

ATTACHMENT C7
TRU WASTE CONFIRMATION

Waste Isolation Pilot Plant
Hazardous Waste Permit
March 2018~~March 13, 2013~~

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ATTACHMENT C7
TRU WASTE CONFIRMATION
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Figure C7-1 Overview of Waste Confirmation

1 from a waste stream in a particular shipment, a minimum of one container from the waste
2 stream shipped will be selected. If the random selection of containers in a shipment occurs prior
3 to loading the waste containers into the Shipping Package, the randomly selected containers
4 may be consolidated into a single Type B package consistent with transportation requirements.
5 Documentation of the random selection of containers for waste confirmation will be placed in the
6 WIPP facility operating record.

7 For each container selected for confirmation in accordance with the process above, the
8 Permittees will examine the respective nonconformance report (**NCR**) documentation to verify
9 NCRs have been dispositioned for the selected container as required by Permit Attachment C3,
10 Section C3-13.

11 C7-1a(1) ~~TRU Waste~~ Confirmation Training Requirements

12 ~~TRU W~~aste confirmation may be completed by performing actual radiography/visual
13 examination on the waste container(s) or by a review of radiography/visual examination media
14 and records. This allows for a tiered approach for the training of WIPP TRU waste confirmation
15 personnel.

16 ~~TRU W~~aste confirmation personnel may be trained to either review ~~of~~ radiography/visual
17 examination media and records (Level 1) or to perform actual radiography/visual examination on
18 the waste container(s) (Level 2). Level 2 personnel may also perform waste confirmation by
19 review of media and records.

20 C7-1b Radiography Methods Requirements

21 Radiography has been developed by the Permittees specifically to aid in the examination and
22 identification of containerized waste. The Permittees shall describe all activities required to
23 achieve the radiography objectives in standard operating procedures (**SOPs**). These SOPs shall
24 include instructions specific to the radiography system(s) used by the Permittees at an off-site
25 facility (e.g., the generator/storage site). For example, to detect liquid, some systems require the
26 container to be rotated back and forth while other systems require the container to be tilted.

27 A radiography system (e.g., real time radiography, digital radiography/computed tomography)
28 normally consists of an X-ray-producing device, an imaging system, an enclosure for radiation
29 protection, a waste container handling system, a video and audio recording system, and an
30 operator control and data acquisition station. Although these six components are required, it is
31 expected there will be some variation within a given component between radiography systems.
32 The radiography system shall have controls or an equivalent process which allow the operator
33 to control image quality. On some radiography systems, it should be possible to vary the
34 voltage, typically between 150 to 400 kilovolts (**kV**), to provide an optimum degree of
35 penetration through the waste. For example, high-density material should be examined with the
36 X-ray device set on the maximum voltage. This ensures maximum penetration through the
37 waste container. Low-density material should be examined at lower voltage settings to improve
38 contrast and image definition. The imaging system typically utilizes either a fluorescent screen
39 and a low-light television camera or x-ray detectors to generate the image.

40 To perform radiography, the waste container is scanned while the operator views the television
41 screen. A video and audio recording is made of the waste container scan and is maintained in
42 the WIPP facility operating record as a non-permanent record. A radiography data form is also

1 used to document the Waste Matrix Code, ensure that the waste container contains no
2 ignitable, corrosive, or reactive waste by documenting the absence of liquid in excess of TSDF-
3 WAC limits or compressed gases, and verify that the physical form of the waste is consistent
4 with the waste stream description documented on the WSPF. Containers whose contents
5 prevent full examination of the remaining contents shall be subject to visual examination unless
6 the Permittees certify that visual examination would provide no additional relevant information
7 for that container based on the acceptable knowledge information for the waste stream. Such
8 certification shall be documented in the WIPP facility operating record.

9 For containers that have been characterized using radiography by the generator/storage sites in
10 accordance with the method in Attachment C1, Section C1-3, the Permittees may perform
11 confirmation by review of the generator/storage site's radiography audio/video recordings.

12 For containers which contain classified shapes and undergo radiography, the radiography will
13 occur at a facility with appropriate security provisions and the video and audio recording will be
14 considered classified. The radiography data forms will not contain classified information.

15 C7-1b(1) Radiography Training

16 The radiography system involves qualitative and semiquantitative evaluations of visual displays.
17 Operator training and experience are the most important considerations for ensuring quality
18 controls in regard to the operation of the radiography system and for interpretation and
19 disposition of radiography results. Only trained personnel shall be allowed to operate
20 radiography equipment.

21 ~~The Permittee radiography operators performing waste confirmation shall be trained in~~
22 ~~accordance with the requirements of Permit Attachment F1.~~

23 Radiographer Level 1 personnel performing TRU mixed waste confirmation shall be trained in:

- 24 • TRU Waste Confirmation Radiographer Level 1 Qualification.

25 Radiographer Level 2 personnel performing TRU mixed waste confirmation shall be trained in:

- 26 • TRU Waste Confirmation Radiographer Certification Level 2 Qualification.

27 C7-1b(1)(i) TRU Waste Confirmation Radiographer Certification Level 1 Qualification

28 Level 1 radiographer operators are instructed in the specific waste-generating practices and
29 typical packaging configurations expected to be found in each Waste Matrix Code at each site
30 shipping waste to the WIPP facility. The on-the-job training (OJT) and apprenticeship is
31 conducted by an experienced, qualified radiography operator or trainer prior to the qualification
32 of the training candidate. Radiography operators are qualified once every two years.

33 The level 1 radiography training program includes the following elements:

34 Formal Training

- 35 • Project Requirements
- 36 • State and Federal Regulations

- 1 • Basic Principles of Radiography
- 2 • Radiography of Waste Forms (including the ability to identify liquid and compressed
- 3 gases which will be verified by the radiography subject matter expert)
- 4 • Waste Stream-Specific Instruction (e.g., specific waste-generating processes, typical
- 5 packaging configurations, waste material parameters)

6 On-the-Job Training

- 7 • System Operation (equipment and procedures used by Level 1 radiographers)
- 8 • Identification of Packaging Configurations
- 9 • Identification of Waste Material Parameters/Waste Matrix Codes
- 10 • Identification of liquid in excess of the TSDf-WAC limits and compressed gases
- 11 • Verification of waste stream description

12 C7-1b(1)(ii) TRU Waste Confirmation Radiographer Level 2 Qualification

13 Level 2 radiography operators are instructed in the specific waste-generating practices and
14 typical packaging configurations expected to be found in each Waste Matrix Code at each site
15 shipping waste to the WIPP facility. The OJT and apprenticeship are conducted by an
16 experienced qualified radiography operator prior to the qualification of the training candidate.
17 Radiography operators are requalified once every two years.

18 The Level 2 radiography training program included the following elements:

19 Formal Training

- 20 • Project Requirements
- 21 • State and Federal Regulations
- 22 • Basic Principles of Radiography
- 23 • Radiographic Image Quality
- 24 • Radiographic Scanning Techniques
- 25 • Application Techniques
- 26 • Radiography of Waste Forms
- 27 • Standards, Codes, and Procedures for Radiography
- 28 • Waste Stream-Specific Instruction

29 On-the-Job Training

- 30 • System Operation
- 31 • Identification of Packaging Configurations
- 32 • Identification of Waste Material Parameters/Waste Matrix Codes
- 33 • Identification of liquid in excess of the TSDf-WAC limits and compressed gases
- 34 • Verification of waste stream description

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C7-1b(2) Radiography Oversight

The Permittees shall be responsible for monitoring the quality of the radiography data and calling for corrective action, when necessary.

A training drum with internal containers of various sizes shall be scanned biennially by each Level 2 operator. The video and audio media shall then be reviewed by a radiography subject matter expert to ensure that operators' interpretations remain consistent and accurate. Imaging system characteristics shall be verified on a routine basis.

Independent replicate scans and replicate observations of the video output of the radiography process shall be performed under uniform conditions and procedures. Independent replicate scans shall be performed on one waste container per day or once per shipment, whichever is less frequent. Independent observations of one scan (not the replicate scan) shall also be made once per day or once per shipment, whichever is less frequent, by a qualified radiography operator other than the individual who performed the first examination. When confirmation is performed by review of audio/video recorded scans produced by the generator/storage site as specified in Permit Attachment C1, Section C1-1, independent observations shall be performed on two waste containers per shipment or two containers per day, whichever is less frequent.

C7-1c Visual Examination Methods Requirements

Visual examination (**VE**) may also be used as a waste confirmation method. VE shall be conducted by the Permittees in accordance with written SOPs to describe the contents of a waste container. Visual examination shall be conducted to identify and describe all waste items, packaging materials, and waste material parameters. VE may be used to examine a statistically representative subpopulation of the waste certified for shipment to WIPP to confirm that the waste contains no ignitable, corrosive, or reactive waste. This is achieved by confirming that the waste contains no liquid in excess of TSDF-WAC limits or compressed gases, and that the physical form of the waste matches the waste stream description documented on the WSPF. During packaging, the waste container contents are directly examined by trained personnel. This form of waste confirmation may be performed by the Permittees at a generator/storage site. The VE may be documented on video and audio media, or by using a second operator to provide additional verification by reviewing the contents of the waste container to ensure correct reporting. When VE is performed using a second operator, each operator performing the VE shall observe for themselves the waste being placed in the waste container or the contents within the examined waste container when waste is not removed. The results of all VE shall be documented on VE data forms, which are used to document (1) the Waste Matrix Code, (2) that the waste container contains no ignitable, corrosive, or reactive waste by documenting the absence of liquids in excess of TSDF-WAC limits or compressed gases, and (3) that the physical form of the waste is consistent with the waste stream description documented on the WSPF.

In order to keep radiation doses as low as reasonably achievable at generator/storage sites, the Permittees may use their own trained VE operators to perform VE for waste confirmation by reviewing generator/storage site VE data, which includes VE data forms, waste packaging records, and may also include audio/video media. The Permittees shall document their review of generator/storage site VE data on confirmation data forms.

1 If the generator/storage site documented VE using audio/video media in accordance with Permit
2 Attachment C1, Section C1-2, the Permittees must use the audio/video media to perform
3 confirmation. If the Permittees perform waste confirmation by review of audio/video media, the
4 audio/video record of the VE must be sufficiently complete for the Permittees to confirm the
5 Waste Matrix Code and waste stream description, and verify the waste contains no liquid in
6 excess of TSDf-WAC limits or compressed gases. Generator/storage site VE video/audio
7 media subject to review by the Permittees shall meet the following minimum requirements:

- 8 • The video/audio media shall record the waste packaging event for the container such
9 that all waste items placed into the container are recorded in sufficient detail and shall
10 contain an inventory of waste items in sufficient detail that a trained Permittee VE
11 operator can identify the associated waste material parameter.
- 12 • The video/audio media shall capture the waste container identification number.
- 13 • The personnel loading the waste container shall be identified on the video/audio media
14 or on packaging records traceable to the loading of the waste container.
- 15 • The date of loading of the waste container will be recorded on the video/audio media or
16 on packaging records traceable to the loading of the waste container.

17 VE audio/video media of containers that contain classified shapes shall be considered classified
18 information.

19 If the generator/storage site did not document VE using audio/video media, the Permittees may
20 use their own trained VE operators to perform VE for waste confirmation by reviewing VE data
21 forms or packaging records prepared by the generator/storage site. To be acceptable, the
22 generator/storage site VE data forms or packaging records must be signed by two
23 generator/storage site personnel who witnessed the packaging of the waste and must provide
24 sufficient information for the Permittees to determine that the waste container contents match
25 the waste stream description on the WSPF and the waste contains no liquids in excess of
26 TSDf-WAC limits or compressed gases. Generator/storage site VE forms or packaging records
27 subject to review by the Permittees shall meet the following minimum requirements:

- 28 • At least two generator site personnel shall approve the data forms or packaging
29 records attesting to the contents of the waste container.
- 30 • The data forms or packaging records shall contain an inventory of waste items in
31 sufficient detail that a trained Permittee VE operator can identify the associated waste
32 material parameters.
- 33 • The waste container identification number shall be recorded on the data forms or
34 packaging records.

35 Visual examination video media of containers which contain classified shapes shall be
36 considered classified information. Visual examination data forms will not contain classified
37 information.

1 C7-1c(1) Visual Examination Training

2 ~~The Permittees 's VE operators performing waste confirmation shall be trained in accordance~~
3 ~~with the requirements of Permit Attachment F1.~~

4 Visual Examination Operator/Expert Level 1 personnel performing TRU mixed waste
5 confirmation shall be trained in:

- 6 • TRU Waste Confirmation Visual Examination Level 1 Qualification.

7 Visual Examination Operator/Expert Level 2 performing TRU mixed waste confirmation shall be
8 trained in:

- 9 • TRU Waste Confirmation Visual Examination Level 2 Qualification.

10 C7-1c(1)(i) TRU Waste Confirmation Visual Examination Level 1 Qualification

11 Level 1 visual examination personnel are instructed in the specific waste-generating processes,
12 typical packaging configurations, and waste material parameters expected to be found in each
13 Waste Matrix Code in the waste stream being confirmed using visual examination. The OJT
14 and apprenticeship are conducted by an operator experienced and qualified in visual
15 examination or a qualified trainer prior to qualification of the candidate. The training is waste
16 stream specific to include the various waste configurations being confirmed. For example, the
17 particular physical forms and packaging configurations at each site will vary and operators shall
18 be trained on types of waste that are generated, stored, and/or characterized at that particular
19 site. Visual examination personnel are requalified once every two years.

20 The Level 1 visual examination training program included the following elements:

21 Formal Training

- 22 • Project Requirements
- 23 • State and Federal Regulations
- 24 • Batch Data Report Forms
- 25 • Waste Stream-Specific Instruction (e.g., waste-generating processes, typical
26 packaging configurations, waste material parameters)

27 On-the-Job Training

- 28 • System Operation (equipment and procedures used by Level 1 visual examination
29 personnel)
- 30 • Identification of Packaging Configurations
- 31 • Identification of Waste Material Parameters/Waste Matrix Codes
- 32 • Identification of liquid in excess of the limits in the TSDf-WAC and compressed gases
33 • Verification of waste stream description

1 C7-1c(1)(ii) TRU Waste Confirmation Visual Examination Level 2 Qualification

2 Level 2 visual examination personnel are instructed in the specific waste-generating processes,
3 typical packaging configurations, and waste material parameters expected to be found in each
4 Waste Matrix Code in the waste stream being confirmed using visual examination. The OJT
5 and apprenticeship are conducted by an operator experienced and qualified in visual
6 examination or a qualified trainer prior to qualification of the candidate. The training is waste
7 stream specific to include the various waste configurations being confirmed. For example, the
8 particular physical forms and packaging configurations at each site will vary so operators shall
9 be trained on types of waste that are generated, stored, and/or characterized at that particular
10 site. Visual examination personnel are requalified once every two years.

11 The Level 2 visual examination training program includes the following elements:

12 Formal Training

- 13 • Project Requirements
- 14 • State and Federal Regulations
- 15 • Batch Data Report Forms
- 16 • Application Techniques
- 17 • Waste Stream-Specific Instruction (e.g., specific waste-generating processes, typical
- 18 packaging configurations, waste material parameters)

19 On-the-Job Training

- 20 • Identification of Packaging Configurations
- 21 • Identification of Waste Material Parameters/Waste Matrix Codes
- 22 • Identification of liquid in excess of the TSDF-WAC limits and compressed gases
- 23 • Verification of waste stream description

24 C7-1c(2) Visual Examination Oversight

25 The Permittees shall designate at least one VE expert. The VE expert shall be familiar with the
26 processes that were used to generate the waste streams being confirmed using VE. The VE
27 expert shall be responsible for the overall direction and implementation of the Permittees 's VE
28 program. The Permittees shall specify the selection, qualification, and training requirements of
29 the visual examination expert in an SOP.

30 C7-1d Quality Assurance Objectives (QAOs) for Radiography and Visual Examination

31 The QAOs the Permittees must meet for radiography and visual examination are detailed in this
32 section. If the QAOs described below are not met, then corrective action as specified in Permit
33 Attachment C3, Section C3-7 shall be taken.

34 C7-1d(1) Radiography QAOs

35 The QAOs for radiography are detailed in this section. If the QAOs described below are not met,
36 then corrective action shall be taken.

1 Data to meet these objectives must be obtained from a video and audio recorded scan provided
2 by trained radiography operators. Results must also be recorded on a radiography data form.
3 The precision, accuracy, representativeness, completeness, and comparability objectives for
4 radiography data are presented below.

5 Precision

6 Precision is maintained by reconciling any discrepancies between two radiography operators
7 with regard to the waste stream waste confirmation, identification of liquid in excess of TSDF-
8 WAC limits, and identification of compressed gases through independent replicate scans and
9 independent observations.

10 Accuracy

11 Accuracy is obtained by using a target to tune the image for maximum sharpness and by
12 requiring operators to successfully identify 100 percent of the required items in a training
13 container during their initial qualification and subsequent requalification.

14 Representativeness

15 Representativeness is ensured by performing radiography on a random sample of waste
16 containers from each waste stream in each shipment.

17 Completeness

18 A video and audio media recording of the radiography examination and a validated radiography
19 data form will be obtained for 100 percent of the waste containers subject to radiography.

20 Comparability

21 The comparability of radiography data from different operators shall be enhanced by using
22 standardized radiography procedures and operator qualifications.

23 C7-1d(2) Visual Examination QAOs

24 Results must be recorded on a VE data form. The precision, accuracy, representativeness,
25 completeness, and comparability objectives for VE data are presented below.

26 Precision

27 Precision is maintained by reconciling any discrepancies between the operator and the
28 independent technical reviewer with regard to the waste stream waste confirmation,
29 identification of liquid in excess of TSDF-WAC limits, and identification of compressed gases.

30 Accuracy

31 Accuracy is maintained by requiring operators to pass a comprehensive examination and
32 demonstrate satisfactory performance in the presence of the VE expert during their initial
33 qualification. VE operators shall be requalified ~~as specified in Permit Attachment F2~~ once every
34 two years.

1 Representativeness

2 Representativeness is ensured by performing VE on a random sample of waste containers
3 within each waste stream in each shipment.

4 Completeness

5 A validated VE data form will be obtained for 100 percent of the waste containers subject to VE.

6 Comparability

7 The comparability of VE data from different operators shall be enhanced by using standardized
8 VE procedures and operator qualifications.

9 C7-1e Review and Validation of Radiography and Visual Examination Data Used for Waste
10 Examination

11 This section describes the requirements for review and validation of radiography and VE data by
12 the Permittees.

13 C7-1e(1) Independent Technical Review

14 The radiography and/or VE confirmation data for each shipment shall receive an independent
15 technical review. This review will be performed before the affected waste shipment is shipped to
16 the WIPP facility. The review shall be performed by an individual other than the data generator
17 who is qualified to have performed the work. The review will be performed in accordance with
18 approved Permittee SOPs and will be documented on a review checklist. The reviewer(s) must
19 approve the data as evidenced by signature, and as a consequence, ensure the following:

- 20
- 21 • Data generation and reduction were conducted in a technically correct manner in
22 accordance with the methods used (procedure with revision). Data were reported in the
23 proper units and correct number of significant figures.
 - 24 • The data have been reviewed for transcription errors.
 - 25 • Radiography video and audio media recordings have been reviewed (independent
26 observation) on a waste container basis at a minimum of once per shipment or once per
27 day of operation, whichever is less frequent. The radiography video/audio recording will
28 be reviewed against the data reported on the Permittees 's radiography form to ensure
29 that the data are correct and complete. If review of radiography scans recorded by the
30 generator/storage site was used to perform confirmation, two observations must be
performed for each shipment or two observations per day, whichever is less frequent.

31 C7-1e(2) DOE Management Representative Review

32 The radiography and/or visual examination data forms and independent technical review
33 checklist (confirmation data package) for each shipment shall receive a DOE management
34 review. This review will be performed before the affected waste shipment is disposed of at the
35 WIPP. The review shall be performed by a designated representative of DOE management. The
36 review will be performed in accordance with approved DOE SOPs and will be documented on a

1 review checklist. The reviewer(s) must approve the confirmation data package as evidenced by
2 signature, and as a consequence, ensure the following:

- 3 • The data are technically reasonable based on the technique used.
- 4 • The data have received independent technical review.
- 5 • The data indicate that the waste examined contained no ignitable, corrosive, or reactive
6 waste and that the physical form of the waste was consistent with the waste stream
7 description in the WSPF.
- 8 • QC checks have been performed (e.g., replicate scans, image quality checks).
- 9 • The data meet the established QAOs

10 Upon completion of the DOE management representative review, the waste confirmation data
11 for the shipment shall be submitted to the WIPP facility operating record as non-permanent
12 records. Waste confirmation data includes radiography and VE data forms, video/audio media,
13 and review checklists.

14 C7-1e(3) DOE Management Representative Training

15 The DOE Management Representative performing TRU mixed waste confirmation data package
16 review and approval shall be trained in:

- 17 • Required Reading:
 - 18 - DOE's Quality Assurance Program Document
 - 19 - Permit Attachments C through C7
 - 20 - Required Reading identified in DOE's management procedure, *Approval of*
21 *Contractor-Generator Confirmation Data Packages*

22 C7-2 Noncompliant Waste Identified During Waste Confirmation

23 If the Permittees identify noncompliant waste during waste confirmation at a generator/storage
24 site (i.e., the waste does not match the waste stream description documented in the WSPF or
25 there is liquid in excess of TSDf-WAC limits or compressed gases) the waste will not be
26 shipped. DOE will suspend further shipments of the affected waste stream and issue a CAR to
27 the generator/storage site. Shipments of affected waste streams shall not resume until the CAR
28 has been closed. NMED will be notified within 24 hours of any suspension of waste stream
29 shipments due to the identification of noncompliant waste during waste confirmation.

30 As part of the corrective action plan in response to the CAR, the generator/storage site will
31 evaluate whether the waste characterization information documented in the Characterization
32 Information Summary and/or WSPF for the waste stream must be updated because the results
33 of waste confirmation for the waste stream indicated that the TRU mixed waste being examined
34 did not match the waste stream description. The generator/storage site will thoroughly evaluate
35 the potential impacts on waste that has been shipped to WIPP. DOE will evaluate the potential

1 that prohibited items were shipped to WIPP and what remedial actions should occur, if any. The
2 results of these evaluations will be provided to NMED before shipments of affected waste
3 streams resume. If the Characterization Information Summary or WSPF requires revision,
4 shipments of the affected waste stream shall not resume until the revised waste stream waste
5 characterization information has been reviewed and approved by DOE.

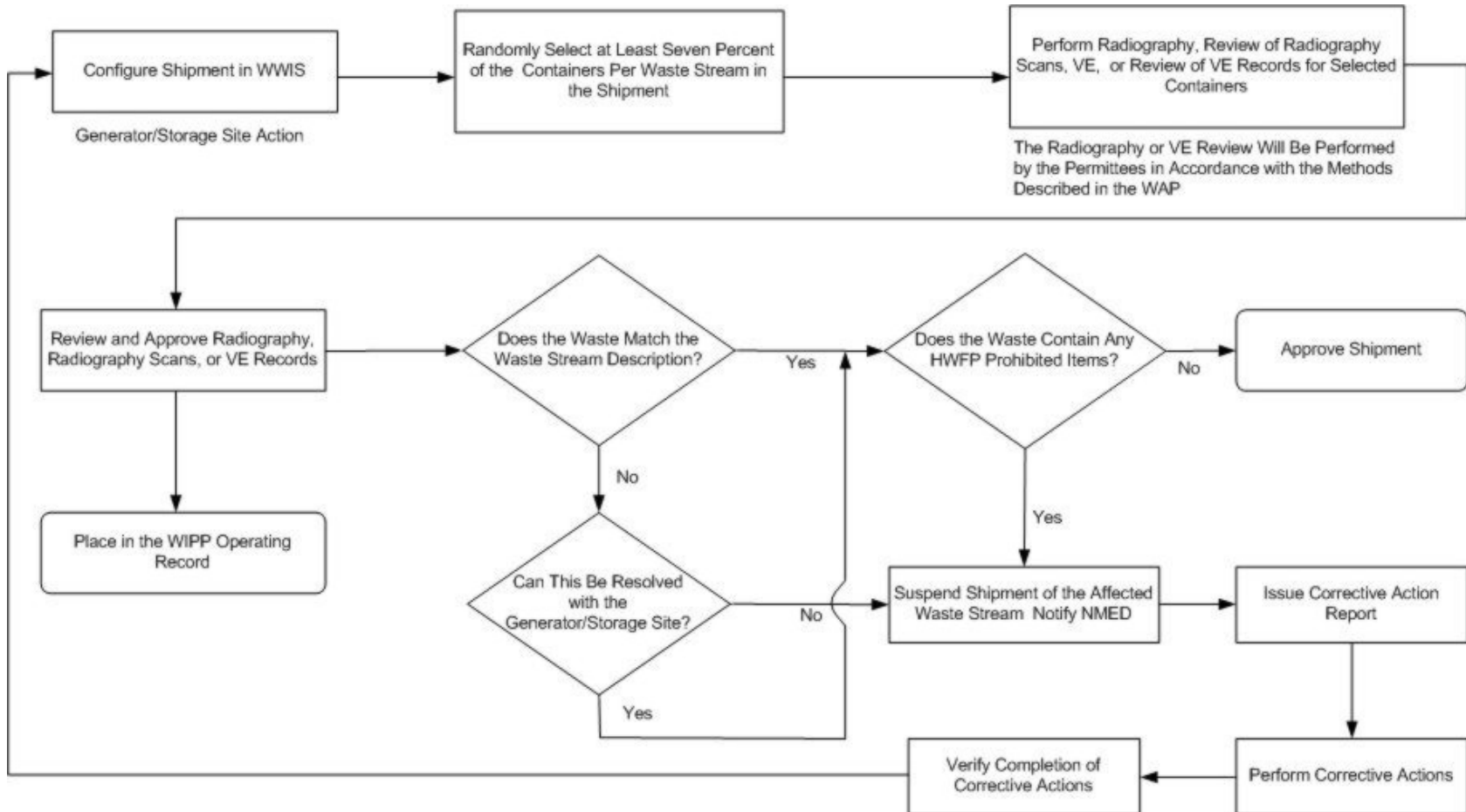
6 If a generator/storage site certifies noncompliant waste more than once during a running 90-day
7 period, DOE will suspend acceptance of that site's waste until DOE finds that all corrective
8 actions have been implemented and the site complies with all applicable requirements of the
9 WAP.

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FIGURES

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**Figure C7-1
 Overview of Waste Confirmation**