WIPP TRU WASTE BASELINE INVENTORY REPORT (WTWBIR) JEFF WILLIAMS

EEG/NMED QUARTERLY MEETING JULY 21, 1994

WIPP TRU WASTE BASELINE INVENTORY REPORT (WTWBIR)

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PRESENTATION TO EEG/NMED QUARTERLY MEETING JULY 21, 1994

WIPP TRU WASTE BASELINE INVENTORY REPORT

SCOPE OF PRESENTATION

- Data and database sources used to define inventory
- Criteria used for waste category determination
- Status and future of the WTWBIR

WIPP TRU WASTE BASELINE INVENTORY REPORT

PURPOSE

- Establish a methodology for grouping wastes with similar physical and chemical properties within the DOE TRU waste system into a series of "waste profiles"

- Use "waste profiles" as the basis for discussing similar waste forms with regulatory agencies and stakeholders

- Support performance assessment and system prioritization methodology calculations

- Support other compliance programs

WIPP TRU WASTE BASELINE INVENTORY REPORT

WHAT SHOULD THE TECHNICAL CONTENT BE OF A WIPP BASELINE INVENTORY?

- Contains information needed to support WIPP long-term performance assessment
  - Total volumes of CH-TRU and RH-TRU in storage and projected (to be produced in the future) that has WIPP identified as the disposal site
  - Total radionuclide inventory expected for disposal in WIPP
  - Basis for building inventory should be on a waste-stream profile basis
  - Develop methodology for grouping wastes of similar properties
  - Data shall be traceable throughout the process of building the inventory per valid QA/QC procedures
  - Based on best available information supplied by DOE TRU waste generator/storage sites

WIPP TRU WASTE BASELINE INVENTORY REPORT

SOURCES OF INFORMATION

- Mixed Waste Inventory Report (MWIR)
  - DOE's response to requirement in the Federal Facility Compliance Act of 1992 (FFCA)
  - Initial draft document was the "Interim Mixed Waste Inventory Report" (IMWIR; DOE/NBM-1100)
  - Phase I and II releases (on diskette) have occurred since publication of the IMWIR
  - Covers only TRU mixed waste

WIPP TRU WASTE BASELINE INVENTORY REPORT

SOURCES OF INFORMATION (CONTINUED)

- Integrated database (IDB)
  - Standard reference used for total TRU waste volumes in storage and projected
  - Covers all TRU waste in the DOE system
  - Contains radionuclide information on a site basis
  - Updated yearly
  - TRU mixed waste part of information superseded by MWIR

WIPP TRU WASTE BASELINE INVENTORY REPORT

SOURCES OF INFORMATION (CONTINUED)

- Nonradionuclide Inventory Database (NID)
  - Developed in 1988/1989
  - Database specifically developed to collect waste information in support of SNL/NM performance assessment (PA)
  - Satisfied need for more detailed information than what occurs in the IDB (e.g., Steel, cellulosics, plastics, etc. in waste)
  - Waste information on a Waste-Stream Profile basis
  - Basis for numbers used in the 1992 PA - Volume 3
  - Fewer waste streams occur in NID than MWIR
  - MWIR supersedes much of the information in the NID

WIPP TRU WASTE BASELINE INVENTORY REPORT

SPECIFIC DATA AVAILABLE FROM DATABASES*

Database	Waste Volumes	Waste Parameter Information	Nonmixed Waste Information	EPA Codes	Radionuclide Information	Waste Matrix Codes
MWIR	Waste Stream Specific	General	No	Yes	Waste Stream Specific - Incomplete	Yes
IDB	Site Specific	None	Yes	No	Site Specific	No
NID	Waste Stream Specific	Detailed	Not Differentiated	No	No	No

*MWIR – Based on waste matrix (treatment) categories

IDB – Based on total site inventories

NID – Based on performance assessment data needs

WIPP TRU WASTE BASELINE INVENTORY REPORT

POTENTIAL BASES FOR GROUPING WASTE FORMS

- Site identification codes
  - System of numbering not consistent across TRU waste system
  - Overlap of numbers between sites for different waste forms (e.g., usage of same ID numbers at RFP, INEL, and Mound)
- TRUPACT-II Content (TRUCON) Code system (DOE/WIPP 89-004; Rev. 6)
  - Developed for the Nuclear Regulatory Commission (NRC) to help the NRC understand the similarities and differences between TRU waste streams across the DOE system
  - TRUCON codes were developed based on differences in gas generation potential from radiolysis of waste
  - Grouping of wastes for PA should concentrate more on degradation of waste materials by biological/corrosion processes for gas generation concerns

WIPP TRU WASTE BASELINE INVENTORY REPORT

POTENTIAL BASES FOR GROUPING WASTE FORMS (CONTINUED)

- Mixed Waste Inventory Report (MWIR)
  - A system-wide categorization by Waste Matrix Code (=treatability code) has been developed
  - Codes mainly derived in order to categorize waste for potential treatment standards
  - Waste Matrix Code system adopted by PEIS effort
- MWIR Waste Matrix Code system adopted

WIPP TRU WASTE BASELINE INVENTORY REPORT

LIST OF HIGHER-LEVEL MWIR WASTE MATRIX CODES

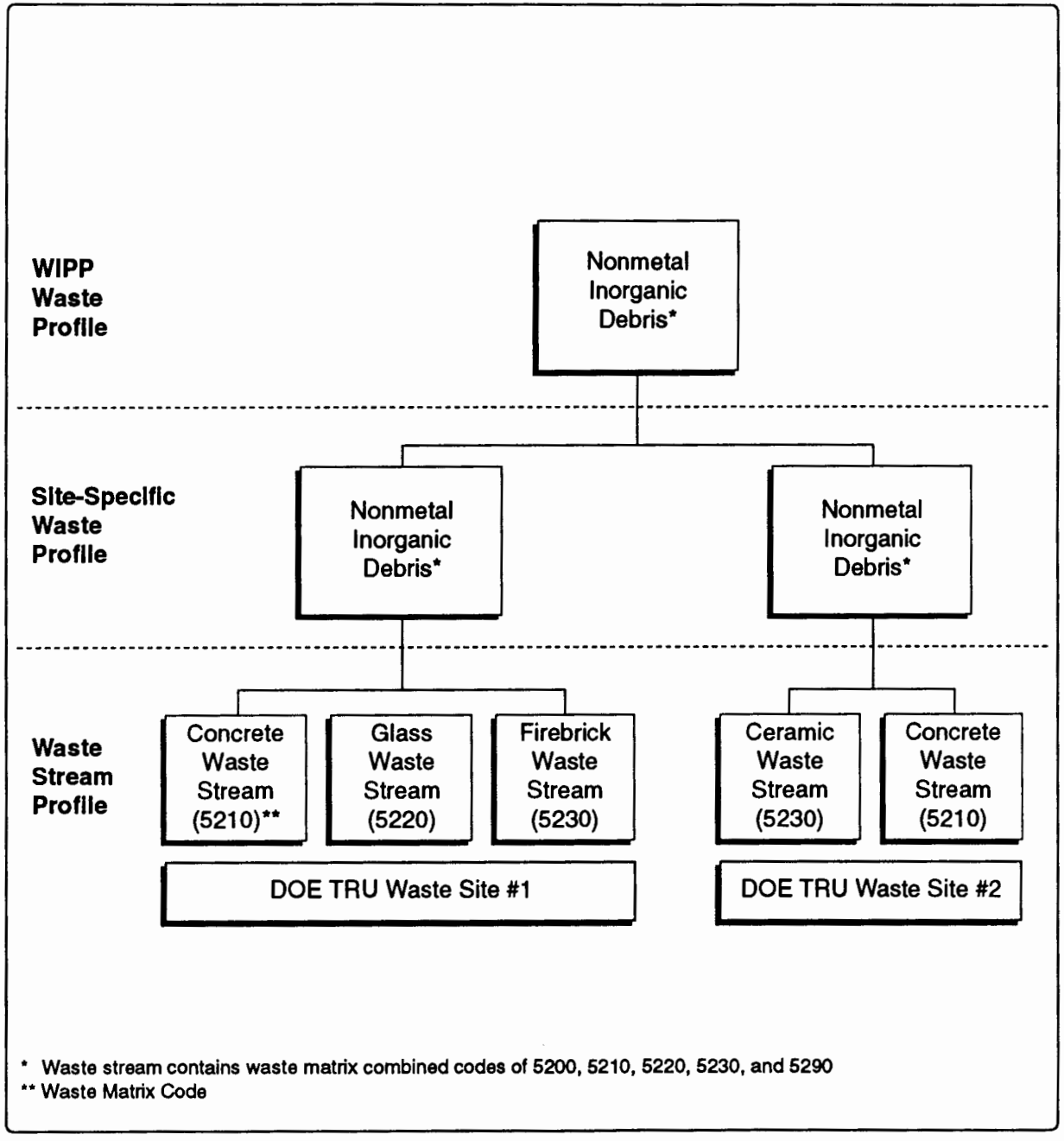
- 1000 - aqueous liquids
- 2000 - organic liquids
- 3000 - solid/solidified process residues/sludges
- 4000 - soils
- 5000 - debris
  - 5100 metal debris
  - 5200 inorganic non-metal debris
  - 5300 combustible debris
  - 5400 heterogenous debris
- 6000 - special wastes (e.g., Lab packs, reactives, explosives, etc.)
- 7000 - inherently hazardous waste (e.g., Elemental lead, batteries, elemental mercury, beryllium)
- 8000 - unknown

WIPP TRU WASTE BASELINE INVENTORY REPORT

WIPP WASTE PROFILE GROUPS

After compiling and categorizing TRU waste streams to meet Revision 4 of the WIPP-WAC, the TRU waste in the DOE system can be grouped into 11 waste categories (plus unknowns):

- **Inorganic process residues (cemented particulates/sludges)**
- **Pyrochemical salts**
- **Organic process residues (cemented resins and sludges)**
- **Soils**
- **Metals**
- **Lead-containing metals**
- **Inorganic non-metal waste**
- **Combustible waste**
- **Graphite waste**
- **Heterogeneous waste**
- **Composite filters**
- **Unknown**



* Waste stream contains waste matrix combined codes of 5200, 5210, 5220, 5230, and 5290
** Waste Matrix Code

29-Jun-94

DATABASE WS ID	IN-W197		HANDLING	CH	FIELD OFFICE Idaho
WS NAME	COMBUSTIBLES (TRU): MOIST PAPER AND RAGS				
NO MIGRATION VARIANCE PETITION	ID 216				
WASTE MATRIX CODE - Site	5440	WIPP PART B APPLICATION	COMBUSTIBLES		
- Group	Heterogeneous Waste		TRUCON	ID 216	

IDC's

Site	ID-EGG-114T-336
Assigned	RF-832

WASTE VOLUMES (cu. m.)

Retrievable	778
Projected	0
Total	778

EPA CODE(s)

F001
D008A
D002B
D008C
F001
F001
F001
F002
F003
F003
D022
F005A
D001C
F001

WASTE PARAMETERS (kg/m3)

		Max	Avg	Min
Inorganics	Iron-Based Metals/Alloys			
	Aluminum-Based Metals/Alloys			
	Other Metals			
	Other Materials	3.53	0.60	0.00
Organics	Celulosics	475.08	115.58	0.00
	Rubber	40.38	16.75	0.00
	Plastics	71.26	35.18	0.00
Solidified	Organic Matrix			
	Inorganic Matrix			
Soils	Soil			
Packaging Materials	Steel		141.83	
	Plastic		39.42	

Footnotes: 16

DATABASE WS ID	RF-W010		HANDLING	CH	FIELD OFFICE: Rocky Flats
WS NAME	Aqueous Sludge/TRM				
NO MIGRATION VARIANCE PETITION	RF 111				
WASTE MATRIX CODE - Site	3150	WIPP PART B APPLICATION	INORGANIC WASTE WATER TREA		
- Group	Solidified Inorganic Waste		TRUCON	RF 111	

IDC's

Site	RF-800
Assigned	RF-800

WASTE VOLUMES (cu. m.)

Retrievable	143
Projected	14
Total	157

EPA CODE(s)

F001
F002
D006A
F001
F005A
F005A
D008A
F002

WASTE PARAMETERS (kg/m3)

		Max	Avg	Min
Inorganics	Iron-Based Metals/Alloys			
	Aluminum-Based Metals/Alloys			
	Other Metals			
	Other Materials			
Organics	Celulosics			
	Rubber			
	Plastics			
Solidified	Organic Matrix			
	Inorganic Matrix	1057.69	793.27	346.15
Soils	Soil			
Packaging Materials	Steel		141.83	
	Plastic		39.42	

Footnotes: 16

DATABASE WS ID	RL-W133		HANDLING	CH	FIELD OFFICE Richland
WS NAME	MTRU-SOIL-TC MET				
NO MIGRATION VARIANCE PETITION	Information Incomplete				
WASTE MATRIX CODE - Site	4200	WIPP PART B APPLICATION	Information Incomplete		
- Group	Soil		TRUCON	Information Incomplete	

IDC's

Site	TRUM-21
Assigned	MD-842

WASTE VOLUMES (cu. m.)

Retrievable	12
Projected	274
Total	286

WASTE PARAMETERS (kg/m3)		Max	Avg	Min
Inorganics	Iron-Based Metals/Alloys	0.57	0.57	0.00
	Aluminum-Based Metals/Alloys			
	Other Metals	0.15	0.08	0.00
	Other Materials	33.91	5.70	0.00
Organics	Celulosics	0.71	0.71	0.00
	Rubber			
	Plastics			
Solidified	Organic Matrix			
	Inorganic Matrix			
Soils	Soil	671.46	564.57	457.45
Packaging Materials	Steel		141.83	
	Plastic		39.42	

Footnotes: 16, 17, 21, 22, 23

29-Jun-94

DATABASE WS ID	LL-W020		HANDLING	CH	FIELD OFFICE: Oakland
WS NAME	TRU MIXED SULFURIC ACID				
NO MIGRATION VARIANCE PETITION	Information Incomplete				
WASTE MATRIX CODE - Site	1210	WIPP PART B APPLICATION	Information Incomplete		
- Group	Solidified Inorganic Waste		TRUCON	Information Incomplete	

IDC's

Site	Not Reported
Assigned	RF-800

WASTE VOLUMES (cu. m.)

Retrievable	2
Projected	42
Total	44

WASTE PARAMETERS (kg/m3)		Max	Avg	Min
Inorganics	Iron-Based Metals/Alloys			
	Aluminum-Based Metals/Alloys			
	Other Metals			
	Other Materials			
Organics	Celulosics			
	Rubber			
	Plastics			
Solidified	Organic Matrix			
	Inorganic Matrix	1057.69	793.27	346.15
Soils	Soil			
Packaging Materials	Steel		141.83	
	Plastic		39.42	

Footnotes: 1, 8, 16, 17, 21, 22, 23

SITE-SPECIFIC CONTACT HANDLED WASTE PROFILES (contd)

30-Jun-94

WASTE PARAMETERS FOR Heterogeneous Waste

WASTE STREAM ID	RETRIEVABLY STORED (m3)	PROJECTED (m3)	TOTAL PER STREAM (m3)
IN-W283	1.06	0.00	1.06
IN-W281	370.89	0.00	370.89
IN-W278	13.95	0.00	13.95
IN-W345	14.59	0.00	14.59
IN-W163	0.85	0.00	0.85
IN-W351	1.48	0.00	1.48
IN-W334	5.51	0.00	5.51
IN-W269	58.84	0.00	58.84
IN-W265	53.15	0.00	53.15
IN-W269	25.86	0.00	25.86
IN-W169	5774.64	0.00	5774.64
IN-W199	1.27	0.00	1.27
IN-W306.3	3465.00	0.00	3465.00
IN-W302	106.00	0.00	106.00
IN-W186	2695.14	0.00	2695.14
IN-W187	0.21	0.00	0.21
IN-W291	770.09	0.00	770.09
IN-W189	6.15	0.00	6.15
IN-W172	165.57	0.00	165.57
IN-W225	22.20	0.00	22.20
IN-W171	3.59	0.00	3.59
IN-W203	79.89	0.00	79.89
IN-W204	1.91	0.00	1.91
IN-W170	0.42	0.00	0.42
IN-W289	25.36	0.00	25.36
IN-W285	64.90	0.00	64.90
IN-W329	1.27	0.00	1.27
IN-W271	0.42	0.00	0.42
IN-W197	778.34	0.00	778.34
	14508.55	0.00	14508.55

Material Parameters (kg/m3)		Max	Average	Min
Inorganics	Iron-based Metals/Alloys	1716.35	41.40	0.00
	Aluminum-based Metals/Alloys	38.22	0.48	0.00
	Other Metals	46.63	0.16	0.00
	Other Inorganic Materials	3072.12	5.20	0.00
Organics	Cellulosics	918.75	100.97	0.00
	Rubber	212.02	9.92	0.00
	Plastics	1060.10	43.83	0.00
Solidified Materials	Inorganic Matrix			
	Organic Matrix	2.98	0.00	0.00
Soils	Soil	144.23	0.24	0.00
Packaging Materials	Steel		141.83	
	Plastic		39.42	

WIPP CONTACT HANDLED WASTE PROFILES (contd)

WASTE MATRIX CODE GROUP Heterogeneous Waste

SITE	Stored Volume	Projected Sum	Total (Volumes in m3)
IN	14508.6	0.0	14508.6
KA	2.4	0.0	2.4
LA	2041.5	4677.0	6718.5
LL	110.5	809.5	920.0
MU	0.1	0.5	0.6
NT	612.0	0.0	612.0
OR	928.3	609.3	1537.6
RF	1493.6	1187.0	2680.5
RL	8991.7	3116.8	12108.5
SR	5022.4	5813.0	10835.4
CH TOTALS:	**33711.0**	**16213.0**	**49924.0**

Material Parameters (kg/m3)

		Max	Average	Min
Inorganics	Iron-based Metals/Alloys			
	Aluminum-based Metals/Alloys			
	Other Metals			
	Other Inorganic Materials	4.23	1.10	0.00
Organics	Cellulosics	576.85	115.83	0.00
	Rubber	47.84	11.11	0.00
	Plastics	84.42	33.32	0.00
Solidified Materials	Inorganic Matrix			
	Organic Matrix			
Soils	Soil			
Packaging Materials	Steel		141.83	
	Plastic		39.42	

Figure 5-4. WIPP CH-TRU Waste Profile for Heterogeneous Waste

TABLE 6-2. WIPP CH-TRU WASTE MATERIAL PARAMETER DISPOSAL INVENTORY

Radiological Desig: CH			(Kg/m^3)		
	Materials		Maximum	Average	Minimum
Inorganics:	Iron Based		1.7E+03	4.0E+01	0.0E+00
	Aluminum Based		7.4E+01	3.0E+00	0.0E+00
	Other Metals		1.6E+03	1.6E+01	0.0E+00
	Other Inorganics		3.1E+03	5.2E+01	0.0E+00
Organics:	Cellulose		2.0E+03	2.0E+02	0.0E+00
	Rubber		4.6E+02	2.0E+01	0.0E+00
	Plastics		2.9E+03	6.5E+01	0.0E+00
Solidified Materials:	Inorganic		2.0E+03	1.9E+01	0.0E+00
	Organic		2.0E+03	1.2E+01	0.0E+00
Soils			6.7E+02	5.3E+00	0.0E+00
Total Volume:		1.3E+05			
Container Materials:					
	Steel			1.4E+02	
	Plastic Liner			3.9E+01	

TABLE 6-3. WIPP RH-TRU WASTE MATERIAL PARAMETER DISPOSAL INVENTORY

Radiological Desig: RH		(Kg/m^3)		
	Materials	**Maximum**	**Average**	**Minimum**
Inorganics:	**Iron Based**	1.7E+03	7.1E+01	0.0E+00
	Aluminum Based	2.8E+01	3.8E+00	0.0E+00
	Other Metals	9.1E+02	5.0E+00	0.0E+00
	Other Inorganics	5.7E+02	1.3E+02	0.0E+00
Organics:	**Cellulose**	4.5E+02	3.4E+01	0.0E+00
	Rubber	1.8E+01	2.9E+00	0.0E+00
	Plastics	1.5E+02	3.2E+01	0.0E+00
Solidified Materials:	**Inorganic**	2.0E+03	7.0E+01	1.6E+02
	Organic	3.0E+00	5.3E-03	0.0E+00
Soils				
Total Volume:	2.6E+03			
Canister, Plug Materials:				
Steel			2.6E+03	
Lead			4.6E+02	

WIPP TRU WASTE BASELINE INVENTORY REPORT
WTWBIR REPORT STATUS

- Internal draft issued in May 1994 for DOE and TRU waste sites review and review by NMED and EEG, as required by the Land Withdrawal Act

- Revision 0 was issued June 30, 1994
  - Text in document is final
  - Tables are stamped "preliminary" because all needed quality control procedures were not completed by publication date
  - SNL/NM should use the tables provided in the document for the system prioritization methodology and any PA analyses/calculations
  - Tables listing the anticipated maximum, average, and minimum amounts of different waste material parameters for the 12 WIPP waste profiles were included

WIPP TRU WASTE BASELINE INVENTORY REPORT
WTWBIR REPORT STATUS (CONTINUED)

- During August DOE-CAO will meet with the TRU waste generator/ storage sites to provide a briefing on the scope and calculations

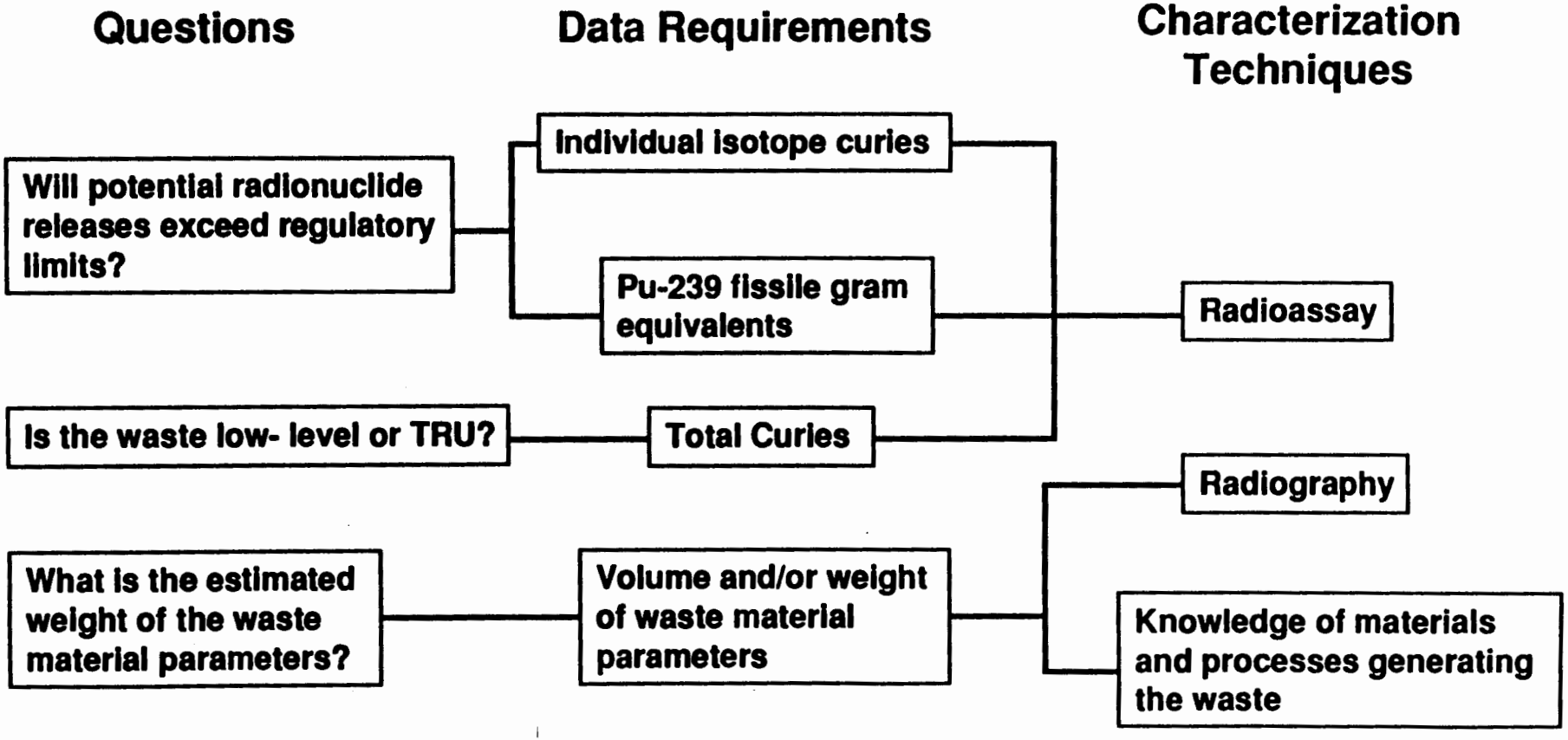
- DOE TRU waste generator sites will be provided data packages to review and update/change any data or calculations presented in the WTWBIR

- Revision 1 will be issued after incorporating any changes from the DOE TRU waste sites and finishing any needed quality checks

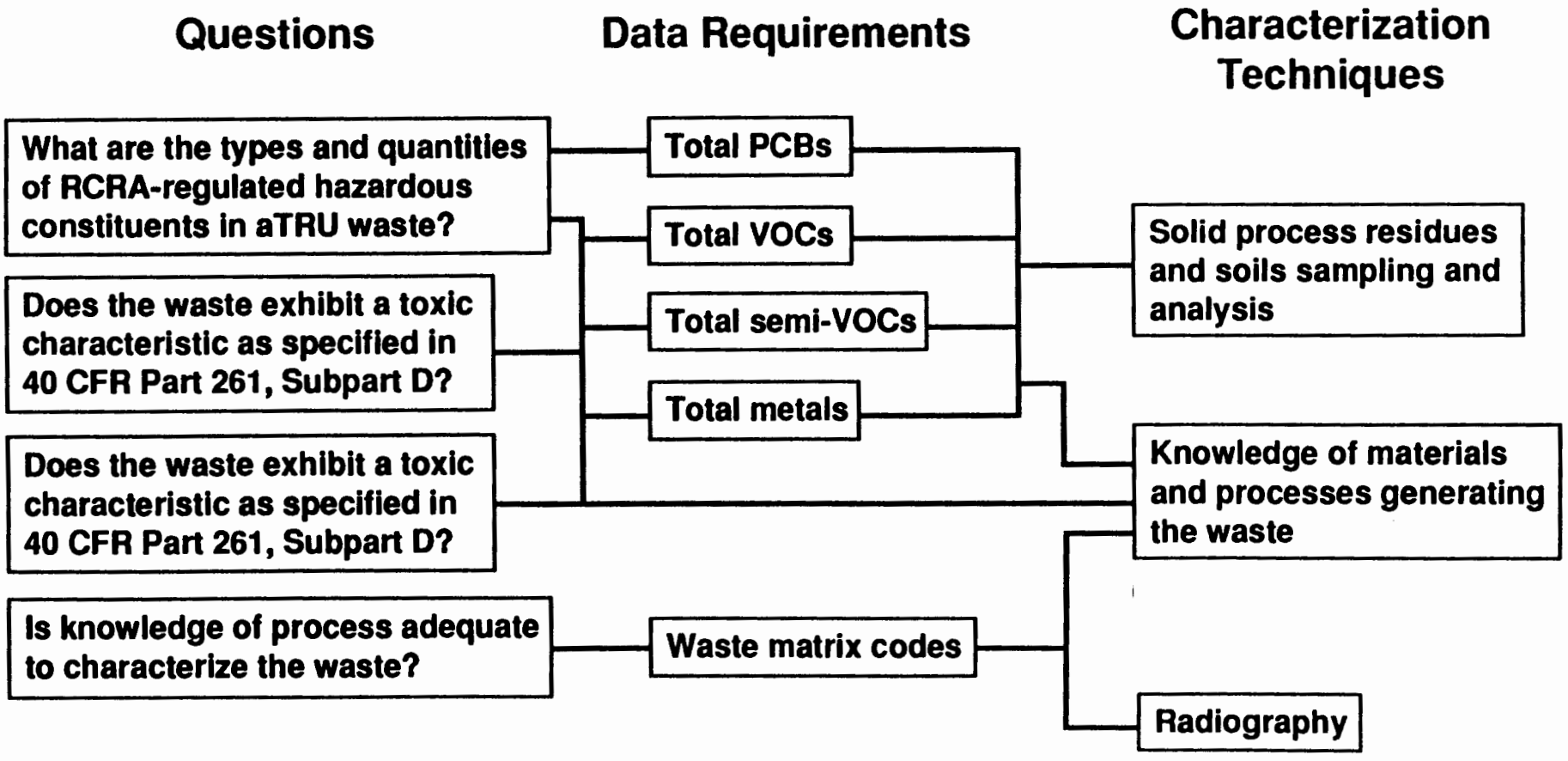
TRU Waste Characterization Quality Assurance Program

- Specifies the Requirements for Program Management; Assessment and Oversight; Data Validation, Usability, and Reporting; and Measurement and Data Acquisition
- Addresses waste characterization requirements associated with Performance Assessment; Transportation; RCRA Land Disposal Restrictions; and RCRA General Waste Analysis
- Identifies the data quality objectives for the TRU Waste Characterization Program and the techniques designed to meet those objectives
- Establishes the performance-based quality assurance criteria associated with TRU waste characterization
- Requirements apply to all DOE generator/storage sites planning to send TRU waste to the WIPP facility

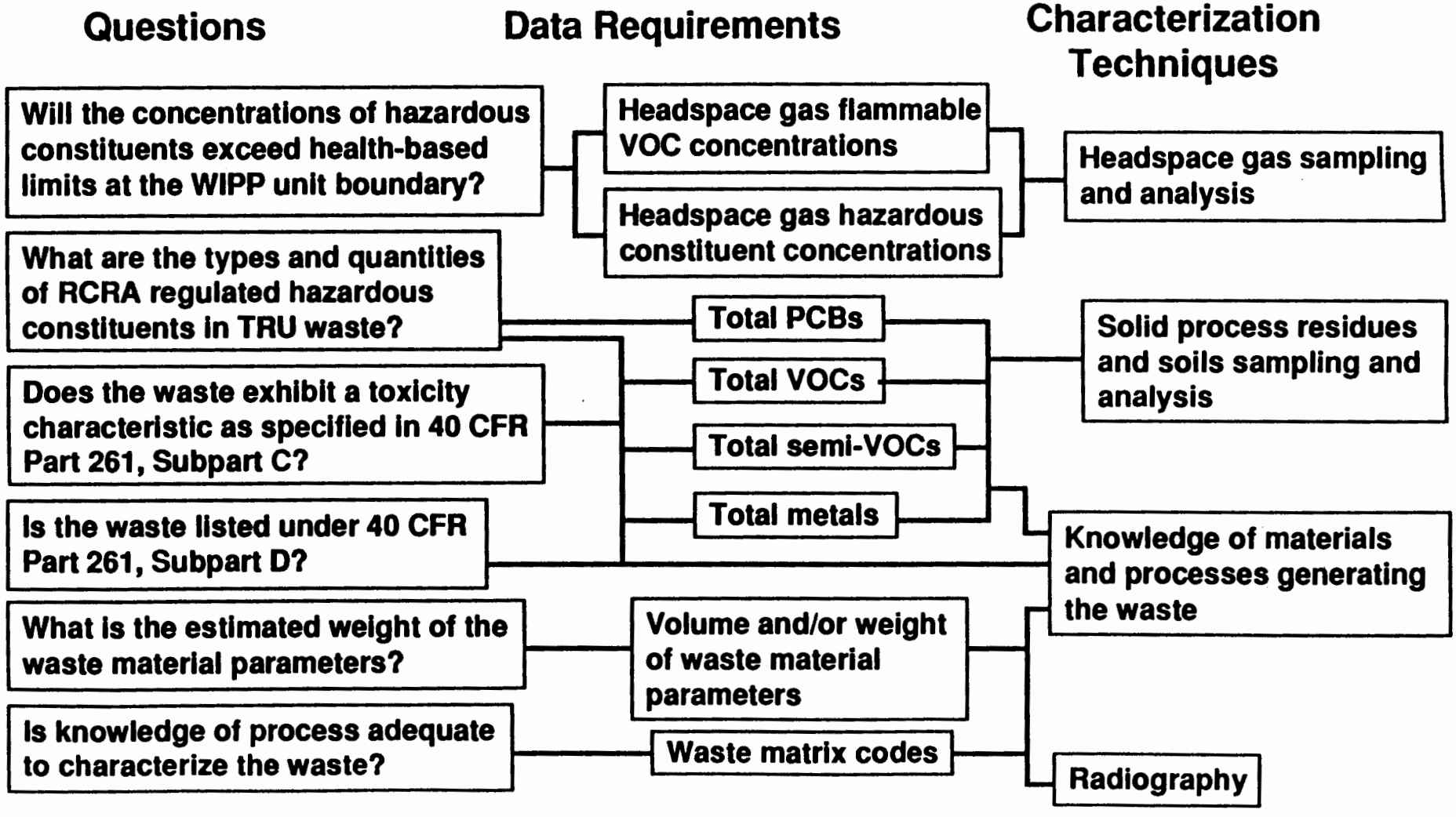
Performance Assessment (40 CFR Part 191)



RCRA General Waste Analysis (40 CFR 270)



RCRA Land Disposal Restrictions (40 CFR Part 268)



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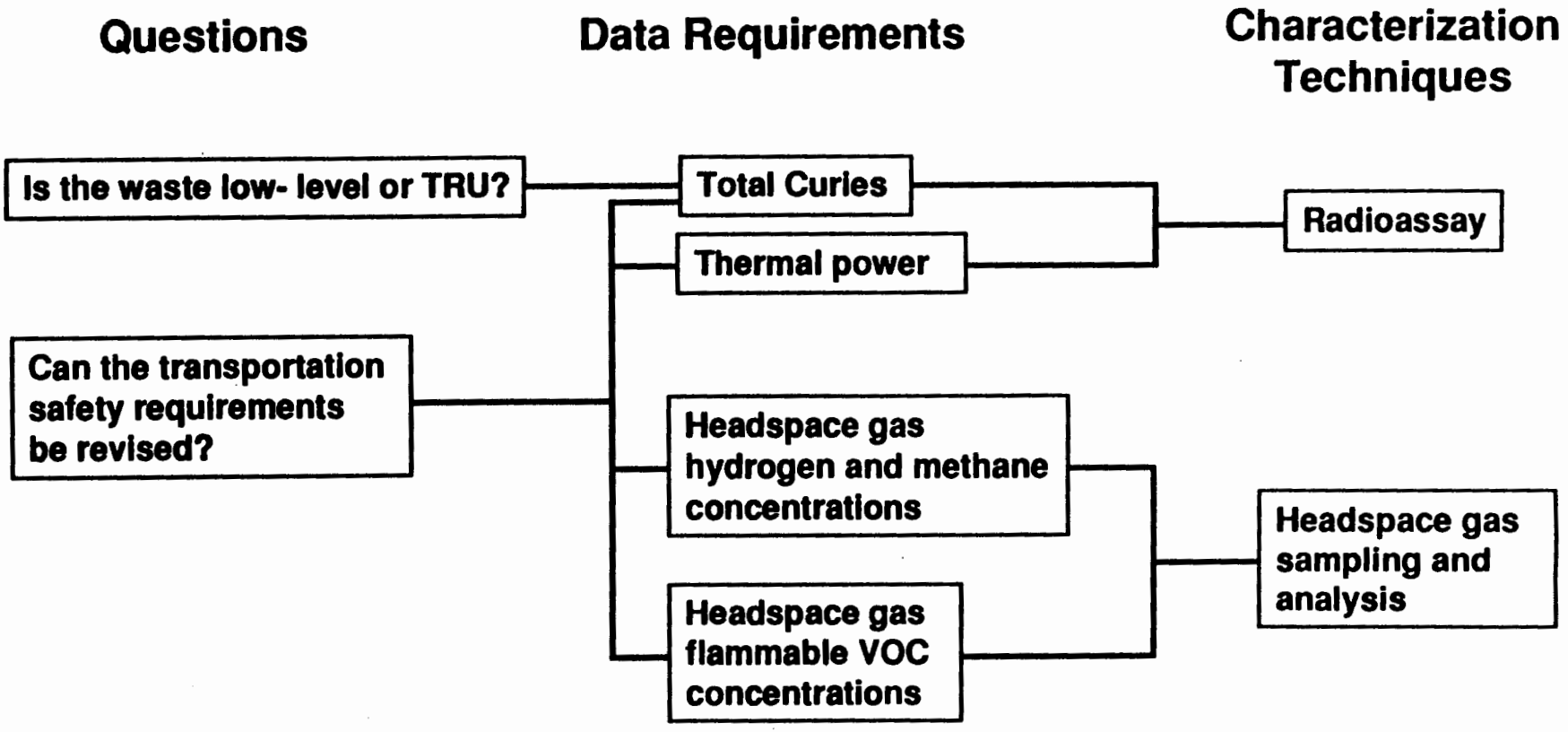
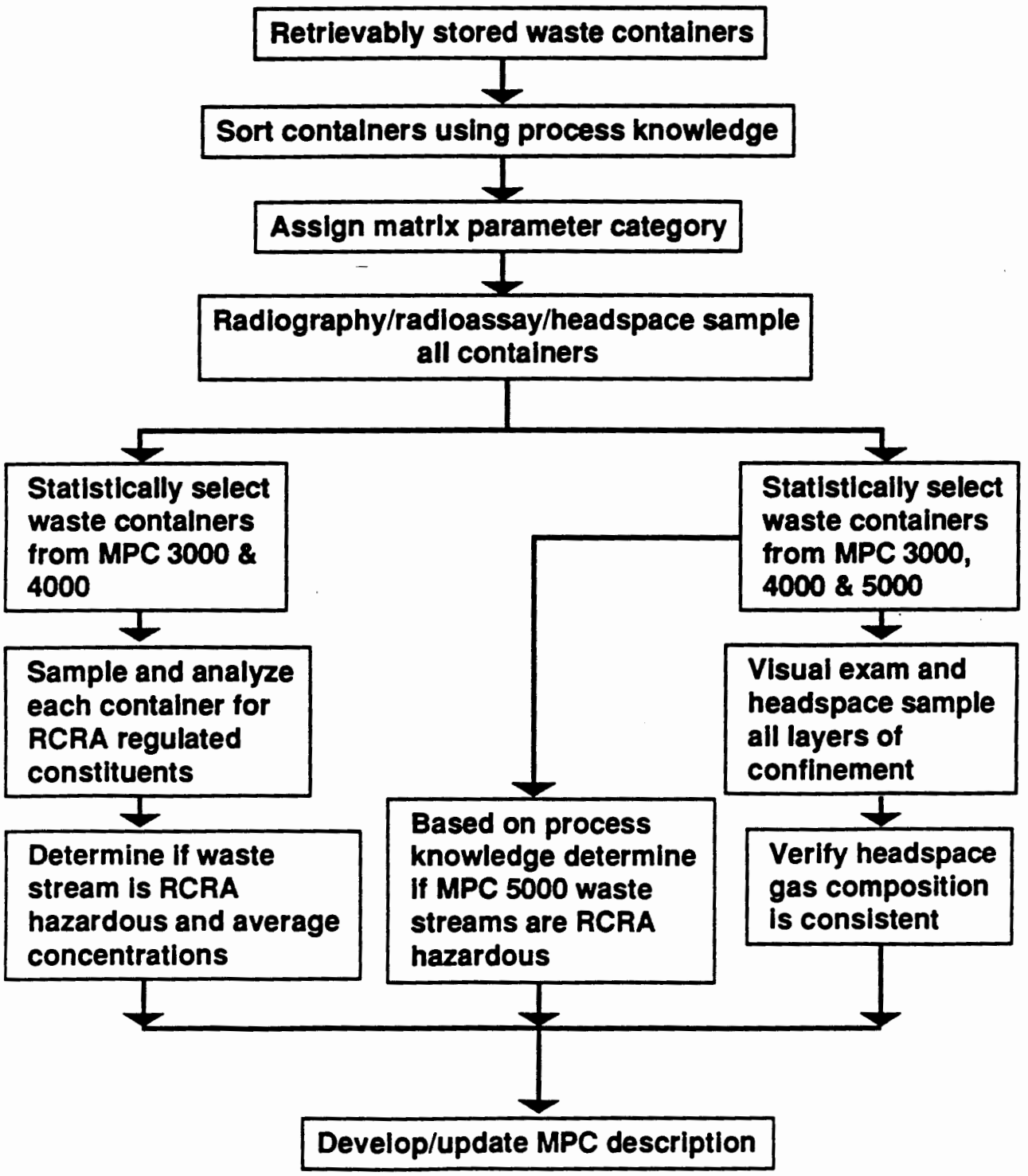
TRUPACT Certificate of Compliance (10 CFR Part 71)



TRU Waste Characterization QAPP Experimental Design



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WIPP TRU Waste Characterization QAPP

Statistical Design

- Statistical sampling applies to waste in retrievable storage
- Newly generated waste is waste generated after a TRU waste characterization program is established at a generator site
- Statistical sampling is performed at the waste stream level
- Site Project Manager must demonstrate that the selected containers are representative of the waste stream

WIPP TRU Waste Characterization QAPP (cont'd)

Statistical Design

- Sampling and analysis of Solid Process Residues (MPC 3000) and Soils (MPC 4000)
  - Waste stream considered hazardous unless it can be shown with 90% confidence that the contaminant(s) is less than RTL
  - Utilizes process knowledge to segregate waste containers
  - Process knowledge may reduce number of containers by reducing variability
  - Process requires a minimum of ten (10) drums per waste stream

WIPP TRU Waste Characterization QAPP (cont'd)

Statistical Design

- Visual exam of Solid Process Residues (MPC 3000), Soils (MPC 4000), and Debris Wastes (MPC 5000)
  - Number of drums selected based on verification with 90% confidence that the WIPP WAC/TRAMPAC miscertification rate is < 14%
  - Utilizes process knowledge to segregate waste containers
  - Containers selected support verification of WTW BIR waste parameter inventories

INEL TRU Waste Characterization Program

- Developed to support WIPP compliance data needs
- All characterization activities performed in accordance with DOE & EPA requirements
- Developed in two phases
  - Phase I initiated September 1991
  - Phase II to be initiated September 1994
- Phase I waste characterization
  - Real-time radiography (RTR)
  - Non-destructive radioassay (NDA)
  - Headspace sampling (drum/inner layers)
  - Visual characterization

INEL TRU Waste Characterization Program (cont'd)

- Phase II characterization
  - Phase I and RCRA characterization of solidified/stabilized waste forms
  - Development of facilities/capabilities at Argonne National Laboratory-West (ANL-W) and Oak Ridge National Laboratoty (ORNL)
  - Development/evaluation of techniques/methods for characterization of solidified/stabilized waste forms

- ANL-W Waste Characterization Area (WCA)
  - State-of-art TRU waste characterization facility
  - Higher drum throughput ~ 100-150 drums/year
  - All waste matrices
  - At-line analysis capabilities

INEL TRU Waste Characterization Program (cont'd)

- ORNL analytical laboratory
  - Developing capabilities for full RCRA analysis
  - Sample throughput ~ 600-800 samples/year
- Developed solidified/stabilized waste sampling techniques
  - Utilized simulated waste
  - Collection of representative samples
  - Rotational and non-rotational coring techniques

TABLE 5-1

Number of Waste Containers Requiring Visual Examination

Annual Number of Waste Containers Undergoing Characterization	Number of Waste Containers Requiring Visual Examination					
50	NA	22	NA	22	NA	29
100	15	24	24	33	33	41
200	15	26	26	35	44	52
300	15	26	26	35	44	53
400	15	26	26	36	45	54
500	16	26	26	36	45	63
Percent of Waste Containers Miscertified to WIPP WAC by Radiography in Previous Year	1%	2%	3%	4%	5%	6%

NA = not applicable

TABLE 10-1

Waste Material Parameters and Descriptions

Waste Material Parameter	Description
Iron-based Metals/Alloys	Iron and steel alloys in the waste. Does not include the waste container materials
Aluminum-based Metals/Alloys	Aluminum or aluminum-based alloys in the waste materials
Other Metals	All other metals found in the waste materials
Other Inorganic Materials	Nonmetallic inorganic waste including concrete, glass, firebrick, ceramics, sand, and inorganic sorbents
Cellulosics	Materials generally derived from high polymer plant carbohydrates. Examples are paper, cardboard, wood, cloth, etc.
Rubber	Natural or man-made elastic Latex materials. Examples are surgeons' gloves, leaded rubber gloves, etc.
Plastics (waste materials)	Generally man-made materials, often derived from petroleum feedstock. Examples are polyethylene, polyvinylchloride, etc.
Organic Matrix	Cemented organic resins, solidified organic liquids and sludges
Inorganic Matrix	Any homogeneous materials consisting of sludge, or aqueous-based liquids which are solidified with cement calcium silicate, or other solidification agents. Examples are waste water treatment sludge, cemented aqueous liquids, and inorganic particulates, etc.
Soils	Generally consists of naturally occurring soils which have been contaminated with inorganic waste materials
Steel (packaging materials)	208-liter (55-gallon) drums
Plastics (packaging materials)	90 mil polyethyline drum liner and plastic bags

Source: *Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report* (DOE 1994d).