



EPA 530-R-16-008
February 2016

Implementation Study of the Electronics Recycling Standards: R2 and e-Stewards®

Prepared by:
United States Environmental Protection Agency,
Office of Resource Conservation and Recovery
and
Abt Associates, Inc. under EPA contract number: EP-W-10-054

[This page intentionally left blank.]

Disclaimer

This document was prepared by the Office of Resource Conservation and Recovery (ORCR), U.S. Environmental Protection Agency (EPA) and Abt. Associates, Inc. under contract number EP-W-10-054. Any opinions, findings, conclusions, or recommendations do not change or substitute for any statutory or regulatory provisions. This document does not impose legally binding requirements, nor does it confer legal rights, impose legal obligations, or implement any statutory or regulatory provisions. Mention of trade names, businesses or organizations, or commercial products is not intended to constitute endorsement or recommendation for use. This document is being made available to the public. Any questions or comments concerning this document should be addressed to Nicole L. Villamizar, U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery, 1200 Pennsylvania Ave. N.W., MC 5306P, Washington, DC 20460 (email:Villamizar.Nicole@epa.gov).

Acknowledgements

The U.S. Environmental Protection Agency (EPA) would like to acknowledge the following organizations and individuals for their substantial contributions to this document:

This study would not have been possible without the voluntary participation of the Standards owners – the Basel Action Network and Sustainable Electronics Recycling International; the ANSI/ASQ National Accreditation Board; the Certifying Bodies - NSF International Strategic Registrations (NSF-ISR), Orion Registrar, Inc., Perry Johnson Registrars, Inc., SAI Global, SGS, TÜV SÜD America - and the electronics recycling facilities who agreed to participate in this study.

The support team for this project was comprised of: Shanika Amarakoon, of Abt Associates, Inc.; Anne Peters, of Gracestone, Inc; Nicole Delich, Kelley Keogh, Bob McCarthy, and Emily Farrant, of Greeneye Partners, LLC; and Libby Chaplin, of Arcadian Solutions, LLC.

Table of Contents

List of Acronyms.....	vi
Glossary.....	viii
Executive Summary.....	1
1. Introduction	10
1.1. Background.....	10
1.2. Study Purpose and Design.....	13
1.3. Study Limitations	16
2. Study Findings	17
2.1. System Requirements	17
2.2. System Planning	18
2.3. Training and Communication.....	19
2.4. Operational Controls.....	21
2.5. Health and Safety	22
2.6. Reuse	25
2.7. Data Security/Data Destruction.....	26
2.8. Management of Focus Materials, Hazardous Electronic Waste, and Problematic Components and Materials.....	27
2.9. Emergency Preparedness and Response.....	28
2.10. Materials Recovery and Disposition	29
2.11. Export Restrictions for Focus Materials and Hazardous Electronic Waste.....	30
2.12. Site Closure and Insurance.....	32
2.13. Downstream Accountability	33
2.14. Monitoring and Measurement	34
2.15. Tracking	35
2.16. Evaluation of Compliance	36
2.17. Nonconformity, Corrective, and Preventive Action.....	37
2.18. Control of Records	38
2.19. Internal Audit	38
2.20. Management Review.....	39
2.21. Additional Findings from Stakeholder Interviews	40
3. Data Analysis	41
3.1. Key System Strengths.....	42
3.2. Key Opportunities for Improvement	43
4. Suggested Strategies for Improvement & Top Recommendations	45
5. Conclusions	47
Appendix A. Compilation of Suggested Strategies for Improvement by Topic Area	49
Appendix B: Audit Observation Checklist	55

List of Acronyms

ANAB	ANSI/ASQ National Accreditation Board
ASTSWMO	Association of State and Territorial Solid Waste Management Officials
BAN	Basel Action Network
CAPA	Corrective and Preventive Action
CB	Certifying Body
CRT	Cathode Ray Tube
DOT	Department of Transportation (state or federal)
EH&S	Environmental Health and Safety
EH&SMS	Environmental Health and Safety Management System
EPA	U.S. Environmental Protection Agency
EPEAT	Electronic Product Environmental Assessment Tool
ETBC	Electronics Take Back Campaign
EU's RoHS, REACH	European Union's Restriction on Hazardous Substances and the Registration, Evaluation, Authorization and Restriction of Chemicals Directives
FAA	Federal Aviation Administration
FM	Focus Material
FTC	Federal Trade Commission
GSA	General Services Administration
HEW	Hazardous Electronic Waste
ISRI	Institute of Scrap Recycling Industries
NAID	National Association for Information Destruction
NCER	National Center for Electronics Recycling
NFPA	National Fire Prevention Association
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NSES	National Strategy for Electronics Stewardship
OECD	Organization for Economic Cooperation and Development
OEM	Original Equipment Manufacturer
OFI	Opportunities for Improvement
OSHA	U.S. Occupational Safety and Health Administration
PACE	Partnership for Action on Computing Equipment
PCM	Problematic Components and Materials
PDCA	Plan-Do-Check-Act

PPE	Personal Protective Equipment
SERI	Sustainable Electronics Recycling International
SDS	Safety Data Sheets

Glossary

- **Acknowledgement of Consent:** A notice issued by the competent authority of an importing country to the competent authority of country proposing to export used or scrap electronics containing hazardous waste, which documents acceptance of the hazardous waste by the importing country.
- **ANAB:** Short for “ANSI-ASQ National Accreditation Board” – an impartial organization that accredits conformity assessment bodies, such as testing and calibration laboratories, inspection, and certification bodies, to recognized standards. ANAB ensures that Certifying Bodies are operating in compliance with practices set forth for Certifying Bodies in international standards, such as ISO 17021. In the electronics recycling industry, as of November 2015, ANAB has accredited 6 organizations to certify recycling facilities to the R2 and/or e-Stewards standards.
- **Audit Observation Checklist:** Tool created by EPA to use in observing the audits of electronics recycling facilities seeking to obtain or maintain certification to the R2 or e-Stewards standards. The Checklist is organized around twenty key topic areas that are addressed in both the e-Stewards and R2 standards, such as Health and Safety, Reuse, and Site Closure and Insurance, and were derived based on all auditable elements in both standards. See Appendix B of this report for more information.
- **Audit Observer:** The individual who observed a Certifying Body audit an electronics recycling facility as part of this Study. Audit Observers received training to help ensure consistent performance across all audit observations included as part of this Study.
- **Basel Action Network (BAN):** BAN is a non-profit organization that is the housing body, or owner of the e-Stewards standard.
- **Basel Convention for the Transboundary Movement of Hazardous Waste:** An international treaty designed to limit the shipment of hazardous waste from developed countries to developing countries by requiring notice and consent from the countries engaged in the trade of hazardous waste. At the time of publication of this document, the United States was a signatory, but not a Party, to the Basel Convention.
- **Basel Convention Ban Amendment:** An amendment to the Basel Convention that prohibits the export of hazardous waste from a developed country to a developing country. As of the publishing date of this report, the Ban Amendment has not entered into force.
- **Bill of Materials:** List of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and components needed to manufacture an electronic product, typically prepared in the manufacturing process. These are of interest to electronics recyclers wishing to identify (a) hazardous materials to design dismantling processes to protect worker health and safety and the environment, (b) valuable materials to optimize value recovery, and/or (c) components or sub-assemblies having resale value to optimize reuse. Bills of Materials are often considered confidential business information.
- **Certified Recycler:** Recycler that has been certified to a recognized standard. In the context of this Study, certified recyclers are those who have been certified to either the R2 or e-Stewards standards.
- **Certifying Body (CB):** An organization that certifies electronics recycling facilities as meeting (or not meeting) the criteria in each of the electronics recycling standards (R2 and e-Stewards). CBs are accredited to perform this activity by ANAB.
- **Competent Authority:** The governmental authority of a country designated by that country to be responsible for receiving notification of transboundary movements of hazardous waste under the Basel Convention. See list at www.basel.int/Countries/CountryContacts/tabid/1342/Default.aspx.
- **Conformance:** Meets the requirement or provision of the Standard being audited. Also see ‘Generally Conforming Practice/Non-conforming Practice’ definition below.

-
- **Controls:** When used in the context of certification, “control” refers to a procedure that is written to define how a task or process is to be completed. Typically it will include mechanisms for checking to make sure a task is completed. There are several types of controls that can be used to achieve a desired environmental, health, or safety risk mitigation (e.g., engineering control – change a piece of equipment’s configuration; administrative control – use administrative tools to address risk; or operational control – change the way technicians operate to address a risk).
 - **Corrective Action:** When used in the context of certification, an action taken to eliminate the cause of a non-conformity that has been identified in the facility’s practices; corrective actions should be tracked by certified facilities.
 - **Downstream Due Diligence:** Investigation by an electronics recycler of a downstream vendor to gather and verify needed information on the vendor’s specific policies and practices, in conformance with the R2 and/or e-Stewards standards’ requirements for downstream vendors and specific materials.
 - **Financial Assurance:** A mechanism put in place by an electronics recycler to ensure its facility can and will be responsibly closed in the event of default, business failure, unplanned closure, and/or abandonment. These mechanisms may include surety bonds, insurance policies, verified documentation of value of assets, or other financial instruments.
 - **Focus Materials (FMs):** As defined in the R2: 2013 standard, “Focus Materials contain: (1) Polychlorinated biphenyls (PCBs), or (2) Mercury, or (3) Cathode Ray Tube (CRT) glass, except for glass with lead content less than 5 parts per million, and clean of phosphors, CRT fines, coatings, and frit, or (4) Batteries, or (5) Whole or shredded circuit boards, except for whole and shredded circuit boards that do not contain lead solder, and have undergone safe and effective mechanical processing, or manual dismantling, to remove mercury and batteries.” See the R2 Standard for full definition. Note that Focus Materials are not necessarily the same as Resource Conservation and Recovery Act (RCRA) designated Hazardous Waste. See the below definition of RCRA.
 - **Generally Conforming Practice/Non-Conforming Practice:** Auditor term for an area of activity in the standards that meets the requirement area (“generally conforming”) or does not meet the requirement area (“non-conforming”) of the standard being audited.
 - **Hazardous Electronic Wastes (HEWs):** As defined in the e-Stewards Standard v2.0, “Includes new or used: (a) Hazardous Electronic Equipment that is destined, or is intended to be destined for: Recycling, energy recovery, or Final Disposal, all or in parts, including shredded material, components, residues, and parts removed during Repair/Refurbishment, and/or Repair/Refurbishment or reuse, but not Direct Reuse, and (b) Electronic Equipment (including components) that is: Tested and Fully Functional but for which a Direct Reuse market has not been affirmed according to requirements in 4.4.6.2 (Reuse), and/or Deemed hazardous waste or banned for importation by the country of import or transit, regardless of type of destination or condition of equipment.” Note that the use of the term “HEW” in this report explicitly refers to HEWs as defined by the e-Stewards Standard, and should not be considered the same as a Resource Conservation and Recovery Act (RCRA) designated hazardous waste. See the below definition of RCRA.
 - **National Strategy for Electronics Stewardship:** A July 2011 report that lays the groundwork for how the federal government can use its authorities and leverage resources to improve the design of electronic products and enhance the management of used or discarded electronics. See: www.epa.gov/smm-electronics/national-strategy-electronics-stewardship
 - **Non-conformity (NC):** Non-fulfillment of a requirement in the facility’s management system. See ‘Generally Conforming Practice/Non-conforming Practice’ definition above.
 - **Original Equipment Manufacturer (OEM):** In the context of this study, a company that manufactures electronics (equipment or components), such as televisions, cell phones, tablets, laptops, computers, etc.

-
- **Plan-Do-Check-Act:** Cycle of continuous improvement used in all quality and environmental management systems.¹
 - **Problematic Components or Materials (PCMs):** As defined in the e-Stewards Standard v2.0, “e-Wastes which may not be defined as Basel Convention hazardous wastes or e-Stewards Hazardous Electronic Waste, but which may be hazardous or require special controls...” See the e-Stewards standard for full definition.
 - **R2/RIOS™:** Combined certification to the R2:2013 Standard and to the Institute of Scrap Recycling Industry Operating Standard® (RIOS). RIOS defines an integrated quality, environment, health and safety management systems standard for the industry. R2/RIOS™ was created in 2013 to offer a certification path for electronics recyclers that combined RIOS with the R2 standard. When the R2:2013 standard emerged, Provision 1(b) mandated, “An R2:2013 electronics recycler shall be certified, throughout the duration of its R2 certification, to one or more environmental, health and safety management system standards (EHSMS) that have been approved by SERI” – it clarifies that SERI “has approved RIOS™, or a combination of both ISO 14001 and OHSAS 18001, to fulfill this requirement.”
 - **RCRA (Resource Conservation and Recovery Act) Hazardous Waste:** The Resource Conservation and Recovery Act (RCRA) and its implementing regulations create the framework for managing hazardous and non-hazardous solid waste in the United States. In the U.S., a solid waste is considered a hazardous waste if it meets the listing criteria and is listed in 40 CFR Part 261, Subpart D, or if the solid waste exhibits the characteristic of ignitability, corrosivity, reactivity, or toxicity.
 - **Root cause analysis:** An analytical approach used to identify the underlying base of faults or problems. A factor is considered a root cause if its removal from the problem-fault sequence prevents the final undesirable event from recurring.
 - **Sustainable Electronics Recycling International (SERI):** SERI is a non-profit organization that is the housing-body for the R2 Standard.
 - **Universal Waste:** The U.S. EPA’s universal waste regulations streamline hazardous waste management standards for federally designated “universal wastes,” which include: batteries, pesticides, mercury-containing equipment, and bulbs (lamps). The federal universal waste regulations are set forth in 40 CFR part 273. States can modify the universal waste rule and add additional universal waste(s) in individual state regulations, so it is important to consult with your state for the exact regulations that apply.
 - **Witness Audit:** ANSI-ASQ National Accreditation Board’s (ANAB) observation of a Certifying Body’s audit of an electronics recycling facility, in order to ensure the Certifying Body is following the requirements of the standard being audited.

¹ For more about P-D-C-A, see <https://en.wikipedia.org/wiki/PDCA> or <http://asq.org/learn-about-quality/project-planning-tools/overview/pdca-cycle.html>.

1. Executive Summary

In the United States, electronics recycling facilities can be certified to standards through two certification programs – the Responsible Recycling (“R2”) Standard for Electronics Recyclers and the e-Stewards® Standard for Responsible Recycling and Reuse of Electronic Equipment® (“e-Stewards®”). Both certification programs were developed to set minimum standards for ensuring worker health and safety, proper management of used electronics through the recycling chain to their final destination, and data security. As of December 2015, more than 550 U.S. electronics recycling facilities are certified to one or both of these standards.²

Under the [2011 National Strategy for Electronics Stewardship \(NSES\)](#), which tasks the federal government to lead by example in encouraging the greener design and responsible management of electronics, the U.S. Environmental Protection Agency (EPA) committed to study – in collaboration with the General Services Administration and the ANSI-ASQ National Accreditation Board (ANAB) – the implementation of these certification programs. The objective of the Implementation Study (“the Study”) was to assess whether the R2 and e-Stewards standards (“the Standards”) are being implemented transparently, consistently, and are achieving the desired results.

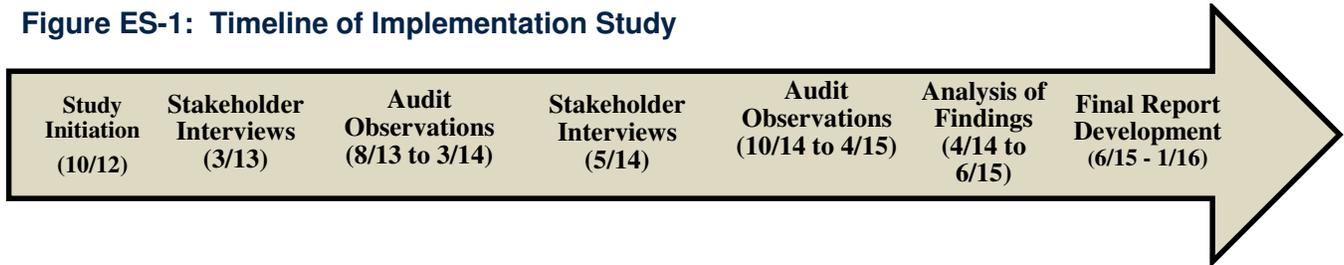
Study Design

To achieve the objective of the Study, EPA conducted interviews with stakeholders across the electronics recycling system, observed audits of recycling facilities seeking to obtain or maintain their certification to one or both of the Standards to assess the consistency and rigourousness of the audits; and documented the findings, conclusions and recommendations in the form of this final report. Figure ES-1 provides an overview of the timeline of the Study.

Study Design

1. Stakeholder Interviews
2. Audit Observations
3. Data Analysis
4. Final Report

Figure ES-1: Timeline of Implementation Study



Stakeholder Interviews

EPA conducted a total of 39 interviews with stakeholders across the electronics recycling system. Interview questions were uniquely tailored to each stakeholder group in order to reflect their different roles, responsibilities, and perspectives with regard to the electronics recycling certification process. The objectives of the first set of interviews, conducted prior to observing any audits, were to establish baseline information about how the different stakeholders across the system were implementing the Standards, identify potential issues of concern, and provide an opportunity for the interviewees to share their perspective on how implementation could be improved. The stakeholders interviewed were:

- Representatives from R2 (owned by Sustainable Electronics Recycling International (SERI)), and e-Stewards (owned by the Basel Action Network (BAN));
- An ANSI-ASQ National Accreditation Board (ANAB) representative;
- A national-level certified recycling facility;
- The six Certifying Bodies authorized to certify recycling facilities to the Standards: NSF-ISR; Orion Registrar, Inc.; Perry Johnson Registrars, Inc.; SAI Global; SGS; and TÜV SÜD America; and
- The Electronics Manufacturers Recycling Management Co. (MRM), which represents a consortium of electronics manufacturers.

² Total number of certified recyclers as indicated on both the R2 and e-Stewards web sites.

Additional interviews were conducted concurrently with the audits that were observed in order to obtain further insight from the auditors and the facilities regarding opportunities to improve implementation of the Standards. These post-audit interviews were always conducted outside of the formal audit to ensure EPA did not influence or interfere with the audit. The stakeholders interviewed were: the nine Certifying Body auditors; two ANAB auditors who were acting in their oversight role witnessing Certifying Body auditors conduct two audits; and the owners or operators of the nine facilities whose audits were observed as part of the Study.

Finally, a subset of stakeholders from the initial interviews were re-interviewed in 2014 to better understand their perspective on how the implementation of the Standards had changed with the issuance of the new 2013 versions of the Standards. The stakeholders re-interviewed were: ANAB, five Certifying Bodies (NSF-ISR, Orion Registrar, Inc., Perry Johnson Registrars, Inc., SAI Global, and SGS), and the Standards owners (SERI and BAN).

The information shared with EPA as part of the interviews was directly incorporated into the findings of the Study and is reflected in Section 2 of this report. EPA did not undertake any additional activities to verify the information that was provided beyond that which was stated or provided by the interviewees.

Audit Observations

Between August 2013 and April 2015, EPA observed a total of nine audits of recycling facilities seeking to obtain or maintain their certification to one or both of the Standards: four e-Stewards audits, four R2 audits, and one R2 and e-Stewards combined audit. Five audits were to the 2008 versions of the Standards, and four were to the 2013 versions of the Standards. In addition, two of the observed audits were ANAB witness audits, where an ANAB auditor assessed a Certifying Body conduct an audit as part of its oversight in observing a Certifying Body auditor observed audits performed by five of the six Certifying Bodies, which collectively are responsible for auditing over 98% of the facilities that are certified to one or both Standards.

The recycling facilities that participated in the Study represented a cross-section of the different facility types, sizes, and ranges of services offered by facilities that can be certified to the Standards. Through the audit observations, EPA identified both positive actions being carried out as well as opportunities for improvement across 20 key topic areas addressed in both of the Standards (see text box to the right). Because the Study intentionally does not compare one Standard to the other, the 20 topic areas were derived based on all auditable elements present in both the e-Stewards and R2 standards.

EPA developed an “Audit Observation Checklist” to support the assessment of the rigorousness and consistency of each of the audits. The Checklist was organized around the 20 topic areas and encompassed 144 discrete elements of the Standards. The checklist was used to rank the auditor’s effectiveness from 1 (auditor was not effective or did not address) to 5 (auditor was highly effective). The Checklist also included interview questions to ask of each key participant in the Audit Observation (CB Auditor; Facility; and, as

20 Key Topic Areas Analyzed in the Study

1. System requirements
2. System planning
3. Training and communication
4. Operational controls
5. Health and safety
6. Reuse
7. Data security/data destruction
8. Management of Focus Materials (FMs) and Hazardous Electronic Waste (HEW) and Problematic Components and Materials (PCMs)
9. Emergency preparedness and response
10. Materials recovery and disposition
11. Export restrictions for Focus Materials (R2) and Hazardous Electronic Waste (e-Stewards)
12. Site closure and insurance
13. Downstream accountability
14. Monitoring and measurement
15. Tracking
16. Evaluation of compliance
17. Nonconformity, corrective and preventive action
18. Control of records
19. Internal audit
20. Management review

appropriate, ANAB Witness Auditors), at the end of the audit, to gain their perspectives about the overall effectiveness of the Standards' implementation. The Checklist is included as Appendix B of this report.

Data Analysis

Information from the interviews and nine observed audits was aggregated and analyzed to identify patterns of strengths, opportunities for improvement, and other trends. With regard to the audit data, average ratings across all nine audits for each of the 144 discrete elements of the Checklist were calculated, and those averages were then weighted according to the number of audits in which each element was assessed.³ The weighted averages for each of the elements were then used to calculate an overall score for each of the 20 Topic Areas (e.g. Health and Safety, Reuse, etc.) to provide a quantitative sense of how well that particular area of the Standards was audited during the observed audits. It is important to note that the auditing process is highly qualitative, and the average overall score for each topic area reflects EPA's assessment of how well that particular topic area of the Standards was audited based only on the nine observed audits. The score is an indicator – but not the only indicator – of the overall effectiveness/strength of that topic area. The qualitative information provided through the structured stakeholder interviews also was carefully reviewed to determine trends, such as frequently mentioned strengths and opportunities for improvement, in the implementation of the Standards. Thus, EPA considered both the combination of the audit findings and the interview responses in identifying patterns of strengths, opportunities for improvement, and other trends.

Finally, it should be noted that the Study intentionally does not draw conclusions about whether one Standard is being implemented more or less rigorously, transparently, or consistently than the other. The purpose of the Study was to conduct a system-level review to assess whether the Standards as a whole are being implemented transparently, consistently, and are achieving the desired results. As such, the interviews and audits focused on how well the Standards are being implemented in 20 key topic areas present in both of the Standards.

Study Limitations

Table ES-1 provides a summary of the limitations of the Study, which are important to provide context for the findings and conclusions, as well as for future studies that may be undertaken.

Table ES-1: Implementation Study Limitations

Limitation	Discussion
Snapshot in time in a rapidly changing industry	<ul style="list-style-type: none"> Interviews and audit observations were conducted from March 2013 through May 2015, and only represent findings during that period.
Subset of entire universe of electronics recyclers studied	<ul style="list-style-type: none"> As of December 2015, more than 550 U.S. electronics recycling facilities were certified to one or both of the R2 and e-Stewards Standards.⁴ As such, the Study's findings should not be construed to apply to the full universe of electronics recyclers operating in the U.S.
Limited sample size	<ul style="list-style-type: none"> The Paperwork Reduction Act limited the number of interviews and audits that could be observed by the EPA as a part of this Study.⁵ The Study's findings are based on the stakeholder interviews EPA conducted and the audits EPA observed, which reflect a small percentage of all certified electronics recycling facilities and of all auditors working in the electronics recycling industry in the U.S.

³ Not every element was assessed in each of the nine audits due to the requirements of different audit types (e.g. Stage 2, surveillance, and recertification) and of the different versions of the two Standards (2008 and 2013).

⁴ Total number of certified recyclers as indicated on both the R2 and e-Stewards web sites.

⁵ The Paperwork Reduction Act was enacted to minimize the paperwork burden for individuals; small businesses; educational and nonprofit institutions; federal contractors; state, local, and tribal governments; and other persons resulting from the collection of information by or for the federal government.

Limitation	Discussion
Role of the Audit Observers was observational only	<ul style="list-style-type: none"> EPA did not ask direct questions while observing the Certifying Body auditors conduct the facility audits. Findings based on the observed audits are therefore limited to what could be seen rather than discussed with the Certifying Body auditors.
Facilities agreed to let EPA observe audits	<ul style="list-style-type: none"> For the nine audits EPA observed, the Certifying Bodies contacted their clients (facilities) in advance, and those facilities all agreed to allow EPA to observe their audits. It can be surmised that the clients had confidence in a positive outcome of the audit in order to agree to let EPA observe the audit.
Not all CBs observed in audit portion of the Study	<ul style="list-style-type: none"> EPA observed audits performed by only five of the six Certifying Bodies during the Study. As of the writing of this report, those five Certifying Bodies are collectively responsible for auditing over 98% of the facilities that are certified to one or both of the Standards.
No Stage 1 audits were observed	<ul style="list-style-type: none"> Audit Observations were for facilities obtaining Stage 2 certification, surveillance, or re-certification audits; no Stage 1 (readiness review) audits were observed. Stage 1 audits primarily consist of reviewing facility documents in preparation for a Stage 2 audit, where certification may first be achieved.

Summary of Findings

The Study’s findings are based on the stakeholder interviews EPA conducted and the audits EPA observed, which reflect a small percentage of all certified electronics recycling facilities and of all auditors at work in the electronics recycling industry in the U.S. The interviews EPA conducted included all of the key entities that are critical to the implementation of the Standards. Though limited in number, the audit observations reflect a cross-section of the types of facilities that can be certified to the Standards in terms of the different types of audits (e.g., Stage 2, surveillance, recertification), facility sizes (ranging from 5-40 employees; single facility vs. multiple facilities across the country), and services offered (reuse, manual disassembly, shredding, data destruction, etc.). As previously noted, the data from the interviews and audits were analyzed to identify key strengths, opportunities for improvement, and other trends, which are summarized below.

Strengths

The Study’s findings suggest that overall, the Standards have brought order, better management, and a growing understanding of regulatory requirements, best practices, and environmental, health, and safety risks to electronics recyclers and related stakeholders throughout the system. In addition, the interviews found that stakeholders are operating with a willingness to learn complex new subject matter, such as legal and environmental compliance, downstream due diligence practices, export requirements, and occupational health and safety practices. Furthermore, interviews and audits indicated that the roles and responsibilities among the key implementers in the system - ANAB, the Standards owners, the six Certifying Bodies, auditors, and recycling facilities – appear to be clear and effective, and opportunities for constructive feedback are integrated throughout the system. Certifying Bodies have developed and implemented effective training programs for their auditors covering the critical elements of the Standards. Auditors were found to be very hard working and diligent, using their often limited time on the audits well.

Table ES-2 below provides highlights of areas of strength in the Standards that were observed to be audited comprehensively and consistently across multiple audits. The average overall score provided for each topic area is derived from assessing all 20 topic areas across the nine audits observed. As previously mentioned, the auditing process is highly qualitative, and the average overall score for each topic area reflects EPA’s assessment of how well that particular topic area of the Standards was audited based only on the nine observed audits. The score is an indicator – but not the only indicator – of the overall effectiveness/strength of that topic area. The qualitative information provided through the structured stakeholder interviews also was carefully reviewed to determine trends, such as frequently mentioned strengths and opportunities for improvement, in the implementation of the Standards. Thus, EPA considered both the combination of the audit findings and the interview responses in identifying patterns

of strengths, opportunities for improvement, and other trends. Section 2 of this report provides a detailed assessment of findings observed within each topic area, and Section 3 provides a comprehensive discussion of the data analysis and aggregation process for identifying overall strengths and opportunities for improvement. Table ES-2 is not intended to be an inclusive list of all areas that were found to be strengths in the Standards.

Table ES-2: Key Areas of Strength

Topic Area #	Topic Area Name	Discussion	Weighted average audit score (1-5)
1.	System requirements	<ul style="list-style-type: none"> Facilities are devising Environmental, Health, and Safety Management Systems (EHSMS) that cover the entire scope of the applicable Standard(s), and are ensuring that EHSMS are kept up-to-date. 	5.00
7.	Data security/data destruction	<ul style="list-style-type: none"> The updated versions of the Standards have improved the detail and requirements for this area, and very thorough auditing of this topic area was observed. 	4.21
14.	Monitoring and measurement	<ul style="list-style-type: none"> Auditors are ensuring facilities are monitoring and measuring, on a regular basis, their activities that have environmental and health and safety impacts. 	4.54
7.	Nonconformity, corrective and preventive action	<ul style="list-style-type: none"> Auditors are ensuring the facilities assess internal nonconformity with their EHSMS and are taking corrective and preventive action. 	4.83

Interviews suggest that the continued evolution of the Standards and their implementation are helping to maintain the integrity of the Standards and helping to ensure they are being implemented in a clear and consistent manner. Both Standards were updated during the course of the Study, in the latter half of 2013, and the interviews conducted and audits observed during and after the updates indicated the roll-out of the new versions went smoothly. Key improvements made to the Standards’ text and implementation systems included:

- Updating training programs,
- Updating certain requirements (e.g., environmental, health and safety criteria), and
- Providing clarification or additional guidance documents on existing requirements to aid in consistent implementation of the Standards.

Finally, with respect to the recycling facilities, the interviews and audit observations also found that they are well engaged in the certification process and view it as a benefit to their customers. As a result, market demand for certifications continues to grow among generators of electronic waste.

Opportunities for Improvement

The interviews and audit observations indicated that overall, the Standards are generally being implemented well; however, opportunities for improvement in implementation were identified across all 20 topic areas assessed in the Study. Key areas for improvement are summarized in Table ES-3 and were based primarily on the average overall score for each of the 20 topic areas, with additional consideration of the qualitative information from the interviews. As previously mentioned, it is important to note that the auditing process is highly qualitative, and the average overall score for each topic area reflects EPA’s assessment of how well that particular topic area of the Standards was audited based only on the nine observed audits. The score is an indicator – but not the only indicator – of the overall effectiveness/strength of that topic area. The qualitative information provided through the structured stakeholder interviews also was carefully reviewed to determine trends, such as frequently mentioned strengths and opportunities for improvement, in the implementation of the Standards. Thus, EPA considered both the combination of the audit findings and the interview responses in identifying patterns of strengths, opportunities for improvement, and other trends.

Note that Section 2 of this report provides a detailed description of all of the observed opportunities for improvement and Table ES-3 is not intended to be an all-inclusive list of opportunities for improvement.

Table ES-3: Key Opportunities for Improvement

Topic Area #	Topic Area	Discussion	Weighted Average Audit Score
3.	Training and communication*	<ul style="list-style-type: none"> • Auditor and facility training, understanding and consistent implementation of: <ul style="list-style-type: none"> ▪ Environmental health and safety hazard risk reduction strategies; ▪ Hazardous waste requirements; ▪ Import/export requirements (especially for Cathode Ray Tubes (CRTs); Organization for Economic Cooperation and Development (OECD) countries vs. non-OECD countries); ▪ Federal, state, and local legal requirements (e.g., Universal Waste rule); and ▪ Proper materials management (including batteries). 	4.32
4.	Operational control	<ul style="list-style-type: none"> • Auditor verification of implementation of written procedures – such as how to manage FMs and how to best mitigate environmental, health, and safety risks – during audits. 	3.77
5.	Health and safety	<ul style="list-style-type: none"> • Auditor and facility understanding and dissemination of actionable information regarding human health risks posed by dismantling end-of-life electronics, including potential exposures and subsequent use of risk-based controls (e.g., personal protective equipment (PPE)). 	3.87
8.	Management of FMs, HEWs, and PCMs	<ul style="list-style-type: none"> • Auditor and facility understanding of what is and is not hazardous or universal waste under state and federal regulations, and the associated management requirements. 	4.04
10.	Materials recovery and disposition	<ul style="list-style-type: none"> • Facility and auditor attention to safe packaging of hazardous equipment (e.g., CRTs, batteries). • Auditor verification of facilities' controls for ensuring downstream processors conform to Standards' requirements. 	4.06
11.	Export restrictions for Focus Materials (R2) and Hazardous Electronic Waste (e-Stewards)	<ul style="list-style-type: none"> • Auditor and facility training, understanding, and awareness of export requirements (particularly for CRTs). 	3.00
12.	Site closure and insurance**	<ul style="list-style-type: none"> • Auditor understanding of the form and accessibility of insurance (or other forms of financial assurance) in the event of abandonment or bankruptcy. 	4.44
13.	Downstream accountability	<ul style="list-style-type: none"> • Auditor verification of requirements in areas such as: confirming that all downstream material flows are identified throughout the recycling chain beyond the first downstream 	3.85

Topic Area #	Topic Area	Discussion	Weighted Average Audit Score
		vendor; and improving downstream verification practices by auditors during an audit.	
15.	Tracking	<ul style="list-style-type: none"> Auditor performance of the mass balance calculation (account for all transactions into facilities and all transactions out of facilities) to verify equipment going for reuse. 	4.12
16.	Evaluation of compliance	<ul style="list-style-type: none"> Auditor review of legal and environmental, health and safety requirements, and compliance with those requirements. 	3.38

* Auditors assess whether or not facilities have determined their training needs and communicate them appropriately. While these clauses were observed to be well audited, the need for further training and knowledge development was noted across numerous topic areas and emerged as a top area for improvement from the interviews.

** Auditors assess whether the closure plans are in place and contain the required components; however, while these requirements were generally audited well (meaning the auditors identified the closure plans with required elements), an important opportunity for improvement emerged to improve auditor understanding of the adequacy of the forms of insurance (or other forms of financial assurance).

Suggested Strategies for Improvement and Top Recommendations

The Study identified specific strategies for addressing the opportunities for improvement identified in each of the 20 topic areas assessed in the Study. These strategies are listed in tables at the end of each subsection of Section 2, and are compiled in a summary table in Appendix A.

Top Recommendations

EPA also developed top recommendations to address the root causes of many of the opportunities for improvement, which were developed based on the analysis of patterns and trends from the interviews and audits. In practice, many stakeholders will continue to influence and shape the development of responsible recycling in the U.S. and therefore have been considered when drawing the Study’s conclusions and making recommendations; as such, EPA encourages all organizations that have a role to play in shaping the standards and certification process to consider the suggested strategies for improvement and top recommendations in the Study. This broader group of stakeholders includes:

- The Standards owners (Sustainable Electronics Recycling International and the Basel Action Network)
- The Certifying Bodies
- Federal and state regulators
- Trade associations
- ANAB
- EPA and other federal agencies, including the Occupational Safety and Health Administration, the National Institute for Occupational Safety and Hazards, and the Department of Transportation
- Original equipment manufacturers
- Academic researchers
- Non-governmental organizations
- Private-sector companies

It is important to note that because of the commitment to continual improvement by stakeholders in the system, some of the below recommendations – as well as the suggested strategies for improvement presented in Section 2 of the report – may already be in motion.

The top recommendations are:

- ***Provide additional training and guidance materials to grow the knowledge base.*** Growing the base of knowledge for all stakeholders, including auditors and facilities, is important for ensuring the Standards are implemented properly. In total, 85% of all interviewees – including 100% of Certifying Bodies and 91% of auditors – indicated that more robust training programs are needed in order to strengthen knowledge of health and safety risks, legal requirements – particularly related to exports and management of CRTs - and best operational practices in many of the 20 topic areas. Combined with the observations from the audits and the low weighted average scores of many of the topic areas, providing additional training and guidance materials to grow the knowledge base for all stakeholders in the system was determined to be one of the recommendations with the most far-reaching possible impacts in improving the overall implementation of the Standards. Section 2 of the Study offers suggested strategies for consideration in developing the additional training materials, guidance, and other tools in the context of each of the relevant topic areas.
- ***Provide regular updates to the Standards to ensure they continue to evolve alongside this rapidly changing industry.*** E-Stewards and R2 are both relatively new standards and their recent updates went smoothly. Updating and revising the Standards on regular, well-publicized timetables is important to address areas that could benefit from clarification in a Standard or lessons learned from prior audits. Support for more systematic, well-publicized plans and/or timetables for subsequent updates was indicated in 69% of all interviews, including 73% of stakeholder interviews conducted before the 2013 Standards revisions and 100% of stakeholder interviews conducted after the revisions. Scheduled and publicized plans to update the Standards will allow stakeholders to fully contribute and participate in the continual improvement in a fair and transparent manner.
- ***Increase audit time to allow for more thorough auditing of the Standards.*** Inadequate audit time was mentioned in 56% of all interviews as a limiting factor, particularly for integrated audits where R2 and e-Stewards are being audited at the same time as other standards, such as RIOS and ISO 14001. In interviews where the adequacy of the amount of time allowed for audits was questioned specifically, 75% of interviewees indicated a desire for increased audit times, as did five of the nine facilities audited. Audit time for ISO 14001-based standards is specified in “IAF MD 5: Duration of QMS and EMS Audits.” To better reflect the complexity of electronics recycling operations, there is a need to fine-tune the formulas found in the R2 Code of Practices and e-Stewards Appendix C to ‘right-size’ audit time. Many facilities can have multi-faceted downstream material flows, export situations, regulatory status, reuse practices, and other variables that pose challenges to the most efficient auditors to adequately review materials and follow audit trails in the allotted time. Moreover, many audits cover multiple standards simultaneously. Increasing audit time would allow auditors to more closely examine health and safety monitoring, measurement, record-keeping, and communication issues in order to give facilities critical feedback on their health and safety systems.
- ***Explore and address perceived conflict of interest issues to enhance overall rigorousness of the audits.*** Study participants expressed a concern that there is a perceived conflict of interest between CBs wishing to retain their clients (who are the recycling facilities) and the recycling facilities themselves; that is, the CB auditors may not be as stringent or thorough in their audits in an effort to retain a competitive business relationship. Similarly, auditors being observed by ANAB Witness Auditors may be more stringent in their findings, in an effort to prove competency and thoroughness; this inconsistent scrutiny may pose concerns to a facility getting more

Top Recommendations

- Provide additional training and guidance materials to grow the knowledge base for all stakeholders
- Provide regular updates to the Standards to ensure they continue to evolve
- Increase audit time to allow for more thorough audits
- Explore and address perceived conflict-of-interest issues

non-conformances than it expected when ANAB is present, for example. When asked specifically about whether they feel that the perception of a conflict of interest exists, 63% of stakeholders interviewed said that they did. Exploring ways in which the key players in the system – Certifying Bodies, recycling facilities, the Standards owners, and ANAB – could potentially address these perceptions of conflict of interest, such as implementing new or different funding mechanisms, could enhance the implementation of the Standards.

Conclusions

The Study suggests that overall, the accreditation, certification and implementation process of the R2 and e-Stewards standards is working well. Through the interviews with stakeholders across the electronics recycling system and the observed audits representing a cross-section of facility sizes, types and services offered, the Study suggests that the Standards have brought order, better management, and a growing understanding of environmental, health and safety risks, regulatory requirements, and best practices to electronics recyclers and related stakeholders across the system.

Though limited in scope, an analysis of the interview and audit findings for patterns and trends identified opportunities to improve the implementation of the Standards in a few key areas: health and safety risks, management, and best practices; awareness and understanding of all applicable federal, state and local legal requirements; export requirements; and knowledge of hazardous substances in electronics. One central theme that emerged from the Study was that the knowledge base needs to continue to grow and tools are needed for all stakeholders (e.g., for auditors to more efficiently audit, for facilities to more readily operationalize improvements in these areas, and for regulators to better inform the regulated community). The Study offers four recommendations that, if implemented, could address many of the root causes of the opportunities for improvement, and Section 2 of the Study also provides numerous suggested actions that may be taken to address the specific opportunities for improvement identified in all 20 topic areas assessed in the Standards.

EPA remains committed to continuing the dialogue started by this Study and supporting the continual improvement of the implementation of the electronics recycling standards, and will provide assistance and support to stakeholders in discussing and implementing the recommendations outlined in this report.

The following report presents additional detail on the Study's background, approach, detailed findings (including strengths and opportunities for improvement) as well as final conclusions and recommendations. A complete summary of suggested actions to address the opportunities for improvement can be reviewed in Appendix A of the Study.

1. Introduction

Electronics recycling began in the United States in the 1970s after the introduction of the first computers in the mid-1960s. Electronic equipment manufacturers realized the potential profits from product resale and/or the recovery of gold, silver, platinum, palladium and other precious metals, and thus began their own in-house recovery and refurbishment/resale operations. It was not until the late 1980s/early 1990s, when computers and other electronics were found on every desk in the workplace and in homes that non-manufacturer recycling companies started to develop the electronics recycling industry as it is known today.

The rapid growth of the industry resulted in a need for minimum standards for worker health and safety, [downstream due diligence](#) and data security. Further, non-governmental organizations (NGOs) worked in the early 2000s to raise awareness of the problems caused by exporting [hazardous waste](#)-containing electronic scrap to developing countries. These NGOs were joined by regulators and responsible recyclers to jointly create standards that would differentiate electronics recycling operations that were committed to (i) protecting worker health and the environment, (ii) preventing export of e-scrap to destinations without adequate worker and environmental protection, and (iii) properly sanitizing data.

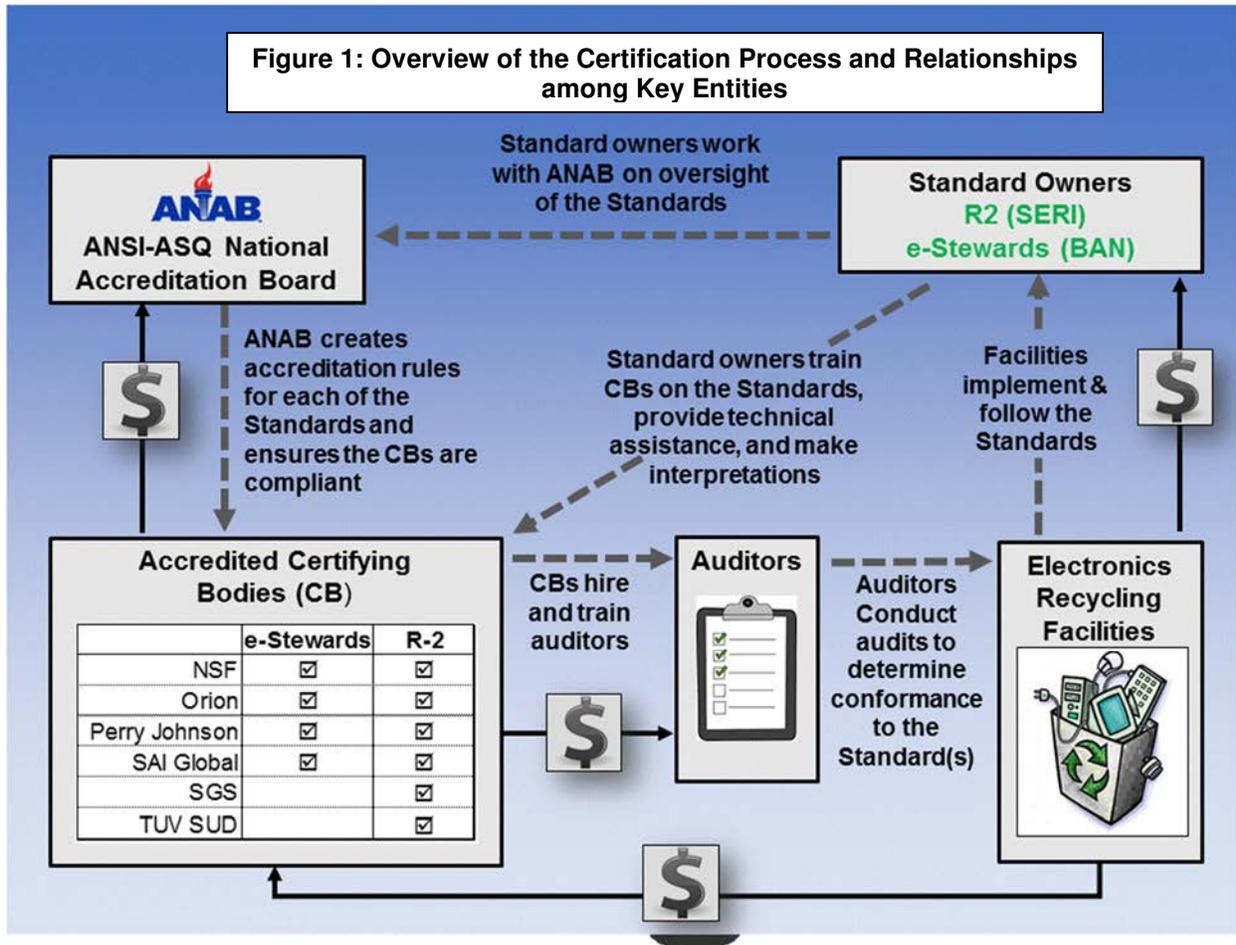
Under the 2011 [National Strategy for Electronics Stewardship \(NSES\)](#), EPA committed to study – in collaboration with the General Services Administration (GSA) and the [ANSI-ASQ National Accreditation Board \(ANAB\)](#) – the implementation of the two electronics recycling certification programs currently used in the United States: the Responsible Recycling (R2) practices and e-Stewards® Standard for Responsible Recycling and Reuse of Electronic Equipment® (e-Stewards®).⁶ The main goal of this Implementation Study (“the Study”) was to conduct a system-level review of the accreditation, certification and implementation process to determine whether the Standards are being implemented transparently, consistently, and are achieving the desired results.

1.1. Background

In order to evaluate the effectiveness of the implementation of the Standards, the Study examined all aspects of the electronics recycling certification process, including the Standards owners ([Sustainable Electronics Recycling International \(SERI\)](#), which owns the R2 Standard, and the [Basel Action Network \(BAN\)](#), which owns the e-Stewards Standard); the ANSI-ASQ National Accreditation Board (ANAB), the six [Certifying Bodies \(CBs\)](#) accredited to certify facilities to R2, e-Stewards, or both; and a limited number of facilities seeking to obtain or maintain certification. The CBs, their auditors, and electronics recycling facilities were the main focus of the Study as the entities most directly engaged with implementing the Standards; however, each entity in the system plays an important role in ensuring effective implementation of the Standards. Each entity is described below, including its role in the overall certification system, and how it was examined in the Study. Figure 1 illustrates the certification process and the relationships among key entities.⁷

⁶ The NSES details the federal government’s plan to enhance the management of electronics throughout the product life cycle—from design to the eventual recycling or disposal of the products (see <http://www.epa.gov/smm-electronics/national-strategy-electronics-stewardship-nses>).

⁷ For a more detailed explanation of how this system works, see “Understanding the Certification Process for End-of-Life Electronics,” December 2012, by Libby Chaplin, Arcadian Solutions, for EPEAT and the Green Electronics Council, at <http://arcadiansolutions.com/wp-content/uploads/R007-eole-certification-process-2012-12-21.pdf> .



1. **Standard Owners.** The parties that developed the E-Stewards and R2 standards. Sustainable Electronics Recycling International owns the R2 Standard and the Basel Action Networks owns the e-Stewards Standard. SERI and BAN play a critical management and support role throughout the certification process. Their activities include:

- Working with ANAB on oversight of the Standards;
- Developing training and guidance materials (e.g. interpretations) to support implementation of the Standards;
- Training the CBs on the Standards;
- Witnessing audits performed by the CBs, and, at times, directly conducting audits (or “spot checks”) of recycling facilities as part of a quality assurance plan;
- Planning for and carrying out updates to their Standards with public comment processes;
- Having advisory boards; and
- Managing fiscal matters for their Standards.

It is important to note that both BAN and SERI issued new versions of their Standards in 2013 while the Study was underway, and continue to develop comprehensive and effective training and guidance materials to support implementation of the Standards. Highlighted below are key changes that were made to the Standards in 2013:

- Updating the language in both Standards to:
 - Enhance language regarding export requirements;
 - Update operational criteria for environmental, health, and safety;
 - Provide greater detail of reuse requirements; and
 - Expand definitions sections.
- Updating and improving guidance documents to aid stakeholders in implementing the Standards;
- Formalizing operating structures for the legal entities that actually own the Standards, including hiring additional staff in both Standards’ organizations to better support the implementation of the Standards;
- Approving additional CBs to audit to each Standard;
- Updating training programs for CB auditors, electronics recyclers, and other stakeholders, reviewed and approved by the Standards owners; and
- Improving quality assurance systems, including programs such as [witness audits](#) or spot checks by the Standards owners on CB audits and on facilities.

In order to ensure that the new versions of the Standards – and associated guidance and changes in implementation - were appropriately addressed, EPA extended the timeframe to complete the Study to include additional stakeholder interviews and audit observations.

2. **ANSI-ASQ National Accreditation Board (ANAB).** ANAB is a non-governmental organization that provides accreditation services to public- and private-sector organizations and is jointly owned by the American National Standards Institute (ANSI) and the American Society for Quality (ASQ). The ANAB portfolio covers the spectrum of conformity assessment accreditation to recognized standards, including testing and calibration laboratories, inspection, and certification bodies. ANAB ensures that Certifying Bodies are operating in compliance with standard practices set forth for Certifying Bodies in international standards, such as ISO 17021. In the electronics recycling system, ANAB is currently the only accrediting body authorized to determine the competency of the Certifying Bodies responsible for certifying recycling facilities to the R2 and e-Stewards standards. To this end, ANAB meets regularly with the Certifying Bodies and conducts regular witness audits of Certifying Body auditors. ANAB participated in the development of the minimum requirements for Certifying Body competency, although the Standards owners can require further competencies. EPA interviewed ANAB representatives during the Study and also observed two ANAB Witness Audits as part of the Study.
3. **Certifying Body.** CBs are the organizations responsible for certifying electronics recycling facilities to the e-Stewards and R2 standards. CBs hire and train auditors to certify electronics recycling facilities as meeting (or not meeting) the criteria in Standards, and ensure their auditors are properly trained on the requirements associated with the Standards. Most CBs utilize training programs offered by third parties for their initial auditor training, complemented by additional in-house training. As of January 2016, six CBs are accredited to certify electronics recycling facilities to one or both of the Standards:

Table 1. Certifying Bodies and the Standards

Certifying Body	e-Stewards	R2
NSF-ISR	☒	☒
Orion Registrar, Inc.	☒	☒
Perry Johnson Registrars, Inc.	☒	☒
SAI Global	☒	☒
SGS		☒

Certifying Body	e-Stewards	R2
TÜV SÜD America		<input checked="" type="checkbox"/>

4. **Auditors.** Hired by CBs, auditors perform the audits of the electronics recycling facilities seeking to obtain or maintain certification. Auditors are the ‘front line’ of certification – going on-site and examining all aspects of the management system set up by an electronics recycler to ensure it meets the criteria of the Standard(s). EPA observed nine audits as they were performed by the CB auditors over the course of the Study.
5. **Electronics recycling facilities** implement certified management systems to improve quality and to protect environmental and human health and safety. Electronics recycling facilities can be certified to one or both of the Standards. EPA observed nine audits of electronics recycling facilities seeking to obtain or maintain their certification to one or both Standards. While the primary focus of the audit observations was to assess how effectively the CB auditors conducted their audits, EPA also noted how the facilities were operating in [conformance](#) with the Standard(s), such as how well they demonstrated knowledge and understanding of the Standards’ requirements. EPA also interviewed the recycling facility owners or operators outside of the formal audits to gain additional information and hear their perspectives on strengths and opportunities for improvement in implementation.

1.2. Study Purpose and Design

The purpose of the Study was to conduct a system-level review of how the two used electronics recycling certification programs in the U.S. are being implemented, in order to determine if they are being implemented transparently, consistently, and are achieving the desired results. The Study approach was to examine whether the *entire* system of certification – from the Standards owners, to ANAB, to on-the-ground CB auditors – is operating to meet its desired results. Accordingly, the objectives for the Study are to identify areas of strength in implementation and, where appropriate, to make recommendations for improvement. The Study consisted of interviewing key stakeholders responsible for implementing the Standards, observing audits of facilities seeking to obtain or maintain their certification, and analyzing the information to develop the findings, conclusions, and recommendations in this final report.

Study Design

1. Stakeholder Interviews
2. Audit Observations
3. Data Analysis
4. Final Report

Stakeholder Interviews

EPA conducted a total of 39 interviews with stakeholders across the electronics recycling system, including all of the key entities that are critical to the implementation of the Standards. Interview questions were different for each stakeholder group in order to reflect their different roles, responsibilities, and perspectives with regard to the electronics recycling certification process. The objective of the first 11 interviews, conducted prior to observing any audits, was to establish baseline information about how the different stakeholders across the system were implementing the Standards, identify potential issues of concern, and provide an opportunity for the interviewees to share their perspective on how implementation could be improved. The stakeholders interviewed were:

- Representatives from R2 (owned by Sustainable Electronics Recycling International and e-Stewards (owned by the Basel Action Network);
- An ANSI-ASQ National Accreditation Board representative;
- A national-level certified facility;
- The six Certifying Bodies authorized to certify recycling facilities to the Standards: NSF-ISR; Orion Registrar, Inc.; Perry Johnson Registrars, Inc.; SAI Global; SGS; and TÜV SÜD America; and
- The Electronics Manufacturers Recycling Management Co. (MRM), which represents a consortium of electronics manufacturers.

An additional 20 interviews were conducted concurrently with the audits that were observed in order to obtain further insight from the auditors and the facilities regarding opportunities to improve implementation of the

Standards. These post-audit interviews were always conducted outside of the formal audit to ensure EPA did not influence or interfere with the audit. The stakeholders interviewed were: the nine Certifying Body auditors; two ANAB auditors who were acting in their oversight role witnessing Certifying Body auditors conduct two audits; and the owners or operators of the nine facilities whose audits were observed as part of the Study.

Finally, eight stakeholders from the initial interviews were re-interviewed in 2014 to better understand their perspective on how the implementation of the Standards had changed with the issuance of the new 2013 versions of the Standards. The stakeholders interviewed were: ANAB, five Certifying Bodies (NSF-ISR, Orion Registrar, Inc., Perry Johnson Registrars, Inc., SAI Global, and SGS), and the Standards owners (SERI and BAN).

The information shared with EPA as part of the interviews was directly incorporated into the findings of the Study and is reflected in Section 2 of this report. EPA did not undertake any additional activities to verify the information that was provided beyond that which was stated or provided by the interviewees.

Audit Observations

EPA observed nine audits of electronics recycling facilities between August 2013 and April 2015. EPA observed audits performed by five of the six Certifying Bodies (including observing two audits witnessed by ANAB in its oversight role), which collectively are responsible for auditing over 98% of the facilities that are certified to one or both of the Standards. Though limited to nine in accordance with Paperwork Reduction Act requirements,⁸ in terms of the different types of audits (e.g., Stage 2, surveillance, recertification), facility sizes (ranging from 5-40 employees; single facility vs. multiple facilities across the country), and services offered (reuse, manual disassembly, shredding, data destruction, etc.), the audit observations reflect a cross-section of the types of facilities that can be certified to the Standards. The audits also included an equal number of R2 and e-Stewards audits, as well as one combined audit where a facility was seeking certification to both Standards, as well as audits to both versions of the Standards. Five audits were to the 2008 version of the Standards, and four were to the 2013 versions of the Standards.

Protocols were developed and followed before, during, and after the audits, to ensure consistency in how the audits were observed and the information captured and analyzed. EPA developed an analytical tool to support the observations, an [Audit Observation Checklist](#), with 20 topic areas encompassing 144 discrete items, to use to rank (from 1 to 5) the CB Auditor's effectiveness (see Appendix B of this Report). The 20 topic areas were derived based on all auditable elements present in both of the Standards. Because the Study period spanned the time when both Standards were revised, the audit observation checklist was updated mid-Study to reflect the new versions of the Standards. The Checklist also included questions to ask of each key participant in the Audit Observation (CB Auditor; Facility, and, as appropriate, ANAB Witness Auditors), at the end of the audit, to gain their perspectives about overall effectiveness of the Standards' implementation.

Table 2, below, lists the observed audits in random order, and includes the facility operation type (services offered), size, and type of the audit observed, including whether it was an ANAB Witness Audit. It should be noted that for all audits EPA observed, the CB ultimately recommended the facilities be certified.

⁸ The Paperwork Reduction Act was enacted to minimize the paperwork burden for individuals; small businesses; educational and nonprofit institutions; federal contractors; state, local, and tribal governments; and other persons resulting from the collection of information by or for the federal government.

Table 2. Summary of Audits Observed (In Random Order)

	Type of Operations	# of Employees and Type of Company	Type of Audit
1.	Manual disassembly, reuse and refurbishment, shredding circuit boards, Hg-containing component removal, break/cut Cathode Ray Tubes (CRTs), baling, data destruction	35; N. American multi-site e-cycler	R2:2008; Re-certification
2.	Manual disassembly, shredding circuit boards and hard drives (HDs), break/crush CRTs, baling, data destruction	15; Single-site e-cycler	R2:2008; Stage Two
3.	Manual disassembly, reuse and refurbishment, shredding HDs, break/cut CRTs, baling, data destruction	32; U.S. multi-site e-cycler	e-Stewards:2008; Re-certification
4.	Reuse, data destruction, manual disassembly	5; U.S. multi-site e-cycler	e-Stewards: 2008; Stage Two (ANAB Witness audit)
5.	Recycling, manual disassembly, baling	<i>Not included in audit plan</i> U.S. multi-site e-cycler	R2 and e-Stewards: 2008; Surveillance (ANAB Witness audit)
6.	Reuse, refurbishment, recycling, data destruction, manual disassembly, baling	<i>Not included in audit plan</i> Single-site e-cycler	R2:2013; Stage Two
7.	Recycling, manual disassembly, shredding, data destruction	13; Single-site liquid crystal display (LCD) screen de-manufacturing specialist	e-Stewards 2.0; Surveillance
8.	Recycling, manual disassembly, data destruction	8; Single-site e-cycler	e-Stewards 2.0; Re-certification
9.	Asset recovery and remarketing, recycling, data destruction	40; Single-site e-cycler	R2:2013; Surveillance

Data Analysis

Information from the interviews and audits was aggregated and analyzed to identify patterns of strengths, opportunities for improvement, and other trends. With regard to the audit data, average ratings across all nine audits for each of the 144 discrete elements of the Checklist were calculated, and those averages were then weighted according to the number of audits in which each element was assessed.⁹ The weighted averages for each of the elements were then used to calculate an average overall score for each of the 20 Topic Areas (e.g. Health and Safety, Reuse, etc.) to provide a quantitative sense of how well that particular area of the Standards was audited during the audits that EPA observed. See Section 3 of this report for a comprehensive description of the data aggregation and analysis process.

Final Report

This report documents the Study’s findings, conclusions, and recommendations, which are based on the interviews, audits, and an analysis of the patterns and trends identifying strengths and opportunities for improvement.

⁹ Not every element was assessed in each of the nine audits due to the requirements of different audit types (e.g. Stage 2, surveillance, and recertification) and of the different versions of the two Standards (2008 and 2013).

1.3. Study Limitations

Table 3 provides a summary of the key limitations of the Study, which are important to provide context for the findings and conclusions, as well as for future studies that may be undertaken.

Table 3: Implementation Study Limitations

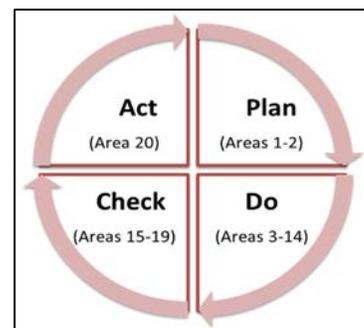
Limitation	Discussion
Snapshot in time in a rapidly changing industry	<ul style="list-style-type: none"> Interviews and audit observations were conducted from March 2013 through May 2015, and only represent findings during that period.
Subset of entire universe of electronics recyclers studied	<ul style="list-style-type: none"> As of December 2015, more than 550 U.S. electronics recycling facilities were certified to one or both of the R2 and e-Stewards Standards.¹⁰ As such, the Study's findings should not be construed to apply to the full universe of electronics recyclers operating in the U.S.
Limited sample size	<ul style="list-style-type: none"> The Paperwork Reduction Act limited the number of interviews and audits that could be observed by the EPA.¹¹ The Study's findings are based on the stakeholder interviews EPA conducted and the audits EPA observed, which reflect a small percentage of all certified electronics recycling facilities and of all auditors working in the electronics recycling industry in the U.S.
Role of the Audit Observers was observational only	<ul style="list-style-type: none"> EPA did not ask direct questions while observing the Certifying Body Auditors conduct the facility audits. Findings based on the observed audits are therefore limited to what could be seen rather than discussed with the Certifying Body auditors.
Facilities agreed to let EPA observe audits	<ul style="list-style-type: none"> For the nine audits EPA observed, the Certifying Bodies contacted their clients (facilities) in advance, and those facilities all agreed to allow EPA to observe their audits. It can be surmised that the clients had confidence in a positive outcome of the audit in order to agree to let EPA observe the audit.
Not all CBs observed in audit portion of the Study	<ul style="list-style-type: none"> EPA observed audits performed by only five of the six Certifying Bodies during the Study. As of the writing of this report, those five Certifying Bodies are collectively responsible for auditing over 98% of the facilities that are certified to one or both of the Standards.
No Stage 1 audits were observed	<ul style="list-style-type: none"> Audit Observations were for facilities obtaining Stage 2 certification, surveillance, or re-certification audits; no Stage 1 (readiness review) audits were observed. Stage 1 audits primarily consist of reviewing facility documents in preparation for a Stage 2 audit, where certification may first be achieved.

¹⁰ Total number of certified recyclers as indicated on both the R2 and e-Stewards web sites.

¹¹ The Paperwork Reduction Act was enacted to minimize the paperwork burden for individuals; small businesses; educational and nonprofit institutions; federal contractors; state, local, and tribal governments; and other persons resulting from the collection of information by or for the federal government.

2. Study Findings

This section presents the findings from the stakeholder interviews conducted and audits observed. Sections 2.1 through 2.20 present the Study's findings organized under the 20 topic areas that are included in both Standards. The findings primarily represent information from the nine audit observations with supporting information from the interviews, as appropriate. Section 2.21 documents any additional findings from the stakeholder interviews that did not directly fall within one of the 20 topic areas, but are nonetheless critical to informing the Study's conclusions and recommendations.



The 20 topic areas parallel the organization of the Audit Observation Checklist (Appendix B), which includes 20 key areas and 144 discrete items. The 20 topic areas also follow the [Plan-Do-Check-Act \(PDCA\)](#) management system, which is the foundation of all certified systems for [control](#) and continuous improvement processes. The electronics recycling system has roots in ISO 9001 Quality Management Systems Requirements and, as a result, PDCA principles are incorporated as part of the certification requirements. It is also important to note that the PDCA system results in some subject areas being examined multiple times during an audit. For example, the auditor may be assessing health and safety (H&S) first through the 'Plan' lens ('Was an H&S hazard analysis conducted so the facility can plan appropriate procedures?'), then 'Do' ('Do employees know and follow H&S requirements?'), then 'Check' ('What mechanisms are in place to ensure H&S procedures are followed and tracked?'), and finally 'Act' ('Is management following up to ensure [non-conformances](#) to the H&S procedures are corrected?').

Key Topic Areas Assessed in the Study

1. System requirements
2. System planning
3. Training and communication
4. Operational controls
5. Health and safety
6. Reuse
7. Data security/data destruction
8. Management of Focus Materials (R2) and Hazardous Electronic Waste and Problematic Components and Materials (e-Stewards)
9. Emergency preparedness and response
10. Materials recovery and disposition
11. Export restrictions for Focus Materials (R2) and Hazardous Electronic Waste (e-Stewards)
12. Site closure and insurance
13. Downstream accountability
14. Monitoring and measurement
15. Tracking
16. Evaluation of compliance
17. Nonconformity, corrective and preventive action
18. Control of records
19. Internal audit
20. Management review

2.1. System Requirements

Description. The "scope" statement that appears on the certificate issued to an electronics recycler by the Certifying Body delineates the limit of the functional area(s) within the organization to which certification applies. It is very important that scope statements be written to align with the requirements of the standard to which the facility is being certified and to clearly describe operational systems (and the related management oversight) that is being certified. It is one of the first things an auditor should verify.

Strengths. Verification of this area by auditors was done consistently. Because this element of conformity verification comes from the ISO standards, it is done fairly uniformly by all auditors. One auditor actually stopped the audit when a discrepancy was discovered between the scope statement and actual practices, and sought clarification from the CB's management, resulting in a quick resolution of the matter.

Opportunities for Improvement. **Generally conforming practices** were observed with regard to this system-level requirement. However, one facility included ‘refurbishing’ in its R2 scope statement, when no refurbishing activities were taking place. Further, this facility’s scope statement did not include “sorting, collection, dismantling, and data destruction” although those activities were taking place. The auditor did not inquire about the discrepancy between the scope and the activities on site – for example, to determine if refurbishing was an activity that was planned to be added, occurred at another facility, or had been discontinued; or why the scope statement was not in alignment with actual practices.

Key Takeaways. It is important that both facilities and CB auditors understand the importance of aligning scope statements with company operations.

(2.1) SYSTEM REQUIREMENTS	
ISSUE	SUGGESTED STRATEGY FOR IMPROVEMENT
Aligning scope statement in certificate with company actions	<ul style="list-style-type: none"> • Ensure this high-level item is reviewed in seminars and educational settings instructing e-cyclers and auditors about certification to ensure relevant aspects of company operations are audited effectively.

2.2. System Planning

Description. System planning requirements involve identifying legal requirements, understanding health and safety risks, having a document control procedure and setting objectives and targets. System Planning is a foundational part of the ‘Plan’ phase in a Plan-Do-Check-Act (PDCA) management system.

Strengths. Thorough auditing practices were observed, including instances in which auditors:

- Verified Policy/Plan based on hierarchy of responsible management;
- Reviewed system documentation; and
- Reviewed procedures for identifying legal and other requirements.

Opportunities for Improvement. Generally conforming practices were observed with regard to this system-level requirement. Generally **CB auditors’** understanding of system planning appeared to be well developed. The exception to this is in the area of auditor awareness of legal requirements. Attention paid to this element by auditors was not consistent with its importance. Several auditors failed to request and review documents proving the facility was tracking and ensuring its own compliance with all legal requirements, especially with regard to both data destruction and export. In addition, management and employee awareness of legal risks was not always audited.

The observations also indicated that opportunities for improvement on the part of recycling **facilities** exist in the following areas:

- Comprehensive identification of legal requirements – particularly pertaining to critical areas including equipment operation (such as shredders), export, air emissions, and data security;
- The complexity and ever-changing nature of legal and export requirements poses a challenge to a facility’s ability to effectively create a system to ensure compliance with applicable laws and regulations;
- Evaluation of environmental health and safety risks – these were conducted, but in a number of the audits observed this analysis was not comprehensive, failing to address key issues such as potential release of toxins or dust exposure;
- Communication and awareness of roles and responsibilities was not always clear. For example, in one case responsibilities were managed at the corporate level with no responsible party at the facility level; and

- Ensuring use of the most current documents and procedures in various day-to-day operations to avoid variances between Procedures in use and what is listed on the Master Document List.

Key Takeaways. Clear identification of legal and other requirements and environmental health and safety risks is fundamental for an effective environmental, health and safety management system. Suggested actions include the creation of tools and methodologies to expand knowledge in this area for all system participant. An example would be a succinct summary of all federal laws pertaining to e-waste. In addition, many interviewees and facilities suggested providing additional guidance and clarification on the CRT rule.

(2.2) SYSTEM PLANNING	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Identification of legal and other requirements	<ul style="list-style-type: none"> • Create a database for auditors identifying key legal requirements for each of the jurisdictions in which the CB operates. The database could be designed to generate state-specific checklists prior to an audit. Auditors need related guidance regarding expectations for the level of detail and comprehensiveness.
	<ul style="list-style-type: none"> • Provide a clear summary of federal laws pertaining to e-Waste processing, management, transportation, and export; conduct webinars on legal requirements.
	<ul style="list-style-type: none"> • Enhance evaluation of auditor competency regarding knowledge of legal and other requirements, as part of auditor training requirements.
CRT Rule	<ul style="list-style-type: none"> • Develop outreach and training materials to clearly explain the CRT rule.

2.3. Training and Communication

Description. Part of the ‘Do’ phase of the Plan-Do-Check-Act system is establishing roles and responsibilities, and ensuring resources are in place for system implementation through training and external and internal communications. Additionally, training and communication at a certified facility is the means by which all employees and stakeholders are made aware of the requirements and procedures of the environmental health and safety management system, including all electronics recycling-specific requirements from the Standards.

Strengths. Under this area, EPA did identify several good examples of thorough auditing by *auditors*. For example:

- Using auditing of this element to identify facility-specific training and communication opportunities in important areas (e.g., forklift maintenance; failure to train temporary employee in up-to-date work instructions);
- Asking to see facility’s customer complaint log, then following the audit trail by checking the Non-Conformance record for a complaint involving a lack of personal protective equipment (PPE) at a customer facility, contrary to agreement; auditor verified that the complaint was closed appropriately;
- Identifying the lack of U.S. Department of Transportation (DOT)/Hazmat training as a minor Non-Conformity; and
- Confirming that a [corrective action](#) led to a change in procedure.

For *facilities*, the following strengths were noted:

- Applying the principles of the Standard to which they are certified, to develop easy-to-remember reminders and training tools very specific to their laborers’ level of understanding – and then supporting employees’ learning through positive reinforcement; and
- Improving training to help prevent shipping to non-approved downstream vendors (i.e., vendors not vetted to the standard requirements).

Opportunities for Improvement. Conforming practices were generally observed with regard to this system-level requirement. However, opportunities for improvement related to training and communication for *facilities* were indicated in areas such as:

- Training employees on environmental aspects and health and safety hazards;
- Creating written procedures for training temporary employees;
- Demonstrating that key employees understand hazardous content (i.e., substance), by component;
- Demonstrating that key employees understand the definition of [Universal Waste](#) and applicable federal and state regulations (including battery storage requirements);
- Demonstrating necessary comprehensive knowledge of import/export and legal compliance matters;
- Demonstrating knowledge and awareness of fire evacuation and emergency preparedness procedures;
- Ensuring understanding of the management system requirements across a work force that may not use English fluently; and
- Communicating awareness of roles and responsibilities clearly. In one case, responsibilities that were corporate in nature were not being effectively translated at the facility level.

For *auditors*, opportunities for improvement were identified as follows:

- Asking for training materials to review them for adequacy;
- Auditing how employee communication occurs;
- Looking at a facility's processes for reviewing and responding to customer complaints, as an indicator of conforming communication practices;
- Identifying facility staff that need to be better trained on legal, downstream material flows, and related issues;
- Ensuring this element is audited (one auditor did not appear to audit this element); and
- Training in auditing for hazardous waste and export requirements.

In addition, findings from the interviews and audits indicated there is a **system-wide** lack of comprehensive knowledge on the environmental, health and safety (EH&S) legal compliance requirements specific to the electronics recycling industry. For example, facilities were observed that appeared to not understand Universal Waste requirements for battery management. This lack of understanding may be attributed to inadequate training and communication with regard to the applicable requirements in this unique industry. All stakeholders (CBs, auditors, ANAB, facilities, regulators, and Standards owners) demonstrated limitations of knowledge in this area during the Study. It appears that there is not sufficient access to both initial and ongoing training in the many aspects of electronics-recycling-specific compliance. Although improvements were observed during the Study period, particularly with the issuance of the new versions of the e-Stewards and R2 standards with their emphasis on training, these knowledge limitations are still problematic and present significant opportunities for improvement.

Further, the knowledge base in the industry is still North American-centric, even though electronics recycling operates in a global commodities market. As U.S.-based stakeholders in the electronics recycling industry expand beyond the U.S., this insufficient comprehensive knowledge is further compounded, especially in the context of international trade laws and conventions. This may be due to inadequate access to authoritative knowledge of legal requirements related to EH&S, data destruction, and export.

Key Takeaways. Training and communication are fundamental to the success of these standards. Though generally audited well, there is an opportunity for auditors to better verify if facility employees, internal auditors, and other stakeholders in the management system have adequate training to thoroughly support a facility's use of training and communication tools to implement its certified EH&S management systems. Effective training is essential and is needed on virtually all the auditable subject-matter areas listed in this report.

Suggested strategies for improvement include exploring and enhancing training tools covering the basics of health and safety, operational controls, data security and destruction, emergency response and preparedness, legal requirements, management of **focus materials (FMs)**, **hazardous electronic wastes (HEWs)**, and **problematic components and materials (PCMs)**. This training could be implemented in a consistent and accountable manner (e.g., continuing education units (CEU) style). In addition, such training might provide opportunities for private sector companies to deliver effective education, much as is done in health care, legal, and other professions where CEUs or training updates are needed to maintain licensing or, in the electronics recycling industry, certification.

(2.3) TRAINING AND COMMUNICATION	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Training and communication	<ul style="list-style-type: none"> Develop best practices or standardized, easy-to-follow training tools for electronics recycling industry stakeholders (CBs, recycling facilities) that covers the basics of health and safety, operational controls, data security and destruction, emergency response and preparedness, legal requirements, management of FMs, HEWs and PCMs, etc.
	<ul style="list-style-type: none"> Provide consistent and 'certified' (i.e., Continuing Education Units (CEU)-style) training covering health and safety, operational controls, data security and destruction, emergency response and preparedness, legal requirements, management of FMs, HEWs and PCMs, etc.

2.4. Operational Controls

Description. Operational control pertains to the processes and procedures that facilities set up and use to ensure they maintain control over the significant environmental, health and safety aspects of their operations. It encompasses setting up operating procedures that spell out how operating criteria will be determined and established. Examples include detailed instructions for processes such as waste management and storage of chemicals; procedures to evaluate the need for engineering, administrative and personal protective equipment (PPE) controls; communications mechanisms; and change management. As part of the 'Do' stage of Plan-Do-Check-Act, operational controls ensure an effective EH&S management system.

Strengths. Because operational controls are required by the Standards, certified facilities develop processes and procedures tailored specifically to the facility and operations. The monitoring and measurement of operational controls (e.g., using inspection checklists) ensures the environmental health and safety management system (EHSMS) is not shelved until the next audit year. In addition, one Study interviewee mentioned use of PPE vending machines as being an effective tool in getting better technician compliance in using PPE regularly.

Opportunities for Improvement. Opportunities for improvement noted in the Audit Observations for **auditors** included:

- The need to consistently verify that written procedures were implemented correctly by staff. For example, auditors missed important audit opportunities such as:
 - Reviewing the Focus Material (FM) Management Plan – and following up to verify that FMs such as mercury-containing devices, CRTs, batteries, etc., were being managed according to the stated procedures in the warehouse and in associated documentation.
 - Following the audit trail to confirm the extent to which engineering or administrative controls were used for specific areas ranked with a high health and safety (H&S) risk.
 - Asking technicians about engineering controls or other required procedures or not noting that technicians did not appear to be clear about some procedures.
 - The need to ensure that practices observed during the audit (e.g., large proportion of CRTs broken in garages, poor ergonomic controls, failure to use PPE) which were at a variance from controls stated in written procedures were addressed in audit findings.

- Ensuring review of purchased materials impacting H&S (e.g., information from propane suppliers).
- Auditing a facility’s Management of Change Procedure, which is a standard operating procedure to be followed when change is planned for a facility (e.g., when considering adding a shredder, management should complete the Management of Change Procedure to ensure proper control of operations in accordance with the requirements of the specific Standard the facility is certified to, including regulatory requirements).

Opportunities for improvement for the electronics recycling *facilities* included:

- Translating risks identified in risk and hazard assessments into procedures, control requirements, and areas where more information is needed to manage risk correctly. For example, facilities were observed:
 - Ranking battery explosion as a ‘high’ H&S risk but not requiring PPE when working with batteries;
 - Lacking a procedure for Universal Waste (UW) storage nor associated controls for risks associated with UW storage, disassembly, transportation, etc.; and
 - Identifying hearing loss as a risk, with hearing protection as a control, but optional for technicians – but then failing to follow up and monitor if hearing loss was occurring.
- Ensuring proper use of PPE and controls. EPA observed, for example, employees with no arm protection, wearing masks improperly, no eye protection and no ear protection – in operating situations which would necessitate such PPE. EPA also observed missing machine guarding in a shredder area.

Key Takeaways. Note that in the interviews conducted directly after the audits, several interviewees pointed to the problems electronics recyclers have in completing adequate and accurate risk and hazard assessments. The interviewees suggested that electronics recyclers do not recognize the importance of this step, how to do it accurately, and how it should be translated into procedures, controls, follow-up activity, and monitoring. These operational control tools and systems, when well-used and well-monitored by key staff and management, form one of the foundations of a good EH&S management system. Recommendations include the need to build better understanding system-wide on how to do risk and hazard assessments and how to use operational controls.

(2.4) EFFECTIVE USE OF OPERATIONAL CONTROLS	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Operational controls	<ul style="list-style-type: none"> • Use training tools and best practice case studies to build better understanding for facilities of how to do risk and hazard assessments and how to use operational controls.
	<ul style="list-style-type: none"> • Use training tools to build better understanding for auditors on how to effectively audit whether operational controls are being used correctly.

2.5. Health and Safety

Description. Addressing Health and Safety (H&S) requirements is one of the most important and complex aspects of being certified to the e-Stewards and R2 Standards. Health and safety is a critical ‘Do’ phase of the Plan-Do-Check-Act system, which encompasses:

- Knowing and meeting applicable health and safety laws;
- Understanding all H&S hazards posed by working with end-of-life electronic equipment;
- Using appropriate engineering and administrative controls;
- Ensuring correct use of personal protective equipment;
- Maintaining workplace hygiene;
- Knowing and managing H&S risks;
- Monitoring;
- Conducting programs, training and communication about H&S, and

- Completing extensive documentation of all H&S procedures and practices.

Strengths. Findings from the interviews and audits indicate that because of the Standards, electronics recycling facilities have implemented significant steps toward improving industry health and safety, such as using ongoing health and safety committees, air quality testing, medical surveillance, and hazard assessments. Findings indicate that these practices were minimally implemented or less common prior to the emergence of standards specific to the electronics recycling industry. Adding OHSAS 18001 (referenced in each Standards' second iteration) is further raising the bar and encouraging better health and safety practices.

Standards owners are aware of and are addressing these issues. E-Stewards noted that the 2013 National Institute for Occupational Safety and Health (NIOSH) report on lead (Pb) issues at electronics recycling facilities¹² came out immediately before version 2.0 of the e-Stewards Standard was published. E-Stewards plans to specifically address the need for better monitoring (including possible bio-monitoring of workers, and surface sampling) and reporting of Pb levels, via its Sanctioned Interpretations, leading to best practices for e-Stewards.¹³ In addition, SERI has developed its modular Implementation Guide for R2-certified electronics recyclers; it includes a module addressing Provision 4 of the R2:2013 Standard addressing health and safety issues.¹⁴ NIOSH's ongoing research data is beginning to contribute better data and baselines for Pb-related or other industrial hygiene issues for electronics recyclers, (see NIOSH's July and September 2014 articles¹⁵).

Opportunities for Improvement. Conformity with this area was one of the most difficult for the observed facilities and posed challenges for all other players in the system. Opportunities to better audit health and safety for *auditors* included:

- Ensuring, through records review and asking employees questions, that all workers (temporary as well as permanent) are aware of and in conformity with the H&S system requirements;
- Reviewing the PPE or Hazard Communication Procedure, the Illness and Injury Prevention Program, and ensuring conformity in practice;
- Viewing all pertinent records – not just looking at procedures, but asking to view items including:
 - H&S meeting minutes;
 - Health-related test results (e.g., lead) or hearing tests, including documentation of informing workers of test results;
 - Monthly and OSHA inspection records;
 - Location and proof of use of SDSs (Safety Data Sheets), and
 - Evidence of following workplace hygiene/cleaning procedures;
- Demonstrating their understanding of exposures and risk-based controls by asking the facility questions to elicit operator knowledge of those issues; and
- In one case, an auditor failed to audit the basics of a health and safety program.

Opportunities for improvement for the electronics recycling *facilities* included the need for:

- Better understanding of hazards analysis, potential exposures, and subsequent use of risk-based controls, including taking steps such as:
 - Creating and actively using procedures based on hazards analysis findings,

¹² Letter to Sarah Westervelt, BAN, from Elena H. Page, MD, MPH, Medical Officer and Diana Ceballos, PhD, CIH, Industrial Hygienist; Hazard Evaluations and Technical Assistance Branch; Division of Surveillance, Hazard Evaluations and Field Studies; National Institute for Occupational Safety and Health, July 23, 2013, available at www.ban.org/files/NIOSHI_Letter_to_BAN.pdf

¹³ Personal communications, Sarah Westervelt, BAN, June 8, 2014, November 6, 2015.

¹⁴ See <https://sustainableelectronics.org/implementation-guide-provision-4>, accessed November 6, 2015.

¹⁵ See *Occupational Exposures at Electronic Scrap Recycling Facilities, September 30, 2014*, by Diana Ceballos, PhD, MS, CIH and Elena Page, MD, MPH, <http://blogs.cdc.gov/niosh-science-blog/2014/09/30/escrap/>; also see *Evaluation of Occupational Exposures at an Electronic Scrap Recycling Facility*, Report No. 2012-0100-3217, July 2014, by Diana Ceballos, PhD, MS, CIH; Lilia Chen, MS, CIH; Elena Page, MD, MPH; Alan Echt, MPH, CIH; Aalok Oza, MPH; and Jessica Ramsey, MS, CPE. www.cdc.gov/niosh/hhe/reports/pdfs/2012-0100-3217.pdf accessed November 6, 2015

- Using PPE hazard assessments in alignment with hazards identification,
 - Improving understanding of SDS and how and when to use them and where to get them,
 - Knowing and posting occupational health providers,
 - Conducting air monitoring to determine if medical surveillance is needed, and
 - Using their management systems to communicate all aspects of EH&S monitoring to those impacted;
- Consistent ability to identify hazardous substances in equipment (e.g., an auditor identified medical equipment not labeled as hazardous and also observed leaking batteries, which the facility operator had not noticed). Facilities face challenges in this area such as:
 - Lack of documented information on hazardous substances associated with equipment being received,
 - Manufacturers of electronic equipment not providing information on hazardous or potentially hazardous materials in components, and
 - Understanding risks posed by lead (Pb) and other toxins in electronic equipment depending on type of processing being used;
 - Better understanding by electronics recyclers of the importance of consistent workplace hygiene procedures (housekeeping and cleanliness);
 - Using standing H&S Committee meetings to further conformance with the H&S System throughout the facility; and
 - Evaluation of business models that may undermine attention to H&S. For example, it appears that paying employees on a pound-per-hour basis creates disincentives for workers and managers to adequately attend to housekeeping, safety, and ergonomics.

Key Takeaways. This area needs significant attention from all stakeholders in the electronics recycling industry and beyond (from manufacturers through regulators). For the near-term, suggested strategies for improvement include the need for additional time during audits for auditors to more thoroughly audit health and safety monitoring, measurement, record-keeping, and communication issues to give facilities critical feedback on their H&S systems. Also, electronics recyclers need further training and guidance on conducting proper risk assessments and hazards analyses, complying with health and safety requirements, and using appropriate controls. Additional research is needed into the potential health hazards of exposure to electronics in the various ways it is managed at end of life – related to both short- and longer-term exposures and manifestations.

(2.5) HEALTH AND SAFETY	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Health and safety conformity and compliance	● Improve compliance with and enforcement of occupational health and safety laws and requirements.
	● Develop training and guidance for facilities on conducting comprehensive risk assessments and hazards analyses; use of safety data sheets; applicable legal requirements; monitoring results; machine guarding and lockout/tag-out; etc.
	● Develop ongoing mechanism to identify hazardous substances in electronic devices as they evolve.
	● Provide training on transportation requirements for hazardous substances (e.g., FAA restrictions on lithium-ion batteries in air transport).
	● Publish research-based baseline requirements for Pb and other toxic substances sampling for human health and indoor environment, specific to the electronics recycling industry.
	● Provide training and guidance for facilities and auditors on industrial health monitoring, measurement, recordkeeping, and communication.

2.6. Reuse

Description. As part of the ‘Do’ phase of Plan-Do-Check-Act, reuse of electronics is encouraged by both Standards over recycling or disposal. Reusable electronics and components must be tested for functionality, cleared of any customer data, and packaged adequately for protection during shipment. Outsourcing of testing is addressed along with management of scrap from the test and refurbishment process. This area is of special concern in the Standards due to the risk of having equipment and components destined for reuse being exported to destinations allowing illegal dumping and other unethical practices.

Strengths. Good practices observed included the use of protective packaging in shipping, and adequate data destruction of equipment going for resale. Further, the updated versions of both Standards provide greater clarity in the Reuse area, as does additional information provided from the Standards to their certified facilities.¹⁶

Opportunities for Improvement. A mix of conforming and **non-conforming practices** were observed with regard to this requirement. The Study found that **both facilities and auditors** do not consistently understand the Standards’ reuse requirements. Opportunities for improvement were noted in the following areas:

- Increasing the audit time for this provision;
- Better auditing of provisions in both Standards which prohibit sale or donation for reuse if contrary to commercial agreements;
- Verifying that equipment is destined for Reuse and not Recycling or Final Disposal; and
- Implementing and auditing functionality testing for equipment and components in a consistent manner. Specifically, the following issues were noted related to functionality testing:
 - Several recyclers outsourced testing; however there was minimal verification by the recycler that downstream vendors were actually conducting functionality testing;
 - In several cases, auditors did not request functionality testing results or records and/or recyclers did not maintain these records;
 - A lack of consistency in testing procedures. For example, in one instance, power-on testing only was performed which was not identified by the auditor as a non-conformance;
 - Inconsistent interpretation of key terms by auditors and facilities. For example, definitions of “key” functions and “full” functionality testing in the Standards were not consistently interpreted; and
 - Facilities may be exporting non-functional focus materials without proper documentation of functionality testing, which is not being caught by facilities or auditors.

Key Takeaways. Consistent definitions of required functionality testing in the Standards or related Guidance documents are essential to ensure effective reusable equipment and to prevent exports of non-tested/non-working components and/or equipment – as well as to provide clarification for auditors. Sufficient audit time is also needed to adequately audit this element, as well as tools for auditors to aid auditing the reuse function in a consistent manner.

¹⁶ E.g., SERI’s March 2015 newsletter, *R2 Update*, contains an article “Ensuring your sales on eBay conform to R2 testing and resale requirements,” which addresses an area of confusion for electronics recyclers, regarding Reuse.

(2.6) REUSE	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Functionality testing	<ul style="list-style-type: none"> • Provide better information/tools to ensure export of equipment for reuse and refurbishment complies with the Standards.
	<ul style="list-style-type: none"> • Develop lists with clear definitions of various functionality tests and key component testing to assist facilities and auditors.
	<ul style="list-style-type: none"> • Provide an improved definition of acceptable test methods, more clarification as to what is acceptable, and additional guidance on different types of testing (e.g., scenarios, flowcharts, or guidelines of good practices).

2.7. Data Security/Data destruction

Description. This element of the e-Stewards and R2 standards goes beyond baseline requirements of an EH&S management system and is necessary to protect sensitive information found in data-bearing devices from theft or misuse. This element is in the ‘Do’ phase of the Plan-Do-Check-Act system.

Strengths. The Standards have improved the detail and requirements for this area in the new versions. Very good auditing of this element was observed during Audit Observations.

Opportunities for Improvement. Generally conforming practices were observed with regard to this requirement. Opportunities for improving the understanding of the following areas for both *auditors* and *facilities* and *other stakeholders*, exist for:

- Customer requirements which should drive the level of security and data destruction;
- Whether a contract or other similar agreement is required with downstream vendors performing data destruction, and specific language that would prove conformity;
- Data destruction concerns for non-computing equipment including non-smart cell phones, printers, scanners, etc.;
- The extension of a facility’s insurance policy to include coverage for data breach issues;
- Independent validation of data destruction (third-party or in-house QC function);
- How asset tag removal and management are handled;
- Data security protection procedures between time of collection and time of hard drive destruction (e.g., theft risks); and
- Security at site entrance, facility entrance, warehouse exit/entry points, and security cage.

Key Takeaways. Overall, this is an area of strength. It is particularly difficult to recommend a “one-size-fits-all” solution for data security and destruction as electronics recyclers deal with vastly differing levels of security needs – from those accepting non-data bearing equipment to those handling data-bearing devices with the highest security clearances needed.

(2.7) DATA SECURITY/ DATA DESTRUCTION	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Protection of data from theft or loss	<ul style="list-style-type: none"> • Develop training on risks of data theft or loss during transportation, especially with outsourced logistics and drivers-for-hire.
	<ul style="list-style-type: none"> • Develop guidance and training on risks associated with data devices being stored onsite, including best practices for facility-level security.

2.8. Management of Focus Materials, Hazardous Electronic Waste, and Problematic Components and Materials

Description. Both Standards include requirements for responsible management of electronic waste with a particular attention to equipment that may be hazardous. R2 defines this equipment as Focus Materials (FM), while e-Stewards defines two categories: Hazardous Electronic Waste (HEW) and Problematic Components and Materials (PCMs). Each Standard provides a general principle that management of these materials must be done in a manner that is protective of human health and the environment – although the approach taken to specifying controls varies between the Standards. This management requirement is part of ‘Do’ phase of the Plan-Do-Check-Act system.

Strengths. Good practices observed included instances where auditors focused on: (i) verifying that a facility would seek to learn what hazardous substances were in non-standard electronic equipment it received, and (ii) reviewing Universal Waste storage and labeling requirements. Facilities were observed effectively planning for and then correctly separating and storing FMs/HEWs/PCMs.

Opportunities for Improvement. While it was clear in a number of audits observed that there was good understanding of appropriate management practices for FMs, HEW, and PCMs, it appeared that some significant instances of unsafe or inappropriate practices were not identified by the *auditors*. For example:

- In some cases, auditors would verify good management practices for some high-risk areas, but paid insufficient attention to others (e.g., safe removal and storage of mercury lamps, CRT breakage, and batteries);
- In one facility, it was noted that there was a conjoined warehouse containing large storage units, owned by the parent company to the [certified recycler](#). The auditor did not ask for records of what was in the conjoined warehouse to make sure there were no FMs, HEW, or PCMs stored there, nor asked to physically inspect the storage units;
- In some cases, it appeared that there was limited verification of labeling and storage time limits for FMs, HEW, and PCMs;
- There was limited review of notification and labeling requirements for overseas shipping of FMs/HEWs/PCMs to precious metals recovery; and
- In nearly all cases, verification of labeling and export status for CRTs was not observed.

A number of opportunities for improvements were identified to enhance the operational knowledge of certified *facilities*, including better understanding of:

- Hazardous content (i.e., substance), by component and/or equipment type;
- Appropriate management practices for equipment with hazardous content; and
- Definition of Universal Waste and applicable federal and state regulations, including battery storage requirements.

Key Takeaways. Management and auditing the safe removal and handling of the hazardous materials in electronic equipment is an area that presents a significant opportunity for improvement. The Study found there appears to be confusion for many industry parties about what is and is not hazardous or Universal Waste under state and federal regulations. Differences among states in how electronic waste is classified (electronic equipment materials including equipment, batteries, and mercury-containing devices are Universal Waste in some states and not in others)¹⁷ contribute to this confusion. Further, it appears that because much electronic equipment is not classified as hazardous or Universal Waste as it moves through the U.S. end-of-life system, some operators do not understand the need to manage e-scrap for the hazardous substances contained therein from both an environmental and worker

¹⁷ See <http://www3.epa.gov/epawaste/hazard/wastetypes/universal/statespf.htm>.

health-and-safety perspective. The difficulties electronics recyclers face when trying to obtain information about hazardous or problematic materials found in equipment and components from manufacturers further compounds this problem. Inadequate audit time negatively impacts this element, particularly for integrated audits.¹⁸

Increased training for appropriate identification and management of hazardous components and materials will begin to address this problem. Based on experience and the findings of this Study, making information on hazardous substances found in equipment available to electronics recyclers, by manufacturers from component-level [Bills of Materials](#), would further assist in this area.

(2.8) MANAGEMENT OF FOCUS MATERIALS, HAZARDOUS ELECTRONIC WASTES, AND PROBLEMATIC COMPONENTS AND MATERIALS	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Awareness of appropriate management practices for hazardous components	<ul style="list-style-type: none"> Encourage all electronic equipment manufacturers to disclose hazardous constituents at the bill-of-materials level to electronics recyclers, to best protect human health and environment.
	<ul style="list-style-type: none"> Conduct research into and create incentives for solutions for safe removal of hazardous components. Could include developing training/webinars, including best practice case study materials for each type of hazardous material and component, to support appropriate management of hazardous constituents.
	<ul style="list-style-type: none"> Better attention to safe dismantling of liquid crystal displays (LCDs). The potential for breaking the small, fragile, mercury-bearing tubes is high.
	<ul style="list-style-type: none"> Conduct or support research into protocols for emerging toxins potentially found in end-of-life electronics that may be released by various processing technologies (e.g., brominated flame retardant (BFR) emissions from shredding and pulverizing plastics). Support transfer of this knowledge to electronics recyclers.

2.9. Emergency Preparedness and Response

Description. Each of the Standards includes requirements for identifying potential emergency situations and requires plans for responding to emergency situations in order to protect worker health and safety and the environment. Emergency preparedness plans should be tested on a regular basis and reviewed after an emergency situation. This is part of the ‘Do’ stage of the Plan-Do-Check-Act system.

Strengths. Good practices observed, including instances in which auditors:

- Reviewed emergency response plans and emergency equipment such as spill kits, fire extinguishers and emergency lighting;
- Interviewed employees for knowledge of what to do in case of specific emergencies, including severe weather shelters and meeting places for evacuation; and
- Issued a nonconformance for not updating and revising procedures when an emergency drill revealed the existing method was not effective (one department could not hear the alarm).

Opportunities for Improvement. Generally conforming practices were observed with regard to this requirement, including facilities’ attention to safe storage and shipping of flammable materials such as batteries. However, the observations indicated that opportunities for improvement exist for *facilities* as follows:

¹⁸ Multiple standards being audited at the same time. For example, a facility may be audited to R2:2013, e-Stewards v2.0, ISO 14001, OHSAS 18001, and ISO 9001, during the same audit. This can both save time and make the audit much more complex for the CB auditor. Facilities choose to have multiple certifications for many reasons, including to: meet requirements of the standards themselves, meet customer requirements, and/or optimize operations.

- Understanding response procedures for material-specific spills (e.g., CRT glass, mercury);
- Expanding emergency drills (test more than just fire drills – test for severe weather, mock medical, etc.); and
- Developing safer dismantling procedures to avoid spills.

Generally, *auditor* understanding of emergency preparedness and response appeared to be well developed; however in several observed audits, auditors asked about emergency drills, but did not request records as evidence.

Key Takeaways. Observations and interviews both indicated that emergency preparedness and response is understood and implemented by facilities and audited effectively by auditors.

(2.9) EMERGENCY PREPAREDNESS AND RESPONSE	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Awareness of appropriate management practices for emergency preparedness	<ul style="list-style-type: none"> • Creation of best practice guidelines for material-specific spills (e.g., CRT glass and mercury spills) and educate employees on the dangers of personal exposure to lead and mercury.
	<ul style="list-style-type: none"> • Expanded emergency drill testing. The majority of facilities focus on just fire drills every year. Testing could be rotated to include mock medical emergency, mock spill, severe weather, etc.

2.10. Materials Recovery and Disposition

Description. Each of the Standards includes requirements for acceptable processing, recovery, or treatment of FMs/HEWs/PCMs materials, including that all operations are fully licensed and permitted. This is also a part of the ‘Do’ phase of the Plan-Do-Check-Act system, and is unique to the electronics recycling Standards.

Strengths. Good practices were also observed, including instances in which *auditors*:

- Selected specific FMs/HEWs and followed them through to final disposition, verifying volumes and acceptable destinations;
- Verified that the recyclers were themselves verifying that downstream processors were meeting the requirements to control downstream destinations, particularly when the audit function was outsourced;
- Focused on high-risk areas such as battery storage; and
- Verified that transporters had the necessary regulatory authorizations and no significant violations.

Opportunities for Improvement. Generally conforming practices were observed with regard to this important requirement. However, the observations indicated that opportunities for improvement exist in the following areas for *auditors*:

- Comprehensive verification of written procedures and associated controls for ensuring downstream processors conformed to Standards’ requirements were not audited in about half of the audits observed;
- Consistent review of final disposition (destinations) and processing of residuals arising from the hazardous constituents of electronic waste (including halogenated compounds from plastics or resin materials); and
- Sufficient verification of controls required (which differ by standard) prior to shipment throughout the recycling chain; for example:
 - R2 requires identification of countries receiving such shipments and obtaining documentation demonstrating that each country legally accepts such shipments. A facility can then only export to countries for which it has the required documentation as well as controls for downstream processing; parties in the recycling chain must meet R2’s reuse and contractual requirements.

- E-Stewards requires prior approval to confirm export, reuse, materials recovery and disposition, contractual, and downstream accountability requirements are met.

For *facilities*, it appeared that attention to safe packaging of hazardous equipment (e.g., CRTs, batteries, etc.) appropriate to protect public health and environmental during transportation, as required by federal law¹⁹, could be improved.

Key Takeaways. It appeared that there may be a significant opportunity for improvement in verification of downstream materials recovery and disposal through to final disposition. Observations and interviews both indicated that managing downstream conformity to the Standards is perhaps the most challenging aspect of the Standards. In this small sample of observations, it appeared that there may be a significant opportunity for improvement in the methods and level to which audit and other records are reviewed by auditors to verify the efficacy of controls for downstream materials recovery and disposal through to final disposition. Adequate audit time and sufficient tools are suggested strategies for improvement.

(2.10) MATERIALS RECOVERY AND DISPOSITION	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Awareness of best practices	<ul style="list-style-type: none"> • Improvement of training materials for auditor knowledge of downstream processing options and best practices.
	<ul style="list-style-type: none"> • Update relevant web sites, deliver webinars and/or email updates on tools and guidance to help electronics industry stakeholders improve their understanding of best practices.
Verification of downstream processors	<ul style="list-style-type: none"> • Provision of auditing tools/ training/ questions to assist auditors to fully explore audit trails for downstream processing.
	<ul style="list-style-type: none"> • Creation of case studies for training materials on how to audit downstream processing.

2.11. Export restrictions for Focus Materials and Hazardous Electronic Waste

Description. Export controls, for Focus Materials and Hazardous Electronic Waste (FMs and HEWs), are required in both Standards with provisions to ensure export only occurs to countries that legally accept the shipped items or materials in conformance with applicable national laws and/or international laws, such as the [Basel Convention](#) for the Transboundary Movement of Hazardous Waste or OECD Decision C (2001)107/FINAL. The e-Stewards Standard includes requirements to limit the shipment of hazardous waste to countries that are not members of the OECD/EU consistent with the [Ban Amendment](#) under the Basel Convention. The Ban Amendment is not in force, but has been implemented by some Parties to the Basel Convention. This is also a part of the ‘Do’ phase of the Plan-Do-Check-Act system that is unique to the electronics recycling Standards.

Strengths. The Standards’ second versions (issued in 2013) both made their provisions regarding export more specific, which has further highlighted the need in the entire system for attention to responsible export of electronics. Prior to the development of the Standards, less attention was paid to the issue of exporting hazardous electronic waste to developing countries; this practice has been documented to have far-reaching global implications in terms of environmental injustices and adverse health and environmental impacts. Also, post-Audit Observation interviews indicated that e-scrap generators as well as electronics recycling facilities generally want to comply with legal requirements when exporting used electronics.

¹⁹ See 49 CFR Parts 100-185 and the Federal Motor Carrier Safety Regulations (49 CFR Parts 382, 383, 387, 390-397, and 40). See more at: www.fmcsa.dot.gov/regulations/hazardous-materials/how-comply-federal-hazardous-materials-regulations .

Opportunities for Improvement. In the majority of Audit Observations in which export was in scope, it appeared that export practices were not thoroughly audited. The observations identified opportunities for improvement for *auditors* in reviewing the following areas during the audit:

- Export records throughout the recycling chain rather than focusing on the Recycler’s first-tier immediate downstream vendor(s);
- The validity of the consent (including expiration dates) of the foreign [Competent Authority](#) to accept the proposed or actual export;
- Downstream audit packets/reports to verify conformity to export requirements (auditors were observed simply accepting the presence of an audit report to indicate conformity); and
- Issuances of non-conformity if the company exporting CRTs for recycling is not on EPA’s approved list (available on EPA’s website).

For electronics recycling *facilities*, it appears there is an opportunity to improve:

- Record-keeping regarding exported shipments;
- Obtaining and retaining Competent Authority and [Acknowledgement of Consent](#) notices (export, transit, and import) in a timely and updated fashion; and
- Reviewing the EPA website for notifications regarding companies approved to export CRTs for reuse or recycling.

The Study found that there appears to be a lack of clarity in the industry about the implementation of the U.S. export laws and OECD Decision C(2001)107/FINAL (referenced by both R2 and e-Stewards), and the Basel Convention and the Basel BAN Amendment (referenced by e-Stewards), and challenges understanding these compliance and operational requirements. Post-Audit Observation interviewees noted a need for better tools, guidance and information to be able to better understand and thus comply with these requirements in the Standards.

Key Takeaways. Audit observations and interviews both indicated that electronics recyclers’ management systems and auditing of export requirements by CB auditors are not wholly achieving the intent of either Standard. There is a need to increase training and awareness of export requirements (particularly for CRTs), and to enhance the operational knowledge of certified electronics recyclers and auditors, in relation to import-export and legal compliance know-how.

(2.11) EXPORT RESTRICTIONS FOR FOCUS MATERIALS AND HAZARDOUS ELECTRONIC WASTE	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Implementation, training and awareness	<ul style="list-style-type: none"> • Create tools such as a lockbox or other confidential means by which auditors can verify information without disclosing commercial terms or confidential business information (CBI).
	<ul style="list-style-type: none"> • Develop and conduct additional training for auditors on how to evaluate compliance with export requirements, including using case studies.

2.12. Site Closure and Insurance

Description. Each of the Standards includes controls for site closure and [financial assurance](#) to ensure the proper closure of facilities and to prevent abandonment of electronics. Adequate insurance is required to cover processing risks, health and safety risks, environmental liability, professional liability and data liability, as appropriate. While it might seem like a ‘Plan’ step, keeping a closure plan up to date makes this part of the ‘Do’ phase of the Plan-Do-Check-Act system.

Strengths. Good practices were observed, including instances in which auditors reviewed certificates of insurance and checked the expiration dates. In addition, some auditors spent considerable time exploring indemnification and how it was communicated to customers.

Opportunities for Improvement. Generally conforming practices were observed. However, opportunities for improvement at *facilities* exist in the following areas:

- Closure for an additional warehouse was not included in the Closure Plan at one facility;
- Several facilities did not address environmental sampling and remediation in their Closure Plans, which is required by both standards.

For *auditors*, it appears there is an opportunity to improve:

- Verification/validation of the value of an electronics recycler’s facility assets used as a closure mechanism (i.e., the auditor should verify that the value of equipment in the facility that would be sold in the event of a closure is as stated; ideally this should be independently verified);
- In one case, an auditor did not question details of a closure plan that appeared (to the [Audit Observer](#)) to be inadequate; and
- In addition, some assets listed, such as vehicles or movable equipment, could be removed before abandonment, and thus should not be counted as a closure asset.

It is important to note that because Closure Plans are not legally binding (unless there is a state-required program), in a bankruptcy situation, sale of assets may go to banks that have liens or to other creditors. It was not clear, based on observations, that *recycling facilities or auditors* understand this when reviewing a facility’s closure plan that states that the value of assets would offset closure. This is an area for further improvement within the entire system.

Key Takeaways. This area would benefit from increased scrutiny by all stakeholders, in order to create knowledge, enhanced site closure assurance practices, and more thorough auditing of this element by CB auditors. Case studies or recommendations regarding appropriate insurance limits and instruments focusing on site closure “financial surety” would be helpful.

(2.12) SITE CLOSURE AND INSURANCE	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Strength of closure plans and financial assurance requirements; better understanding of this by stakeholders	<ul style="list-style-type: none"> • Develop case studies or recommendations regarding appropriate insurance limits and instruments focusing on site closure “financial surety.”
	<ul style="list-style-type: none"> • Improve auditors’ and facilities’ understanding of the limits of use of assets as closure mechanism.

2.13. Downstream Accountability

Description. Specific provisions in each Standard require electronics recyclers to conduct initial and ongoing due diligence of and accountability for the practices of all downstream recyclers, particularly for FMs, HEWs, and PCMs. Thorough record-keeping is critical for this subject area. Differentiated from Section 2.10, Materials Recovery and Disposition (auditors look at how materials are processed and disposed per the Standards' requirements), in the Downstream Accountability section auditors look for how facilities select, audit, and document their downstream vendors' practices, to be assured the Standards' requirements are met. This is a very important part of the 'Do' phase of the Plan-Do-Check-Act system, and is unique to the electronics recycling Standards.

Strengths. A number of systems strengths were observed during the audit observations, including instances in which **auditors**:

- Reviewed auditor qualifications for those conducting downstream audits;
- Conducted a thorough exploration of all downstream material flows and verification of conformity at each stage of the recycling chain;
- Verified signed agreements between the recycler and downstream vendor;
- Issued non-conformities due to issues such as incomplete due diligence records, downstream processors not agreeing to transparency as required; and lack of contracts with downstream vendors; and
- Verified contracts with downstream vendors conducting reuse tasks.

In addition, the Study identified an emerging good practice in which **facilities** are setting up software programs that will prohibit shipping to destinations that are not approved in the software system.

Opportunities for Improvement. Observations indicated that verification of downstream accountability requirements varied, with opportunities for improvement for **auditors** in the following areas:

- Confirming that all downstream material flows are identified throughout the recycling chain, beyond the first downstream vendor and especially for vendors conducting reuse activities;
- Interviewing local facility representatives involved in contracting and shipping to downstream to verify implementation of corporate downstream accountability processes;
- Reviewing downstream audit packets/reports to verify conformity of requirements rather than simply accepting the presence of an audit report to indicate conformity;
- In one instance, an auditor failed to review shipping records at all and also simply noted verbal reports from the facility about downstream accountability, without checking records;
- Improving the sampling of shipping records by:
 - Ensuring an adequate sample size of downstream records to verify system conformity. This is thought to be a challenge related to inadequate audit time; and
 - Conducting random sampling of downstream vendors to verify conformity, rather than relying on samples chosen by the recycler; and Issuing a non-conformance (NC) rather than an area of concern (AOC), which may have been a more appropriate finding in an instance in which approval of downstream vendors is not systematically demonstrated in the management system.

Opportunities for improvement for **facilities** include strengthening systems of controls and better training within facilities, to ensure that requirements are translated into procedures and practices.

Key Takeaways. Verification of downstream accountability requirements is perhaps the most challenging element of the Standards due to:

- The desire of downstream vendors to maintain the confidential business information and/or the intellectual property associated with their processes. When responding to an upstream certification recycler’s query, a downstream vendor may be reluctant to be transparent (i.e., disclose details of its subsequent downstream vendors, its EH&S practices, its regulatory status, its processing technologies, etc.) for fear of this information ‘getting out’ – thus costing its customers or causing a disadvantage in relation to competition;
- Costs associated with adequate auditing of downstream vendors;
- The size and/or fluidity of some facilities’ downstream recycling chains; and
- The need for auditors to randomly sample sufficient numbers of records to verify conformity in limited amounts of time.

However, interviewees concurred that attention brought to downstream due diligence by the Standards has dramatically improved the electronics recycling industry.

(2.13) DOWNSTREAM ACCOUNTABILITY	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Downstream accountability	<ul style="list-style-type: none"> • Standardized audit packet guidance tool – what an upstream can ask for from its downstream, as a basic practice in the electronics recycling industry.
	<ul style="list-style-type: none"> • Develop easier-to-use and standardized tools or requirements for mass balance reports (e.g., new e-Stewards standard requires linking shipping records to tracking information).
	<ul style="list-style-type: none"> • Tools to keep transparency of downstream vendors but which respect commercial privacy.
	<ul style="list-style-type: none"> • Consider audit queries by auditors for downstream sampling to go beyond getting data from electronics recyclers’ EH&S staff (e.g., ask Accounting).

2.14. Monitoring and Measurement

Description. This important area ensures organizations are monitoring and measuring, on a regular basis, their activities that have environmental and health and safety (EH&S) impacts. Monitoring also includes calibration of equipment, industrial hygiene testing, tracking EH&S performance, tracking of equipment, logging progress on objectives and targets, and periodic management reviews. While ‘measurement’ sounds like ‘checking’ it is a part of the ‘Do’ phase of the Plan-Do-Check-Act system.

Strengths. Many good practices were observed including the use of very thorough monitoring checklists by *facilities* for (i) workplace checklists (e.g., such as weekly, monthly, quarterly and/or annual EH&S inspections), and (ii) daily hygiene checklists. In addition, strengths were observed by *auditors* who reviewed the management review process in which objectives and targets are monitored and checked the status of scale calibrations.

Opportunities for Improvement. Generally conforming practices were observed. However, the observations indicated that opportunities for improvement for *facilities* exist in the following areas:

- Identifying testing equipment in testing and refurbishment areas in need of calibration;
- More frequent health and safety monitoring. Several non-conformances were issued including blocked electrical panels and two facilities where fire extinguishers missed monthly inspections; and
- Auditors noted that while companies have thorough EH&S checklists, they often do not follow-up and take care of issues identified via the checklists.

Opportunities for improvement for *auditors* were observed as follows:

- Requesting monitoring records. During one audit, monitoring records were not requested by the auditor.

Key Takeaways. Observations and interviews both indicated that monitoring and measurement is understood and implemented by facilities and audited effectively by auditors.

(2.14) MONITORING AND MEASUREMENT	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Effective use of monitoring and measurement tools and systems	<ul style="list-style-type: none"> • Ensure compliance with legal requirements is transposed into periodic monitoring / measurement tools which are used regularly.
	<ul style="list-style-type: none"> • Standardized monitoring and measurement software for the electronics recycling industry, crossing all operational and compliance areas.

2.15. Tracking

Description. Tracking is part of the ‘Check’ stage in the Plan-Do-Check-Act cycle. Each of the Standards requires facilities to have ‘controls’ (or well-documented systems) for tracking electronics throughout the recycling chain and to reuse markets, which the facility should be checking periodically to ensure conformity to the Standard. Tracking helps ensure material is going to acceptable markets and to qualified downstream vendors, and CB auditors look for these controls to verify conformity. Tracking differs from downstream due diligence as it is part of the ‘Do’ phase (Section 2.13) instead of the ‘Check’ phase.

Strengths. Good practices observed included:

- Facilities using bar-coding for inventory management and/or other custom software to ease work related to tracking of material flow;
- Auditors sampling the mass balance of specific materials such CRTs and batteries; and
- An auditor noted that e-Stewards’ mass balance calculations and the requirement for transparency have transformed the industry.

Opportunities for Improvement. Generally conforming practices were observed, however, observations indicated that opportunities for improvement for *facilities* exist in the following areas:

- Tracking of reusable electronics (it can be difficult to reconcile pounds in with units out or units in and pounds out);
- Providing auditors with better evidence that customers may obtain downstream flow chart if requested; and
- Assembling better evidence of monitoring and control of the destinations of FMs/HEWs.

It appears that there may be a significant opportunity for improvement in verification by *auditors* of tracking material through to final disposition, for example:

- In several cases it appeared that auditors did not review the mass balance of equipment going for reuse;
- Inquiring if the electronics recyclers’ customers requested and were provided downstream vendor information; and
- Auditors mentioned they did not have adequate time to conduct the mass balance in debriefs after the Audit Observations.

Key Takeaways. Observations and interviews both indicated that tracking is perhaps one of the most challenging aspects of the Standards. Without doing a thorough accounting audit of all transactions into facilities and all transactions out of facilities, within the given mass balance time period, there is room for misrepresenting data in a category that does not get sampled (e.g., where an auditor might miss the fact that a facility is illegally stockpiling CRTs by not tracking transaction documentation thoroughly).

(2.15) TRACKING	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Tracking to downstream destinations – adequate time to audit	<ul style="list-style-type: none"> • Ensure auditors have control of sample selection when tracking to downstream destinations (and have adequate time to audit).
	<ul style="list-style-type: none"> • Fine-tune formulas for audit time to ensure adequate time for sufficient sample size review and analysis. Formula could consider the number of downstream vendors, volume, complexity of material, complexity of organization. Standards owners could do an analysis of adequacy of audit time – in relation to this specific issue.

2.16. Evaluation of Compliance

Description. Certified facilities are required to have a system whereby they evaluate their own compliance with legal requirements including environmental health and safety, data security, and export requirements. This area is also part of the “Check” stage in the Plan-Do-Check-Act cycle. Specifically, facilities are required to have a procedure that spells out how recyclers periodically check that they are in compliance with legal and other requirements. This ensures that facilities do not just identify their compliance requirements, but also assess whether their operations and processes are in compliance. An auditor will look for items like a list of legal compliance requirements; an independent audit assessing conformity with legal requirements; certificates, licenses, and reports proving up-to-date conformity; and management/employee knowledge of applicable regulations.

Strengths. This provision is causing certified electronics recyclers to better know and understand complex legal requirements that apply to their facilities.

Opportunities for Improvement. Opportunities for improvement by *auditors* include ensuring that this element is audited and asking to see the procedure for evaluating compliance with export, legal and other requirements. For the *facilities*, several additional opportunities were identified and indicated the need to:

- Demonstrate compliance with this requirement. One facility had not had an external audit of its legal compliance conducted since 2011, had not conducted any internal reviews since that time, and its list of legal requirements was not up-to-date; and
- Understand which laws apply and which do not. For example, one facility missed having stormwater compliance evaluation on its legal requirements, but had items listed that did not apply to the facility (a Treatment Storage and Disposal Facility closure plan).

Key Takeaways. As mentioned under System Planning (Section 2.2), clear identification of legal and other requirements and environmental health and safety risks is fundamental for an effective management system. This requirement ensures that facilities do not just identify their compliance requirements but assess if they are in compliance. For facilities new to having an ISO 14001-based EH&S Management System, the “Check” part of the cycle can be a challenge. The ‘evaluation of compliance’ requirement helps ensure some ‘checking’ goes on. Suggested strategies for improvement center on training and awareness. It also was noted by interviewees that better enforcement of existing laws by regulators would motivate facilities to use this function to their advantage.

(2.16) EVALUATION OF COMPLIANCE	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Understanding how evaluation of compliance works and putting it into better practice	<ul style="list-style-type: none"> • Better enforcement of existing laws by regulators would encourage facilities to “check” their compliance more proactively and thoroughly.
	<ul style="list-style-type: none"> • See suggested strategies for improvement under (2) System Planning; but also provide training on ‘how to do this.’
	<ul style="list-style-type: none"> • Ensure “evaluation of compliance” procedures include looking at export, transportation, and data security – these areas are often overlooked.

2.17. Nonconformity, Corrective, and Preventive Action

Description. Also part of the ‘Check’ stage in the Plan-Do-Check-Act cycle, facilities are required to have and use tools to assess internal nonconformity with their EHSMS, and to take and document corrective and preventive actions. This system helps ensure facilities proactively put themselves back on track when they stray – which in turn reinforces organizational knowledge of what conformity means –leading to effective change and improvement in the EHSMS.

Strengths. Stakeholders in the system appear to generally understand this requirement and implement it well. Facilities were observed that responded to their non-conformities in a timely and focused way, using their corrective action logs and their continual improvement and preventive action logs effectively. One facility uses its external consultant to verify Corrective and Preventive Actions (CAPA) have been closed from all items on the facility’s non-conformance log.

Opportunities for Improvement. This area was generally observed to be well understood by both facilities and CB auditors. **Auditors** noted when facilities’ non-conformances (NCs) from previous audits had not been correctly transposed into CAPA reports and also noted when NCs were closed in a timely and effective fashion. Our findings and those of the astute auditors noted the following areas of improvement for **facilities**, including:

- Correctly using the [root cause analysis](#) in a facility’s CAPA reports. Failing to do this means a facility may not identify more important underlying areas needing improvement;
- Generating CAPAs related to actual operations versus only from the CB audits;
- Ensuring documented changes to related Procedures and Training Materials are implemented; and
- Reviewing CAPAs at management meetings.

Key Takeaways. Although the use of nonconformity tracking and CAPA reports is one of the best-established elements in the entire system, there is room for tools to be developed to further enhance this element. Such tools might include training in root cause analysis specific to the electronics recycling industry, templates for internal nonconformity assessments, or other similar mechanisms.

(2.17) NONCONFORMITY, CORRECTIVE AND PREVENTIVE ACTION	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Correct use of and auditing of nonconformity, corrective and preventive action tools	<ul style="list-style-type: none"> • Develop easier-to-use tools for doing CAPA-related work – e.g., apps for smart phones and tablets, software for facilities (noting that operational folks are less inclined to use paper and forms).
	<ul style="list-style-type: none"> • Periodic review of nonconformity, corrective and preventive action requirements and best practices for auditors as well as facilities, perhaps as part of CEU-style requirements.

2.18. Control of Records

Description. As part of the ‘Check’ stage in the Plan-Do-Check-Act cycle, facilities are required to implement tools to track and control all records that demonstrate conformity to the Standards to which they are certified. Records demonstrate evidence of completing a required task such as training records, inspection records or management review records. A procedure must be established for the identification, storage, protection, retrieval, retention and disposal of records. Records must also be used to demonstrate the flow of materials through the facility.

Strengths. Facilities were observed that properly completed their materials flow records at each month-end, along with a physical inventory.

Opportunities for Improvement. Opportunities for improvement by *auditors* in this area were noted as follows:

- Ensuring that this requirement is not overlooked (in one case this requirement was not audited);
- Sampling an adequate number of records to be assured the facility’s system is working. This limitation in sampling is attributable to time limitations for the audit; and
- Checking actual documents. One auditor simply relied on what the facility stated was in its records, rather than viewing them directly.

Opportunities for improvement for the *facilities* included attending to this detail-oriented task and using it to ensure alignment between procedures, actions, and Records Control documents.

Key Takeaways. This is a basic element of running a well-managed EHSMS. Failure to do this indicates a lack of attention to detail that might indicate problems elsewhere in a facility with more serious consequences.

(2.18) CONTROL OF RECORDS	
ISSUE	SUGGESTED STRATEGY FOR IMPROVEMENT
Correct control of records	<ul style="list-style-type: none"> • Develop easier-to-use tools for records control – e.g., apps for smart phones and tablets. Use scheduling tools as part of improving operations.

2.19. Internal Audit

Description. The internal audit, conducted by trained staff or a second-party auditor, should provide useful information on whether the facility’s EH&S management system is well-implemented, reviewed adequately, and conforms to the requirements of the Standards to which the facility is certified. Internal audits of an electronics recycling facility, regardless of who conducts them, should provide management with identification of non-conformities and information on deficiencies, along with recommendations for system improvement. Internal audits are a critical part of the ‘Check’ phase of the Plan-Do-Check-Act system, enabling management to monitor key activities, identify and correct problems, and gauge ongoing progress.

Strengths. The internal audit requirement has led to facilities having more thorough review of their operations than just the annual audit by a Certifying Body. This, in turn, has resulted in more opportunities for facilities to improve operations and practices within their environmental health and safety management systems.

Opportunities for Improvement. Opportunities for improvement for *auditors* were noted as follows:

- Verifying conformity between the internal audit plan and the internal audit report;
- Following through on discrepancies between observations in the internal auditor’s report versus actual practices in relation to export and downstream due diligence;
- Completing queries to facility about how it follows up on its internal audit findings (i.e., determining if facility acted on NCs, AOCs, or Opportunities for Improvement from internal audit); and
- Adequately determining competency and credentials of the internal auditors.

Key Takeaways. If auditors focused more on ensuring internal audits are carried out in conformance with the Standards’ requirements, facilities will be more likely to take the findings of the internal audits seriously, and use those findings to implement improvements. Building capacity for internal audits within organizations would support facilities using the internal audit as a valued management improvement tool. Better clarification of minimum competency requirements for internal auditors from the Standards owners would help.

(2.19) INTERNAL AUDITS	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Internal audit issues	<ul style="list-style-type: none"> • Use CEUs as tool to ensure continued training in key topic areas, such as how to effectively conduct an internal audit, qualifications of internal auditors, how to effectively use the findings of an internal audit.
	<ul style="list-style-type: none"> • Offer more frequent training (including training for new areas highlighted above), which should lead to better availability of skilled internal auditors.
	<ul style="list-style-type: none"> • Clarification of minimum competency requirements for conducting internal audits.

2.20. Management Review

Description. As the ‘Act’ stage in the Plan-Do-Check-Act cycle, Management Review requires management to provide periodic reviews of the facility’s entire environmental health and safety management system, and to keep records of those reviews. The Management Review includes the assessment and implementation of any changes to the EHSMS deemed necessary by the Internal Audit.

Strengths. Facilities were observed that have moved from annual to more frequent management reviews. One facility shifted to monthly management review meetings (with corresponding better documentation and communications) and saw improvements in overall EH&S management system implementation. Another facility effectively used management review action logs to track progress.

Opportunities for Improvement. Auditors were observed auditing this element comprehensively. However, opportunities for improvement by *auditors* include:

- Meeting with facility management and inquiring about participation in management reviews; and
- Ensuring that management review meetings: (i) cover all required topics (e.g., compliance evaluation, follow-up on customer complaints, completions) by reviewing minutes; and (ii) include required outcomes (i.e., Action Plans related to deficiencies discussed).

For *facilities*, opportunities for improvement were also observed, as follows:

- Demonstrating a serious commitment to use management reviews to actually ensure the EH&S management system is being implemented correctly by all staff;

- Addressing all outstanding NCs, OFIs, and AOCs which have been documented during both external and internal audits with full follow-up and accurate documentation; and
- Using management review to follow-up on serious matters (e.g., OSHA recordable incidents, regulatory compliance matters).

Key Takeaways. Establishing and sustaining complete management support for environmental health and safety management systems in the electronics recycling industry has proven challenging. Interviews and audits suggested that causes for this include managers’ and/or owners’:

- Limited understanding of risk management and the value of accurate risk assessment.
- Difficulty with effectively implementing a successful EH&S management system, which can be a change not just in operations but in company culture.

Suggested actions for addressing these causes include a focus on training and awareness for facility managers and owners.

(2.20) MANAGEMENT REVIEW	
ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
Management commitment and company culture	<ul style="list-style-type: none"> • Target electronics recycling facilities’ management via webinars, conferences, and other professional settings, offering training specific to management and owners – not just EH&S managers.
	<ul style="list-style-type: none"> • Research how managers can change company culture and employee behavior when implementing an EH&S management system, specifically for the electronics recycling industry; disseminate findings through trainings.

2.21. Additional Findings from Stakeholder Interviews

This section documents additional findings from the stakeholder interviews that were not already captured in the discussion in Sections 2.1-2.20. This section includes additional information on ANAB’s oversight role in reviewing and ensuring the CBs’ competence; and how the CBs select and train their auditors, information about their training programs, and their quality assurance/quality control processes and procedures.

ANAB’s Oversight Role

ANAB informs the Standards owners of changes to accreditation rules, and communication during the recent revisions to the Standards was noted to be clear and effective. ANAB is currently the only approved Accreditation Body to accredit CBs to certify facilities to the e-Stewards and R2 standards. ANAB has worked with R2 since 2008 and e-Stewards since 2009. A Certification Body’s management of competency is governed by ISO 17021:2011: *Conformity Assessment Requirements for Bodies Providing Audit and Certification of Management Systems*. ISO 17021 was developed in part by ANAB, and is used by ANAB to ensure the CBs meet the technical requirements, and competency criteria to audit to e-Stewards and R2.

ANAB’s oversight process includes the periodic review of the CBs’ processes to ensure they are conforming to ISO 17021 and the requirements of each Standard. This process includes assessors, administrative roles, and accreditation council and subcommittees that are involved in the management review and accreditation process for the CBs. ANAB assessors are required to have similar competencies as the CB auditors. Once all the information is gathered (appropriate documentation from the CBs’ management operations and the results of witness audit(s)), ANAB program and accreditation management make the determination that the CB is conforming to the requirements of ISO 17021. Interviews also indicated that ANAB has an effective process in place to ensure regular communication with both R2 and e-Stewards.

Certifying Bodies

Interviews with the six CBs revealed that all CBs have training programs in place to ensure their auditors are well trained in the requirements of auditing an environmental management system (ISO 14001) as well as the electronics recycling-specific requirements of both of the Standards. The CBs utilize the effective core training programs and resources offered by the Standards owners or third-party training organizations, with many providing additional in-house training to further enhance auditor knowledge and competency. Interview findings also indicated that all six CBs have solid quality control and quality assurance programs and procedures in place to verify their auditors’ competency prior to conducting audits in the field, and also to ensure proper review of auditors’ reports that document facility audit findings, major and minor non-conformances, and recommendations for certification.

3. Data Analysis

Information from the interviews and audits was aggregated to identify patterns of strengths and opportunities for improvement. The Checklist data from the audits contained a combination of ratings from 1 to 5. The data were aggregated across all nine audits for each of the 144 discrete elements audited (See section 9 of Appendix B for a listing of all discrete elements). The data were then aggregated by each of the 20 topic areas to determine an average overall score between 1 and 5. The discrete elements in each topic area were weighted according to the number of audits addressing that element, to account for the fact that not every topic area was audited in every audit due to the different audit types as well as the different versions of the Standards. EPA carefully reviewed the audit findings – as well as the findings from the interviews - to identify patterns of strength, opportunities for improvement, and other trends.

Table 3.1 details the aggregate scores across all audits in each of the topic areas. These scores were determined by calculating the average score across all discrete elements in a given topic area, with each discrete element weighted according to the number of audits in which it was assessed. For example, if Topic 1, Element 1 received an average score of 4.75 across nine audits, and Topic 1, Element 2 received an average score of 3.25 across six audits, then Topic 1 would receive an aggregate score of 4.15 using the formula:

$$\frac{a_1x + a_2y + \dots}{a_1 + a_2 + \dots}$$

In this formula, “*a_i*” is the number of audits where Element 1 was assessed, “*a₂*” is the number of audits where Element 2 was assessed, “*x*” is the average score for Element 1, and “*y*” is the average score for Element 2.

Table 3.1: Aggregated Audit Checklist Scores by Topic Area

Topic Area	# Discrete Elements	Weighted Average Audit Score (1-5)
1. System requirements	2	5.00
2. System planning	16	4.18
3. Training and communication	3	4.32
4. Operational control	7	3.77
5. Health and safety	23	3.87
6. Reuse	15	4.22
7. Data security and destruction	11	4.21
8. Management of FMs, HEWs, and PCMs	9	4.04
9. Emergency preparedness and response	3	4.30
10. Materials recovery and disposition	9	4.06
11. Export restrictions for FMs and HEWs	2	3.00
12. Site closure and insurance	12	4.44
13. Downstream accountability	9	3.85
14. Monitoring and measurement	4	4.54
15. Tracking	7	4.12

Topic Area	# Discrete Elements	Weighted Average Audit Score (1-5)
16. Evaluation of compliance	2	3.38
17. Nonconformity, corrective and preventive action	3	4.83
18. Control of records	3	4.22
19. Internal audit	3	4.28
20. Management review	1	4.33

3.1. Key System Strengths

The data aggregation and analysis from the interviews and audits identified a number of strengths in how the system functions as a whole:

- Updates and improvements over time.** Both Standards are committed to continual improvement. During the past few years, as they have grown and become more established, both Standards owners have listened to stakeholders, conducted research, published updated and improved versions, begun observing audits in a witness capacity, and implemented programs providing tools and resources to their certified recyclers. In addition, both Standards have updated their organizational and operating structures, and continue to do so, to better serve their constituents. The Standards are engaged in the training regimes for CB auditors, and are continually expanding training offerings for electronics recycling facility operators.
- Clear understanding of roles and responsibilities.** Stakeholders in the electronics recycling certification system know their roles and carry them out with integrity. Certification bodies appear to work well with ANAB and work to keep up with issues in the industry. CB management appears to understand the challenges faced by their auditors and the structural limitations in the system (such as auditor time constraints). This Study observed many hard-working, diligent, focused auditors using their limited time well. Auditors were observed generally tracking audit trails well; performing sound auditing of: records control; monitoring and measurement; corrective and preventive action procedures; and facilities' tracking systems for incoming and outgoing materials flows.
- Receptive to feedback.** Certified electronics recycling facilities are particularly strong at giving clear, thoughtful, and honest feedback, including constructive comments to other system stakeholders. Further, many facilities are patiently taking both management and staff up the steep but necessary learning curves needed for certification for difficult requirements such as legal and environmental compliance, occupational health and safety mandates and best practices, export matters, and downstream due diligence practices. Managers are demonstrating ongoing willingness to learn how to effectively run a Plan-Do-Check-Act management system in an industry new to systematic management systems.
- ANAB's role is clear and effective.** It appears that the ANAB system of accrediting CBs is generally working well. The ANAB witness auditors and the CB auditors permitted the EPA to sit in on the de-briefs ANAB provided immediately after the CB auditor finished the audit. In both instances, the ANAB witness auditor demonstrated thorough knowledge of the Standard being audited, provided constructive feedback, and identified useful areas of non-conformance, and opportunities for improvement.

With regard to the observed audits, Table 3.2 below provides highlights specific of areas of strength in both Standards that were observed to be audited comprehensively and consistently across multiple audits. Note that Section 2 of this report provides a detailed assessment of the strengths observed within each topic area, and Table 3.2 is not intended to be an all-inclusive list.

Table 3.2: Key Areas of Strength

Topic Area #	Topic Area Name	Discussion	Weighted average audit score (1-5)
1.	System requirements	<ul style="list-style-type: none"> Facilities are devising Environmental, Health, and Safety Management Systems (EHSMS) that cover the entire scope of the applicable Standard(s), and are ensuring that EHSMS are kept up-to-date. 	5.00
7.	Data Security/data destruction	<ul style="list-style-type: none"> The updated versions of the Standards have improved the detail and requirements for this area, and very thorough auditing of this topic area was observed. 	4.21
14.	Monitoring and measurement	<ul style="list-style-type: none"> Auditors are ensuring facilities are monitoring and measuring, on a regular basis, their activities that have environmental and health and safety impacts. 	4.54
17.	Nonconformity, corrective and preventive action	<ul style="list-style-type: none"> Auditors are ensuring the facilities assess internal nonconformity with their EHSMS, and are taking corrective and preventive action. 	4.83

3.2. Key Opportunities for Improvement

While the Standards generally are being implemented well, the analysis of patterns and trends identified opportunities for improvement in a few key topic areas, which are outlined below in Table 3.3. These areas were all discussed in detail above in Section 2, and are linked to specific suggested strategies for improvement in that section as well as summarized in Appendix A. As previously mentioned, it is important to note that the auditing process is highly qualitative, and the average overall score for each topic area reflects EPA’s assessment of how well that particular topic area of the Standards was audited based only on the nine observed audits. The score is an indicator – but not the only indicator – of the overall effectiveness/strength of that topic area. The qualitative information provided through the structured stakeholder interviews also was carefully reviewed to determine trends, such as frequently mentioned strengths and opportunities for improvement, in the implementation of the Standards. Thus, EPA considered both the combination of the audit findings and the interview responses in identifying patterns of strengths, opportunities for improvement, and other trends.

Table 3.3: Key Opportunities for Improvement

Topic Area #	Topic Area	Discussion	Weighted Average Audit Score
3.	Training and communication*	<ul style="list-style-type: none"> Auditor and facility training, understanding and consistent implementation of: <ul style="list-style-type: none"> Environmental health and safety hazard risk reduction strategies; Hazardous waste requirements; Import/export requirements (especially for Cathode Ray Tubes (CRTs); Organization for Economic Cooperation and Development (OECD) countries vs. non-OECD countries); Federal, state, and local legal requirements (e.g., Universal Waste rule); and Proper materials management (including batteries). 	4.32

Topic Area #	Topic Area	Discussion	Weighted Average Audit Score
4.	Operational controls	<ul style="list-style-type: none"> Auditor verification of implementation of written procedures – such as how to manage FMs and how to best mitigate environmental, health, and safety risks – during audits. 	3.77
5.	Health and safety	<ul style="list-style-type: none"> Auditor and facility understanding and dissemination of actionable information regarding human health risks posed by dismantling end-of-life electronics, including potential exposures and subsequent use of risk-based controls (e.g., personal protective equipment (PPE)). 	3.87
8.	Management of FMs, HEW, and PCMs	<ul style="list-style-type: none"> Auditor and facility understanding of what is and is not hazardous or universal waste under state and federal regulations, and the associated management requirements. 	4.04
10.	Materials recovery and disposition	<ul style="list-style-type: none"> Facility and auditor attention to safe packaging of hazardous equipment (e.g., CRTs, batteries). Auditor verification of facilities' controls for ensuring downstream processors conform to Standards' requirements. 	4.06
11.	Export restrictions for Focus Materials (R2) and Hazardous Electronic Waste (e-Stewards)	<ul style="list-style-type: none"> Auditor and facility training, understanding, and awareness of export requirements (particularly for CRTs). 	3.00
12.	Site closure and insurance**	<ul style="list-style-type: none"> Auditor understanding of the form and accessibility of insurance (or other forms of financial assurance) in the event of abandonment or bankruptcy. 	4.44
13.	Downstream accountability	<ul style="list-style-type: none"> Auditor verification of requirements in areas such as: confirming that all downstream material flows are identified throughout the recycling chain beyond the first downstream vendor; and improving downstream verification practices by auditors during an audit. 	3.85
15.	Tracking	<ul style="list-style-type: none"> Auditor performance of the mass balance calculation (account for all transactions into facilities and all transactions out of facilities) to verify equipment going for reuse. 	4.12
16.	Evaluation of compliance	<ul style="list-style-type: none"> Auditor review of legal and environmental, health and safety requirements, and compliance with those requirements. 	3.38

* Auditors assess whether or not facilities have determined their training needs and communicate them appropriately. While these clauses were observed to be well audited, the need for further training and knowledge development was noted across numerous topic areas and emerged as a top area for improvement from the interviews.

** Auditors assess whether the closure plans are in place and contain the required components; however, while these requirements were generally audited well (meaning the auditors identified the closure plans with required elements), an important opportunity for improvement emerged to improve auditor understanding of the adequacy of the forms of insurance (or other forms of financial assurance).

4. Suggested Strategies for Improvement & Top Recommendations

The Study's findings are based on the stakeholder interviews EPA conducted and the audits EPA observed, which reflect a small percentage of all certified electronics recycling facilities and of all auditors at work in the electronics recycling industry in the U.S. Though limited in scope, patterns and trends nonetheless emerged from the Study's findings, and specific strategies for addressing the observed opportunities for improvement are provided in Section 2 of this report (and are compiled in Appendix A). Analysis of these patterns and trends also enabled EPA to develop a set of top recommendations to address the root causes of many of the opportunities for improvement, which are presented in this Section of the report.

Top Recommendations

- Provide additional training and guidance materials to grow the knowledge base for all stakeholders
- Provide regular updates to the Standards to ensure they continue to evolve
- Increase audit time to allow for more thorough audits
- Explore and address perceived conflict-of-interest issues.

Top Recommendations

In practice, many stakeholders will continue to influence and shape the development of responsible recycling in the U.S. and therefore have been considered when drawing the Study's conclusions and making recommendations; as such, EPA encourages all organizations that have a role to play in shaping the standards and certification process to consider the suggested strategies for improvement and top recommendations in the Study. This broader group of stakeholders includes:

- The Standards owners (Sustainable Electronics Recycling International and the Basel Action Network)
- The Certifying Bodies
- Federal and state regulators
- Trade associations
- ANAB
- EPA and other federal agencies, including the Occupational Safety and Health Administration, the National Institute for Occupational Safety and Hazards, and the Department of Transportation
- Original equipment manufacturers
- Academic researchers
- Non-governmental organizations
- Private-sector companies

It is important to note that because of the commitment to continual improvement by stakeholders in the system, some of the below recommendations – as well as the suggested strategies for improvement presented in Section 2 of the report – may already be in motion.

The top recommendations are:

- ***Provide additional training and guidance materials to grow the knowledge base for all stakeholders.*** Growing the base of knowledge for all stakeholders, including auditors and facilities, is important for ensuring the Standards are implemented properly. In total, 85% of all interviewees – including 100% of Certifying Bodies and 91% of auditors – indicated that more robust training programs are needed in order to strengthen knowledge of health and safety risks, legal requirements – particularly related to exports and management of CRTs - and best operational practices in many of the 20 topic areas. Combined with the observations from the audits and the low weighted average scores of many of the topic areas, providing additional training and guidance materials to grow the knowledge base for all stakeholders in the system was determined to be one of the recommendations

with the most far-reaching possible impacts in improving the overall implementation of the Standards. Areas observed that would benefit from the development of more comprehensive additional training and guidance materials include:

- Health and safety risks. This area needs significant attention from all stakeholders in the electronics recycling industry and beyond (from manufacturers through regulators). Also, 45% of post-audit interviews, including interviews with facility staff, CB auditors, and ANAB auditors, indicated specifically that electronics recyclers need training and guidance on conducting proper risk assessments and hazards analyses, complying with health and safety requirements, and using appropriate controls. Additional research is needed into the potential health hazards of both short- and long-term exposure to electronics during end-of-life management.
- Legal requirements. Clear understanding of federal, state, and local legal and other requirements – coupled with an understanding of environmental, health, and safety risks – provides a fundamental basis for an effective environmental, health, and safety management system. Additional training and guidance for all system players in this area, such as a succinct summary of all federal laws pertaining to e-waste, could help expand knowledge and improve implementation. Several interviewees suggested specifically that providing additional guidance and clarification on the CRT rule would be beneficial.
- Site closure and insurance adequacy. The interviews and observed audits indicated that this area would benefit from increased scrutiny by all stakeholders, in order to create knowledge, enhance site closure assurance practices, and provide for more thorough auditing of this element by CB auditors. Case studies or recommendations regarding appropriate insurance limits and instruments focusing on site closure “financial surety” would be helpful.

Section 2 of the Study offers suggested strategies for consideration in developing the additional training materials, guidance, and other tools in the context of each of the relevant topic areas.

- ***Provide regular updates to the Standards to ensure they continue to evolve alongside this rapidly changing industry.*** E-Stewards and R2 are both relatively new standards and their recent updates went smoothly. Updating and revising the Standards on regular, well-publicized timetables is important to address areas that could benefit from clarification in a Standard or lessons learned from prior audits. Support for more systematic, well-publicized plans and/or timetables for subsequent updates was indicated in 69% of all interviews, including 73% of stakeholder interviews conducted before the 2013 Standards revisions and 100% of stakeholder interviews conducted after the revisions. Scheduled and publicized plans to update the Standards will allow stakeholders to fully contribute and participate in the continual improvement in a fair and transparent manner.
- ***Increase audit time to allow for more thorough auditing of the Standards.*** Inadequate audit time was mentioned in 56% of all interviews as a limiting factor, particularly for integrated audits where R2 and e-Stewards are being audited at the same time as other standards, such as [RIOS](#) and ISO 14001. When asked specifically about the adequacy of the amount of time allowed for audits, 75% of interviewees indicated a desire for increased audit times, as did five of the nine facilities audited. Audit time for ISO 14001-based standards is specified in “IAF MD 5: Duration of QMS and EMS Audits.” To better reflect the complexity of electronics recycling operations, there is a need to fine-tune the formulas found in the R2 Code of Practices and e-Stewards Appendix C to ‘right-size’ audit time. Many facilities can have multi-faceted downstream material flows, export situations, regulatory status, reuse practices, and other variables that pose challenges to the most efficient auditors to adequately review materials and follow audit trails in the allotted time. Moreover, many audits cover multiple standards simultaneously. Increasing audit time would allow auditors to more closely examine health and safety monitoring, measurement, record-keeping, and communication issues in order to give facilities critical feedback on their health and safety systems.

- ***Explore and address perceived conflict of interest issues to enhance overall rigorousness of the audits.*** Study participants expressed a concern that there is a perceived conflict of interest between CBs wishing to retain their clients (who are the recycling facilities) and the recycling facilities themselves; that is, the CB auditors may not be as stringent or thorough in their audits in an effort to retain a competitive business relationship. Similarly, auditors being observed by ANAB Witness Auditors may be more stringent in their findings, in an effort to prove competency and thoroughness; this inconsistent scrutiny may pose concerns to a facility getting more non-conformances than it expected when ANAB is present, for example. When asked specifically about whether or not they feel that the perception of a conflict of interest exists, 63% of stakeholders interviewed said that they did. Exploring ways in which the key players in the system – Certifying Bodies, recycling facilities, the Standards owners, and ANAB – could potentially address these perceptions of conflict of interest, such as implementing new or different funding mechanisms, could enhance the implementation of the Standards.

5. Conclusions

Overall, the Study suggests that the accreditation, certification and implementation process for the R2 and e-Stewards standards is improving the responsible management of used electronics in the U.S. Through the interviews with stakeholders across the electronics recycling system and the observed audits representing a cross-section of facility sizes, types and services offered, the Study found that the Standards have brought order, better management, and a growing understanding of environmental, health and safety risks, regulatory requirements, and best practices to electronics recyclers and related stakeholders across the system.

Furthermore, interviews and audits indicate that the roles and responsibilities among the key implementers in this system - ANAB, the Standards owners, the six CBs and their auditors, and the recycling facilities – appear to be clear and effective, and opportunities for constructive feedback are integrated throughout the system.

- ANAB’s system of accrediting CBs appears to be generally working well. ANAB’s oversight witness auditors demonstrated thorough knowledge of the Standard(s) being audited, provided constructive feedback, and identified useful areas of non-conformance, and opportunities for improvement.
- CB interview findings indicate that all six CBs appear to have consistent core requirements for selecting and training their auditors; have implemented training programs covering the critical elements of the Standards (supported by the tools and training programs developed by the Standards owners), and have in place quality assurance and quality control protocols for reviewing auditors’ findings (major and minor non-conformances, and recommendations pertaining to whether a facility achieves certification to the Standards).
- Auditors were observed to be very hard working and diligent, using their limited time on the audits well.
- Recyclers were observed to be operating with a willingness to learn complex new subject matter, such as legal and environmental compliance, downstream due diligence practices, export requirements, and occupational health and safety practices.

The Study identified opportunities to improve the implementation of the Standards in a few key areas, including improving stakeholders’ knowledge of health and safety risks, understanding of legal requirements, and awareness of hazardous substances in electronics. One central theme that emerged from the Study was that the knowledge base needs to continue to grow and tools are needed for all stakeholders (for auditors to more efficiently audit, for facilities to more readily operationalize improvements in these areas, for regulators to better inform the regulated community), in the following areas:

- Awareness and understanding of all applicable federal, state, and local legal requirements (e.g. Universal Waste and CRT rules and associated labeling and management requirements; as well as export, communications, and documentation requirements);

- Health and safety risks and hazard assessments, management, and best practices (e.g. information on what hazardous substances are present in electronic equipment and components, and the risks and best practices associated with various types of processing techniques; and
- Knowledge of potentially hazardous processing technologies.

The Study offers suggested strategies to address the opportunities for improvement identified in the Study, which are presented in Section 2 of the report and are compiled in Appendix A. EPA's top recommendations, which are intended to address the root causes of many of the opportunities for improvement, are to: provide additional training and guidance materials in key topic areas highlighted in this report; regularly update the Standards to ensure they continue to evolve alongside this rapidly changing industry; increase audit times to allow for more thorough audits; and explore and address perceived conflict of interest issues to enhance the overall consistency and rigorousness of the audits.

EPA remains committed to continuing the dialogue started by this Study and supporting the continual improvement of the implementation of the electronics recycling standards, and will provide assistance and support to stakeholders in discussing and implementing the recommendations outlined in this report.

Appendix A. Compilation of Suggested Strategies for Improvement by Topic Area

Below is a compilation of the suggested strategies for improvement by topic area that are presented in Section 2 of this report. It is important to note that because of the commitment to continual improvement by stakeholders in the system, the suggested strategies for improvement may already be in motion.

ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
(1) SYSTEM REQUIREMENTS	
Aligning Scope statement in Certificate with company actions	<ul style="list-style-type: none"> Ensure that this high-level item is reviewed in seminars and educational settings instructing e-cyclers and auditors about certification to ensure that relevant aspects of company operations are audited effectively.
(2) SYSTEM PLANNING	
Identification of legal and other requirements	<ul style="list-style-type: none"> Create a database for auditors identifying key legal requirements for each of the jurisdictions in which the CB operates. The database could potentially generate state-specific checklists prior to an audit. Auditors need related guidance regarding expectations for the level of detail and comprehensiveness.
	<ul style="list-style-type: none"> Provide a clear summary of federal laws pertaining to e-Waste processing, management, transportation, and export; conduct webinars on legal requirements.
	<ul style="list-style-type: none"> Enhance evaluation of auditor competency regarding knowledge of legal and other requirements, as part of auditor training requirements.
CRT Rule	<ul style="list-style-type: none"> Develop outreach and training materials to clearly explain the CRT rule.
(3) TRAINING AND COMMUNICATION	
Training and communication	<ul style="list-style-type: none"> Develop best practices or standardized, easy-to-follow training tools for electronics recycling industry stakeholders (CBs, recycling facilities) that covers the basics of health and safety, operational controls, data security and destruction, emergency response and preparedness, legal requirements, management of FMs, HEWs and PCMs, etc.
	<ul style="list-style-type: none"> Provide consistent and 'certified' (i.e., Continuing Education Units (CEU)-style) training (covering health and safety, operational controls, data security and destruction, emergency response and preparedness, legal requirements, management of FMs, HEWs and PCMs, etc.).
(4) EFFECTIVE USE OF OPERATIONAL CONTROLS	
Operational controls	<ul style="list-style-type: none"> Use training tools and best practice case studies to build better understanding for facilities of how to use operational controls.
	<ul style="list-style-type: none"> Use training tools to build better understanding for auditors of how to effectively audit if operational controls are being used correctly.

ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
(5) HEALTH AND SAFETY	
Health and safety conformity and compliance	<ul style="list-style-type: none"> • Improve compliance with and enforcement of occupational health and safety laws and requirements.
	<ul style="list-style-type: none"> • Develop training and guidance for facilities on conducting comprehensive risk assessments and hazards analyses; use of SDSs; applicable legal requirements; monitoring results; machine guarding and lockout/tag-out; etc.
	<ul style="list-style-type: none"> • Develop ongoing mechanism to identify hazardous substances in electronic devices as they evolve.
	<ul style="list-style-type: none"> • Provide training on transportation requirements for hazardous substances (e.g., FAA restrictions on lithium-ion batteries in air transport).
	<ul style="list-style-type: none"> • Publish research-based baseline requirements for Pb and other toxic substances sampling for human health and indoor environment, specific to the electronics recycling industry.
	<ul style="list-style-type: none"> • Provide training and guidance for facilities and auditors on industrial health monitoring, measurement, record-keeping, and communication.
(6) REUSE	
Functionality testing	<ul style="list-style-type: none"> • Provide better information/tools to ensure export of equipment for reuse and refurbishment complies with the Standards.
	<ul style="list-style-type: none"> • Develop lists with clear definitions of various functionality tests and key component testing to assist facilities and auditors.
	<ul style="list-style-type: none"> • Provide an improved definition of acceptable test methods, more clarification as to what is acceptable, and more guidance on different types of testing (e.g., scenarios, flowcharts, or guidelines of good practices).
(7) DATA SECURITY/DATA DESTRUCTION	
Protection of data from theft or loss	<ul style="list-style-type: none"> • Develop training on risks of data theft or loss during transportation, especially with outsourced logistics and drivers-for-hire.
	<ul style="list-style-type: none"> • Develop guidance and training on risks associated with data devices being stored onsite, including best practices for facility-level security.

ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
(8) MANAGEMENT OF FOCUS MATERIALS, HAZARDOUS ELECTRONIC WASTES, AND PROBLEMATIC COMPONENTS AND MATERIALS	
Awareness of appropriate management practices for hazardous components	<ul style="list-style-type: none"> • Encourage all electronic equipment manufacturers to disclose hazardous constituents at the bill-of-materials level to electronics recyclers, to best protect human health and environment. • Conduct research into and create incentives for solutions for safe removal of hazardous components. Could include developing training/webinars, including best practice case study materials for each type of hazardous material and component, to support appropriate management of hazardous constituents. • Better attention to safe dismantling of liquid crystal displays (LCDs). The potential for breaking the small, fragile, mercury-bearing tubes is high. • Conduct or support research into protocols for emerging toxins potentially found in end-of-life electronics that may be released by various processing technologies (e.g., brominated flame retardant (BFR) emissions from shredding and pulverizing plastics). Support transfer of this knowledge to electronics recyclers.
(9) EMERGENCY PREPAREDNESS AND RESPONSE	
Awareness of appropriate management practices for emergency preparedness	<ul style="list-style-type: none"> • Creation of best practice guidelines for material-specific spills (e.g., CRT glass and mercury spills) and educate employees on the dangers of personal exposure to lead and mercury. • Expanded emergency drill testing. The majority of facilities focus on just fire drills every year. Testing could be rotated to include mock medical emergency, mock spill, severe weather, etc.
(10) MATERIALS RECOVERY AND DISPOSITION	
Awareness of best practices	<ul style="list-style-type: none"> • Improvement of training materials for auditor knowledge of downstream processing options and best practices. • Update relevant web sites, deliver webinars and/or email updates on tools and guidance to help electronics industry stakeholders improve their understanding of best practices.
Verification of downstream processors	<ul style="list-style-type: none"> • Provision of auditing tools/ training/ questions to assist auditors to fully explore audit trails for downstream processing. • Creation of case studies for training materials on how to audit downstream processing.
(11) EXPORT (APPLIES TO FOCUS MATERIALS (AS DEFINED BY R2) /HAZARDOUS ELECTRONIC WASTES (AS DEFINED BY E-STEWARDS ONLY)	
Implementation training and awareness	<ul style="list-style-type: none"> • Create tools such as a lockbox or other confidential means by which auditors can verify information without disclosing commercial terms or confidential business information (CBI). • Develop and conduct additional training for auditors on how to evaluate compliance with export requirements, including using case studies.

ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
(12) SITE CLOSURE AND INSURANCE	
Strength of closure plans and financial assurance requirements; better understanding of this by stakeholders	<ul style="list-style-type: none"> • Develop case studies or recommendations regarding appropriate insurance limits and instruments focusing on site closure “financial surety.”
	<ul style="list-style-type: none"> • Improve auditor and facility understanding of limits of use of assets as closure mechanism.
(13) DOWNSTREAM ACCOUNTABILITY	
Downstream accountability	<ul style="list-style-type: none"> • Standardized audit packet guidance tool – what an upstream can ask for from its downstream, as a basic practice in the electronics recycling industry.
	<ul style="list-style-type: none"> • Develop easier-to-use and standardized tools or requirements for mass balance reports (e.g., new e-Stewards standard requires linking shipping records to tracking information).
	<ul style="list-style-type: none"> • Tools to keep transparency of downstream vendors but which respect commercial privacy.
	<ul style="list-style-type: none"> • Consider audit queries by auditors for downstream sampling to go beyond getting data from electronics recyclers’ EH&S staff (e.g., ask Accounting).
(14) MONITORING AND MEASUREMENT	
Effective use of monitoring and measurement tools and systems	<ul style="list-style-type: none"> • Ensure compliance with legal requirements is transposed into periodic monitoring / measurement tools which are used regularly.
	<ul style="list-style-type: none"> • Standardized monitoring and measurement software for the electronics recycling industry, crossing all operational and compliance areas.

ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
(15) TRACKING	
Tracking to downstream destinations – adequate time to audit	<ul style="list-style-type: none"> • Ensure auditors have control of sample selection when tracking to downstream destinations (and have adequate time for to audit). • Fine-tune formulas for audit time to ensure adequate time for sufficient sample size review and analysis. Formula could consider the number of downstream vendors, volume, complexity of material, complexity of organization. The Standards owners could do an analysis of adequacy of audit time – in relation to this specific issue.
(16) EVALUATION OF COMPLIANCE	
Understanding how evaluation of compliance works and putting it into better practice	<ul style="list-style-type: none"> • Better enforcement of existing laws by regulators would encourage facilities to “check” their compliance more proactively and thoroughly. • See suggested strategies for improvement under (2) System Planning; but also provide training on ‘how to do this.’ • Ensure “evaluation of compliance” procedures include looking at export, transportation, and data security – these areas are often overlooked.
(17) NONCONFORMITY, CORRECTIVE AND PREVENTIVE ACTION	
Correct use of and auditing of nonconformity, corrective and preventive action tools	<ul style="list-style-type: none"> • Develop easier-to-use tools for doing Corrective and Preventive Action-related work – e.g., apps for smart phones and tablets, software for facilities (noting that operational folks are less inclined to use paper and forms). • Periodic review of nonconformity, corrective and preventive action requirements and best practices for auditors as well as facilities, perhaps as part of CEU-style requirements.
(18) CONTROL OF RECORDS	
Correct control of records	<ul style="list-style-type: none"> • Develop easier-to-use tools for records control – e.g., apps for smart phones and tablets. Use scheduling tools as part of improving operations.
(19) INTERNAL AUDITS	
Internal audit issues	<ul style="list-style-type: none"> • Use CEUs as tool to ensure continued training in key topic areas, such as how to effective conduct an internal audit, qualifications of internal auditors, how to effectively use the findings of an internal audit. • Offer more frequent training (including training for new areas highlighted above), which should lead to better availability of skilled internal auditors. • Clarification of minimum competency requirements for conducting internal audits.

ISSUE	SUGGESTED STRATEGIES FOR IMPROVEMENT
(20) MANAGEMENT REVIEW	
Management commitment and company culture	<ul style="list-style-type: none"> • Target electronics recycling facilities' management via webinars, conferences, and other professional settings, offering training specific to management and owners – not just EH&S managers.
	<ul style="list-style-type: none"> • Research how managers can change company culture and employee behavior when implementing an EH&S management system, specifically for the electronics recycling industry; disseminate findings through trainings.

Appendix B: Audit Observation Checklist

U.S. EPA Office of Resource Conservation and Recovery
Implementation Study of R2 and e-Stewards®

[INSERT STANDARD] [INSERT AUDIT TYPE] Audit
[INSERT COMPANY NAME] in [INSERT STATE], [INSERT DATES]

Audit Observation Checklist

1. BACKGROUND

This checklist is to be used in conjunction with the requirements of the standard being audited (i.e., R2, e-Stewards).

Goal is to ensure that waste electronics are being responsibly managed from an environmental, health, safety and data security perspective.

The purpose of observing the audits is to:

- ▶ Evaluate the effectiveness of the auditing process and of the entire system – e.g., strengths & deficiencies
- ▶ Identify examples of good management practices.
- ▶ Document the findings of the audits
- ▶ Identify recommendations for improvement, if appropriate

The result will be an evaluation of both the certification process and effectiveness of the system.

2. AUDIT OBSERVATION PROTOCOLS: Role of the audit observer

DO:

- ▶ Review the Audit Observation Preparation Notes
- ▶ Oversee audit process in an impartial manner and follow the Audit Observation Protocols
- ▶ Request documents reviewed by the auditor
- ▶ Be aware that the audit is intended to verify conformity to both the standards **and** the facility's management system

DO NOT:

- ▶ Ask questions of the auditee during the audit process
- ▶ Answer questions posed by the auditee
- ▶ Prejudge an auditor's audit trail
- ▶ Lead the CB Auditor or indicate flaws in their process
- ▶ Mention the names of other facilities involved in the study

Confidentiality & Independence

- ▶ Verify conflict of interest and confidentiality status of Audit Observer

Safety

- ▶ Review beforehand and conform to Gracestone Inc. Health and Safety Policy
- ▶ Audit Observers are responsible for their own safety, for taking action to avoid injury, for conforming to the facility's safety procedures, consulting with the CB lead auditor if there are questions about safety, and if necessary, leaving the facility.
- ▶ Confirm all appropriate security, safety and PPE requirements

3. AUDIT OBSERVATION PLANNING	
<input type="checkbox"/>	Is the NDA between EPA & CB in place and is the facility aware the EPA Team will be coming onsite?
<input type="checkbox"/>	Was a copy of previous audit report provided?
<input type="checkbox"/>	Was a copy of the audit plan provided?
<input type="checkbox"/>	Confirm location, dates, and start time
<input type="checkbox"/>	Confirm contacts at the facility, the auditor, ANAB auditor (if applicable), and start time
<input type="checkbox"/>	Familiarization of company business model/ Technologies (Shredders, Balers, CRT cleaning), materials processed
<input type="checkbox"/>	Familiarization of regulatory requirements

4. ROLES & RESPONSIBILITIES OF KEY PLAYERS	
Participant	Role in Audits for the Implementation Study
EPA	<ul style="list-style-type: none"> ▶ Overall Project Director; up to 3 observers may be onsite at audits ▶ Will work directly with ANAB and CBs to schedule audits EPA & contractor can observe ▶ Play observation role during audit and participate in any post-audit discussions ▶ Schedule pre-audit logistics call with Electronics Recycler being audited
ANAB	<ul style="list-style-type: none"> ▶ Provides dates & specifics of two Witness audits for two CBs to EPA ▶ Coordinates with EPA to schedule selected audits ▶ Participates in pre-audit logistics calls hosted by EPA, if needed, to go over all details, roles and responsibilities for the scheduled Witness Audit(s) ▶ Oversees all ANAB formal witness audits according to ANAB’s policies and procedures ▶ May attend and observe the additional audits being conducted by CBs that EPA schedules directly with CBs (depending on ANAB’s availability/interest) ▶ Participates in post-audit Q&A sessions
Electronics Recycler being audited	<ul style="list-style-type: none"> ▶ Participates in pre-audit logistics call hosted by EPA to go over all details, roles and responsibilities for the scheduled audit ▶ Hosts the witness audit ▶ May participate in post-audit Q&A with EPA.
Certifying Body	<ul style="list-style-type: none"> ▶ CB (and its auditor if deemed necessary) participates in pre-audit logistics call hosted by EPA to go over all details, roles and responsibilities for the scheduled audit(s) ▶ CB Auditor conducts appropriate audit (initial or surveillance, etc.). ▶ CB may send its own staff person to witness the auditor, if it wishes.

5. General Information				
Audit Observer		Audit Date(s)		# Audit Days
ANAB Witness Auditor				EPA Representative
CB Auditor Name(s)				Certification Body
Name, location of facility				# of employees
Facility contact				Phone:
Facility contact				Phone:
Standard(s)	<input type="checkbox"/> e-Stewards	<input type="checkbox"/> R2	<input type="checkbox"/> ISO 14001	<input type="checkbox"/> ISO 9001
	<input type="checkbox"/> OHSAS 18001	<input type="checkbox"/> RIOS	<input type="checkbox"/> Additional Standards:	
Type of audit	<input type="checkbox"/> Stage 1	<input type="checkbox"/> Stage 2	<input type="checkbox"/> 1 st Yr Surveillance	<input type="checkbox"/> 2nd Yr Surveillance
Scope of certification	<input type="checkbox"/> Recertification			
Functional Units				
Other				

6. TYPE OF OPERATIONS / PROCESSING (CHECK ALL THAT APPLY)	
<input type="checkbox"/> Reuse: parts harvesting	<input type="checkbox"/> Breaking, cutting, crushing, shredding, or pulverizing CRTs
<input type="checkbox"/> Refurbishment	<input type="checkbox"/> Removing mercury-containing components
<input type="checkbox"/> Data destruction	<input type="checkbox"/> Using power machinery to shred, cut, grind, or shear EE
<input type="checkbox"/> Manual disassembly	<input type="checkbox"/> Using a shredder dedicated to hard drives
<input type="checkbox"/> Shredding	<input type="checkbox"/> Using thermal processes for melting, smelting, or combustion of Electronic Equipment
<input type="checkbox"/> Compacting/Baling	<input type="checkbox"/> Using acids or solvents for precious metals or plastics recovery or cleaning procedures

7. TYPE OF MATERIALS PROCESSED (CHECK ALL THAT APPLY)	
<input type="checkbox"/> Electronic Equipment, parts, and materials for which the constituents are unknown (get examples, and determine how this facility and jurisdiction define "EE", including UW classification notes)	
<input type="checkbox"/> Circuit boards or circuit board bearing material (printers, keyboards, mice, fax machines)	
<input type="checkbox"/> Printer, toner & toner cartridges, &/or copy drums (containing selenium and/or arsenic)	
<input type="checkbox"/> Mercury-containing devices (mercury switches, laptops, flat panel monitors)	
<input type="checkbox"/> Batteries	<input type="checkbox"/> Components containing radioactive substances
<input type="checkbox"/> Leaded display glass	<input type="checkbox"/> Items containing polychlorinated biphenyls (PCBs)
<input type="checkbox"/> Other, especially any other toxic materials:	

8. ITEMS TO REVIEW AT THE OPENING MEETING	
<input type="checkbox"/> Purpose of the observation	
<input type="checkbox"/> Evaluate the effectiveness of the auditing process and of the entire system – e.g., strengths & opportunities for improvement <input type="checkbox"/> Identify examples of good management practices <input type="checkbox"/> Document the findings of the audits <input type="checkbox"/> Identify opportunities for improvement, if appropriate	
<input type="checkbox"/> Questions for the facility	
<input type="checkbox"/> Please let us know if there any documents you would rather not share e.g. due to confidentiality	
<input type="checkbox"/> Are photographs acceptable?	
<input type="checkbox"/> How many employees at the site?	
<input type="checkbox"/> How many shipments are picked up from the facility each year?	
<input type="checkbox"/> Have there been any process or equipment changes in the past year?	
<input type="checkbox"/> Request auditor verbalize audit process for the Audit Observers	
<input type="checkbox"/> Identify which clause is being audited	
<input type="checkbox"/> Share documents and records (unless they are confidential)	
<input type="checkbox"/> Sample sizes for records	
<input type="checkbox"/> Audit observers will be following protocols to ensure we do not influence the audit:	
<input type="checkbox"/> In essence we are not really here	
<input type="checkbox"/> Are not able to give guidance or to ask questions	
<input type="checkbox"/> Not make comments	
<input type="checkbox"/> Not identify areas of potential non-conformity during the audit	
<input type="checkbox"/> Outputs	
<input type="checkbox"/> EPA Implementation Study Report	
<input type="checkbox"/> No company-specific information will be included	
<input type="checkbox"/> Follow-up	
<input type="checkbox"/> Interviews with auditor, and EHS Rep and Operations Rep	

9. AUDIT OBSERVATION											
Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.1. System requirements											
<input type="checkbox"/> Scope & EH&S Management System based on Plan Do Check Act	08:1.(a)(2) 13:1.(a)-(c)	V8: 4.1 V13: 4.1									
<input type="checkbox"/> Certified to EH&S Management System	13:1.(b)	V8: 4.1 V13: 4.1									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.2. System planning											
<input type="checkbox"/> EH&S Policy	13:1(b)	V8: 4.2 V:13 4.2									
<input type="checkbox"/> Policy/Plan based on hierarchy of responsible management	08:1.(a)(3)(A) 13:2.(a)	V8: 4.4.6.4 V13: 4.3.4									
<input type="checkbox"/> EA and hazards/Risk assessment	08:1.(a)(2), 4(c) 13:1.(b),4.(c)	V8: 4.3.1									
<input type="checkbox"/> Identification of legal / other requirements EH&S, Permits, Waste Storage, Labeling, Storm-water, Export	08:1.(a)(1) 1.(a)(3)(B) 13:1.(b),3.(a)(1)	V8: 4.3.2 4.3.2.1 4.3.2.2 4.3.2.3 V13: 4.4.2, 4.3.2.1									
<input type="checkbox"/> Identification of legal / other requirements procedure	08:1.(a)(1) 1.(a)(3)(B) & 3.(1) 13:1.(b),3	V8: 4.3.2 4.3.2.1 4.3.2.2 4.3.2.3 V13: 4.3.2									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.2. System planning											
<input type="checkbox"/> Identification of legal / other requirements: Data Security	08:1.(a)(1) 1.(a)(3)(B) & 3.(1) 13:3	V8: 4.3.2 4.3.2.1 4.3.2.2 4.3.2.3 V13: 4.3.2									
<input type="checkbox"/> Identification of legal / other requirements related to storm-water	08:1.(a)(1) 1.(a)(3)(B) & 3.(1) 13:1.(b),3	V8: 4.3.2 4.3.2.1 4.3.2.2 4.3.2.3 V13: 4.3.2									
<input type="checkbox"/> Identification of legal / other requirements related to EH&S including permits, Waste Storage, Labeling.	08:1.(a)(1) 1.(a)(3)(B) & 3.(1) 13:1.(b),3	V8: 4.3.2 4.3.2.1 4.3.2.2 4.3.2.3 V13: 4.3.2									
<input type="checkbox"/> Identification of legal / other requirements related to export	08:1.(a)(1) 1.(a)(3)(B) & 3.(1) 13:3.(2)	V8: 4.3.2 4.3.2.1 4.3.2.2 4.3.2.3 V13: 4.3.2.1									
<input type="checkbox"/> EPA: How well are the air emissions health and safety requirements being met?											
<input type="checkbox"/> EPA: Were legal requirements for shredder dust reviewed?											
<input type="checkbox"/> Objectives, targets, & action plan	08:1.(a)(2) 1.(a)(3)(f) 13:1(b),1(c)(1)	V8: 4.3.3 V13: 4.3.3									
<input type="checkbox"/> Availability of resources	08:1.(a)(2) 13:1(b)	V8: 4.4.1 V13: 4.4.1									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.2. System planning											
<input type="checkbox"/> Roles, responsibilities & authorities defined, communicated & understood	08:1.(a)(2) 13:1(b)	V8: 4.4.1 V13: 4.4.1									
<input type="checkbox"/> System documentation is identified	08:1.(a)(3)(f), 4.(d)(2)(A) 13:1(b), 1.(c)(2),13	V8: 4.4.4 V13: 4.4.4									
<input type="checkbox"/> Document control procedure implemented	08:1.(a)(2) 13:1.(b)	V8: 4.4.5 V13: 4.4.5									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.3. Training and communication											
<input type="checkbox"/> Training needs identified	08:1.(a)(2), 4.(d)(2)(A) 13:1.(b), 4.(d)(2)(A)	V8: 4.4.2 V13: 4.4.2									
<input type="checkbox"/> Workforce has appropriate training – EH&S, data security, export, etc.	08:1.(a)(2), 4.(d) 13:1.(b), 4.(d)(2)(A)	V8: 4.4.2 V13: 4.4.2									
<input type="checkbox"/> Communication	08:1.(a)(2), 4.(d)-(g) 13:1.(b),4.(d)	V8: 4.4.3 V13: 4.4.3									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.4. Operational control											
<input type="checkbox"/> Identification & planning of operations associated with significant EAs & H&S risks	08:4.(c) 13:1.(b), 4.(c)	V8: 4.4.5 V13: 4.4.6.1									
<input type="checkbox"/> Engineering/administrative/PPE controls	08:4.(d) 13:4.(d)	V8: 4.4.6.1.g V13: 4.4.6.1									
<input type="checkbox"/> Administrative operating procedures that stipulate operating criteria	08:1.(a)(2) 13:1.(b),4.(d)-(e)	V8: 4.4.6.a-b V13: 4.4.6.1									
<input type="checkbox"/> Procedures for significant environmental aspects of goods and services used by the organization	13:1.(b)	V8: 4.4.6.c V13: 4.4.6 c									
<input type="checkbox"/> Communication: suppliers & contractors	08:1.(a)(2) 13:1.(b),4(f)	V8: 4.4.6.c V13: 4.4.6C									
<input type="checkbox"/> Operations are controlled	08:1.(a)(2) 13:1.(b), 4.(d)-(e)	V8: 4.4.6 V13: 4.4.6, 4.4.6.3g									
<input type="checkbox"/> Management of change	08:1.(a) 13:1.(c)	V8: 4.4.6 V13: 4.4.6, 4.4.6.3g									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.5. Health and safety											
<input type="checkbox"/> Capability to process EE in a manner protective of worker &, public EH&S.	08:4(a) 13:4.(a)	V8: 4.4.6.1 V13: 4.4.6.1									
<input type="checkbox"/> Workforce, volunteers & temporary workers in conformity with system	08:4(f) 13:4.(f)	V8: 4.4.6.1 V13: 4.1, 4.4.3.1a, 4.4.6.1									
<input type="checkbox"/> Identification of hazardous substances in the EE	08:4(c) 13:4©	V8: 4.4.6.1.c V13: 4.3.4									
<input type="checkbox"/> H&S inspection	08:4(b) 13:4.(b)	V8: 4.4.6.1.b V13: 4.4.6d									
<input type="checkbox"/> Plan to reduce & eliminate workplace exposures & physical hazards	08:4(d) 13:4.(d)	V8: 4.4.6.1.d V13: 4.4.6.1									
<input type="checkbox"/> Ergonomic evaluation	08:4(c) 13:4.(c)	V8: 4.4.6.1.e V13: 4.3.1, 4.4.6.1c									
<input type="checkbox"/> Industrial Hygiene monitoring NOTE: EPA is interested in how well the housekeeping/ cleanliness criteria (if there are any) in the standards are being met.	08:4(e) 13:4.(b),(e)	V8: 4.4.6.1.1 V13: 4.5.1.2									
<input type="checkbox"/> Calibration of monitoring equipment	08:NA 13:2.(b), 6.(c)(1)(B), (2)(b)	V8: 4.4.6.1.1 V13: 4.5.1.2									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.5. Health and safety											
<input type="checkbox"/> ISO 17025 certified lab/equivalent used	NA	V8: 4.4.6.1.1 V13: 4.5.1.2e3									
<input type="checkbox"/> Semi-annual monitoring of high hazard risk	08:4.(e) 13:4.(e)	V8: 4.4.6.1.1 V13: 4.5.1.2 & App A									
<input type="checkbox"/> Precautionary approach to risk reduction	NA	V8: 4.4.6.1.1 V13: 4.4.6.1									
<input type="checkbox"/> Informing workers of results	08:4.(e) 13:4.(e), 4.(g)	V8: 4.4.6.1.1 V13: 4.4.3.1a3									
<input type="checkbox"/> Injury & illness prevention program	08:3.(a)(1) 13:3.(a)(1), 4.(d)	V8: 4.4.6.1.1.c V13: 4.4.6.1									
<input type="checkbox"/> H&S committee	08:3.(a)(1) 13:3.(a)(1)	V8: 4.4.6.1.1.d V13: 4.4.3.1a4									
<input type="checkbox"/> Designated H&S coordinator	08:4.(g) 13:4.(g)	V8: NA V13: NA									
<input type="checkbox"/> Two-way communication on H&S	08:4.(g) 13:4.(g)	V8: 4.4.6.1.1.d V13: 4.4.3.1a4									
<input type="checkbox"/> Investigation & resolution of H&S complaints	NA	V8: 4.4.6.1.1.e									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.5. Health and safety											
		V13: 4.4.3.1a4									
<input type="checkbox"/> Ongoing hazards & risks assessment	08:4.(c) 13:4.(c)	V8: 4.4.6.1.1.f V13: 4.3.1									
<input type="checkbox"/> Engineering, administrative, & PPE controls	08:4(d) 13:4.(d)	V8: 4.4.6.1.1.g V13: 4.4.6.1									
<input type="checkbox"/> Access to MSDSs	08:3.(a)(1) 13:3.(a)(1)	V8: 4.4.6 V13: 4.4.6, 4.4.6.3g									
<input type="checkbox"/> Workplace hygiene / cleaning procedures	08:4(b) 13:4.(b)	V8: 4.4.6.1.1.i V13: 4.4.6.1b									
<input type="checkbox"/> Designated occupational health provider for medical surveillance	NA	V8: 4.4.6.1.1.k V13: 4.5.1.2e									
<input type="checkbox"/> Medical surveillance	08:4(d)(2)(D) 13:4.(d)(2)(D)	V8: 4.4.6.1.1.k V13: 4.5.1.2e									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.6. Reuse											
<input type="checkbox"/> Prohibit sale or donation for reuse if contrary to commercial agreements	08:6.(a) 13:6.(a)	V8: NA V13: NA									
<input type="checkbox"/> Functionality testing	08:6.(c)(1) 13:6.(c) (1)&(2)	V8: 4.4.6.2.a V13: 4.4.6.2a									
<input type="checkbox"/> Implement a Quality Assurance Plan (or maintain ISO9001 certification)	13:6.(c)(1)(B)&:6.(c)(2)(B)	V8: NA V13: NA									
<input type="checkbox"/> Availability of functionality test results	08:13.(a) 13:6.(c)(1)(B), 6.(c)(2)(B),	V8: 4.4.6.2.a V13: 4.4.6.2a									
<input type="checkbox"/> Data eradication procedures	08:8.(b) 13:8.(b)	V8: 4.4.6.2.c V13: 4.4.6.2b									
<input type="checkbox"/> Labeling	08:6.(b)(1) 13:6.(b)(1)	V8: 4.4.6.2.d V13: 4.4.6.2 c									
<input type="checkbox"/> Accessibility of identifying records	08:9.0 & 13.0 13:6.(b)(1)	V8: 4.4.6.2.d V13: 4.4.6.2c, 4.4.3.1b									
<input type="checkbox"/> Protective packaging of refurbished equipment	08:6.b.2; 12(a) 13:6.(b)(3); 9.(a),12(a)	V8: 4.4.6.2.e V13: 4.4.6.2d									
<input type="checkbox"/> Assurance that equipment is destined for Reuse and not Recycling or Final Disposal	08:6.(c)(3)(B) 13:6.(c)(1), 6.(c)(2),	V8: 4.4.6.2.f									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.6. Reuse											
		V13: 4.4.6.2e									
<input type="checkbox"/> Brokers reselling tested working equipment for reuse	NA	V8: 4.4.6.2.f.2 V13: 4.4.6.5 a									
<input type="checkbox"/> Management of FM/HEW scrap from reuse	08:6.(c)(3)(B) 13:6.(c)(3)(B) (iii)	V8: 4.4.6.2.g V13: 4.4.6.2g									
<input type="checkbox"/> Mass balance includes equipment going for reuse	08:7 13:7.(a)	V8: 4.4.6.2.h V13: 4.5.1.3									
<input type="checkbox"/> Take Back Service/Product Return Plan	13:6.(c)(1)(C), 6.(c)(2)(D)	V8: 4.4.6.2.i V13: 4.4.6.2f									
<input type="checkbox"/> Outsourcing	08:6.(c)(3) 13:6.(c)(3)(B)	V8: 4.4.6.2.j V13: 4.4.6.2h									
<input type="checkbox"/> Requirements for "Collectible, Specialty or Unusual" electronics	13:6.(d)	V8: 4.4.6.2 Table A V13: 4.4.6.2 a									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.7. Data Security/data destruction											
<input type="checkbox"/> Data destruction according to NIST 800-88	08:8(a) 13:8.(a)	V8: 4.4.6.3.b.3									
<input type="checkbox"/> Employee training & evaluation on data destruction	08:NA 13:8.(c)	V8: NA V13: NA									
<input type="checkbox"/> Review & validation of data destruction processes by an independent party	08:8(d) 13:8.(d)	V8: NA V13: NA									
<input type="checkbox"/> Quality controls documented for data destruction	13:8.(e)	V8: 4.4.6.3.d V13: 4.4.6.3b									
<input type="checkbox"/> Communication with Customers awareness of concerns over loss of data, and of service terms & liabilities	NA	V8: 4.4.6.3 & 4.4.6.3.b.1 V13: 4.4.3.1b									
<input type="checkbox"/> Protection of data from theft or loss/Security	08:10 13:8.(f); 10.	V8: 4.4.6.3.b.2 V13: 4.4.6.3b&e									
<input type="checkbox"/> Documentation of data destruction procedures	08:8.(b) 13:8.(b),8.(e)	V8: 4.4.6.3.b.4 V13: 4.4.6.3d									
<input type="checkbox"/> Procedures used to address imperfections in hard drives	08:NA 13:8.(b),8.(e)	V8: 4.4.6.3.b.3 V13: 4.4.6.3c									
<input type="checkbox"/> Maintain records of data destruction	13:8.(g)	V8: 4.4.6.3.d V13: 4.4.6.3d									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.7. Data Security/data destruction											
<input type="checkbox"/> Requirements for Outsourcing of data destruction	13:8.(h)	V8: 4.4.6.3.f V13: 4.4.6.3f									
<input type="checkbox"/> Provision of information to customers about liabilities	NA	V8: 4.4.6.3.b.5 V13: 4.4.6.3a									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause			1	2	3	4	5	
9.8. Management of Focus Materials, Hazardous Electronic Wastes, and Problematic Components & Materials											
<input type="checkbox"/> Plan/Hierarchy for FMs/HEW/PCMs	08:2.0 13:2.0; 5.(a)	V8: 4.4.6.4 V13: 4.3.4									
<input type="checkbox"/> Management of Focus Materials/ Hazardous e-Waste / Problematic Components & Materials	08:5.0 13:5.(a)	V8: 4.4.6.4 V13: 4.4.6.4									
<input type="checkbox"/> Safe removal of FMs/HEW/PCMs (see details in the standard)	08:5.0 13:5.(b)	V8: 4.4.6.4.a V13: 4.4.6.4a									
<input type="checkbox"/> Separation and storage	08:5.(b); 9.(a) 13:5.(b),9.0	V8: 4.4.6.4.b V13: 4.4.6.4d & e									
<input type="checkbox"/> EPA: Were notifications, and requirements about labeling, if they are shipping to overseas											

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause			1	2	3	4	5	
9.8. Management of Focus Materials, Hazardous Electronic Wastes, and Problematic Components & Materials											
smelters for precious metals recovery reviewed?											
<input type="checkbox"/> Limited storage time for FM/s/HEW	08:3.(a)(1) 13:3.(a)(1), 9.(a)(2)	V8: 4.4.6.4.c V13: 4.4.6.4e									
<input type="checkbox"/> EPA: Can recycler demonstrate that CRTs are being managed in a compliant fashion, either onsite or at their downstream vendor											
<input type="checkbox"/> Storage for reuse	08:9.(a) 13:9.(a)	V8: 4.4.6.4 V13: 4.4.6.2d									
<input type="checkbox"/> EPA: For facilities that shred, is the auditor asking for TCLP results?											

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	O FI	N C	1	2	3	4	5	
9.9. Emergency preparedness & response											
<input type="checkbox"/> Up-to-date Emergency preparedness & response procedure(s)	08:1.(a)(3)(E), 1.(2) 13:4.(h)	V8: 4.4.7 V13: 4.4.7									
<input type="checkbox"/> Periodic review & revision of procedures	08:1.(a)(3)(E), 1.(a)(2) 13:1(c)	V8: 4.4.7 V13: 4.4.7									
<input type="checkbox"/> Periodic testing of procedures	08:NA 13:4.(h)	V8: 4.4.7 V13: 4.4.7									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	N C	1	2	3	4	5	
9.10. Materials recovery & disposition											
<input type="checkbox"/> Treatment and control of final disposition of FMs, HEW and PCMs	08:5.(a) 13:5.(a)-(g)	V8: 4.4.6.6 V13: 4.4.6.6									
<input type="checkbox"/> Only disposed of in licensed and permitted facilities	08:5.(c) 13:5.(c)(d) & (e)(3)	V8: 4.4.6.6 V13: 4.4.6.6 V13:									
<input type="checkbox"/> Not disposed of in solid waste landfills or incinerators throughout the Recycling Chain	08:1; 2.(a)(3); 5.(d) 13:5.(d)	V8: 4.4.6.6 V13: 4.4.6.6									
<input type="checkbox"/> Controls for recycling of plastics and resin materials containing or consisting of Halogenated Compounds	NA	V8: 4.4.6.6 V13: 4.4.6.6									
<input type="checkbox"/> Control of waste /residues	08:3.(a)(2) 13:2.(a)(3); 5(d)	V8: 4.4.6.6 V13: 4.4.6.6 & Def 3.42									
<input type="checkbox"/> Knowledge and approval of final disposition BEFORE shipment.	08:3.(a)(2) 13:3.(a)(2)	V8: 4.4.6.6 V13: 4.4.6.6 & 4.4.6.5									
<input type="checkbox"/> Equipment is packaged appropriate to risks during transportation to public health or the environment and level of care	08:12.(b) 13:12.(b)	V8: 4.4.6.7, V8: 4.4.6.4.b& 4.4.6.5 V13: 4.4.6.4									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.10. Materials recovery & disposition											
<input type="checkbox"/> EPA question: written documentation that <u>their</u> transporters have regulatory authorizations and no significant violations	08:12.(b) 13:12.(b)	V8: NA									
<input type="checkbox"/> Management of ink and toner cartridges	13:5(h)	V8: 4.4.6.6.g V13: 4.4.6.6f									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.11. Export restrictions for focus materials (R2) and Hazardous Electronic Waste (e-Stewards)											
<input type="checkbox"/> Import & Export controls in place through to Final Disposition including Intermediaries	08:5.(e)(4) 13:3(a)(2), 5.(e)(3) & (4)	V8: 4.4.6.7 V13: 4.3.2.1 & 4.4.6.7									
<input type="checkbox"/> Export of cleaned CRT cullet only:	08:3.(a)(2)(B) 13:3.(a)(2)	3.4.4, V8: 4.4.6.7.c V13: 4.4.6.7 a2									
<input type="checkbox"/> If it is thoroughly cleaned											
<input type="checkbox"/> Will be used as a direct feedstock											
<input type="checkbox"/> Competent Authority (export, transit & import) countries in file											

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.12. Site closure & insurance											
<input type="checkbox"/> Site closure plan	08:11.(b) 13:11.(b)	V8: 4.4.6.8 V13: 4.4.9									
<input type="checkbox"/> Plan assures proper closure of the facility & against abandonment of EE	08:11.(b) 13:11.(b)	V8: 4.4.6.8 V13: 4.4.9									
<input type="checkbox"/> Plan includes indoor dust sampling where PHPTs have been used indoors	13:11.(b)(3)	V8: 4.4.6.8 V13: 4.4.9									
<input type="checkbox"/> Ensures remediation of any contamination for workplace dust	13:11.(b)(3)	V8: 4.4.6.8 V13: 4.4.9									
<input type="checkbox"/> Includes facility soil and groundwater testing for threshold levels listed in 3.43(b) if PHPTs are used or HEE or PCMs are stored or managed outside of fully contained, impermeably floored buildings	NA	V8: 4.4.6.8 V13: 4.4.9									
<input type="checkbox"/> Stipulates testing be conducted by a third party including a signed affidavit	NA	V8: 4.4.6.8 V13: 4.4.9									
<input type="checkbox"/> Legal and financial assurances for proper closure	08:11.(b) 13:11.(a)&(b)	V8: 4.4.8 V13: 4.4.9									
<input type="checkbox"/> Insurance for potential risks and liabilities (environmental risks)	08:11.(b) 13:11.(a)&(b)	V8: 4.4.8 V13: 4.4.8									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.12. Site closure & insurance											
<input type="checkbox"/> Insurance for potential risks and liabilities (data destruction risks)	NA	V8: 4.4.8 V13: 4.8									
<input type="checkbox"/> Insurance in place to underwrite it if indemnification is offered	NA	V8: 4.4.8.b V13: 4.4.8									
<input type="checkbox"/> Clear specification to customers of what indemnification are or are not being offered	NA	V8: 4.4.8.a V13: 4.4.3.1b									
<input type="checkbox"/> Utilize PHPTs? Pollution Liability insurance is commensurate with the nature/size of the operation	08:11.(b) 13:11.(a)	V8: 4.4.8.c V13: 4.4.8									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.13. Downstream accountability											
<input type="checkbox"/> Downstream vendor flow chart	13:7.(b)	V8: 4.5.1.1.d V13: 4.4.6.5a									
<input type="checkbox"/> Vendor selection	08:5.(e) 13:5.(e)	V8: 4.4.6.5 V13: 4.4.6.5									
<input type="checkbox"/> Initial due diligence (per standard requirements)	08:5.(e) 13:5.(e)	V8: 4.4.6.5 V13: 4.4.6.5									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.13. Downstream accountability											
<input type="checkbox"/> Ongoing due diligence (per standard requirements)	08:5.(f) 13:5.(f)	V8: 4.4.6.5 V13: 4.4.6.5									
<input type="checkbox"/> Shipping records	08:5.(e)(7); 3.(a)(2);13(a) 13:5.(e)(6), 3.(a)(2); 13.(a)	V8: 4.4.6.5 V13: 4.4.6.5									
<input type="checkbox"/> Did the auditor look at documentation for shipments and check record-keeping requirements (for R2)?											
<input type="checkbox"/> Downstream audits records	08:5.(f);13.(a) 13:5(e),5(f); 13.(a)	V8: 4.4.6.5 V13: 4.4.6.5									
<input type="checkbox"/> Outsourcing of Reuse tasks (next tier only)	08:NA 13:6.(c)(3)	V8: 4.4.6.2 V13: 4.4.6.2h									
<input type="checkbox"/> Responsibility for equipment going for reuse until it is sold or donated as fully functional equipment or parts	NA	V8: 4.4.6.5 V13: 4.4.6.2									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.14. Monitoring and measurement											
<input type="checkbox"/> Procedure/Plan to monitor and measure operations that could have a significant EH&S impact?	08:1.(a)(2) 13:1(b)	V8: 4.5.1									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.14. Monitoring and measurement											
<input type="checkbox"/> Monitoring of performance of applicable operational controls	08:1.(a)(2) 13:1.(b); 4(e)	V8: 4.5.1									
<input type="checkbox"/> Monitoring of EH&S objectives and targets	08:1.(a)(2) 13:1.(b),1.(c)	V8: 4.5.1									
<input type="checkbox"/> Calibration – schedule & records	08:1.(a)(2) 13:1.(b), 6.(c)(1)(B) & (2)(B)	V8: 4.5.1									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.15. Tracking											
<input type="checkbox"/> Tracking system (controlling, weighing, & documenting) total incoming & outgoing materials, wastes, & equipment & components going for reuse, including off-site storage	08:7.0 13:7.0	V8: 4.5.1.1 V13: 4.5.1.3									
<input type="checkbox"/> Calculation of a Mass Balance Accounting on a six-monthly basis at a minimum & linking of shipping records	NA	V8: 4.5.1.1.a V13: 4.5.1.3b & c									
<input type="checkbox"/> Does the mass balance calculation include equipment going for reuse	NA	V8: 4.5.1.1.a V13: 4.5.1.3b									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.15. Tracking											
<input type="checkbox"/> Monitoring and control of the destinations of HEWs	08:5.(e)(7) 13:5.(e)(6)	V8: 4.5.1.1 V13: 4.5.1.3									
<input type="checkbox"/> Provision to customers (if requested) of records and contact info of Downstream Recyclers throughout the Recycling Chain	13:7.(b)	V8: 4.5.1.1.c V13: 4.4.3.1b									
<input type="checkbox"/> Provision to customers (if requested) of downstream flow chart	13:7.(b)	V8: 4.5.1.1.c V13: 4.4.3.1b									
<input type="checkbox"/> Accurately quantify, record & submit data to the central database on an annual basis, for all certified sites (i.e. mass balance, test results etc)	NA	V8: 4.5.1.2 V13: 4.5.1.4									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.16. Evaluation of compliance											
<input type="checkbox"/> Procedure/plan for evaluating compliance with EH&S legal & other requirements	08:3.(a)(1) 13:1.(b),3.0	V8: 4.5.2 V13: 4.5.2									
<input type="checkbox"/> Procedure for evaluating compliance with export legal & other requirements	08:3.(a)(1) 13:1.(b); 3.(a)(2)	V8: 4.3.2.2 V13: 4.3.2.1 & 4.5.2									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.17. Nonconformity, corrective & preventive action											
<input type="checkbox"/> Nonconformity, Corrective Action and Preventive Action Procedure	08:NA 13:1.(b)	V8: 4.5.3 V13: 4.5.3									
<input type="checkbox"/> Review of the effectiveness of corrective action(s) and preventive action(s) taken	08:NA 13:1.(b)	V8: 4.5.3.e V13: 4.5.3.e									
<input type="checkbox"/> Nonconformities, corrective & preventive actions lead to EH&S MS change	08:1.(a)(2) 13:1.(b)	V8: 4.5.3 V13: 4.5.3									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification n [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.18. Control of records											
<input type="checkbox"/> Records demonstrate flow of materials	08:7 13:7.0	V8: 4.5.1.1 V13: 4.4.6.5 c 3 & d									
<input type="checkbox"/> Records demonstrate system conformity and are maintained in a single location	08:13 13:13.0	V8: 4.5.4 V13: NA									
<input type="checkbox"/> Records Control Procedure(s): ID, storage, protection, retrieval, retention (>5 years) + 30 years for medical records (e-Stewards)	08:NA 13:1.(b)	V8: 4.5.4 V13: 4.5.4.1									
<input type="checkbox"/> Records are controlled, backed-up, disposed of according to procedure	08:NA 13:1.(b)	V8: 4.5.4 V13: 4.5.4									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.19. Internal audit											
<input type="checkbox"/> Annual system review / periodic internal EH&S system audits	08:1.(a)(2) 13:1.(b)(c)	V8: 4.5.5 V13: 4.5.5									
<input type="checkbox"/> Audit program and schedule	08:NA 13:1.(b)(c)	V8: 4.5.5 V13: 4.5.5									
<input type="checkbox"/> Auditors are competent, objective & impartial	13:1.(b)	V8: 4.5.5 V13: 4.5.5									

Requirement	R2	e-Stewards	Other (NA)	CB Finding		Audit Observation					Comments/Evidence/Justification [Comments required for anything less than 5]
	Clause	Clause	Clause	OFI	NC	1	2	3	4	5	
9.20. Management review											
<input type="checkbox"/> Management review covering all elements conducted on a regular basis and records are maintained	08:1.(a)(2) 13:1.(b)	V8: 4.6 V13: 4.6									

10. Post-Audit Discussion Questions for the Facility Owner/Manager											
	1	2	3	4	5						
<input type="checkbox"/> How well do you believe the audits are evaluating your conformance to the Standard(s)?						▶					
<input type="checkbox"/> How well do you believe the management system is facilitating continual improvement in your organization?						▶					
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at preventing illegal exports?						▶					

10. Post-Audit Discussion Questions for the Facility Owner/Manager						
	1	2	3	4	5	
<input type="checkbox"/> How effective do you feel the audit process is at preventing illegal exports of scrap material for recycling?						▶
<input type="checkbox"/> How effective do you feel the audit process is at preventing illegal exports of scrap material for shipped as “reuse”?						▶
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at protecting worker health and safety?						▶
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at securing and properly handling data bearing devices?						▶
<input type="checkbox"/> Was there a particular area of the standard that you believe was not audited sufficiently in the audit?						▶
<input type="checkbox"/> Was there a particular area of the standard that that you believe was over-audited (spent more time than necessary)?						▶
<input type="checkbox"/> Do you believe that the auditor struck a good balance on evaluation of intent, implementation and effectiveness?						▶
<input type="checkbox"/> Do you believe the audit time is appropriate?						▶
Are there any other comments or thoughts you would like to share with EPA?						

11. Post-Audit Discussion Questions for the Facility Operations Staff						
	1	2	3	4	5	
<input type="checkbox"/> How well do you believe the audits are evaluating your conformance to the Standard(s)?						▶
<input type="checkbox"/> How well do you believe the management system is facilitating continual improvement in your organization?						▶

11. Post-Audit Discussion Questions for the Facility Operations Staff						
	1	2	3	4	5	
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at preventing illegal exports?						▶
<input type="checkbox"/> How effective do you feel the audit process is at preventing illegal exports of scrap material for recycling?						▶
<input type="checkbox"/> How effective do you feel the audit process is at preventing illegal exports of scrap material for shipped as “reuse”?						▶
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at protecting worker health and safety?						▶
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at securing and properly handling data bearing devices?						▶
<input type="checkbox"/> Was there a particular area of the standard that you believe was not audited sufficiently in the audit?						▶
<input type="checkbox"/> Was there a particular area of the standard that that you believe was over-audited (spent more time in than necessary)?						▶
<input type="checkbox"/> Do you believe that the auditor struck a good balance on evaluation of intent, implementation and effectiveness?						▶
<input type="checkbox"/> Do you believe the audit time is appropriate?						▶
Are there any other comments or thoughts you would like to share with EPA?						

12. Post-Audit Discussion Questions for the Certifying Body Auditors						
	1	2	3	4	5	
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at preventing illegal exports of scrap material for recycling?						▶

12. Post-Audit Discussion Questions for the Certifying Body Auditors						
	1	2	3	4	5	
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at preventing illegal exports of scrap material for shipped as “reuse”?						▶
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at protecting worker health and safety?						▶
<input type="checkbox"/> How effective do you feel the Standard(s) is/are at securing and properly handling data bearing devices?						▶
<input type="checkbox"/> Are there any areas of the Standard(s) you feel the Standard Owners (BAN or SERI) could provide better training for auditors?						▶
<input type="checkbox"/> Do you believe you had enough time to audit the standards effectively?						▶
<input type="checkbox"/> Are there any other thoughts or comments you wish to share with EPA?						
<input type="checkbox"/> If needed, how did you determine conformance with “abc”? Did you review materials electronically or otherwise, ahead of time, if so, what were they?						

13. Post-Audit Discussion Questions for the EPA Audit Observers						
	1	2	3	4	5	
<input type="checkbox"/> Do you believe there was adequate time to conduct the audits?						▶
<input type="checkbox"/> Did you feel that the auditor spent adequate time to explore the requirements?						▶
<input type="checkbox"/> Were there any clauses that you felt were particularly well audited?						▶
<input type="checkbox"/> Were there any clauses that you felt were inadequately audited?						▶

13. Post-Audit Discussion Questions for the EPA Audit Observers						
	1	2	3	4	5	
<input type="checkbox"/> Do you believe that sample sizes were adequate to verify conformity? E.g. records and number of people interviewed?						▶
<input type="checkbox"/> Do you believe that the ratio of time spent with the EHS representative and facility management and employees was appropriate?						▶
▶ Are there any other thoughts or comments?						

14. CB's Observations of Facility's EH&S Management System Strengths (In context of Audit Process (i.e., does the audit process help reinforce strengths?))
▶

15. CB's Observations of Facility's EH&S Management System non conformities (In context of Audit Process (i.e., does the audit process help reinforce strengths?))
▶

16. CB's Observations of Facility's EH&S Best Practices
In context of Audit Process (i.e., does audit help facility learn, implement, & improve best practices?)
▶

17. Observations of Audit/certification Process Opportunities for Improvement in Context of Audit Process (i.e., are opportunities identified with regard to the implementation of standards?)

▶

18. Evaluation of Effectiveness of the audit in determining that the EH&S Management system...	1	2	3	4	5
▶ Conforms to requirements identified in the audit scope					
▶ Demonstrates that non-conformities from previous audits were effectively closed (surveillance audits only)					
▶ Complies with legal and other requirements					
▶ Supports pollution prevention					
▶ Supports a safe work environment					
▶ Maximizes reuse of equipment					
▶ Protects and correctly handles data-bearing devices					
▶ Prevents non-functional equipment being shipped under the guise of “Reusable” equipment					
▶ Properly controls export of electronics containing hazardous materials to developing countries					

19. Evaluation of Effectiveness of Audit Processes	1	2	3	4	5
▶ Opening meeting					
▶ Management of the audit, including adjustments to the audit plan					
▶ Time management and attention to evaluation of key requirements					
▶ Audit team’s knowledge of the standard(s)					
▶ Audit team’s knowledge of the industry					
▶ Following of audit trails (keep in mind that not all audit trails can be followed)					
▶ Communication of findings with auditee					
▶ Documentation of findings					
▶ Closing meeting					

20. Audit Observation Follow-up
<input type="checkbox"/> Conduct follow-up with facility, if not able to complete on-site – Question 9.
<input type="checkbox"/> Conduct follow-up with certification body auditor, if not able to complete on-site – Question 10.
<input type="checkbox"/> Request copy of the CB auditor (and ANAB audit, if applicable) report.

Additional considerations to support the assessment (for EPA Audit Observer use only)	
<input type="checkbox"/> What kind of documentation was reviewed for export and import (do they have documentation of importation (legality – does the country say it is legal to import) and how is it managed in the importing country)?	▶
<input type="checkbox"/> What was the sample size of the documents the auditor is asking for? (100 shipments go out a year, & auditor asks 10 documents = 10% sample size)	▶
<input type="checkbox"/> Are exports of CRTs in compliance with CRT Final Rule – Specifically, for filing an Acknowledgement of Consent to export unprocessed CRTs from the US to Mexico for recycling? (Unprocessed means CRTs that have not had the phosphor coatings removed). Did the auditor check to make sure the downstream processor is one of the companies currently approved?	▶
<input type="checkbox"/> Number of vendors reviewed for due diligence? (Should be 100% of the downstream recyclers/processors of focus material/hazardous electronic waste.) What documents are viewed to determine how materials are handled through final disposition?	▶
<input type="checkbox"/> What was the sample size of employees interviewed by the CB auditor? How many people work at the facility?	▶