
CRADLE-TO-GRAVE COMPLIANCE TRACKING OF U.S./MEXICO TRANSBOUNDARY HAZARDOUS WASTE: THE HAZTRAKS TRACKING SYSTEM

COLEMAN, SAMUEL, P.E.¹ AND SCHULTES, JOSEPH V., P.E.²

¹ Director, Compliance Assurance and Enforcement Division

² Haztraks Project Manager

U.S. Environmental Protection Agency, Region VI, 1445 Ross Avenue, Dallas, Texas
75202 USA

SUMMARY

This hazardous waste tracking system (Haztraks) presents a unique cooperative effort between neighboring governmental entities through the development of a common automated mechanism to support independent inspection, enforcement and compliance monitoring of mutual transboundary hazardous waste shipments. Computer assisted procedures are speeding the process for identifying non-compliant trends and regulatory deviations. Based on information captured by Haztraks, enforcement actions have brought over 1500 tons/year of transboundary hazardous waste shipments into compliance. Since employing Haztraks, there has been a 20% annual increase in shipment compliance with Mexico's requirement to return maquiladora waste to the country of origin of the raw materials for proper disposal by the Mexican maquiladora industry and their U.S. parent companies.

1 ENVIRONMENTAL COMPLIANCE, ENFORCEMENT AND WASTE TRACKING

1.1 Sizing the problem

Over the past 25 years, the environmental picture in the U.S. has changed dramatically. We are at or near maintenance levels of compliance in many programs. We are moving from an "end of pipe" orientation to one of pollution prevention. Beyond compliance, environmental protection becomes a partnership between state, local, and federal regulators and the regulated community. Accessible, accurate, and current information is the heart of such a partnership.

Under most of the U.S. environmental statutes, the Environmental Protection Agency established and implemented a national compliance program as a standard to be achieved by individual U.S. states. Once achieved, the lead passed to the appropriate state agency through program delegation. Today, much of the national environmental compliance program is administered by state agencies. However, the Environmental Protection Agency continues to orchestrate the coordinated, national compliance program, particularly in the area of transboundary waste shipments. In Mexico, there is also a federal system with delegations to the State level authorized to carry out and maintain compliance with environmental program mandates.

Information sharing has been particularly important to international environmental cooperation. Among the highlights of U.S. cooperative efforts is the data system the U.S. and Mexico uses to track the transboundary movement of hazardous waste, Haztraks.

Haztraks reflects the Environmental Protection Agency direction in designing and using information sharing systems. It has particular relevance to Basel and Organization for Economic Cooperation and Development parties for information sharing and reporting.

1.2 Uses of automation

Effective use of computers in compliance assurance today is an evolving art, not a science. The formula that worked for you or your agency yesterday might not be so effective today — and could be dead wrong by tomorrow. As we move forward into the next century, and the regulatory process becomes more knowledge based, we firmly believe that computing strategies will become a competitive issue.

In this paper we will show computing technology can work for enforcement and compliance strategies. Information technology has acquired a role so central in evaluating compliance that it has become practically irreplaceable for monitoring transboundary waste shipments along the U.S./Mexican border. Haztraks users can take advantage of information technology to reengineer the compliance assurance process employing “wizard” programs to help perform common tasks, such as creating forms, formatting reports, and setting up queries, and exchanging data with the regulated community by means of electronic data interchange.

2 NEEDS FOR INFORMATION EXCHANGE

Haztraks stems from a critical need by the U.S. and Mexico to track thousands of tons of hazardous waste that crosses the Mexico-U.S border annually. Mexico is the U.S. third largest trading partner in chemicals behind Japan and Canada. Six percent of U.S. export and 3 percent of U.S. import chemical trade are with Mexico. Since 1965, some 2000 industrial maquiladora facilities have been established in Northern Mexico. Maquiladora facilities are Mexican manufacturing and assembly plants which are owned by foreign parent companies. Under Mexico’s maquiladora program, foreign parent companies (most are U.S.) export raw materials and partially assembled components to their maquiladora plants for final assembly. Under the current system, the finished goods produced at the Mexican facility can then be exported with tariffs charged only on the value added to the material during the processing steps which occurred in Mexico. Mexican law requires that hazardous wastes generated in the maquiladora plants be exported to the country of origin for management or to be nationalized. Nationalization, whereby the waste could remain in Mexico, has been a seldom used option. Therefore, most hazardous waste produced by maquiladora plants comes back to the U.S. These include acids, bases, liquids containing heavy metals, metal plating wastes, organic solvents, and cyanide wastes.

Transboundary movement of hazardous waste between Mexico and the United States poses unique challenges. A primary concern has been the loss of waste identity at the border until the implementation of Haztraks. Additionally, further complicating the waste identification process, the definitions of hazardous waste varied between Mexico and the U.S. Neither the United States nor Mexico had systematic access to information on the number of authorized hazardous waste transporters or the amounts and types of hazardous wastes transported from Mexico to the U.S. The problem was exacerbated by the complexities of cross-border truck transportation and the difficulties involved in coordinating the activities of the numerous U.S. and Mexican agencies responsible for hazardous waste regulation.

2.1 Waste tracking in Mexico

Waste tracking in Mexico relies on the Guia Ecologica (Ecological Guides), which include a manifest and transport and acceptance of hazardous residues forms, as well as semiannual shipment reports. These must be forwarded to the Mexican Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology, which is the Environmental Protection Agency's counterpart in Mexico responsible for environmental affairs. Mexican law requires consent by the receiving country for exports of hazardous waste. In practice, however, the requirement is not applied to hazardous waste exports from maquiladora plants thereby posing a shortfall of monitoring information.

2.2 Waste tracking in the United States

Among the many challenges facing environmental managers are the millions of tons of hazardous waste produced each year that must be managed to protect human health and the environment. Quality information about off-site hazardous waste shipment to the site or facility where it is ultimately disposed or treated is crucial to carrying out this task. The hazardous waste manifest is an integral part of the U.S. cradle-to-grave hazardous waste transport tracking system.

Required pursuant to the Resource Conservation and Recovery Act, the manifest is a multi-part shipping document that must accompany any hazardous waste shipment, regardless of the mode of transport. Generators of the hazardous waste are responsible for initiating a manifest for each shipment and for ensuring a transporter delivers the waste to the management facility that will dispose of the waste.

Current U.S. tracking of waste received from a foreign source also consists of advance one-time notification by the treatment, storage, and disposal facility. This notification gives the Environmental Protection Agency, the state environmental agency and U.S. Customs advance notice for each waste type, foreign source shipping the waste and the U.S. parties involved. However, this information is often incomplete.

Also, U.S. waste exporters are required to file an annual notice of the projected amount of waste that they will ship. The Environmental Protection Agency uses this information to request consent from the Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology for the shipment to take place.

2.3 Background of international waste tracking

On November 27, 1990, President Salinas of Mexico and President Bush of the United States agreed to coordinate border area environmental activities resulting in the Integrated Border Environmental Plan which provides for the creation of a hazardous waste tracking system. The U.S. and Mexico focused early efforts on developing a joint capability to monitor transboundary waste shipments in accordance with their bilateral commitment with the exchange of shipment documentation. These efforts culminated with the first phase development of this database system. The tracking system became operational as of October 1992. As a first effort of its kind, Haztraks developed a correlation between Mexican export authorizations and U.S. transport manifests to establish "cradle-to-grave" linkage.

2.4 Country-to-Country waste tracking coordination

Under the 1983 Agreement between the United States and Mexico on Cooperation for the Protection and Improvement of the Environment in the Border Area, a Work Group co-chaired by representatives of the Environmental Protection Agency and its Mexican counterpart

was established to resolve country-to-country hazardous waste issues. The primary focus of the Hazardous Waste Work Group centered on the maquiladora industry in Mexico. Nearly half of the 2000 maquiladora plants generate hazardous waste. Since Mexican law requires all of it to return to the country of origin, the vast majority of it, 30,000 tons per year (under Mexican hazardous waste definition), which includes 11,000 tons per year (under U.S. hazardous waste definition), returns to the U.S. Philosophically, Mexico has expected the U.S. to assume some responsibility for U.S. affiliated maquiladora waste management in Mexico. Instances of hazardous waste shipments and mismanagement were frequently agenda items at the Hazardous Waste Work Group meetings. However, fruitful dialog was often impossible because documentation as to waste origin, type, volume, etc. was anecdotal. The Work Group, agreed to study the management of hazardous waste along the border by conducting joint visits to maquiladora operations in Mexico and their U.S. counter parts (sister plants). While these were valuable for training purposes, they produced little information. The Work Group also looked at the viability of correlating hazardous waste shipment documentation to produce a picture of waste movement.

In September 1990, the Environmental Protection Agency and SEDUE representatives met in Mexico City to identify such documentation. Although there were several documents that were required for transboundary shipments, not all of them were available to the Environmental Protection Agency or SEDUE. It was important too, that there exist some correlatable data among the U.S. and Mexican documents. The Mexican Guia Ecologica and the U.S. hazardous waste manifest were available and contained correlatable data. The Guia is shipment specific, describes waste type and quantity as well as destination for prospective hazardous waste shipments. Similarly the U.S. Hazardous Waste Manifest is shipment specific, contains waste type, quantity, and destination. Pilot data exchange in 1991 revealed reconcilable differences in units and waste types. The pilot demonstrated the feasibility to construct a useful data exchange and compliance monitoring tool. Accordingly, using funds designated for enforcement and compliance monitoring purposes, the Haztraks data system was built in 1991 to serve these functions. It was also at this time that the NAFTA debate highlighted U.S./Mexico border environmental problems, among them, illegal hazardous waste management. This helped fuel the rapid development and expansion of Haztraks into a proven reliable compliance monitoring tool.

2.5 Information was centrally unavailable prior to Haztraks

As stated earlier, hazardous waste shipments lost identity at the border and little data was available to determine the magnitude and character of imported hazardous waste prior to 1992. The Environmental Protection Agency did not have accurate information on the quantity, type, origin, method of handling, and U.S. receivers of foreign waste streams. In the U.S., receiving facilities are required to provide the delegated authority with a one-time notification of intent to receive individual waste streams from a foreign source. Delegated state agencies did not maintain databases capturing these notifications nor import manifest information. It was difficult or impossible to maintain compliance with the one-time notification requirement. Traditionally, an on site inspection of the receiving facility and manual correlation of notification with the import manifest was the only means of verifying compliance. This effort was time consuming and not efficient for monitoring large numbers of facilities managing foreign source waste streams.

The primary hazardous waste tracking document is the manifest. The Environmental Protection Agency import regulations require the foreign generator of the waste to be identified on the manifest. This document is not required to be reported to the Environmental Protection Agency. For the Environmental Protection Agency or any delegated authority to establish a

compliance monitoring program, the manifest is the critical document for beginning any review. And it became quickly apparent that any appreciable success for waste tracking would be dependent on the development of system access to manifests and other information sources.

2.6 Opening information sources

Gathering information on foreign source waste required close cooperation with a variety of agencies including the foreign environmental authority, foreign commerce department, customs authorities of each country, and the delegated U.S. border state authorities. It was found that inconsistency of information handling was the general rule.

In Mexico, transport manifests are required to accompany hazardous waste shipments but were not collected by any governmental agency at that time. However, strict compliance was required for a 90-day authorization (Guia Ecologica) issued by the competent environmental authority to accompany each imported or exported hazardous waste or hazardous material shipment. Since this authorization was prospective, with overestimated quantities, it contained information useful for tracking waste shipments when compared with the U.S. transport manifest. The Mexican authority agreed to establish a compatible database and enter all applicable information beginning with the initial authorization issued in accordance with the Mexican General Environmental Law of 1987 and share the database with the Environmental Protection Agency.

U.S. Customs port policy along the U.S./Mexican border, while varying from port to port, required the U.S. importer to furnish a manifest prior to the transport of hazardous waste through the Customs facility. Customs officials were concerned with illegal contraband accompanying unauthorized hazardous waste shipments. The Environmental Protection Agency assisted Customs Port agents with training courses on environmental import/export regulations, provided joint inspections of shipments and furnished contact numbers for emergency assistance. In turn, the Customs Port Directors informally agreed to forward this initial manifest to the Environmental Protection Agency Region VI office on a monthly basis for inclusion into Haztraks.

Additionally, there is a biannual reporting mechanism requiring the reporting of imported hazardous waste shipments to the Environmental Protection Agency. This information is neither timely, nor accurate, and generally not reported by industry. Efforts to collect imported waste shipment information was then directed to the shipment manifest as the only reliable tracking document.

Therefore, the Environmental Protection Agency Region VI and I offices established support agreements with each of their U.S./Mexico border states to collect completed import manifests, as well as receiving facility notifications, and forward them to the Region VI.

The information collected from the Mexican Guia authorization, transport manifests from U.S. Customs and the delegated border states, and the receiving facility one-time notifications from the states became the cornerstone for the hazardous waste tracking system's data base.

2.7 Hazardous waste tracking system development

Haztraks was designed, with the support of a commercially available off-the-shelf database management system, to track volumes and types of waste shipped between the U.S. and Mexico. The basis of this mechanism is a series of informational and relational databases, programmed in a menu driven format, known as the U.S./Mexico Hazardous Waste Tracking System (Haztraks). The tracking system utilizes information received from Environmental Protection Agency Regions VI and IX and the States in both regions, U.S. Customs, and the Secretary of Environment, Natural Resources and Fisheries. The U.S. database component is based on information received from Uniform Hazardous Waste Manifests required to import or export hazardous waste. In Mexico, the Secretary of Environment, Natural Resources and Fisheries must authorize an import or export of hazardous waste by

issuing an Ecological Guide (Guia Ecologica). The Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology enters the Guia data into Haztraks reporting all of the Guias issued by the National Institute of Ecology in each of the Mexican border states.

As stated earlier, completed copies of manifests are collected by the U.S. border States; and through Environmental Protection Agency grant agreements or through voluntary submissions, the border States provide the manifests to Environmental Protection Agency Region VI, (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas) to enter into Haztraks. Treatment Storage Disposal facilities file a notification with the States import notifications on a one-time basis for each stream of waste expected from a foreign source. These Treatment Storage Disposal import notifications are also collected by the U.S. border States, forwarded to Environmental Protection Agency Region IX, (Nevada, California, Arizona, and U.S. Territories), and entered into Haztraks.

2.8 Tracking system technical support

Environmental Protection Agency Region VI in Dallas, Texas supports the tracking system through its enforcement support contract program. The contract provides software programming, data transcription, document filing, user training programs, report development, company profile research and data quality control. Initial funding of \$30,000 was required for needs assessment, requirements definition and prototype database development. Present funding levels have been considerably less than comparable systems (\$150,000, annually) while providing support for various Federal, State and local agencies involved in compliance monitoring along the U.S./Mexico border.

3 HOW THE ENVIRONMENTAL PROTECTION AGENCY USES HAZTRAKS

Haztraks enables the Environmental Protection Agency to perform a variety of compliance verification and targeting functions as well as generating ad hoc query reports and hazardous waste tracking from generation to disposal. Manifests and notice/consent information can be cross-checked to identify shipments which fail to conform to export notification or consent terms (e.g., different type of waste or greater volume than represented in export notice or consented to). Manifests from export country and import country are cross-checked to identify manifest discrepancy violations (e.g., inaccurate or missing waste handler information). Transporter facilities are identified for storing waste shipments beyond authorized time limits for which they do not hold appropriate permits. Haztraks provides information for its use by enforcement authorities in targeting inspection/investigatory activities (e.g., information on regions and border crossings with the most waste traffic, profile of industries which export high risk hazardous wastes, or exporter/importer/broker compliance history data). Haztraks aids the foreign country notice review process, a waste code translator is integrated into the report menu to quickly correlate and identify International Waste Identification Codes with domestic waste codes.

4 THE WASTE TRACKING PAPER TRAIL PROCESS

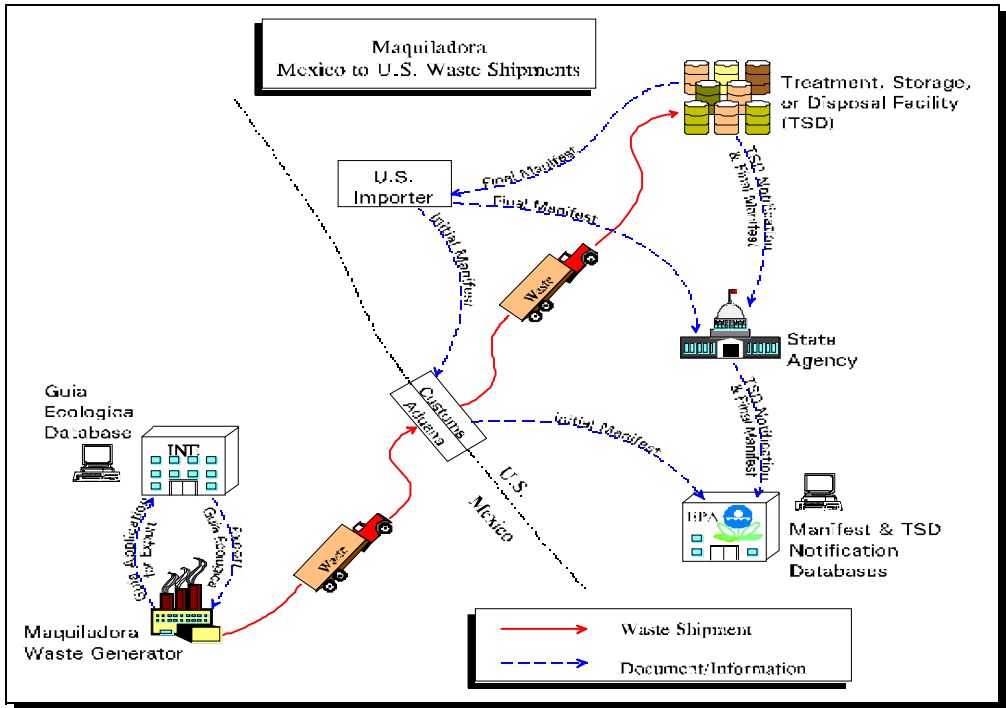
Waste tracking along the U.S./Mexico border can be shown by the following paper trail processes:

- tracking maquiladora waste shipments from Mexico to the U.S.;
- tracking non-maquiladora waste shipments from Mexico to the U.S.;

- tracking hazardous waste shipments from the U.S. to Mexico; and
- tracking raw material shipments from the U.S. to Mexico.

Each process has been described diagrammatically followed by a process narrative.

4.1 Tracking Maquiladora Waste Shipments from Mexico to U.S.



Export Guia Ecologica

1. Through a guia ecologica application (Manifiesto para la Importacion o Exportacion de Materiales o Residuos Peligrosos), the maquiladora notifies the National Institute of Ecology of its intention to ship hazardous waste to the U.S.
2. The National Institute of Ecology issues an export guia ecologica approving this shipment.
3. The National Institute of Ecology enters information from the export guia ecologica into Haztraks. Mexico sends its updated guia ecologica database to the U.S. on a quarterly basis.

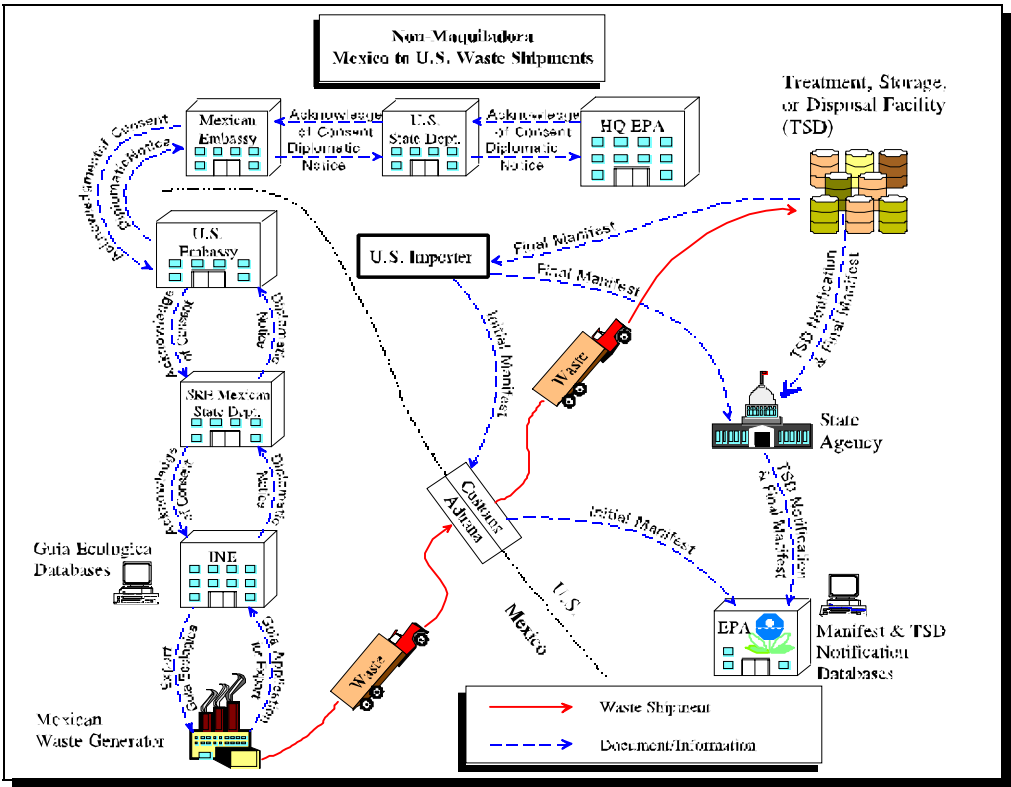
Treatment Storage Disposal Notification

1. A maquiladora notifies a Treatment Storage Disposal facility of its intent to ship hazardous waste.
2. The Treatment Storage Disposal facility notifies its state agency of its intent to receive waste from a foreign source.
3. The Treatment Storage Disposal facility forwards this notification to the Environmental Protection Agency.
4. The Environmental Protection Agency enters information from the Treatment Storage Disposal notification into Haztraks.

U.S. Hazardous Waste Manifest

1. The U.S. importer (referred to on the manifest as U.S. generator) prepares a prefilling copy of the manifest and sends it to U.S. Customs.
2. The waste is transported from the maquiladora to the border.
3. The waste is checked through U.S. Customs, which sends a preliminary copy of the manifest to the Environmental Protection Agency.
4. The Environmental Protection Agency enters information from the manifest into Haztraks.
5. Transporter 1 signs the manifest and takes the waste at the border. The waste is shipped either directly to the Treatment Storage Disposal facility or to a staging company. In the latter case, Transporter 2 signs the manifest and takes the waste to the Treatment Storage Disposal facility.
6. The Treatment Storage Disposal facility receives the waste and signs the manifest.
7. The Treatment Storage Disposal facility submits the completed manifest to the appropriate state agency.
8. The state agency submits completed manifests to the Environmental Protection Agency.
9. The Environmental Protection Agency enters information not found on the preliminary manifest into Haztraks.

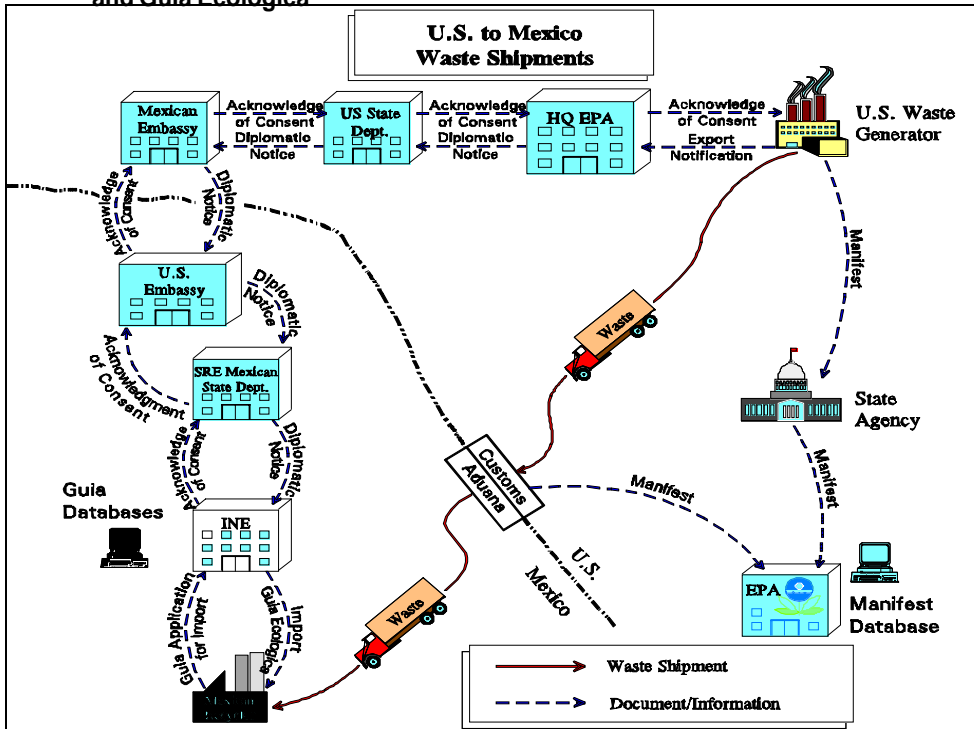
4.2 Tracking Non-Maquiladora Waste Shipments from Mexico to U.S.



Diplomatic Notice

1. A non-maquiladora generator informs the National Institute of Ecology of its intent to ship hazardous waste to the U.S.
2. The National Institute of Ecology submits a diplomatic notice to the Environmental Protection Agency.
3. Once the Environmental Protection Agency receives the diplomatic notice, it responds with an Acknowledgment of Consent.
4. When the National Institute of Ecology receives the Acknowledgment of Consent, the generator is given an export guia ecologica approving the shipment.

U.S. Hazardous Waste Manifest, Treatment Storage Disposal Notification, and Guia Ecologica



These documents follow the same paper flow as discussed in the previous section "Tracking Hazardous Waste Shipments from Maquiladoras to the U.S."

4.3 Tracking Hazardous Waste Shipments from the U.S. to Mexico

Notification of Intent to Export

1. The U.S. waste generator submits a Notification of Intent to Export (NOI) to the Environmental Protection Agency.
2. The Environmental Protection Agency responds to the NOI by issuing an AOC to the U.S. importer permitting the waste shipment. NOIs and AOCs are not tracked by Haztraks.

U.S. Hazardous Waste Manifest

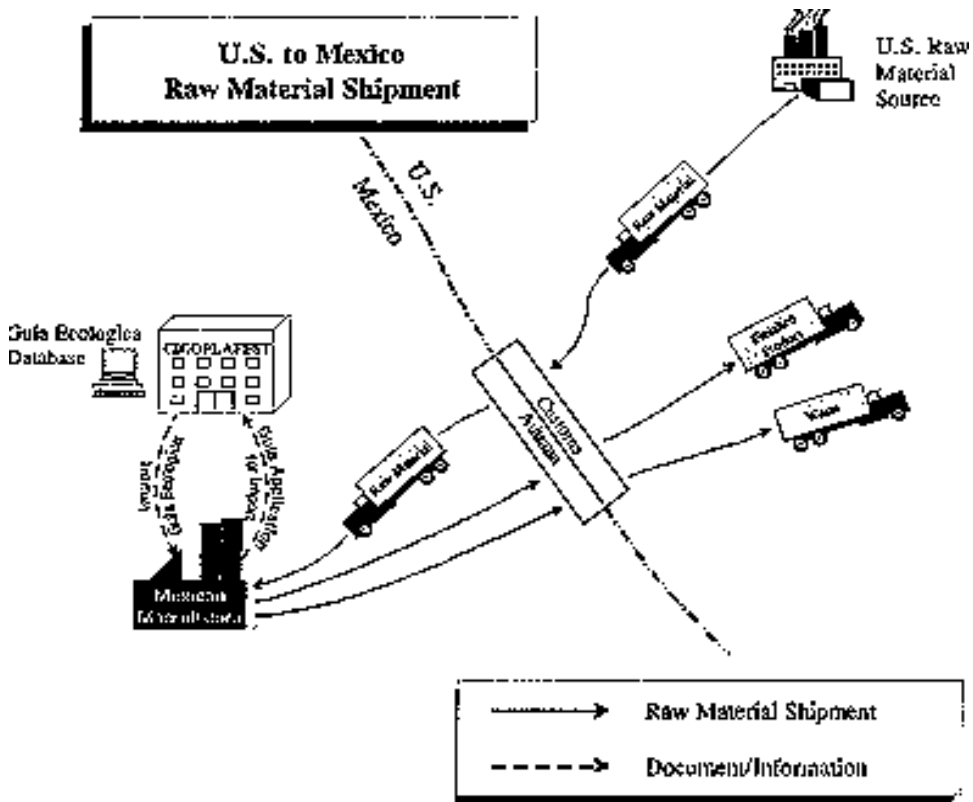
1. The U.S. importer completes the manifest and ships the waste to Mexico.
2. The waste shipment clears U.S. Customs. U.S. Customs sends a copy of the manifest to the Environmental Protection Agency.

3. The U.S. waste generator sends the manifest to the appropriate state agency, which then submits the manifest to the Environmental Protection Agency.
4. The Environmental Protection Agency enters information from the manifest into Haztraks.
5. The Mexican receiver acknowledges receipt of the waste to the U.S. importer. Recyclers are currently the only companies in Mexico that receive waste from the U.S.

Import Guia Ecologica

1. Through a guia ecologica application (Manifiesto para la Importacion o Exportacion de Materiales o Residuos Peligrosos), the Mexican receiver notifies the National Institute of Ecology of its intention to receive waste from the U.S.
2. The National Institute of Ecology issues an import guia ecologica approving the receipt of this shipment.
3. The National Institute of Ecology enters information from the import guia ecologica into Haztraks. Mexico sends its updated guia ecologica database to the U.S. on a quarterly basis.

4.4 Tracking Hazardous Material Shipments from the U.S. to Mexico

**Import Permit (Guia Ecologica)**

Many raw materials with hazardous characteristics are imported into Mexico for use within the maquiladora industry. These hazardous raw materials require the maquiladora to obtain an import permit (guia ecologica). The Mexican Intersectorial Commission for the Control of Processing and Use of Pesticides, Fertilizers and Toxic Substances (CICOPLAFEST) is a multi agency commission responsible for the import control of a wide variety of hazardous materials.

1. The maquiladora notifies CICOPLAFEST of its intention to receive hazardous materials from the U.S. by submitting a guia ecologica application.
2. CICOPLAFEST issues an import guia ecologica approving the receipt of this shipment.
3. CICOPLAFEST through the National Institute of Ecology enters information from the import guia ecologica into Haztraks. Mexico sends its updated guia ecologica database to the U.S. on a quarterly basis.

5 SYSTEM DESIGN ATTRIBUTES

5.1 Haztraks electronic platform

Haztraks is a PC-based, multi-user database application developed using Microsoft FoxPro version 2.6 for Windows and DOS. It may be installed on a network server and has the capability of handling many users. Haztraks is a multi-platform application which may be executed as a DOS or a Windows program. Future enhancements of Haztraks are being researched and may include support for Windows 95 as well as client-server capability.

5.2 Information security

The database files are protected with a tiered access password protocol to discourage unauthorized access and changes. The Environmental Protection Agency and the Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology system administrators assign data entry users "read/write" or "read only" access. Changes to data entries may only be made by the system administrator after data has been quality checked.

The U.S./Mexican bilateral agreement permits either country to protect its information from public release. The Mexican guia database is presently handled as "business confidential" and is not releasable by the Environmental Protection Agency. All U.S. data information is available upon request.

5.3 Haztraks accessibility

Haztraks' system programs and User Manual are available to another country's environmental agency upon written request to the U.S. Environmental Protection Agency.

5.4 U.S./Mexico Haztraks telecommunications

Environmental Protection Agency Region VI has successfully completed the implementation of two electronic file transfer platforms (FTPs) to provide quick and up-to-date access to Haztraks. The Environmental Protection Agency's public access Internet server, known as "Earth 1", now provides State environmental offices access to domestic Haztraks programs and databases to facilitate reporting, tracking and enforcement of transboundary hazardous waste shipments. The specific FTP address is EARTH1.EPA.GOV. To obtain access via the Internet, a user account must first be obtained from Joseph Schultes, Haztraks Project Manager, in the Environmental Protection Agency Region VI office. Requests for a user account must include user's name, organization, user's Internet IP address, and phone number. Send requests via E-mail or Internet to Schultes.Joseph@EPAMAIL.EPA.GOV.US.

The Environmental Protection Agency's internal FTP, known as "Lotus Notes", now provides EPA Headquarters, Regional and border offices, U.S. Embassy in Mexico City, and Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology access to domestic and Mexican Haztraks programs and databases.

5.5 Haztraks database contents

Haztraks contains data pertaining to the import and export of hazardous wastes, mainly between the U.S. and Mexico, although some data also reflect exports and imports from Canada and other countries. Haztraks also contains databases of international companies involved with the handling of hazardous waste and other information such as international waste code listings. The databases contained in Haztraks are briefly described in Annex A.

6 COMPLIANCE MONITORING ACHIEVEMENTS

As a result of Haztraks, the Environmental Protection Agency and the Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology can track the volumes and types of waste imported and exported through Environmental Protection Agency Region VI and Region IX. The tracking system enables environmental enforcement officials from both countries to monitor and confirm the movement of hazardous waste and thus detect violations of import/export regulations of their respective countries.

Through use of this tracking system, the Environmental Protection Agency has filed several enforcement actions against unregistered hazardous waste handlers and handlers which have improperly shipped tons of hazardous waste potentially impeding safe transit of their shipments through the border communities. The Environmental Protection Agency enforcement actions have generally dealt with violations of manifest requirements in the transportation of hazardous waste, such as failure to list the foreign generator, failure to obtain Environmental Protection Agency identification numbers, and use of transporters without valid Environmental Protection Agency identification numbers and DOT registrations. Use of Haztraks as a compliance monitoring tool will grow as agencies become familiar with its pragmatic user friendly programs. The Environmental Protection Agency and the Secretary of Environment, Natural Resources and Fisheries's Attorney General for the Protection of the Environment (PROFEPA) now have comprehensive data available concerning the compliance history of their mutual transboundary hazardous waste shipments. Compliance strategies can now be developed to best resolve the patterns of violations identified.

The Environmental Protection Agency/Secretary of Environment, Natural Resources and Fisheries effort to develop the Haztraks represents an innovative cooperative approach to improve both countries' compliance monitoring capacity. However, Haztraks must be continually upgraded to take advantage of technology, to meet user demands, and to handle the increased volume of transboundary shipments of the hazardous waste. As the methods to collect information regarding the movement of hazardous waste improve, Haztraks' capacity to capture greater number of transboundary shipments will also improve. This increased capacity is crucial since there has been a substantial increase in the importation of hazardous waste from Mexico. For example, from 1991 to 1993, the number of manifests and tonnage of waste imported from Mexico more than doubled. Although these figures are not conclusive as to the exact amount of waste crossing the border, they do provide support for the Secretary of Environment, Natural Resources and Fisheries' finding of increased compliance by maquiladoras with Mexico's requirement to return hazardous waste to the country of origin. Moreover, there has been a significant increase in the number of Treatment Storage Disposal import notifications for the prospective receipt of foreign wastes by the U.S. from Mexico, which reflects increased compliance by U.S. industry with Environmental Protection Agency regulations.

7 FUTURE DIRECTIONS

As the tracking system develops, the U.S. and Mexico are exploring the development of computer interfaces to allow direct electronic transmission of compliance data by the regulated community and "real-time" sharing of data between the two countries. Direct Electronic Data Interchange (EDI) transmission of data would greatly increase the quality and timeliness of information entered into the system, thereby advancing the continued binational success of Haztraks.

7.1 Electronic reporting of transboundary documentation

The submission of compliance reports is a labor intensive process, requiring both industry submitter and government recipient to transpose information between electronic databases and paper forms. To streamline the compliance reporting process, the Environmental Protection Agency sponsored a project to explore the use of electronic data interchange (EDI) to submit this information electronically. The Environmental Protection Agency's approach was to adapt the existing industry standards for electronic data interchange developed by the American National Standards Institute (ANSI) Accredited Standards Committee (ASC) X12 to the special environmental compliance reporting requirements of hazardous waste imported from Mexico. The goals of this project were to demonstrate the electronic streamlining of transboundary documentation and to reduce the compliance reporting time of manifests and notifications to the State, the Environmental Protection Agency and the Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology.

The pilot project, known as the Transborder Hazardous Waste Data EDI Pilot Project, examined all related documentation required to ship waste between U.S. and Mexico. Project participants involved in the transborder shipment process consisted of many stakeholders: industry, U.S. Customs, customs brokers, importers, generators, the State, the Environmental Protection Agency region, Environmental Protection Agency headquarters, other U.S. government agencies, Mexican Customs (Aduana), and the Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology. A brief discussion of this pilot project is provided in Annex B. Pilot test transmission demonstrations of hazardous waste manifests, Treatment Storage Disposal Notifications and TNRCC Foreign Shipment Summary reports were completed September 1995. This project successfully demonstrated the "real time" reporting, accuracy and paperless efficiency of electronic telecommunications for documentation of imported hazardous waste shipments from Mexican maquiladora companies bound for U.S. Treatment Storage Disposal receiving facilities. Full EDI implementation can reduce paperwork, speed up transboundary hazardous waste transactions, and provide real-time data for ongoing border compliance monitoring efforts.

7.2 Future directions for electronic reporting

The subsequent phases of the project will seek to expand the project participants. Communications have already been established with Canada, Environmental Protection Agency Region IX, Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology, U.S. Customs, and customs brokers. Some may decide to participate in one or more projects during the next fiscal year. The tracking system has continued to undergo development with the exploration of state-of-the-art innovative electronic solutions.

8 CONCLUSION

The Wall Street Journal (July 30, 1993) reported this hazardous waste tracking system as "a marked improvement from the days when environmental regulators relied on informants' tips, citizens' complaints and blind luck to nab illegal dumpers. 'It's a deterrent factor', 'says Dick Kamp, director of the Border Ecology Project, an Arizona environmental group active in free-trade issues. 'It's a necessary thing to do, and it's long overdue.'" In the meantime, this tracking system has made substantial advances for international environmental compliance and enforcement. The Haztraks system concept for tracking transboundary movements of hazardous waste and for monitoring compliance with a country-to-country linkage for real-time transfer of hazardous waste information sharing and reporting has significant potential for use

by Basel Agreement and Organization for Economic Cooperation and Development parties. It provides the technical architecture for enhancing international and interagency cooperation in compliance monitoring and enforcement of transboundary hazardous waste laws.

In a unique cooperative effort between neighboring governmental entities, a common automated mechanism successfully supports independent inspection, enforcement and compliance monitoring of mutual transboundary hazardous waste shipments. The Haztraks system assimilates appropriate information to support governmental and community environmental concerns regarding the generation, transportation, and disposal of hazardous materials and hazardous waste.

Increased transboundary activity underscores the importance of having a comprehensive and efficient tracking system. The Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology General Director recently emphasized that hazardous waste issues in Mexico are considered most important. The National Institute of Ecology desires continued close coordination with the Environmental Protection Agency to continue development of the transborder hazardous waste tracking mechanisms, Haztraks. Both countries continue to work to provide accurate information to Haztraks to improve the quality of the tracking system as a tool for detecting potential transboundary shipment violations.

Effective domestic environmental compliance and enforcement programs are an important factor in global efforts to reduce international trade barriers and enhance economic development in a manner consistent with each country's laws and regulations so as not to create unfair competition or pressure diminishing environmental quality and stewardship over the health and safety of the border area community. Tools, such as Haztraks, combined with effective cooperative enforcement can provide an element of fairness to the regulatory process, instill credibility to governmental institutions, and prevent short-term economic counterproductive gains between regional areas and between facilities that might undermine longer-term economic and environmental goals for a sustainable future.

Since 1992, considerable effort has been underway to improve the tracking of hazardous waste across the U.S./Mexican border. Its utility for enforcement targeting has been established with the filing of enforcement in the U.S. for violations of import/export regulations which has brought companies shipping 1500 tons of hazardous waste per year into compliance. Additionally, there has been a 20% annual increase in shipment compliance with Mexico's requirement to return maquiladora waste to the country of origin of the raw materials for proper disposal by the Mexican maquiladora industry and their U.S. parent companies.

Haztraks has demonstrated the capability to fulfill the tracking requirements necessary to ensure compliance programs of other mutual international parties. Efforts are presently underway to build upon the existing work between U.S. and Mexico by initiating electronic hazardous waste tracking capabilities for shipments between the U.S. and Canada and between Mexico and Canada. Both Mexico and Canada are Basel Agreement countries and the tracking system will include methodology to incorporate international waste code correlation with country specific codes. The tracking system is expected to continue development with the exploration of state-of-the-art innovative electronic solutions, since it is readily apparent that its full potential has not been achieved as yet.

ANNEX A HAZTRAKS DATABASES

U.S. Documents

- Hazardous Waste Manifest - A manifest is required for international hazardous waste shipments between the U.S. and Mexico, Canada, and other countries.
- Treatment Storage Disposal Notification - A Treatment Storage Disposal facility must notify the state of its intent to receive hazardous waste from a foreign source.

Mexican Documents

- Guia Ecologica - A Mexican generator must apply for a guia ecologica before it can ship waste. This is the National Institute of Ecology's authorization for the waste shipment. These documents are prospective — meaning that the actual volume or type of waste may vary somewhat.
- Semestral Report - Mexican generators, transporters, and Treatment Storage Disposal facilities must submit a report of their waste activities to the National Institute of Ecology twice a year.
- Diplomatic Notice - Mexico to U.S. waste shipments for non-maquiladora companies require notification by the National Institute of Ecology to the Environmental Protection Agency. The Environmental Protection Agency then responds to the National Institute of Ecology with an acknowledgment of consent for authorized shipments.

Company Databases

- Generators - This database contains facility information for generators located in the U.S., Mexico, and other countries.
- Importers - This database contains facility and Resource Conservation Resource Information System (RCRIS) information for U.S. importers of hazardous waste.
- Treatment Storage Disposal Facilities - This database contains facility information for Treatment Storage Disposal facilities located in the U.S., Mexico, and other countries. RCRIS information is listed for U.S. Treatment Storage Disposal facilities.
- Transporters - This database contains facility and RCRIS information for U.S. transporters.

Waste Code Listings

- Environmental Protection Agency waste codes
- SIC codes
- Handling codes

- Organization for Economic Cooperation and Development waste codes
- United Nations codes
- Canadian International Waste Identification codes
- Mexican waste codes

Management Databases

- Data Receipt Database - The data receipt database tracks the number and type of documents the Environmental Protection Agency receives from each agency for entry into Haztraks.
- Enforcement Database - The enforcement database (enforcement confidential) enables the Environmental Protection Agency import/export coordinator to track investigations of companies prior to enforcement action.

ANNEX B ELECTRONIC DATA INTERCHANGE BACKGROUND

Environmental programs rely heavily on enormous quantities of regulatory compliance data passed from the regulated community to Federal, State, and local environmental agencies. In nearly all cases, paper is the medium, despite the fact that the effect of this transfer is generally to take data from one database and put it in another. Doing this via paper incurs enormous data processing costs while at the same time seriously compromising the timeliness and quality of the data being transferred. At least in theory, then, the elimination of paper through "electronic reporting," that is, direct, computer-to-computer electronic transmission of data promises dramatic improvements in the cost/benefit ratio of compliance reporting, lessening the burden on industries and government. Furthermore, the robust nature of the EDI standards enable the automation of other business needs, thereby permitting the re-engineering of the internal processes of an organization.

The Mexican Maquiladora industry, which produces goods for exportation using imported raw materials, is an extreme case of an industry subject to myriad environmental reporting requirements. This is due to the transborder nature of their business--they are subject to environmental compliance reporting requirements of two separate countries (U.S. and Mexico) and the additional requirements of their respective customs and other agencies (U.S. States, etc.). For this industry, the automation of compliance reporting may provide unique opportunities to streamline environmental compliance reporting requirements by collapsing the paper requirements of multiple agencies into a single electronic format. Transmitting the data electronically can lead to dramatic reductions in data entry costs by both the industry submitter and the government recipients. Furthermore, electronic submissions provide opportunities for automated edit checks and audits, leading to a vast improvement in data quality and the timeliness of the data submitted.

Electronic Reporting at the U.S. Environmental Protection Agency

A few years ago, the U.S. Environmental Protection Agency's Office of Policy, Planning, and Evaluation (OPPE) initiated a project to introduce electronic reporting of compliance data for Agency and State hazardous waste management programs, such as the Uniform Hazardous Waste Manifest and Hazardous Waste Biennial Report. To institute electronic reporting, OPPE is taking an approach known as "electronic data interchange" (EDI), a standards-based method that permits open exchange of data among participants that may be operating on vastly different hardware/software platforms. The pilot projects conducted by the U.S. Environmental Protection Agency, States, and corporate participants over the past two years suggest that EDI may be the best available way to institute electronic exchange of data between government agencies and their regulated communities.

Electronic Reporting Standards

The standards used by the U.S. Environmental Protection Agency are those developed and maintained by an accredited standards committee (ASC) of the American National Standards Institute (ANSI), specifically ANSI ASC X12. For more than a decade ASC X12 has sponsored the development of standard electronic/magnetic file formats for standard business transactions (or "transaction sets"), as well as standard protocols for their transmission. There are currently several hundred such transaction sets covering such transactions as invoices, ship notices, purchase requests, and more specialized reports of technical specifications and

test results. Electronic exchanges of information that conforms to these standards have come to be known as electronic data interchange. In the United States EDI is generally taken to be synonymous with electronic commerce under the ASC X12 standards.

The Benefits of Electronic Reporting

EDI solves the problem of multiple electronic reporting systems by providing a common "language" into which data being communicated between any two databases can be translated. So long as a data set maps to a standard EDI transaction set, EDI translation will move it between any two databases with fields for the data elements--no matter how divergent the two database structures, and no matter how divergent the two software/ hardware platforms. In terms of system architecture, EDI is supported by "translator" packages, available "off the shelf" from a wide array of software vendors, in versions for virtually all kinds of hardware and operating systems. Any translator will incorporate all the current ASC X12 standards, and, with appropriate configurations, will: 1) translate an outgoing flat file generated by the host database into a standard ASC X12 transaction set recognizable to any other EDI translator, and 2) translate any incoming X12 transaction set into a flat file that will automatically load to the host.

The exchange of data via EDI usually involves one more piece of architecture, a "value-added" network (VAN). A VAN is a specialized electronic mailbox service, tailored to the transmission of X12-formatted data files. The "value-added" that VANs provide--over and above the basic service of managing the connection among EDI participants--include such things as format-checking, transmission logging, and automated acknowledgments and error messages. Typically an EDI participant will subscribe to a VAN service in just the same way he or she would subscribe to a phone service. Those to whom he or she sent EDI messages would subscribe to their own VAN services--with the VANs handling an interconnect just as different telephone companies do.

Transborder Hazardous Waste (TransHaz) Electronic Reporting Project

In the fall of 1993, the Transboundary Hazardous Waste EDI workgroup was formed by the Environmental Protection Agency to establish a pilot project using EDI to automate the hazardous waste compliance reporting requirements of government and industry parties involved in U.S./Mexico transboundary hazardous waste shipments. The workgroup is a cooperative effort by the U.S. Environmental Protection Agency, the Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology, Texas Natural Resource Conservation Commission (TNRCC), other State and Federal Agencies, and includes participation by industry. The objective was to streamline the flow of hazardous waste import compliance reporting requirements through the use of EDI for transborder shipments.

The purpose of the project was to explore the value and economies of using electronic data interchange as a means of transmitting environmental compliance data. *The long range goal* was to achieve cost savings, and improve data quality and timeliness of data submissions through the use of EDI over traditional paper reporting methods. *The short term goal* was to establish a demonstration project to determine exactly what may be required in terms of resources, technologies and expertise for the electronic transmission of hazardous waste documentation to be successful. A well-defined data flow has been developed. This flow indicates that about two dozen forms are involved in 60 paper transactions with at least 12 different agencies or private entities for the legal transport of hazardous waste to occur. In comparing the forms, and the data elements on these forms, we were able to reduce overlaps of data and identify their potential relationships.

Despite the enormous complexity of the process, there appears to be no technical or legal obstacles that would prevent the attainment of our short term goal of a demonstration project. The workgroup generally agreed that the project will have to be conducted in phases beginning with test transmissions of the manifest and notification reports to the TNRCC. Follow-on phases will include the Guia application test transmission to the Secretary of Environment, Natural Resources and Fisheries/National Institute of Ecology.

For the purposes of the pilot project, the workgroup developed an EDI convention that will permit the pilot transmission of three, possibly four, environmental compliance reports: U.S. Hazardous Waste Manifest; Treatment Storage Disposal Notification; TNRCC Monthly Summary Report; and the Mexican Environmental Guide (Guia Ecologica) Request form. The "trading partners" for the first phase of the project included Environmental Protection Agency Region VI, TNRCC, four Maquiladora facilities and a treatment, storage and disposal Treatment Storage Disposal receiving facility. A three month demonstration project was successfully conducted during June through September of 1995. A project report and Implementation Guide will be available later in 1996.