components against CARS database of COCs)
- Chemical ranking based on an organization's selected priorities and concerns

The CARS provides detailed information on how it can be used by outside organizations. The cost of the system would be determined by the level of effort and labor required to use the system. The frequency of database updates is unknown but it includes carcinogens, teratogens, hazardous air pollutants, greenhouse gases, ozone depleting substances, persistent, bioaccumulative and toxic substances, extremely hazardous substances, other regulated chemicals and suspected endocrine disrupting chemicals (EDCs). The tool has the potential for broader applicability and tailoring to particular needs within the DoD.

The limitations of CARS are similar to those of the other systems in that it currently includes only regulated chemicals, thus the systems ability to limit future liabilities is of concern.

Also like other tools, CARS cannot evaluate products for which the formulation is unknown—the same challenge LM faces with government-furnished products. The tool is also constrained by the limitations of Material Safety Data Sheets. Additionally, the database, like others that were reviewed for this report, may not include all chemicals that are being registered to enter

commerce through the EPA's pre-manufacturing notice program under the Toxic Substances Control Act.

4.2.4 Labeling System

Green Seal was selected as the top system in the labeling category, in part because it is a U.S.-based labeling system; Environmental Choice (Canada) was the other high quality system in the labeling category. Green Seal's certification process is a hybrid approach encompassing some of the attributes of academic, industry and non-profit organizations. The Green Seal organization provides assistance in purchasing, operations and facilities management through product evaluations and recommendations, guidance manuals, certifications and special projects. The system itself focuses exclusively on environmentally-preferable products, purchasing and operations activities.

Product certification information is accessible by DoD personnel on the Green Seal website. Like the CARS system, cost would be determined by level of effort and labor required to use the system. Updates to the labeling system would be ongoing and openly communicated. The labeling system's focus is on products rather than specific chemicals, allowing for a unique focus on mixtures of compounds. Detailed information is available and its focus on purchasing and commercial products may make the system especially suitable for O&M functions. Evidence suggests Green Seal certified products are already preferred by some programs within the DoD⁷, but applications may be limited in relation to weapons systems because of the diversity of chemistries involved.

The third party certification is a valuable feature, although this check is a simple pass/fail test based on certification criteria.

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5 Discussion and Analysis

The following section provides a cross-walk of the top systems identified in the analysis with the criteria such as access, flexibility and quality set out in Section 3.3. Table 5-1 summarizes these data and Tables 5-2–5-9 split out the criteria and add narrative for how the systems meet them in more detail. A conceptual map illustrating which systems were determined to be more suitable for use by design engineers and scientists on the one hand and implementers and downstream users on the other, is provided in Figure 5-1. Likewise, Figure 5-2 identifies which ranking systems may be of greater utility for weapons development and acquisition processes and which for O&M functions. These two figures are integrated in the recommendations section in Figure 6-1.

5.1 System Comparison

A review of each identified chemical ranking system—four non-DoD and three DoD—was completed using the criteria identified by OADUSD(ESOH). A summary of all of the systems with the comparison criteria is included in Table 5-1. The breakout charts and text that follow describe how the selected systems met a specific criterion. For purposes of analysis, the F-22 Raptor and F-35 Joint Strike Fighters detailed in 4.1.3 and 4.1.4 have been combined as “aircraft systems” below because they have the same proponent. The following chemical ranking systems were selected for an in-depth consideration for applicability to the DoD:

- Greenlist™
- ZWA CARS
- Navy NAVSEA PCCL
- Aircraft Systems Contractor HMEL
- Army AMCOM
- EPA DfE approach
- Green Seal

Table 5-1. Chemical Ranking Systems Summary*

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DfE	Green Seal
Access	Accessible if annual results publicly reported	Broad, open-access system	Extensive within Navy	Available on contractor web site for subcontractors	Broad within Army	Available across federal agencies, other organizations	Widely accessible
Restrictions	Patented but available with caveats	None	Navy tool	Weapons-system specific	Army tool	EPA promotes use	Already in use within some DoD programs
Cost	Royalty-free if results publicly reported	Based on level of effort and costs to use program	Within the DoD, update costs \$100K	Presumably free as is available to contractors	Within the DoD, costs based on 3-4 days labor for annual update	N/A	Based on level of effort and labor to use system
DoD User-Flexibility	Focused on 16 categories of	Very flexible addresses broad	Good	Versatile but specific	Flexible but Hazardous	Good but limited to design of new	Flexible but focused on

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DfE	Green Seal
	ingredients – surfactants, solvents, insecticides and others	categories of chemistries including GHGs, health and ecotoxins			materials focus only	products/material	purchasing products
Frequency updates	N/A	Presumably often as open-system with public input	5 years @ \$100K	Planned in Winter 2007, frequency as needed when sufficient new data awaits entry	Annual	Irregular	Ongoing
Quality	Award-winning tool but narrow focus, no ECs	High quality, open system, no ECs	Excellent, addition of ECs planned	Substantial, unique attributes, but no ECs	Very strong, but no ECs	Solid with motivated agency backing, but no ECs	Consensus-based life-cycle standards of strong merit
Info Avail.	ECOTOX and other databases, EDC information	Broad range of chemicals including carcinogens, HAPs, teratogens, PBTs, EDCs	1327 chemicals	Drawn from hazardous materials list	1751 chemicals	Broad range of chemicals	Detailed information is available
Current Use	S.C Johnson products	Across organizations and industries	Pollution Prevention and ESOH	F-35 weapons systems	Hazardous materials reduction in maintenance and repair ops.	Design Phase of products/material	Preferable products for purchasing and operations
Wider Applicability	Good for these chemistries (not weapons), unclear on ranking of cancer and noncancer risk values	Very broad	Solid potential	Strong but specific	Very strong	Good if engaged during design phase	Excellent for commercial products (not weapons)
Key Attributes	Company performance data is available	Open-access, uses CAS numbers, allows emerging info and innovations to be tracked	Pollution prevention, ESOH but not cleanup. Uses CAS numbers. Ranks in three bins according to low, medium, high risk and uses regulatory weightings.	Also used EPA DfE to “design” out hazardous materials to max. extent technically feasible.	Ranks by ESOH and Regulatory impacts. Automates material evaluation	Focuses managers on making green selections up front	Geared towards products i.e. mixtures of chemicals, not single compounds

*Detailed information on these systems is available in Appendices A and B.

The evaluation criteria used to compare and contrast the identified systems included the following specified by the OADUSD(ESOH):

- Accessibility by DoD personnel including use restrictions, costs/fees
- Different needs of many potential DoD user communities
- Quality of the chemical ranking system
- Frequency of updates

- Range of chemicals included
- Breadth/extent and level of detail considered
- Current uses of the system
- Applicability for DoD-wide use

Table 5-2. Accessibility

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DFE	Green Seal
Access	Accessible if annual results publicly reported	Broad, open-access system	Extensive within Navy	Available on contractor web site for subcontractors	Broad within Army	Available across federal agencies, other organizations	Widely accessible
Restriction	Patented but available with caveats	None	None	Weapons-system specific	Army tool	EPA promotes use	Already in use within some DoD programs

Access to all of the systems selected—with the exception of S.C. Johnson’s Greenlist™—is excellent. Greenlist™ is patented and restricted but the company grants use as long as adopters commit to publicly release annual performance data. Most of the other systems have few, if any, outright restrictions although some barriers to efficient use may not emerge until an adoption action is underway. However, for the majority of systems selected, responsible officials made information broadly available for the purposes of this report, suggesting that adoption processes and access would be efficient at least in the initial stages.

Table 5-3. Cost

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DFE	Green Seal
Cost	Royalty-free if results publicly reported	Based on level of effort and costs to use program	Within the DoD, updates cost \$100K	Presumably free as is available to contractors	Within the DoD, costs based on 3-4 days labor for Annual Update	N/A	Based on level of effort and labor to use system

Cost information for these programs is sometimes based on level of effort and labor/training expenditures and in other cases only cost data for database updates was provided. DoD systems such as the NAVSEA and AMCOM tools offer the advantage of existing in-house documentation and trained personnel and thus may be poised for lower-cost adoption by other DoD organizations.

Table 5-4. User Flexibility

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DFE	Green Seal
DoD User-Flexibility	Focused on 16 categories of ingredients – surfactants, solvents, insecticides and others	Very flexible addresses broad categories of chemistries including GHGs, health and ecotoxins	Good	Versatile but very system specific; hazardous materials focused	Flexible, but hazardous materials focus only	Good but limited to design of new products/materials	Flexible but focused on purchasing products (not individual chemicals)

Greenlist™ and Green Seal focus on ingredients and products more likely to be used by O&M personnel, whereas Aircraft systems contractor HMEI is geared towards weapons system development and acquisition. The EPA’s DfE is flexible and has demonstrated an application during weapons design phase with the F-35 Joint Strike Fighter. The selected systems appear to fall into these two distinct groups—weapons development/acquisition and O&M—with some tools demonstrating flexibility in both areas.

Table 5-5. Update Frequency

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DfE	Green Seal
Frequency updates	N/A	Presumably often as open-system with public input	5 years @ \$100K	Planned in Winter 2007, frequency as needed when sufficient new data awaits entry	Annual	Irregular	Ongoing

The AMCOM system has the most regular updates although with an open, publicly-accessible system like ZWA CARS, new information from a variety of sources may frequently be integrated into the tool, increasing its utility. The root of the databases underlying many of these tools is the EPA’s EPCRA List of Lists so centralizing updates to one linked database would introduce a major efficiency. The lack of an integrated tool means the updates to the NAVSEA PCCL and the AMCOM systems are done in isolation to each other and cannot benefit from economies or scale or data sharing methods. Changes to regulations of chemicals in the database could still take the DoD by surprise and lead to inefficiencies in the management of the DoD’s environmental legacies. Instituting or ensuring a “once-in, never-out” provision could be a valuable attribute for a database.

Table 5-6. Quality

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DfE	Green Seal
Quality	Award-winning tool but narrow focus, no ECs	High quality, open system, no ECs	Excellent, addition of ECs planned	Substantial, unique attributes, but no ECs	Very strong, but no ECs	Solid with motivated agency backing, but no ECs	Consensus-based life-cycle standards of strong merit

All of the tools selected for recommendation had a fairly high level of transparency about their functions and features, broad coverage within their scope and have a track record of effectiveness and results. As is evident from the tables, different systems vary in terms of their focus, reach and emphasis. Because many of the existing systems are geared towards a certain product line or type—such as cleaners, insecticides or hazardous materials used in specific weapons systems—some questions may arise about where those systems can be applied more broadly. However, the seven are effective and/or exhibit unique and potentially valuable attributes within their current scope.

Table 5-7. Information Availability

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DfE	Green Seal
Information Available	Health, ECOTOX, other databases, EDC information	Broad range of chemicals including carcinogens, HAPs, teratogens, PBTs, EDCs	1327 chemicals	Drawn from hazardous materials list	1751 chemicals	Broad range of chemicals	Detailed information is available

The extent and accuracy of the chemical database underpinning the ranking and substitution system is a key feature. Any database needs to be sufficiently populated with chemical compounds so users can extract value from a system’s outputs and the alternatives it generates. From the standpoint of breadth, the ZWA CARS system includes a wide range of toxicants, greenhouse gases and endocrine-active compounds allowing for the consideration of multiple environmental attributes. Both the NAVSEA PCCL and the Army’s AMCOM chemical ranking systems contain over 1,000 chemicals, although it should be noted that the root database does not necessarily have to be all-inclusive or comprehensively cover the chemicals in the DoD’s portfolio from the outset. But the ability to accept new ECs and add recently published environmental health data from DoD experts, weapons system contractors and other peer-reviewed sources are key attributes.

Table 5-8. Applicability

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DfE	Green Seal
Current Use	S.C Johnson products	Across organizations and industries	Pollution Prevention and ESOH	F-35 weapons systems	Hazardous materials reduction in maintenance and repair ops.	Design phase of products/ material	Preferable products for purchasing and operations
Wider Applicability	Good for these chemistries, (not weapons); unclear on ranking of cancer and noncancer risk values	Very broad	Solid potential	Strong but specific	Very strong	Good for product and weapons uses if engaged during design phase	Excellent for commercial products (not weapons)

Examining current uses may help group various tools for application to either weapons system development and acquisition or O&M functions. By centralizing the maintenance and updating of the root database serving a suite of DoD chemical ranking tools and ensuring this linkage runs seamlessly, individual tools could still be used. Thus, current and future “niche” users could continue to select lower risk chemicals with proven methods while innovating new and potentially wider applications.

Table 5-9. Key Attributes

Criteria	Chemical Ranking and Substitution Systems						
	Greenlist™	ZWA CARS	NAVSEA PCCL	Aircraft Systems	AMCOM	EPA DfE	Green Seal
Key Attributes	Company performance data is available	Open-access, uses CAS numbers, allows emerging info and innovations to be tracked	Pollution prevention, ESOH but not cleanup. Uses CAS numbers. Ranks in three bins according to low, medium, high risk and uses regulatory weightings.	Also used EPA DfE to “design” out Hazardous materials to maximum extent technically feasible	Ranks by ESOH and regulatory impacts Automates material evaluation	Focuses managers on making green selections up front	Geared towards products (mixtures of chemicals and not single compounds)

Greenlist™ results are published each year by the company noting how each product has improved in its formulation. This performance metric is a potentially valuable attribute and similar “scorecards” could be developed to help the DoD provide information in meeting Government Performance and Results Act (GPRA) mandates and Office of Management and

Budget Program Assessment Rating Tool (PART) budgetary reviews. These reviews focus on demonstrating results through empirical indices and performance metrics such as the one included in Greenlist™ could be valuable in informing responses to GPRA and PART data requests.

The open-architecture model of ZWA CARS allows wide exposure and input, allowing users to track emerging concepts and data and promote a professional culture of innovation and exchange. NAVSEA PCCL encompasses pollution prevention, ESOH—and along with ZWA CARS uses CAS numbers—features which make it a mature tool with potentially broader applicability. Some ECs, such as those in the nanomaterial category, may be difficult to incorporate as they are not assigned CAS numbers and are not regulated under the EPCRA List of Lists. Classification by CAS numbers as the NAVSEA PCCL and ZWA CARS tools use is widely-accepted by ESOH professionals and offers significant benefits. Therefore, CAS-oriented systems should not be passed over because compounds, such as nanoparticles, have yet to be classified under the CAS regime.

The use of three “risk bins” may not provide as much precision as AMCOM’s ranking of chemicals but could be more valuable to implementers and users downstream who would benefit from straightforward choices from three groups, as opposed to potentially overly-detailed decision-logics (see Figure 5-1). The Army’s AMCOM tool encompasses ESOH concerns and provides a sophisticated ranking of chemicals for design engineers and scientists. On the other hand, it features an automated tool for product evaluation creating “user-friendliness” for implementers and users downstream.

Aircraft systems contractor HMEL has shifted the “burden of proof” onto subcontractors for not using a lower-risk alternative, creating a presumption of greener choices at the outset. The systems designers indicated that in some instances they set “greener” targets than government requirements, which in effect constrains their ability to use lower-risk alternatives.

The EPA’s DfE tool provides technical assistance during the design phase of development, again prioritizing the selection of lower-risk alternatives early in the process and thereby minimizing the need to re-engineer products after the fact to address risk concerns. Finally, the labeling system Green Seal offers the ability to account for mixtures and not just individual chemicals, one of the challenges most other tools do not address.

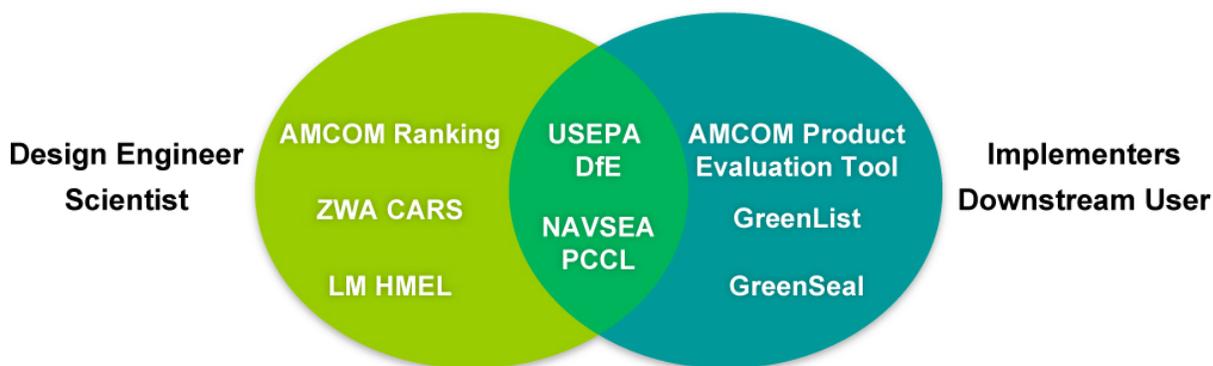


Figure 5-1 Appropriate Chemical Ranking and Labeling Systems for Designers versus Downstream Implementers

5.2 Chemical Ranking Systems Availability

The evidence supports the conclusion that a number of DoD and non-DoD chemical ranking systems are functioning, available and achieving good results. There is a rich array of system options and attributes to consider as innovators have achieved notable successes and optimized the environmental profile of a significant number of commercial products and chemical constituents in weapons systems.

According to the review and analysis, some non-DoD systems are mature enough for the DoD to adopt; however, their immediate applicability for all DoD user communities is questionable. As defined in the scope of this report, the DoD is focused on two primary user communities for a chemical ranking system in this effort: (1) weapon systems development and acquisition and (2) O&M. It may be that candidate systems naturally serve one of these communities more effectively than the other (see Figure 5-2), indicating that having a suite of tools to serve users' unique needs is important.

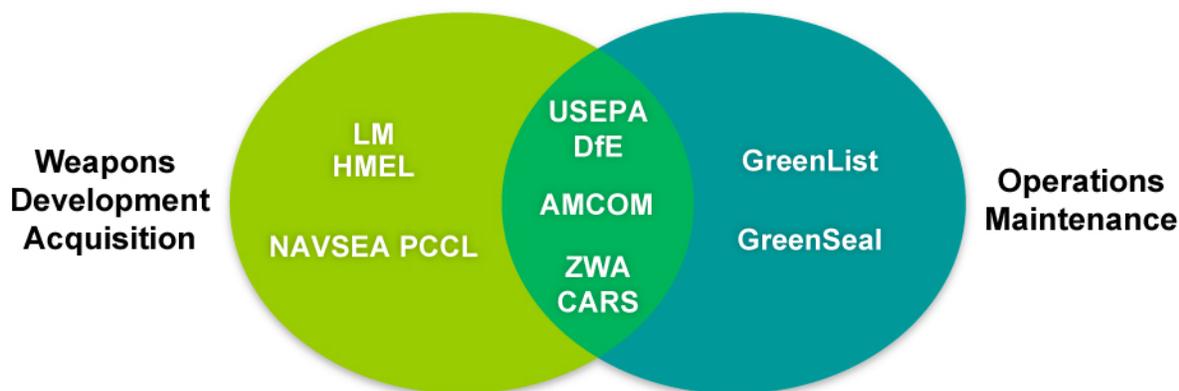


Figure 5-2 Applicability of Chemical Ranking and Labeling Systems to Different DOD Processes

5.2.1 Use of Toxicity Data

Any given chemical ranking system may not capture multiple dimensions of a chemical's toxicity (aquatic, teratogenic, carcinogenic, immunotoxic, etc.) or environmental fate, so a particular system should only be part of a larger decision-making process on "greening" the DoD's acquisition procedures. Professional judgment will be key in the evaluation of multiple types of toxicity and determining their importance in weapons system development and acquisition processes.

Few, if any, tools account for uncertainties surrounding toxicity risks from chemicals. Creating EPA toxicity risk ranges for chemicals to reflect the uncertainty surrounding these estimates has been a high priority of the agency's current research director. The AMCOM system's use of numerical rankings may give a false sense of precision in this regard. However, it offers more precision to design engineers and scientists than assigning chemicals to undifferentiated "bins"

of low, medium and high-risk categories as the Navy PCCL does. Professional judgment will be valuable in utilizing these systems to their full potential, particularly when one chemical is ranked only slightly higher or lower than another in AMCOM or is on the “cusp” between two bins as they are categorized under the PCCL system.

S.C. Johnson’s Greenlist™ accesses databases on ecological risk such as the EPA’s ECOTOX that most human health-oriented chemical ranking and substitution systems’ databases may not. This could be an important asset in identifying chemicals that pose ecological risks.

However, it should be recognized that human health risk considerations usually drive EPA risk evaluations. As noted above, how S.C. Johnson’s Greenlist™ integrates cancer and non-cancer human health toxicity values is unclear. In an effort to clarify the Greenlist™ process, S.C. Johnson officials have been contacted by Noblis to provide detailed information on how the tool operationally integrates cancer and non-cancer risk values in its rankings.

Transparency on this issue is important, especially if value judgments are embedded in the tool that conclude that a given cancer, for example, is a more severe risk or “worse” outcome than liver damage. The EPA takes a stricter approach to cancer risk policies, posing challenges to chemical evaluation and ranking systems based on risk assessments developed by the agency.

Some momentum is evident within the EPA to harmonize risk approaches to cancer and non-cancer toxicity values based on a compound’s specific biochemical impacts, which would ease this integration. If a policy to integrate cancer and non-cancer toxicity risk values is aggressively pursued by the EPA, future ranking efforts may not be complicated by the different approaches the EPA assumes. But the cases at the EPA where this harmonization has been accomplished to date are few and largely still under development. A report due out in the fall of 2008 from the National Research Council’s Board on Environmental Studies and Toxicology on improving risk assessment is likely to address the issue of cancer and non-cancer harmonization. The report could provide both an impetus and strategies for the EPA to accelerate movement in this direction.

Greenlist™ and ZWA CARS identify “endocrine active” chemicals, which is a forward-looking feature similar to the DoD’s scanning activities for ECs. The EPA’s mandated testing and screening program for “endocrine disrupters” is still in the process of formalization. In addition, a series of anticipated challenges are likely to take years to resolve in the legal system before the agency’s statutory authority for regulatory action on pesticides and drinking water contaminants is clarified under the 1996 Food Quality Protection Act and Safe Drinking Water Act amendments. However, a former S.C. Johnson scientist has reported that chemicals that are suspected of being endocrine active are frequently deselected by the company to avoid product stigmatization,⁸ a trend which may grow in industry.

For weapons systems, the DoD may benefit from transparent tools that can be used by decision-makers who, along with expert staff providing professional judgment, are in a position to oversee or make chemical selections. In cases where some compound-specific data is proprietary, the possibility of obtaining access to environmental profile data could be explored with the holder of the technology as long as it protects confidential business information.

5.2.2 Performance and Cost

Not all chemical ranking systems take into account cost or performance, with the notable exception of LM’s HMEL system and the EPA’s DfE Formulator Initiative. For substitutes to be perceived as

viable by weapons program managers within the DoD, alternatives may be expected to meet or exceed performance criteria. The F-35 approach is noteworthy wherein LM contractors had to prove alternatives were technically or economically infeasible to use higher risk alternatives. This shift of the “burden of proof” has sparked innovative uses of lower risk materials and could be a valuable attribute.

The EPA’s DfE approach to alternatives assessment, which looks first at performance requirements and functional uses, might make sense for broader DoD weapons system development and acquisition applications. Lower-risk, alternative chemicals that meet or exceed the performance requirements and cost criteria for particular DoD uses is important, recognizing that life-cycle costs for higher risk chemicals may be significantly larger even if their initial costs are lower than those of an alternative.

In addition, compliance with EO 13423 may mandate closer examination of the energy requirements associated with producing, transporting and disposing of a chemical when making a final chemical selection. All of the requirements articulated in the EO should be balanced in accordance with an integrated ESOH risk management plan.

5.2.3 Applications Beyond Weapons and Maintenance

End users of DoD chemical ranking tools include industrial users involved in ship or aircraft maintenance, but could extend to other units within the DoD involved in food service, housing or other general uses. Although these users are outside the scope of this report, a forward-looking stance that considers broader adoption by other types of military units could result in significant gains given that the majority of exposures to chemicals are associated with applications in facilities, utilities and in other common occupational settings.

The potential problem of small purchases with government purchase cards also merits consideration. It may be possible to have purchase cards include a prohibited list of chemicals that cannot be purchased. This may be a way to track usage of chemicals outside the DLA green purchasing program. As it is currently unknown what types and volumes of chemical products are purchased using this program, prohibiting purchases of a list of chemicals through the purchase card system should remain under consideration until more information is available about potential gains that could be made through policy adjustments in this area.

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6 Recommendations

The following section is focused on strategic recommendations regarding implementation, quality assurance/quality control (QA/QC) and database centralization. The advantages of supporting access to both existing ranking systems and customizing one to meet unique DoD processes and needs are also detailed. Making a suite of tools available so that different users within the DoD can select a system that best suits their needs and priorities is a major finding and recommendation of this report.

Recommendation 1: Establish and support a suite of web-based tools to suit unique DoD users and processes.

Making a broader set of tools available for weapons development and acquisition functions and another set for O&M, would optimize DoD efforts in these arenas. Likewise, design engineers and scientists may find some ranking systems valuable whereas downstream users and implementers may prefer the functions and outputs of other ranking tools (see Figure 6-1). To ensure progress, establishing and supporting a suite of tools is the best way to consolidate current gains and at the same time open pathways for future potential users.

Recommendation 2: Implementing one uniform chemical ranking system DoD-wide is suboptimal.

Advocating for the adoption and implementation of a single, uniform DoD-wide chemical evaluation and substitution system is contraindicated given the gains that are currently being made within the DoD using a variety of systems that fit particular program needs, situations and priorities. Implementing one uniform system DoD-wide could result in undercutting current programs that are adopting lower-risk alternatives in DoD weapons system development, acquisition and O&M. However, although many of these systems and tools are functioning well and making real improvements, existing DoD systems and practices could be made more efficient and cost-effective.

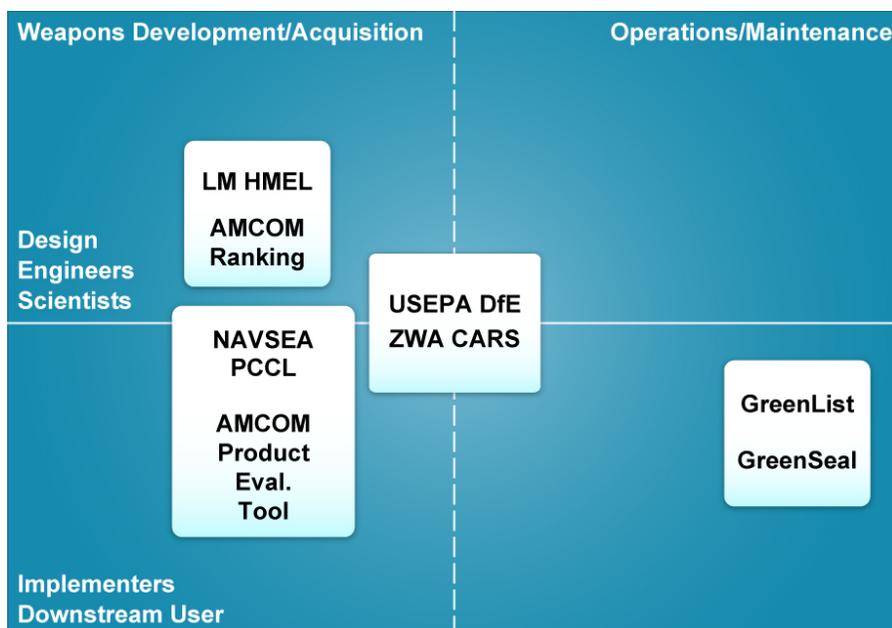


Figure 6-1 Integrated Mapping of Ranking Systems Suited for User Groups and DoD Processes.

Recommendation 3: Focus resources on one database for chemical ranking and substitution that includes ECs and ensure that linkages to other ranking systems are seamless.

In providing and supporting a suite of chemical ranking and substitution system options, focusing resources on one database from which all the chemical evaluation and substitution systems could draw from would introduce a major efficiency. Managers of the databases that support a DoD chemical ranking system will need to keep up with new ECs and communicate them to database users in a structured and periodic manner. Special attention and resources may have to be dedicated to ensuring the database “links up” the different systems seamlessly to ensure ease of use. In this way, all DoD personnel and contractors could rely on the same rankings and options for substitutes when comparative exercises are involved. Pivoting off of one database would also allow system managers and users to focus resources on more frequent and efficient updates. The database could be maintained according to the lead-agent model, where one service is the lead and houses the database.

If a system already has a process in place for “retiring” chemicals from its database, this could be problematic. Changes to regulations of those chemicals could still take the DoD by surprise and lead to inefficiencies in the management of DoD’s environmental legacies. Instituting or ensuring a “once-in, never-out” provision could be a valuable attribute as long as new environmental health data can be incorporated to incentivize new research.

Recommendation 4: Institute a QA/QC process for each selected ranking system and the supporting database.

Of fundamental importance is the QA/QC steps performed on each ranking system and the core database it relies on. Quality reviews to ensure the system's calculations are correct and functioning as intended help ensure real environmental, health and cost-reduction gains.

Third party validation of chemical rankings and system outputs has the potential to be another powerful quality feature, but is only as valuable as the depth of the assessment. As noted above, Green Seal's third party validation is a somewhat simplistic pass/fail exercise whereas the EPA's DfE validation of scientific data sources by NSF International could be considered a more value-added step. Quality is also linked to the communication and management of chemicals covered by a system's database. The use of CAS numbers to ensure accurate nomenclature reduces error rates and poorly organized evaluations.

The ultimate solution may be a web-based directory of chemical ranking and substitution tools for various types of users or purchasers. The allocation of resources for one frequently-updated database that serves as a central repository for the chemical ranking, evaluation and substitution functions will have benefits. For example, proposals for the use of specific chemicals in a given application could be compared on the same set of terms. However, special attention and resources may have to be dedicated to ensuring quality and that the database "links up" the different systems seamlessly to ensure broader adoption. Maintaining a suite of options, instead of using one tool DoD-wide, is important because it allows users identified within this report—and some outside it—to select tools that best suit their needs and situations.

Recommendation 5: Combine currently operating ranking systems with a customized tool to address unique DoD processes.

A web-based directory with some off-the-shelf modules may offer advantages in terms of time-to-implementation, flexibility and the potential to be adopted beyond weapons acquisition and O&M. But including some that are DoD-specific, or customizing some to address the DoD portfolio of chemicals, are likely to be more applicable to chemistries of interest to the DoD and serve unique Department processes and needs more fully. Thus, a combination of existing and customized tools may be indicated for a DoD suite of options.

Recommendation 6: Leverage experience gained by states and other organizations that provide technical assistance in chemical ranking and substitution efforts.

Lessons learned from the implementation of chemical ranking or chemical reduction systems by states should also be used as a model for any future DoD activities. The DoD may benefit from establishing a multi-service technical center to support a suite of systems that is usable by multiple services and types of users. This approach would be similar to existing centers that provide inter-service coordination and technical assistance. Examples of states that use this approach are Massachusetts, which sponsors Toxics Use Reduction Institute (TURI) and Ohio, which utilizes the Small Business Stationary Source Technical and Environmental Compliance Assistance Program. Conversely, the DoD may elect to designate a single service as the lead agent, especially if one Service represents the overwhelming majority of a specific user type.

Decisions about selecting systems for DoD use may benefit from a forward-looking perspective as new innovations that optimize system functions are likely to continue to emerge. DoD

personnel engaged in organizing and contributing to forums where innovations are explored, defined and refined are likely to continue to add value to DoD approaches.

Appendix A Department of Defense Chemical Ranking Systems

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Table A-1. Department of Defense Chemical Ranking Systems by Organization

Title/Program	Description	POC and Website	Notes, if any	Use*
Air Force (AF)				
F-22 Raptor Hazardous materials Program; F-22 DfE	Integrates some Hazardous materials, environmental and health requirements in the F-22 weapon system life cycle. Developed Hazardous materials database to identify and evaluate several Hazardous materials used on the F-22.	POCs: Arline Denny 770.793.0318 arline.denny@lmco.com Jared Scott, F-22 System Program Office, U.S. Air Force Website: www.af.mil/factsheets/factsheet.asp?fsID=199	Under F-22 DfE, used non-chrome, low volatile organic compound (VOC) outer mold line primers and <1% cadmium plated fasteners.	3
Air Force Material Command (AFMC)				
Burden Reduction Based Approach	Exceeded all the "EPA 17" and "AFMC 24" chemical reductions goals in the mid 1990's; AF switched to "burden reduction" based approach to addressing which processes, not specific chemicals, to target for change. Burden is defined as a combination of cost and risk. Risk is a score based on answers to specific science questions. (Costs included in the burden are the ESOH costs of regulatory compliance.)	POC: Marja A. Weaver AFMC/A7CVQ 937.257.8275 Marja.Weaver@wpafb.af.mil Website: www.afmc.af.mil	To be considered for level 1 Air Force pollution prevention environmental 3400 PEC funding, a project has to address a process in upper 50% of installations burden ranking and be estimated to save environmental funds equivalent to environmental project funds expended within five years.	2
Army Aviation and Missile Life Cycle Management Command (AMCOM)				
Hazardous materials Evaluation via Regulatory Impact/ Priority Order Ranking System for Hazardous Product Substitution	Database and ranking system to assist in objectively evaluating products used for maintenance and repair and comparing potential substitutes for these products. Database includes all chemicals identified in § 302, Extremely Hazardous Chemicals and § 313 Toxic Chemicals, identified in the EPCRA List of Lists (current, May 2006).	POC: Kerry Blankenship kerry.blankenship@conus.army.mil Paul Robinson james.p.robinson2@us.army.mil 256-876-6161	Tool available in MS Excel	1
U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM)				
Industrial Chemical Prioritization and Determination of Critical Hazards of Concern	A general ranked chemical list and supporting methodology that assists in prioritizing industrial chemicals relative to their potential risk of harm to deployed military personnel. Also includes other products.	POC: Veronique Hauschild USACHPPM 410.436.5213 John Resta, USACHPPM 410.436.5244 Website: http://chppm-www.apgea.army.mil	Looks at health concerns for soldiers, not procurement. Good example; is very detailed and provides good background.	2
Army Environmental Center (AEC)				
Development Test Command Test Operations Procedure: Environmental Effects Data Collection	Describes a process for collecting environmental effects data from Army weapon systems and material during the developmental test and evaluation process.	AEC Acquisition Branch Website: http://aec.army.mil/usaec	Focus is on testing requirements for acquisition	2

Title/Program	Description	POC and Website	Notes, if any	Use*
Pollution Prevention (P2)	Focuses on conservation of resources, replacement of Hazardous materials with less Hazardous materials, waste reduction, recycling and other preventive means to successfully and cost effectively avoid, prevent, or reduce the generation of pollutants.	Acquisition and Technology Division (IMAE-AT) 410.436.2466 Website: http://aec.army.mil/usaec/support/p200.html		1
Defense Logistics Agency (DLA)				
Green Procurement Program (GPP)	Encourages green purchasing -- purchasing products that have fewer or less severe effects on human health and environment, compared to other similar products. Uses Environmental Attribute Codes (ENACs) established by recognized environmental entities and approved by DLA Joint Group on Environmental Attributes (JGEnvAtt). ENAC codes are assigned to supplies that meet the requirements set by the responsible environmental entity.	POC: Karen Moran Website: www.dlis.dla.mil/green/attributes/standards.asp	ENACs: Asbestos Alternative Products, Energy Efficient Products, Low Standby Power Products, Low VOC Products, Recycled Content Products and Water Conserving Products. ERLS Green Procurement Report available	1
Marine Corps				
Advance Amphibious Assault (AAA) Program/ Expeditionary Fighting Vehicle	Limiting the use of Hazardous materials was emphasized in the production of the Expeditionary Fighting Vehicle, particularly with regard to hexavalent chromium and lead.	Joe Finch, Program Manager, AAA (703) 492-5159 finchjr@efv.usmc.mil Website: http://www.efv.usmc.mil/	The AAA program does not have a documented chemical ranking system.	3
Naval Air Systems Command (NAVAIR)				
Environmental Systems Allocation (ESA)	Tracks actual usage of Hazardous materials (and generation of hazardous waste) across the naval aviation maintenance community down to the squadron level. ESA data provided a breakdown of consumption rates for each product by platform, location, activity, work center and amount.	Eric Friedl Naval Facilities Engineering Service Center (NFESC) Manager ESA database 805.982.3688 eric.friedl@nav.mil Website: www.enviro-navair.navy.mil/data/pdf/factsheets/files/2007/factsheet_esa_2007.pdf	Tool shows where specific chemicals are used in aviation maintenance processes	2
Hazardous materials Authorized Use List [HMAUL] Analysis Tool (HAT)	HAT scans digital documents for information such as military specifications, National Stock Numbers and solvents (by various names) and provides tabular output that lists the page number of each material reference and other pertinent data. Ensures that manuals comply with environmental regulations.	Eric Rasmussen Naval Air Warfare Center Aircraft Division, Lakehurst, NJ, 732.323.7481 eric.rasmussen@navy.mil Website: www.enviro-navair.navy.mil	"Solving the Solvent Puzzle", Currents Spring 2007, for HAT and ESA Info: Ebbie Crockett, NAVAIR, 619-545-2010, elizabeth.crockett@navy.mil	1
F/A-18 Strike Fighter Program; F/A-18E/F Green Hornet Team	Objectives include: eliminating and/or reducing Hazardous materials; identifying material reduction and recycling opportunities; etc.	Mike Rudy F/A-18 Program Office (PMA265) 301.757.7638 michael.rudy@navy.mil Website: www.navy.mil/navydata/fact_display.asp?cid=1100&tid=1200&ct=1	Acquisition-related; See "Green Hornet Team Achieves Environmental Breakthroughs" article in <i>Currents</i> , Spring 2007	3

Title/Program	Description	POC and Website	Notes, if any	Use*
Naval Sea Systems Command (NAVSEA)				
Prohibited and Controlled Chemical List (PCCL)	Targeting Specific Chemicals for Hazardous materials and Pollution Reduction Efforts by prioritizing the EPA List of Lists to develop three tiers: (1) Prohibited, (2) Controlled and (3) COCs. Emphasizes legal mandates, probability of exposure, effects of prolonged exposure, environmental impact, effects on personnel morale, control and management costs and the level of potential liability and negative publicity associated with the Navy's use of such chemicals.	Scott Sirchio, Ph.D. NSWC Carderock Division 301.227.5196 Website: www.enviro-navair.navy.mil/currents/winter2007/Win07_NAVSEA_Chemical_List.pdf		2
Navy				
Virginia Class Submarine - VIRGINIA Class Hazardous materials Map	A new and innovative process for tracking of Hazardous materials: Design/Build Environmental Analyses, that analyze systems and components for life-cycle environmental issues and Material Substitution, which is the replacement of hazardous or non-compliant substances with tested and approved environmentally-preferable products.	Website: www.naval-technology.com/projects/nssn/ ; https://www.denix.osd.mil/denix/Public/News/Federal/CTC00/envpref.html	FY99 Secretary of Defense Environmental Security Award	Tactical/ weapons Systems
Navy, Air Force, Marines				
Joint Strike Fighter	The DfE process for the F-35 has resulted in reductions in Hazardous materials usage from the concept demonstration (competition) phase through system development, production and O&M of the aircraft's life cycle. Banned and restricted Hazardous materials were designed out of the F-35 and its air support system to the maximum extent technically feasible and the remaining materials are controlled through a product data management system. Part of low life-cycle sustaining cost is attained through the DfE process.	POC: Stacey Luker Wyle Labs-JSFPO, 252 444-2009 stacey.luker@jsf.mil Website: www.jsf.mil	The F-35 Joint Strike Fighter - A DfE Product (http://www.meetingsmanagementgroup.com/achmm/lasvegas_2004/Speakers/haro.htm)	Tactical/ weapons Systems
Air Force, Army, Marines, Navy, NASA and DLA				
Joint Service Solvent Substitution Working Group	On-line database to promote exchange of information about environmentally-friendly cleaning products. To promote a coordinated response to solvent issues related to Defense Land Systems and Miscellaneous Equipment National Emission Standards for Hazardous Air Pollutants regulatory requirements.	POCs: Tom Torres, NFESC 805-982-1658 tom.torres@navy.mil ; Wayne Ziegler, ARL 410-306-0746, wziegler@arl.army.mil Website: www.jgpp.com (permission required)		General purpose
American Society for Testing and Materials (ASTM)/Army Research, Development and Engineering Command (RDECOM)				
ASTM Guide for Research, Development, Testing and Evaluation of Munitions (Draft)	"Standard Guide for the Environmental Health Assessment of New Munition Compounds": intended to provide a standardized method to evaluate the potential environmental impacts of prospective candidate energetic materials. These guidelines provide information useful in a relative ranking procedure to provide the munition scientist with a sound basis for prospectively determining the selection of candidates based on environmental health criteria.	POCs: Bill Ruppert wruppert@haifire.com Mark Johnson, USACHPPM mark.s.johnson@us.army.mil Website: www.astm.org	RDT&E; Development sponsored by DoD	Tactical/ weapons Systems

Title/Program	Description	POC and Website	Notes, if any	Use*
Federal Agencies				
Federal Biobased Product Preferred Procurement Program	As part of the Farm Security and Rural Investment Act mandate, the U.S. Department of Agriculture (USDA) was directed to develop and implement a comprehensive program for designating biobased products. USDA has already designated several items as "preferred" and will be adding significantly to that list in the coming months. Many government agencies are now using these products and have found them to have comparable or superior performance to their petroleum counterparts.	POCs: Lois Gschwender Air Force Research Laboratory (AFRL)/MLBT Douglas Chapman 642 AESS Ed Snyder AFRL/MLBT Website: www.biobased.oce.usda.gov/fb4p	Article on impacts to the Air Force in U.S. Air Force Aeronautical Systems Center, Acquisition Environmental, Safety and Health Division, Pollution Prevention Branch (ASC/ENW), "Monitor," Vol 10, No 1, Winter 2007	General purpose

* Current Use refers to one of three categories: 1 = General Purpose 2 = Commercial/Fleet 3 = Tactical/Weapons Systems

Appendix B Non-Department of Defense Chemical Ranking and Labeling Systems

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Table B-1. Government Chemical Ranking and Labeling Systems by Organization

Title/Program	Description	POC and Website	Application
California Department of Toxic Substances Control			
California Green Chemistry Initiative	Initiative to address the following challenges of Green Chemistry: Moving towards a Cradle to Cradle framework Stimulating the Green Chemistry challenge Identifying Toxics in Products by Design Identifying Toxics in Products by Accident	DTSC: Green Chemistry Initiative Green.Chemistry@dtsc.ca.gov . Website: www.dtsc.ca.gov/PollutionPrevention/GreenChemistryInitiative/index.cfm	Pollution prevention
City of Santa Monica, California			
Sustainable City Program/EPP Program	Set goals in Sustainable City Program to protect and enhance environmental health and public health by minimizing and where possible eliminating: <ul style="list-style-type: none"> • The use of hazardous or toxic materials, in particular persistent organic pollutants (POPs) and persistent bioaccumulative and toxic chemicals (PBTs), by residents, businesses and city operations; • The levels of pollutants entering the air, soil and water and • The risks that environmental problems pose to human and ecological health. • Case Study in EPP 	POC: Dean Kubani, Environmental Analyst, 310-458-2227 dean-kubani@ci.santa-monica.ca.us Websites: www.ci.santa-monica.ca.us/environment/policy www.epa.gov/oppt/epp/pubs/santa.pdf?bcsi_scan_AEE9EC396C942F39=0&bcsi_scan_filename=santa.pdf	Procurement
Commonwealth of Massachusetts Department of Environmental Protection (DEP)			
Toxics Use Reduction Act (TURA)	A three-part approach for reduction of toxics (initially focused on Toxics Release Inventory chemicals): <ul style="list-style-type: none"> • Mass DEP - enforcement • Mass TURI - study and trainings • Office of Technical Assistance – on-site assistance for small and medium sized businesses 	Federal Tier II reporting – Elaine Denniston, 508-820-1447 TURA enforcement - Jen D'Urso, 617-292-5688 Toxics Use Reduction Planner certification - Paul Walsh, 617-556-1011 Website: www.mass.gov/dep/toxics	Regulatory-driven
Commonwealth of Massachusetts Operational Services Division			
Environmentally Preferable Products (EPP) Procurement Program	EPPs are competitively priced, high performance products and services that can be obtained from over three dozen statewide contracts. They can render significant savings while reducing the state's impact on the environment and public health.	One Ashburton Place Room 1017 Boston, MA 02108-1552 (617) 720-3300 Fax: (617) 727-4527 Website: www.mass.gov/	Procurement
Eco Mark			
Global EcoLabelling Network (GEN) member	(Japan) (This system is included here for information only and detailed information will not be provided.)	Website: www.ecomark.jp/english/index.html	Labeling
Ecomark Scheme			
GEN member	(India) (This system is included here for information only and detailed information will not be provided.)	Website: envfor.nic.in/cpcb/	Labeling

Title/Program	Description	POC and Website	Application
Environmental Choice			
EcoLogo (Government of Canada) Founding member of the GEN	EcoLogoM is North America's most widely recognized and respected multi-attribute environmental certification mark. By certifying the environmental leaders in over 300 categories of products, EcoLogo helps environmental marketers win customers and helps buyers - both consumer and corporate - find and trust the world's most sustainable products. Example: Anticorrosion chemicals for vehicles - Certain anticorrosion chemicals may contain reduced levels of volatile organic compounds relative to other s. Reducing volatile organic compound (VOC) emissions will improve air quality thus helping to protect the environment and reduce possible adverse health effects. Based on a review of currently available life cycle information, anticorrosion chemicals for vehicles certified under this criteria document will produce an environmental benefit through a reduction in wastes and toxic emissions to the environment.	ecologo@terrachoice.com Website: www.environmentalchoice.com	Labeling
Environmental Choice New Zealand			
GEN Member	(This system is included here for information only and detailed information will not be provided.)	Website: www.enviro-choice.org.nz/	Labeling
Environmental Label of the Republic of Croatia			
GEN Member	(This system is included here for information only and detailed information will not be provided.)	Website: www.mzopu.hr/default.aspx?id=5145	Labeling
Environmental Labeling Program			
GEN Member	(Korea) (This system is included here for information only and detailed information will not be provided.)	Website: www.koeco.or.kr/eng/business/business01_03.asp?search=1_3	Labeling
European Union (EU), European Commission			
Flower Eco Label	The Flower is the symbol of the European Eco-label – your guide to greener products and services. It is a voluntary scheme designed to encourage businesses to market products and services that are kinder to the environment and for European consumers - including public and private purchasers - to easily identify them. Used throughout the European Union as well as in Norway, Liechtenstein and Iceland. The European Eco-label is part of a broader strategy aimed at promoting sustainable consumption and production.	European Commission Environment DG B - 1049 Brussels Belgium Website: ec.europa.eu/environment/ecolabel/index_en.htm	Labeling
Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	REACH, a European Community Regulation on chemicals and their safe use (EC 1907/2006), effective 1 June 2007, requires manufacturers and importers to gather information on the properties of their chemical substances, which will allow their safe handling and to register the information in a central database run by the European Chemicals Agency in Helsinki. The Agency will manage the databases necessary to operate the system, co-ordinate the in-depth evaluation of suspicious chemicals and run a public database in which consumers and professionals can find hazard information. REACH calls for the progressive substitution of the most dangerous chemicals when suitable alternatives have been identified.	European Commission Environment DG Information Centre Office: BU-9 01/11 B - 1049 Brussels Belgium Website: ec.europa.eu/environment/chemicals/reach/reach_intro.htm	Regulatory-driven

Title/Program	Description	POC and Website	Application
Restriction of the Use of Certain Hazardous Substances (RoHS)	Directives 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment is designed to tackle the fast increasing waste stream of electrical and electronic equipment and complements European Union measures on landfill and incineration of waste. In order to prevent the generation of hazardous waste, Directive 2002/95/EC requires the substitution of various heavy metals (lead, mercury, cadmium and hexavalent chromium) and brominated flame retardants (polybrominated biphenyls [PBB] or polybrominated diphenyl ethers [PBDE]) in new electrical and electronic equipment put on the market from 1 July 2006.	European Commission B - 1049 Brussels Belgium Website: ec.europa.eu/environment/waste/weee/index_en.htm	Regulatory-driven
Waste Electrical and Electronic Equipment	Directive 2002/96/EC on waste electrical and electronic equipment is designed to tackle the fast increasing waste stream of electrical and electronic equipment and complements European Union measures on landfill and incineration of waste. Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account. Consumers will be able to return their equipment free of charge.	European Commission B - 1049 Brussels Belgium Website: ec.europa.eu/environment/waste/weee/index_en.htm	Regulatory-driven
Federal Ministry of the Environment, Nature Protection and Nuclear Safety of Germany			
Blue Angel (GEN Member)	The Blue Angel is the first and oldest environment-related label in the world for products and services. Awarded to products and services which are particularly beneficial for the environment in an all-round consideration and which also fulfill high standards of occupational health and safety and fitness for use. Economical use of raw materials, production, usage, service life and disposal – all these factors are assigned a high importance. Products which are awarded the label bear the logo of the Blue Angel directly on the product whereby service companies use it on materials used to offer their services.	Umweltbundesamt (Federal Environmental Agency) Department III 1.3 Post Office Box 1406 06813 Dessau Tel: +49(0)340/2103-3705 Fax: +49(0)340/2104-2207 Website: www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm	Labeling
Green Label Program			
GEN member	(Thailand) (This system is included here for information only and detailed information will not be provided.)	Website: www.tei.or.th/greenlabel/	Labeling
Green Label Scheme			
GEN member	(Hong Kong) (This system is included here for information only and detailed information will not be provided.)	Website: www.greencouncil.org/eng/greenlabel/cert.asp	Labeling
Hong Kong Ecolabel			
GEN member	(This system is included here for information only and detailed information will not be provided.)	Website: www.hkfep.com/En/Eco.asp?L	Labeling
National Institute of Building Sciences: Whole Building Design Guide			
Unified Facilities Guide Specifications/ Unified Facilities Criteria (UFC)	The DoD and the military services have initiated a program to unify all technical criteria and standards pertaining to planning, design, construction and O&M of real property facilities. The objective of the UFC program is to streamline the military criteria system by eliminating duplication of information, increasing reliance on private-sector standards and creating a more efficient criteria development and publishing process. Both technical publications and guide specifications are part of the UFC program. UFC system administered by Headquarters, U.S. Army Corps of Engineers, Naval Facilities Engineering Command (NAVFAC) and Air Force Civil Engineer Support Agency.	Commander, NAVFAC, Capital Improvements, Engineering Criteria and Programs, 6505 Hampton Blvd, Norfolk, VA 23508-1278 (757) 322-4200 carl.kersten@navy.mil Website: www.wbdg.org/references/pa_dod.php	Design standards

Title/Program	Description	POC and Website	Application
National Programme for Labeling Environmentally Friendly Products			
GEN member	(Czech Republic) (This system is included here for information only and detailed information will not be provided.)	Website: www.cenia.cz/	Labeling
New York City (NYC)			
Green or Environmentally Preferable Purchasing	<ul style="list-style-type: none"> • Environmentally Preferable Purchasing: • Reduces costs and improves the workplace environment. • Strengthens markets for recyclable materials, which benefits the City's recycling program. • Promotes use of less-toxic products that protect the health and safety of workers and minimize harmful emissions to air and water. • Saves energy by promoting the purchase of energy-conserving appliances, equipment and fixtures. 	POC: John J. Doherty, Commissioner NYC Department of Sanitation Central Correspondence Unit 346 Broadway, 10th Floor New York, NY 10013. Website: home2.nyc.gov/html/nycwasteless/html/at_agencies/green_purchasing.shtml	Procurement
PlaNYC	PlaNYC: A Greener, Greater New York includes 127 separate initiatives, designed to achieve the following sustainability goals: housing an additional 1 million New Yorkers affordably; increasing access to parks, playgrounds and open spaces; reclaiming brownfields; developing critical backup systems for an aging water network to ensure reliability; providing additional reliable power sources and upgrading existing power plants; reducing water pollution so NYC can open its waterways for recreation and reducing greenhouse gas emissions by 30%.	POC: Amanda M. Burden, Chair, City Planning Commission Director, Department of City Planning 22 Reade Street New York, NY 10007-1216 Tel. 212-720-3300 FAX 212-720-3219 Website: www.nyc.gov/html/planyc2030/html/home/home.shtml	City planning
Nordic Swan			
GEN member	(covering Denmark, Finland, Iceland, Norway and Sweden) (This system is included here for information only and detailed information will not be provided.)	Website: www.svanen.nu/Eng/criteria/	Labeling
Taiwan			
Green Mark Program (GEN member)	Taiwan Green Mark is a Taiwanese eco-label program launched in August 1992 to promote recycling, pollution reduction, resource conservation and guide consumers in purchasing 'green' products.	Website: greenmark.epa.gov.tw/english/criteria.asp	Labeling
The Australian Ecolabel:			
GEN member	(This system is included here for information only and detailed information will not be provided.)	Website: www.aela.org.au/StandardsRegister.htm	Labeling
The Swedish Society for Nature Conservation			
Good Environmental Choice (GEN member)	(This system is included here for information only and detailed information will not be provided.)	Website: www.snf.se/bmv/english.cfm	Labeling

Title/Program	Description	POC and Website	Application
U.S. Office of the Federal Environmental Executive (OFEE)			
	<p>To initiate momentum for adoption of sustainability practices and policies, the OFEE:</p> <ul style="list-style-type: none"> Encourages sustainable practices; Identifies and shares success stories, best practices and other tools to make sustainable practices easier to adopt and maintain; Provides training, awareness and outreach; Assists in coordinating and advancing sustainability policies across agencies; Publicly advocates and supports sustainable practices and policies and Measures and reports on agencies' progress (working with the Office of Management and Budget on the scorecards). <p>Under EO 13423, the Federal Environmental Executive and the OFEE works to provide clear national direction for federal agencies and help track the government's progress towards the goals and requirements of the order.</p>	<p>Tel: (202) 343-9125 E-mail: task_force@ofee.gov</p> <p>Websites: www.ofee.gov/ www.ofee.gov/gp/gplinks.asp</p>	Regulatory-driven
Office of the Federal Environmental Executive <i>Promoting sustainable environmental stewardship throughout the federal government</i>			
Strategic Approach to International Chemicals Management (SAICM)	<p>Adopted by the International Conference on Chemicals Management on 6 February 2006, in Dubai, United Arab Emirates, the SAICM is a policy framework for international action on chemical hazards. SAICM was developed by a multi-stakeholder and multi-sectoral Preparatory Committee and supports the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that, by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health.</p>	<p>MERIT POC: Capt. Brent Gibson, CHPPM</p> <p>Website: www.chem.unep.ch/saicm/</p>	Policy framework
United Nations (UN) Economic Commission for Europe (UNECE)			
Globally Harmonized System (GHS) of Classification and Labeling of Chemicals	<p>The UN adopted the GHS, which includes criteria for the classification of health, physical and environmental hazards, as well as specifying what information should be included on labels of hazardous chemicals as well as safety data sheets. The U.S. was an active participant in the development of the GHS and is a member of the UN bodies established to maintain and coordinate implementation of the system.</p>	<p>UNECE Information Service Palais des Nations CH - 1211 Geneva 10 Switzerland 41 (0) 22 917 12 34 41 (0) 22 917 05 05 info.ece@unece.org</p> <p>Websites: www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html www.osha.gov/SLTC/hazardcommunications/global.html</p>	Labeling
U.S. Environmental Protection Agency (EPA)			
Comprehensive Procurement Guidelines (CPG)	<p>The CPG program is part of the EPA's continuing effort to promote the use of materials recovered from solid waste. Buying recycled-content products ensures that the materials collected in recycling programs will be used again in the manufacture of new products.</p> <p>The CPG program is authorized by Congress under Section 6002 (PDF) (6 pp, 51 K, About PDF) of the RCRA and EO 13101. The EPA is required to designate products that are or can be made with recovered materials and to recommend practices for buying these products. Once a product is designated, procuring agencies are required to purchase it with the highest recovered material content level practicable.</p>	<p>U.S. EPA Office of Solid Waste (5305P) 1200 Pennsylvania Avenue, NW Washington, DC 20460</p> <p>Website: www.epa.gov/epaoswer/non-hw/procure/index.htm</p>	Procurement/regulatory-driven

Title/Program	Description	POC and Website	Application
	<p>The DfE program is one of the EPA's premier partnership programs, working with individual industry sectors to compare and improve the performance and human health and environmental risks and costs of existing and alternative products, processes and practices. DfE partnership projects promote integrating cleaner, cheaper and smarter solutions into everyday business practices.</p> <p>A DfE partnership utilizes one or more of the following approaches:</p> <ul style="list-style-type: none"> • Cleaner Technologies Substitutes Assessment • Integrated Environmental Management System • LCA • Formulator Initiative • Best Shop Practices • Greening the Supply Chain • Other Related Tools 	<p>DfE Office of Pollution Prevention and Toxics (OPPT) U.S. EPA 1200 Pennsylvania Avenue, NW Mail Code 7406-M Washington, DC 20460</p> <p>Website: www.epa.gov/dfe/</p>	<p>Product design</p>
	<p>EPP is a federal-wide program that encourages and assists Executive agencies in the purchasing of environmentally preferable products and services.</p> <p>EO 13423, "Strengthening Federal Environmental, Energy and Transportation Management," requires federal acquisition of recycled content, energy efficient, biobased and environmentally preferable products and services.</p> <p>EPA/General Services Administration (GSA) Cleaning Products Pilot Project: GSA contracted for applicable chemical items in the supply system to have reduced pollutants—items such as: paints, coatings, sealants, cleaners and degreasers. To do this, GSA modified product specifications for these types of items to require the reduction/ elimination of detrimental components.</p>	<p>EPP Program U.S. EPA 1200 Pennsylvania Ave. NW Mail Code 7409-M Washington, DC 20460 epp.pilot@epa.gov</p> <p>Websites: www.epa.gov/oppt/epp/pubs/about/about.htm www.epa.gov/oppt/epp/pubs/cleaner.pdf</p>	<p>Procurement/ regulatory- driven</p>
	<p>Tools of EPA's Green Chemistry Program include the Green Chemistry Expert System, which is comprised of five modules:</p> <ol style="list-style-type: none"> (1) Synthetic Methodology Assessment for Reduction Techniques (SMART): quantifies and categorizes the hazardous substances used in or generated by a chemical reaction, based on information entered by the user. Reactions can be modified in the SMART module and re-evaluated to optimize their green nature. (2) Green Synthetic Reactions: provides technical information on green synthetic methods. (3) Designing Safer Chemicals: includes guidance on how chemical substances can be modified to make them safer; it is organized by chemical class, properties and use. (4) Green Solvents/Reaction Conditions: contains technical information on green alternatives to traditional solvent systems and allows users to search for green substitute solvents based on physicochemical properties. (5) Green Chemistry References: allows the user to obtain additional information using a number of search strategies. The user may also add references to this module. 	<p>Green Chemistry Program Industrial Chemistry Branch U.S. EPA 1200 Pennsylvania Avenue, NW Mail Code 7406M Washington, DC 20460 (202) 564-8740</p> <p>Websites: www.epa.gov/greenchemistry/index.html www.epa.gov/greenchemistry/pubs/tools.html#expert www.epa.gov/gcc/pubs/smart.html</p>	<p>Pollution prevention/ regulatory- driven</p>

Title/Program	Description	POC and Website	Application
Green Engineering OPPT	<p>Green Engineering is the design, commercialization and use of processes and products that are feasible and economical while: (1) Reducing the generation of pollution at the source and (2) Minimizing the risk to human health and the environment.</p> <p>The EPA's OPPT utilizes various tools and methods to determine if the manufacture, processing, use, or disposal of chemical substances may present unreasonable risks to human health or the environment. OPPT also identifies opportunities to minimize chemical hazards and exposures to raw materials, products and wastes by employing alternative technologies and environmentally benign chemicals. Current engineering approaches to pollution prevention appear to emphasize waste minimization rather than the direct impact on human health and the environment.</p>	<p>POC: Sharon Austin Green Engineering Program Coordinator U.S. EPA Chemical Engineering Branch (7406M) 1200 Pennsylvania Avenue, NW Washington, DC 20460 (202) 564-8523 austin.sharon@epa.gov</p> <p>Websites: www.epa.gov/oppt/greenengineering/index.html</p>	Regulatory-driven
Significant New Alternatives Policy (SNAP) Program	<p>The SNAP Program evaluates and regulates substitutes for ozone-depleting chemicals being phased out under the stratospheric ozone protection provisions of the Clean Air Act (CAA).</p> <p>In section 612(c) of the CAA, the Agency is authorized to identify and publish lists of acceptable and unacceptable substitutes for class I or class II ozone-depleting substances. The purpose of the program is to allow a safe, smooth transition away from ozone-depleting compounds by identifying substitutes that offer lower overall risks to human health and the environment. The SNAP program has reviewed substitutes for the following industrial sectors: Refrigeration and Air Conditioning, Foam Blowing Agents, Cleaning Solvents, Fire Suppression and Explosion Protection, Aerosols, Sterilants, Tobacco Expansion, Adhesives, Coatings and Inks</p>	<p>U.S. EPA Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460</p> <p>Websites: www.epa.gov/ozzone/snap/index.html www.epa.gov/ozzone/snap/about.html</p>	Regulatory-driven (EO 13423, Section 2[d] and 2[h]).
ToxCast™ Program Prioritizing Toxicity Testing of Environmental Chemicals	<p>The EPA has identified a clear need to develop methods to evaluate a large number of environmental chemicals (pesticides and others) for their potential toxicity. Doing so will enable the EPA to prioritize the use of its limited testing resources on those chemicals that present the greatest likelihood of risk to human health and the environment.</p> <p>A good way to approach this prioritization is by combining the pharmaceutical industry's experience in the use of state-of-the-art high-throughput screening, toxicogenomics and computational chemistry tools in the search for new drugs with elements specific to environmental toxicology. So, the EPA has begun a new research effort, the ToxCast™ Program for Prioritizing Toxicity Testing of Environmental Chemicals, to develop the ability to forecast toxicity based on bioactivity profiling and, ultimately, to develop methods of prioritizing chemicals for further screening and testing to assist the EPA in the management and regulation of environmental contaminants.</p>	<p>POC: Sandra Roberts 109 T.W. Alexander Drive Research Triangle Park, NC 27709 919-541-3850 roberts.sandra@epa.gov</p> <p>Website: www.epa.gov/ncct/toxcast/</p>	Risk assessment

Table B-2. Industry Chemical Ranking and Labeling Systems by Organization

Title/Program	Description	POC(s), Address and Website(s)	Application
American Chemistry Council (ACC)			
Responsible Care® Management Systems and Certification 	A global chemical industry performance initiative implemented in the U.S. through the ACC. Through the website, America's leading chemical companies are making available performance information. The approach implements management systems, verified through independent auditors; tracking performance through established environment, health, safety and security measures and extends these best practices to business partners through the industry supply chain.	responsible_care@americanchemistry.com Website: www.americanchemistry.com/s_responsiblecare/sec.asp?CID=1298&DID=4841	Regulatory-driven
Apple			
Greener Apple Program 	Apple products met both the spirit and letter of the RoHS restrictions on cadmium, hexavalent chromium and brominated flame retardants years before RoHS went into effect.	Apple 1 Infinite Loop Cupertino, CA 95014 408.996.1010 Website: www.apple.com/hotnews/agreenerapple/	Consumer/regulatory driven
Carpet and Rug Institute (CRI)			
Green Label Program 	The Green Label Plus program certifies products that have been tested for chemical emissions, ensuring that consumers can identify products that are truly low in VOCs. The CRI Green Label Plus Certification is an enhancement to the CRI Green Label, incorporating additional requirements required by California's Collaborative for High Performance Schools for low emitting materials.	CRI P.O. Box 2048 Dalton, Georgia 30722-2048 Barbra Wilson at 706.428.2125 Website: www.carpet-rug.com	Labeling
Design Chain Associates, LLC (DCA)			
Management consulting to Electronics Original Equipment Manufacturers (OEMs)	DCA provides services that help Electronics OEMs increase engineering, procurement and production efficiency, product and operational environmental performance and corporate profitability by focusing on supply base choices made during the earliest stages of the product life-cycle.	POC: Michael Kirschner, President Design Chain Associates, LLC 415.904.8330 Website: www.designchainassociates.com/	Regulatory-driven

Title/Program	Description	POC(s), Address and Website(s)	Application
DNV Certification, Inc. (DNV)			
None	DNV Certification is a division of Det Norske Veritas (DNV), an independent foundation established in 1864 as a ship classification society. As an international certification body, DNV local units have been awarded accreditation for their certification services by various national authorities. DNV professional staff of auditors positioned throughout our network of offices in more than 100 countries helps ensure consistency in our registration approach and certification. For example, DNV assists clients with ISO 14000 certification under which ingredients list requests may be made. See "Dealing with 'Ingredients List' Requests", Environmental Quality Management, Winter 1999	POC: Russell V. Thornton, 281-721-6752, russell.thornton@dnv.com Website: www.dnvcert.com/	Labeling
Dolphin Safe Source			
Green Product Selector™ (GPS)	The GPS is a unique, Dolphin-developed software platform that analyzes maintenance, repair and operations chemical products by indexing their ingredients. Presents chemical inventory by >700 use categories Sorts and presents inventory data by cost and hazard ranking (human and environmental) using complex algorithms (patent pending) Illustrates product details in easy-to-read graphs Allows evaluation of new products versus current products in use Helps track hazard-reduction progress through generating reports by: <ul style="list-style-type: none"> • Product use category, to analyze human and environmental hazards • Approval category, such as approved, pending and banned • Provides relative ranking for simplified decision making 	Corporate Headquarters Dolphin Software Inc. 9 Monroe Parkway, Suite 150 Lake Oswego, OR 97035 Toll Free: 1.800.275.6737 Phone: +1.503.635.6455 Fax: +1.503.635.3824 Website: www.dolphinsafesource.com	Profitability/ value
Ford Motor Company			
Enterprise Materials Management Restricted Substance Management Standard	To manage materials across the vehicle life-cycle, Ford has developed a comprehensive set of processes and system tools called Enterprise Materials Management. These tools include the Global Material Approval Process, which handles all materials processed in Ford's plants and International Materials Data System, developed by seven auto manufacturers in 1997 to handle the tracking, review and reporting of all vehicle components and service parts from all suppliers (www.mdsystem.com). Ford's Restricted Substance Management Standard has spelled out materials to be avoided or eliminated in Ford operations and the parts and materials provided by suppliers. This helps Ford ensure compliance with European regulations that will ban the use of hexavalent chromium and other substances beginning in 2007. Also use tools such as DfE, LCA and life cycle costing to help make beneficial choices.	Ford Motor Company Customer Relationship Center P.O. Box 6248 Dearborn, MI 48126 Telephone 800-392-3673 Website: www.ford.com/en/company/about/sustainability/2005-06/envReviewMaterialsUndesirable.htm	Regulatory driven – directive to eliminate five heavy metals
GlaxoSmithKline (GSK)			
	GSK has developed tools, guidance and methodologies to aid synthetic chemists within the company to select 'greener' solvents. These methodologies have also been made available through the scientific literature. At the same time, GSK has worked on systematically searching, identifying and evaluating potential solvent replacements that would help to minimize the environment, health and safety challenges of known 'problem' solvents from the EHS viewpoint.	POCs: Concepción Jiménez-González, David JC Constable and Richard K. Henderson GSK Research Triangle Park, NC Website: www.gsk.com/responsibility/cr_issues/environment_health_safety.htm	Consumer/ regulatory-driven (REACH)

Title/Program	Description	POC(s), Address and Website(s)	Application
Herman Miller			
Uses DfE	<p>The DfE Team is responsible for developing environmentally sensitive design standards for new and existing Herman Miller products.</p> <p>The MBDC Cradle to Cradle Design Protocol adopted by Herman Miller goes beyond regulatory compliance to thoroughly evaluate new product designs in three key areas, including: Material Chemistry and Safety of Inputs--What chemicals are in the materials the company specifies and are they the safest available?</p>	<p>Washington, D.C., National Design Center 600 14th Street, NW Suite 700 Washington, DC 20005 202 289 0180 DCNDC@hermanmiller.com</p> <p>Website: www.hermanmiller.com/CDA/SSA/Category/0,1564,a10-c609,00.html</p>	
Hewlett Packard (HP)			
Uses DfE; Blue Angel, Electronic Product Environmental Assessment Tool (EPEAT), Environmental Choice Program, etc.	<p>HP's DfE guidelines recommend that its product designers consider the following:</p> <ul style="list-style-type: none"> • Place environmental stewards on every design team to identify design changes that may reduce environmental impact throughout the product's life cycle. • Eliminate the use of PBB and PBDE flame-retardants where applicable. • Reduce the number and types of materials used and standardize on the types of plastic resins used. • Use molded-in colors and finishes instead of paint, coatings or plating whenever possible. <p>Replace or eliminate substances of concern due to customer requirements (including criteria for eco-labels valued by our customers), legislative requirements or because HP believes it is otherwise appropriate. HP also supports a precautionary approach – and strives to replace a material when scientific data has established a potential health or environmental risk, even if its use is legally permitted. Before substituting a material for these reasons, HP identifies an alternative with lower environmental impacts that meets quality and cost requirements.</p>	<p>HP Company 3000 Hanover Street Palo Alto, CA 94304-1185 USA 800-752-0900</p> <p>Website: www.hp.com/hpinfo/globalcitizenship/environment/productdesign/design.html</p>	Consumer / regulatory driven (RoHS and Japan J-Moss)
IBM			
Product Stewardship program	<p>Established in 1991, IBM's Product Stewardship program has brought about industry-leading practices in DfE, product environmental metrics and product recycling. Its objectives are to:</p> <p>Develop products that minimize resource use and environmental impacts through selection of environmentally preferred materials and finishes.</p>	<p>IBM Corporation 1 New Orchard Road Armonk, New York 10504-1722 1-800-IBM-4YOU</p> <p>Website: www.ibm.com/ibm/environment/products/ www.ibm.com/ibm/environment/products/materials.shtml</p>	Consumer / Regulatory-driven
Intel			
Eco-Technology Innovation	45nm Hi-k microprocessors due to begin production in H2 2007, Intel processors will be 100 percent lead-free.	<p>2200 Mission College Blvd. Santa Clara, CA 95054-1549 (408) 765-8080</p> <p>Website: www.intel.com/technology/index3.htm?iid=technology_lhn+eco-technology</p>	Consumer / Regulatory-driven

Title/Program	Description	POC(s), Address and Website(s)	Application
International Materials Data System			
	<p>Developed by seven auto manufacturers in 1997 to handle the tracking, review and reporting of all vehicle components and service parts from all suppliers. IMDS now has 16 automotive companies as official members. IMDS is a web-based system used internationally by suppliers to report on the materials contained in parts for our vehicles. To align reporting requirements for restricted substances and analyze the data provided. Helps manufacturers identify materials of concern, such as hexavalent chromium and target them for elimination</p>	<p>972-403-3607 imds-eds-helpdesk-nao@eds.com Website: www.mdsystem.com</p>	Regulatory-driven
Kaiser Permanente (KP)			
<p>Environmentally Responsible Purchasing</p>	<p>KP incorporates environmental considerations into targeted national contracts, including:</p> <ul style="list-style-type: none"> • Reducing the toxicity and volume of waste • Increasing post-consumer recycled content • Selecting reusable and durable products • Eliminating mercury content • Selecting products free from polyvinyl chloride (PVC) and di-2-ethylhexyl phthalate (DEHP) <p>Recent successes include replacing three DEHP-containing medical products in the neonatal intensive care units with alternatives, ensuring the continued elimination of mercury containing medical equipment from standards and negotiating a national recycling contract. KP purchasing standards include 30% post-consumer content office paper and mercury-free and latex-free products.</p>	<p>Beverly Hayon KP Phone: (510) 271-5953 E-mail: Beverly.Hayon@kp.org xnet.kp.org/newscenter/index.html Website: www.greenbiz.com/news/news_third.cfm?NewsID=24512</p>	Regulatory/ Value-driven
McDonough Braungart Design Chemistry (MBDC)			
<p>Cradle to Cradle Certification</p> <p>Cradle to Cradle Design Protocol</p> 	<p>Cradle to Cradle Certification means using environmentally safe and healthy materials; design for material reutilization, such as recycling or composting; the use of renewable energy and energy efficiency; efficient use of water and maximum water quality associated with production and instituting strategies for social responsibility. If a candidate product achieves the necessary criteria, it is certified as a Silver, Gold or Platinum product or as a Technical/Biological Nutrient (available for homogeneous materials or less complex products) and can be branded as Cradle to Cradle.</p> <p>To assist companies in (re)designing eco-effective products, MBDC uses the Cradle to Cradle Design Protocol to assess materials used in products and production processes. Materials in products are first inventoried and then evaluated according to their characteristics within the desired application and placed into one of four categories (Green, Yellow, Orange, or Red) based on human health and environmental relevance criteria. After all chemicals are assessed, the materials in a product application are optimized by positively selecting replacements for chemicals characterized as Red and using Green chemicals as they are available.</p>	<p>1001 E Market Street, Suite 101, Charlottesville, VA 22902 phone 434.295.1111 fax 434.295.1500 certification@mbdc.com Website: www.mbdc.com/ www.mbdc.com/c2c_mbdp.htm</p>	Green chemistry/design
Nike			
<p>Nike Environmental Action Team (N.E.A.T.)</p>	<p>Nike is working with MBDC to develop Positive Lists™ of materials and process chemicals that eliminate commonly used substances known or suspected of being harmful to human and/or ecological systems. The ultimate goal is MBDC's cradle-to-cradle approach that will allow Nike customers to know their products are returning to natural cycles safely, or to industrial cycles perpetually.</p>	<p>One Bowerman Drive Beaverton, OR 97005-6453 1-800-344-6453 Website: http://www.nike.com/nikebiz/investors/reporting_sec/ar_old/respons.html</p>	Design-driven

Title/Program	Description	POC(s), Address and Website(s)	Application
Omron (US\$5.5 billion + global leader in sensing and control components with over 25,000 employees in 35 countries)			
Green Omron 21	Creating Eco-products and minimizing the use of hazardous substances: Omron's goal is to make a proactive contribution to reducing the harm caused by our societal system to the environment through the creation of environmentally sound products. At the same time, Omron has been committed to eliminating hazardous chemical substances from its products, having successfully conformed to the European RoHS Directive even before its enforcement in July 2006.	Omron Management Center of America, Inc. (OMCA) 1 East Commerce Dr Schaumburg, IL 60173 TEL:1-847-884-0322 FAX:1-847-884-1866 Website: www.omron.com/corporate/csr/environ/04_chemicals.html	Regulatory-driven (RoHS)
Pfizer			
Green Chemistry Program	Performance – Applying Green Chemistry to Enhance EHS Profile: Avoided 5 million gallons of solvent per year and more than 150 tons of the nickel catalyst in the manufacture of Lyrica®, a drug that treats neuropathic pain associated with diabetes or shingles, using a third-generation synthesis of the product. Designed away 25,000 tons of waste per year in the manufacture of Vfend®, an antifungal medication, through a green chemistry modification in the manufacturing process. The synthesis utilizes two highly innovative types of chemistry; an ultra-efficient synthesis of a key intermediate and the development of a novel, highly selective coupling reaction. This chemistry was among the finalists in the 2006 for the Crystal Faraday Award. Developed a solvent guide for the selection of environmentally-friendly solvents which is being used by chemists and engineers throughout the organization.	Pfizer Inc 235 East 42nd Street New York, NY 10017 1-212-733-2323 Website: www.pfizer.com/responsibility/green_product_manufacturing.jsp	Profitability/value
S.C. Johnson			
Greenlist™ (classification/ranking system) 	Through Greenlist™, a patent-applied-for process, S.C. Johnson is using internationally recognized information sources such as the ECOTOX database to classify all the ingredients that go into its products according to their impact on the environment and human health. Each is evaluated as part of the Greenlist™ process and given a ranking of 3 for "Best", 2 for "Better", 1 for "Acceptable" and 0 for "Restricted Use Material." These are utilized to compute cumulative scores that managers are challenged to increase each year. The company is currently conducting initial screenings for the six material categories that constitute 80% of what is bought and sold: surfactants (detergents), solvents, propellants, insecticides, resins and packaging. According to the EPA's OPPT, SC Johnson is among the first companies to establish a classification system like Greenlist™.	SC Johnson 1525 Howe Street Racine, Wisconsin 53403-5011 1.800.494.4855 Website: www.scjohnson.com/community/greenlist.asp	Product/packaging formulation
Scientific Certification Systems (SCS)			
Certification/Standards 	SCS is a leading third-party provider of certification, auditing and testing services and standards. Its goal is to recognize the highest levels of performance in food safety and quality, environmental protection and social responsibility in the private and public sectors and to stimulate continuous improvement in sustainable development. SCS offers a certification program for EPPs and services. The program is based upon EO 13101 and the EPA's "Final Guidance on Environmentally Preferable Purchasing for Executive Agencies"	Manufacturing (Environmental Claims Program), Sustainable Choice (Carpet & Rug Industry), Material Content: Ed Wyatt 510-452-8032 EPP, Indoor Air Quality Stowe Hartridge-Beam 510-452-8009 Website: www.scs-certified.com/ www.scs-certified.com/epp/	Labeling

Title/Program	Description	POC(s), Address and Website(s)	Application
Service Master			
	Cleaning products; greening products (formulated elsewhere) ServiceMaster Clean is the only cleaning company whose products are certified by three different leading auditors: Envirodesic™, Environmental Choice and Green Seal.	ServiceMaster Clean (Headquarters): 860 Ridge Lake Blvd. Memphis, TN 38120-9417 Website: www.gogreenwithclean.com/ www.servicemasterclean.com/index2.html	Cleaning
Shaw Carpets			
EcoSolution Q® and EcoWorx™	Shaw Industries, Inc. has worked with MBDC from July 2002 to the present on two breakthrough product solutions: EcoSolution Q® fiber and EcoWorx™ backing system. By analyzing its supply chain and all material components down to 100ppm (parts per million) and by making chemical and material substitutions to formulations based on MBDC assessment results, Shaw has been able to ensure that EcoSolution Q® and EcoWorx™ are safe and healthy for humans and the environment. MBDC is currently verifying Shaw's claims regarding the amount of recycled content used in our products.	Shaw Industries, Inc. P.O. Drawer 2128 616 E. Walnut Ave Dalton, GA 30722-2128 Information Center Mail Drop 072-53 1-800-441-7429 Website: www.shawgreenedge.com/home.html www.shawgreenedge.com/	Product formulation/design
Small & Rubin Ltd.			
The ENVIRODESIC™ Certification Program 	Envirodesic™ Certification identifies a growing family of cleaner products, healthier buildings and expert services that promote "Maximum Indoor Air Quality™" and sustainability. The Envirodesic™ certification mark is licensed to qualified builders, manufacturers and service-providers whose buildings, products and services meet stringent standards for healthy indoor environments. The Envirodesic team also helps manufacturers develop products which are ecologically sustainable.	POC: Howard Rubin President, Small & Rubin Ltd. and Envirodesic™ Certification Program Toronto Office, 52 Robert Hicks Drive Toronto, Ontario Canada M2R 3R4 Tel: (416)-650-1567 Fax: (416)-650-1565 enquire@envirodesic.com Website: www.envirodesic.com/	Labeling
Sony			
Green Management 2010	Green Management 2010 provides new mid-term group environmental targets that will run through fiscal 2010 and that will guide the Sony Group in its efforts to help prevent global warming, recycle resources, ensure appropriate management of chemical substances and address a broad range of other complex environmental issues. Individual Targets of Green Management 2010 include: Management of chemical substances; Prohibit, reduce or control use of controlled chemical substances and Reduce use of PVCs and brominated flame retardants. LCA Conduct life cycle assessments for all major products	Corporate Social Responsibility Department Sony Corporation 1-7-1 Konan Minato-ku, Tokyo 108-0075 TEL: +81-3-6748-2111 Website: www.sony.net/SonyInfo/Environment/activities/green10/index.html	Regulatory/design
Synthetic Organic Chemical Manufacturers Association (SOCMA) Sustainability Center			
International Center for Sustainable Chemistry	Core functions of the center include: (1) Providing technical advice on risk-screening models and methods; (2) Delivering customized product stewardship programs and training featuring easy-to-use models and approaches; (3) Developing and evaluating approaches to judge what makes one particular chemical "greener" than other; (4) Convening stakeholder groups to address emerging chemical issues and (5) Serving as a bridge between commercial chemistry and the academic green chemistry community.	Gregory Minchak, Manager, PR and Communications, 202-721-4182, minchakg@socma.org Website: www.socma.com/PDFfiles/NewsReleases/Intl_Center_for_Sustainable_Chem.pdf	Product formulation

Title/Program	Description	POC(s), Address and Website(s)	Application
WalMart			
Sustainable Products/ Preferred Chemical Principles	An initiative to encourage innovation in new product formulations that will be better for customers and the environment. Priority chemicals are addressed in three stages: (1) Awareness where participating suppliers will be given a period to identify for Wal-Mart any of their products that currently use one of the priority chemicals as ingredients; (2) Development of an action plan—where suppliers communicate to Wal-Mart their plans regarding priority chemicals in their products and (3) Recognition and Reward—where Wal-Mart acknowledges the suppliers who participate in this effort.	Wal-Mart Stores, Inc. Bentonville, AR 72716-8611 1-800-WAL-MART (1-800-925-6278). www.walmartstores.com/GlobalWMMStoresWeb/navigate.do?catg=356	Product formulation

Table B-3. Non-Profit Chemical Ranking and Labeling Systems by Organization

Title/Program	Description	POC(s), Address and Website(s)	Application
American National Standards Institute (ANSI)			
EPP	The ANSI, in conjunction with the EPA, has developed a presentation to introduce all ANSI-Accredited Standards Developers to the topic of EPP. A primary objective of this exercise is to assist the EPA in achieving its agency mission, which is to protect human health and to safe guard the natural environment; thus ANSI does not actually develop standards or programs but facilitates other developers. Although ANSI itself does not develop American National Standards, it provides all interested U.S. parties with a neutral venue to come together and work towards common agreements.	POC: Stacey Leistner; sleistne@ansi.org Websites: www.ansi.org/ www.ansi.org/government_affairs/laws_policies/epp.aspx?menuid=6	Labeling procurement requirements
Clean Production Action (CPA)			
The Green Screen for Safer Chemicals	The Green Screen for Safer Chemicals is a hazard-based screening method that is designed to inform decision-making by businesses, governments and individuals concerned with the risks posed by chemicals and to advance the development of green chemistry. The Green Screen defines four benchmarks on the path to safer chemicals, with each benchmark defining a progressively safer chemical: Benchmark 1—"Avoid - Chemical of High Concern"; Benchmark 2—"Use but Search for Safer Substitutes"; Benchmark 3—"Use but Still Opportunity for Improvement" and Benchmark 4—"Prefer - Safer Chemical." Each benchmark includes a set of hazard criteria—including persistence, bioaccumulation, ecotoxicity, carcinogenicity and reproductive toxicity—that a chemical, along with its known and predicted breakdown products and metabolites, must pass.	POC: Mark Rossi, CPA, Research Director, Medford, MA and Lauren Heine, Lauren Heine Group, LLC, Bellingham, WA. CPA (Research) 122 Woburn Street Medford, MA USA 02155 Tel: +1 781 391 6743 mark@cleanproduction.org Website: www.cleanproduction.org/	Product formulation/design
Earthster.org			
LCA tool EPP	A purchasing prioritization tool based on LCA principles, developed on a commercial software platform developed by Lumina Decision Systems, called Analytica. Users can run the tool using the demonstration version of Analytica, which is free and yet allows full analysis capability with the tool. Advanced users can pay for a version of Analytica that allows them to add features and data to the tool. The user decides how they will use the tool: to find the most important purchases for reducing impacts; or to compare two different purchasing scenarios—shifting transportation from truck to rail, for example. Figure 1 shows a window within the tool. Data can be entered according to the user's commodity list or according to another standard (BEA[1] or NIGP[2]). The user specifies only the dollars spent per commodity, allowing analysis of the company, a product line, or a specific product.	POC: Gregory Norris, Sylvatica gnorris@sylvatica.com Website: www.Earthster.org	Purchasing

Title/Program	Description	POC(s), Address and Website(s)	Application
Environmental Defense/DuPont			
Nano Risk Framework	<p>Environmental Defense and DuPont announced the public launch of the Nano Risk Framework, a new tool for evaluating and addressing the potential risks of nanoscale materials. The Framework helps you:</p> <ol style="list-style-type: none"> 1) Organize and evaluate what you already know 2) Assess, prioritize and address data needs 3) Communicate clearly how you are mitigating risks 	<p>POCs: John Balbus, M.D., M.P.H.; Richard Denison, Ph.D.; Karen L. Florini, J.D.; Gwen Ruta, M.P.A.: Scott Walsh, M.B.A.: Environmental Defense 1875 Connecticut Ave., NW Washington, DC 20009 (202) 387-3500 Fax: (202) 234-6049 Website: www.nanoriskframework.com</p>	Decision framework
Global EcoLabeling Network			
	<p>A non-profit association of third-party, environmental performance labeling organizations founded in 1994 to improve, promote and develop the "ecolabeling" of products and services.</p>	<p>TerraChoice Environmental Services Inc. 1280 Old Innes Road Suite 801 Ottawa, ON K1B 5M7 Canada Tel. 1-613-247-1900 Fax. 1-613-247-2228 E-mail. gensecretariat@terrachoice.ca Website: www.gen.gr.jp/</p>	Labeling
Green Blue			
<p>CleanGredients database</p> 	<p>Development of technical tools and approaches that help organizations integrate Green Chemistry and Engineering into their product and process design and development activities, thus eliminating toxics and the concept of waste and moving toward economic, environmental and community sustainability.</p> <p>Green Formulation Initiative for Industrial and Institutional Cleaning Products, a multi-stakeholder effort to develop a database of information on cleaning product ingredients that will support environmentally preferable product formulation.</p>	<p>POC: Lauren Heine, Ph.D. Director of Applied Science GreenBlue 600 East Water Street, Suite C Charlottesville, VA 22901 Tel: 434.817.1424 Fax: 434.817.1425 Websites: www.cleangredients.org/; www.greenblue.org</p>	Product formulation tool, also for consumers
Green Electronics Council of the International Sustainable Development Foundation			
EPEAT	<p>EPEAT is a system to help purchasers in the public and private sectors evaluate, compare and select desktop computers, notebooks and monitors based on their environmental attributes. EPEAT also provides a clear and consistent set of performance criteria for the design of products and provides an opportunity for manufacturers to secure market recognition for efforts to reduce the environmental impact of its products.</p> <p>EPEAT evaluates electronic products according to three tiers of environmental performance – Bronze, Silver and Gold. There are 51 total environmental criteria in IEEE 1680: 23 required criteria and 28 optional criteria. The required and optional criteria are identified in the table, below. To qualify for registration as an EPEAT product, the product must conform to all the required criteria.</p>	<p>POC: Scot Case, EPEAT Program - Customer Services and Relations Manager Green Electronics Council One World Trade Center 121 SW Salmon Street, Suite 210 Portland, Oregon 97204 503-279-9383 Websites: www.epeat.net/ www.greenelectronicscouncil.org/</p>	Product design

Title/Program	Description	POC(s), Address and Website(s)	Application
Green Seal			
Standards and Certifications (GEN member) 	Product evaluations are conducted using a life-cycle approach to ensure that all significant environmental impacts of a product are considered, from raw materials extraction through manufacturing to use and disposal. Wherever possible, Green Seal standards cite international test methods for evaluating product performance or environmental attributes such as toxicity and its procedures conform to international standards for ecolabeling. In developing environmental standards and certifying products, Green Seal follows the Guiding Principles and Procedures for Type I Environmental Labeling adopted by the International Organization for Standardization (ISO 14024).	Green Seal 1001 Connecticut Avenue, NW Suite 827 Washington, DC 20036-5525 Phone: 202-872-6400 Fax: 202-872-4324 green Seal@green Seal.org Website: www.green Seal.org/	Labeling
Health Care Without Harm (HCWH)			
Campaign for Environmentally Responsible Health Care	HCWH is an international coalition of over 460 organizations in more than 50 countries, working to transform the health care sector so it is no longer a source of harm to people and the environment. includes KP, Catholic Health Care West, Consortia Group; represents 37% of all purchases of chemical products in U.S. in 2002 (<i>in California Policy Research Center paper</i>)	POC: Stacey Malkan, Director of U.S. and Canadian Outreach Website: www.noharm.org	Procurement; outreach
HMIS			
Hazardous materials Information System (HMIS) [®]	Similar to NFPA 704. This system uses blue, red, orange and white horizontal bars for the health, flammability, physical hazards and special hazard categories. The label identifies general Health, Flammability and Physical Hazards, using color-coded fields, as well as recommendations for personal protective equipment. Icons then show the specific type of Health, Physical Hazard, or PPE; i.e., the specific target organ affected or that the noted physical hazard is explosive and that the PPE combination of choice consists of a splash shield, protective gloves and a synthetic apron. HMIS [®] III provides more information about a chemical's physical hazard(s). The specific physical hazards that the Hazard Communication Standard addresses are flammability, compressed gases, explosives, organic peroxides, oxidizers, pyrophorics, unstable-reactive and water-reactive chemicals. The new HMIS [®] III not only specifically incorporates each hazard, with specific criteria to evaluate the degree of hazard, but permits employers to identify the hazard present with an icon or symbol.	National Paint and Coatings Association (NPCA) 1500 Rhode Island Ave., NW Washington, DC 20005 (202) 462-6272 Fax: (202) 462-8549 Members e-Mail: members@paint.org Non-members e-Mail: npcapaint.org Website: www.paint.org	Communication (easiest and most readily available system)
IT Eco Declaration (formerly NITO)			
	IT Eco Declaration (formerly NITO) is a voluntary standard certifying that information technology and telecom products meet legal and some customer requirements in Denmark, Norway and Sweden. Includes information on the environmental practices of the manufacturers as well as product features, such as environmentally conscious design, batteries, acoustic noise, electrical safety, energy consumption, chemical emissions, substances and materials included and packaging.	IT-Foretagen, Box 16105, SE-103 22 Stockholm, Sweden +46 8 762 70 50 Website: www.itecodeclaration.org	Labeling - regulatory and voluntary

Title/Program	Description	POC(s), Address and Website(s)	Application
Japan Electronics and Information Technology Industries Association (JEITA)			
Japan PC Green Label	<p>Advances technical standardization and technological development by promoting the standardization activities of the International Electrotechnical Commission and ISO; cooperating in formation of Japan Industrial Standards; establishing JEITA standards.</p> <p>Japan PC Green Label indicates that the product and product manufacturer meet general and specific environmental product design and manufacturing, recycling and reuse criteria.</p>	<p>Communications Group, Policy and Strategy Department, JEITA E-Mail: comm@jeita.or.jp Website: www.jeita.or.jp/english/</p>	Standards promotion and development
Korea Eco-Products Institute (KOECO)			
Korea Eco-Label	Korea Eco-Label indicates that a product meets conservation of resources and pollution prevention criteria.	<p>613-2, Bulgwang-dong, Eunpyeong-gu, Seoul, 122-706, Korea Tel : +82-2-2085-0000 Fax : +82-2-2085-0001-4 E-mail: sgkang@koeco.or.kr Website: http://www.koeco.or.kr/eng/business/business01_01.asp?search=1_1</p>	Labeling
Lowell Center for Sustainable Production University of Massachusetts Lowell			
Alternatives Assessment Framework	<p>Comparative or Design Assessment Processes for comparing existing alternatives or new technologies involve six steps:</p> <ol style="list-style-type: none"> (1) Identify targets for action (2) characterize and prioritize end uses (3) identify alternatives (4) evaluate and compare alternatives (5) select preferred alternative(s) (6) review selection 	<p>University of Massachusetts Lowell One University Ave. Lowell, MA 01854 978-934-2980 fax: 978-934-2025 email: lcsp@uml.edu Website: www.sustainableproduction.org</p>	Product formulation/design
Lowell Center for Sustainable Production University of Massachusetts Lowell			
<p>Chemicals Policy Initiative</p> <p>Green Chemistry and Commerce Council (GC3)</p> 	<p>The mission of GC3 is to promote and support green chemistry and DfE research, practices and purchases nationally among states, federal agencies and other companies by:</p> <ul style="list-style-type: none"> • Implementing Green Chemistry, Green Engineering and DfE throughout supply chains and by sharing strategies to overcome barriers; • Promoting education and information on safer chemicals and products that can increase demand by a broad range of consumers and • Identifying existing and needed information on toxics hazards, risks, exposures and safer alternatives to promote "Green Chemistry" as defined in the 12 Principles of Green Chemistry. 	<p>Lowell Center for Sustainable Production University of Massachusetts Lowell One University Ave. Lowell, MA 01854 Fax: (978) 934-2025 Website: www.chemicalspolicy.org/downloads/GC3factsheet022707.pdf</p>	Information exchange
New American Dream			
Responsible Purchasing Program Institutional Purchasing program	Responsible purchasing , including low toxicity, low VOC, chlorine free, PBT-free attributes.	<p>POC: Center for a New American Dream 6930 Carroll Avenue, Suite 900 Takoma Park, MD 20912 301 891-3683 Websites: www.newdream.org www.newdream.org/procure/resourcesprint.html</p>	Purchasing

Title/Program	Description	POC(s), Address and Website(s)	Application
NFPA			
National Fire Protection Association (NFPA)	The NFPA 704 system provides a readily recognized, easily understood system for identifying specific hazards and their severity using spatial, visual and numerical methods to describe in simple terms the relative hazards of a material. It addresses the health, flammability, instability and related hazards that may be presented as short-term, acute exposures that are most likely to occur as a result of fire, spill, or similar emergency. Originally conceived to safeguard lives of those individuals who may be called upon to remedy a hazardous emergency situation where the location or storage of fire hazards may not be readily apparent. Objectives: To provide an appropriate signal or alert to the type of hazards present.	Website: www.nfpa.org	Safety
Pollution Prevention Resource Exchange (P2Rx™)			
	P2Rx™ is a consortium of eight regional pollution prevention information centers, funded in part through grants from the EPA. These centers all provide pollution prevention information, networking opportunities and other services to States, local governments and technical assistance providers in their region.	POC: Andy Bray, P2Rx™ Program Manager 129 Portland St., Suite 602 Boston, MA 02114-2014 617-367-8558 #306 Fax: 617-367-0449 abray@newmoa.org Website: www.p2rx.org/	Information exchange
Scorecard			
The Pollution Information Site	A popular, free web resource for information about pollution problems and toxic chemicals that can be analyzed by zip code, chemical type and risk. Originally developed by non-profit group Environmental Defense.	Green Media Toolshed 1212 New York Avenue Suite 300 Washington DC 20005 (202) 464-5350 Website: www.scorecard.org/	Information exchange
Singapore Green Labeling Scheme			
GEN member	(This system is included here for information only and detailed information will not be provided.)	Website: www.sec.org.sg/greenlabel_htm/	Labeling
TCO Development (Tjänstemännens Centralorganisation, or the Swedish Confederation of Professional Employees)			
TCO Development and TCO's labeling program for office equipment (GEN Member)	TCO Development is a third party certification organization and offers product labels in notebook and desktop computers, computer displays and other business IT products. All products certified by TCO meet world leading standards for: <ul style="list-style-type: none"> • Minimal use of Hazardous materials – lead, cadmium, mercury and hexavalent chromium • Manufacturer environmental certification • Reduced emission of brominated and chlorinated flame-retardants and heavy metals into the environment • RoHS compliant and beyond – some TCO requirements are even stricter than RoHS. 	PO Box 1530 Sherwood, OR 97140 Phone +1-310-801 8769 Fax +1-503-925 1365 info.us@tco.se Website: www.tcodevelopment.se/	Labeling

Title/Program	Description	POC(s), Address and Website(s)	Application
The Natural Step			
Natural Step 	The Natural Step uses a science-based framework to help organizations, individuals and communities move toward sustainability. Focused on influence personal lifestyle choices. Since 1988, The Natural Step has worked to accelerate global sustainability by guiding companies, communities and governments onto an ecologically, socially and economically sustainable path. More than 70 people in eleven countries work with an international network of sustainability experts, scientists, universities and businesses to create solutions, innovative models and tools that will lead the transition to a sustainable future.	The Natural Step. Det Naturliga Steget, Garvargatan 9c, 112 21 STOCKHOLM. +46-8-789 29 00 Oregon Natural Step Network 720 SW Washington St, Suite 800 Portland, OR 97205 (503) 241-1140 Website: www.naturalstep.org/com/nyStart/	Decision-making framework
U.S. Green Building Council (USGBC)			
Leadership in Energy and Environmental Design (LEED®) Green Building Ranking System™ 	LEED is a voluntary, consensus-based national ranking system for developing high-performance, sustainable buildings. USGBC's members, representing every sector of the building industry, developed and continue to refine LEED. LEED addresses all building types including new construction, commercial interiors, core & shell, O&M, homes, neighborhoods and specific applications such as retail, multiple buildings/campuses, schools, healthcare, laboratories and lodging.	USGBC 1800 Massachusetts Ave, NW, Suite 300 Washington, DC 20036 info@greenbuildexpo.org 1-800-795-1747 Website: http://www.usgbc.org/	Building design
Zero Waste Alliance (ZWA)			
Chemical Assessment And Ranking System (CARS) 	The CARS is a decision support tool. It relies on a broad, credible database of chemical hazard-related information—in conjunction with information on how an organization uses chemical products—to assess and rank chemicals and to set goals for substituting or eliminating problematic materials. The database includes publicly available and well-documented information on the potential chemical hazards related to human health and safety, ecological health and ecosystem-wide impacts. The CARS system provides a framework for assessing chemicals and setting goals for substitution or elimination of problematic materials or processes. CARS identifies hazard and other information, but it is not a risk assessment tool. To date, the application of CARS has resulted in decisions to eliminate a number of Hazardous materials in products and processes—at a wastewater treatment plant, at the Oregon State printing facility in Multnomah County and at manufacturing businesses.	Pamela Brody-Heine, Program Manager pbrodyheine@zerowaste.org or Larry Chalfan, Executive Director lchalfan@zerowaste.org ZWA 121 SW Salmon St, Suite 210 Portland, OR 97212 Tel: 503-279-9383 Fax: 503-279-9381 Website: www.zerowaste.org/cars/index.html	Product design

List of Acronyms

AFIOH	Air Force Institute for Operational Health
AMCOM	Aviation and Missile Life-cycle Management Command (Army)
CARS	Chemical Assessment and Ranking System
CAS	Chemical Abstract Service
COC	Chemical of concern
CPA	Clean Production Action
DfE	Design for the Environment
DLA	Defense Logistics Agency
DoD	Department of Defense
EC	Emerging contaminants
ECD	Emerging Contaminants Directorate
EDC	Endocrine disrupting chemical
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
ESOH	Environmental safety, occupational health
GPRA	Government Performance and Results Act
Hazardous materials	Hazardous Material
HMEL	Hazardous Materials Elimination List
HMMP	Hazardous Materials Management Program
LCA	Life Cycle Assessment
LM	Lockheed Martin
MBDC	McDonough Braungart Design Chemistry, LLC
MERIT	Materials of Emerging Regulatory Interest Team
NAVSEA	Naval Sea Systems Command
O&M	Operations and maintenance
OADUSD(ESOH)	Office of the Assistant Deputy Under Secretary of Defense for Environment, Safety and Occupational Health
PART	Program Assessment Rating Tool
PCCL	Prohibited and Controlled Chemicals List
QA/QC	Quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
TURI	Toxics Use Reduction Institute
ZWA	Zero Waste Alliance

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Endnotes

- ¹ Office of the Federal Environmental Executive http://ofee.gov/eo/eo13423_main.asp.
- ² The guide to the U.S. Army Hazardous materials Evaluation via Regulatory Impact/Priority Order Ranking System for Hazardous Product Substitution includes the following caveat on page 2: “It must be stressed that the Rate-Rank Tool Database is only one part of the overall evaluation process and is not intended to be used solely to identify and recommend substitute products. Proper knowledge of appropriate engineering practices, material and technical specifications and other applicable requirements should be included in the potential substitute identification and evaluation process. (Please note that this tool does not currently address product constituent percentages which should be included in the product evaluation process as a second tier evaluation.) The user of this tool must be familiar with chemistry and chemicals, appropriate engineering practices and related technical issues which are used in conjunction with this tool to reach a final product substitution decision.”
- ³ Personal communication, Arline Denny, LM Corporation, 2 November 2007.
- ⁴ Personal communication, Tony Phillips, LM Corporation, 6 November 2007.
- ⁵ See the EPA site <http://www.epa.gov/greenchemistry/pubs/pgcc/winners/dgca06.html> for more information on the award for S.C. Johnson’s Greenlist™.
- ⁶ Personal communication: Clive Davies, U.S. EPA, 1 November 2007.
- ⁷ Green Seal-facilitated environmental standards for degreasers, institutional cleaners and adhesives for the U.S. Army, Aberdeen Proving Ground.
- ⁸ Personal communication: Dr. Thomas Osimitz, former S.C. Johnson scientist and officer, currently President, Science Strategies, LLC, 15 September 1998.