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Standard Practice for Minimum Geospatial Data for Abandoned Mine Land Problem Areas, Planning Units, Keyword Features, and Project Sites¹

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1. Scope

1.1 This practice covers the minimum elements for the accurate location and description of geospatial data for defining Abandoned Mine Land (AML) Problem Areas, Planning Units, Keyword Features, and Project Sites. Sites as originally defined by the Office of Surface Mining Reclamation and Enforcement (OSMRE), through its Abandoned Mine Land Inventory Manual (Directive AML-1) under the jurisdiction of Surface Mining Control and Reclamation Act of 1977. These standards remain applicable to mining organizations that geospatially locate and identify AML sites, however these standards can be used for entities that are in beginning phases of mapping and identifying AML sites using protocol that is consistent with existing nomenclature.

1.1.1 This practice addresses mining geospatial data relative to the Surface Mining Control and Reclamation Act of 1977 (SMCRA). This geospatial data shall be obtained from each state, tribal or federal coal mining regulatory authority (RA), or combinations thereof, authorized under SMCRA to reclaim the surface and underground effects of past mining operations. Abandoned mine land, as specified in SMCRA Sections 404 (coal), 409 and 411 (non-coal) and cross referenced in additional sections on eligible lands, Abandoned mine lands consist of those lands and waters which were mined for coal or other minerals, or both, or impacted by processing operations prior to the enactment of SMCRA and abandoned or left in an inadequate condition of reclamation and for which there is no continuing reclamation responsibility under state or other federal laws for mitigation of adverse impacts to human health and safety or environmental resources.

1.1.2 Title IV of SMCRA establishes the national AML Reclamation Program under the Office of Surface Mining Reclamation and Enforcement (OSMRE), U.S. Department of the Interior (DOI). The program was developed to reclaim land and water resources adversely affected by past coal and non-coal mining and left abandoned or inadequately restored. During the years immediately following the enactment of SMCRA, OSMRE, states, and Indian tribes conducted surveys of eligible lands and waters and created individual inventories of problems to be addressed under Title IV. In 1990, SMCRA was amended and OSMRE was required to maintain a national inventory of high priority abandoned mine sites and provide standardized procedures for states and tribes to use in updating the data. The need for an automated nationwide inventory system led to the creation of the enhanced AML Inventory System (e-AMLIS), a compilation of the individual state, tribe, Federal Reclamation Program (FRP), and Rural Abandoned Mine Program (RAMP) inventories. The e-AMLIS documents the counts for AML problem types and the costs to remedy those problems. The system captures estimated unfunded costs, estimated construction costs when funding is made available for reclamation projects, and the actual costs for completed construction projects. It is used in support of work plan development and to record the work completed under each RA's program and to report the extent and estimated cost to reclaim remaining AML problems.

1.1.3 Each state in the United States of America has been divided into Water Cataloging Units (WCU) by the U. S. Water Resources Council. These appear in the state's Hydrologic Unit Map prepared by the U.S. Department of the Interior, U. S. Geological Survey, in cooperation with the Water Resources Council. The WCU are divided and sub-divided into successively smaller hydrologic units, which are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique Hydrologic Unit Code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system.³

1.1.2 As used in this practice, an AML Problem Area (PA) represents a closed polygon boundary for a uniquely defined geographic area contained within an AML Planning Unit (PU) as described in the AML Inventory Manual. (PU). An AML PA is

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a subdivision of an AML PU that contains one or more AML keyword features together with impacted land or water resources or both. An AML PA should not cross PU boundaries.

1.1.3 As used in this practice, an AML PU represents a closed polygon boundary of a uniquely defined geographic area identified by unique numbers and names. An entire WCU may be delineated as a single PU or subdivided into multiple PUs. ~~In general, PUs east of the Mississippi River have historically corresponded to watersheds; PUs west of the Mississippi River have been defined in a number of ways, including quadrangles, grazing districts, townships, counties, or entire WCU.~~

1.1.4 As used in this practice, an AML Keyword Feature is a point, line, or polygon defining the location of a specific on-the-ground feature contained within an AML Problem Area (PA) as described in the AML Inventory Manual.

1.1.5 As used in this practice, an AML Project Site is a closed polygon boundary for a uniquely defined geographic area that includes the area disturbed to achieve the reclamation. An AML Project Site may contain one or more AML keyword features together with impacted land or water resources or both.

~~1.2 This practice applies to pre-SMCRA AML Problem Areas, Planning Units, Keyword Features, and Project Sites that are inventoried in the e-AMLIS under the SMCRA Title IV Reauthorization to provide for identification and location of AML sites and reclamation operations and facilitate the sharing of information with the public.~~

1.2 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and ~~health~~ environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

1.5 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

~~D653 Terminology Relating to Soil, Rock, and Contained Fluids~~

2.2 ANSI Standards:³

~~ANSI INCITS 61-1986 (R2002)(R2007) Geographic Point Locations for Information Interchange, Representation of (formerly ANSI X3.61-1986 (R1997))~~

~~ANSI INCITS 320-1998 (R2003)(R2013) Information Technology-Spatial Data Transfer~~

2.3 Federal Geographic Data Committee Standards⁷

~~FGDC-STD-001 Content Standard for Digital Geospatial Metadata~~

~~Project 1574-D Information Technology—Geographic Information Framework Data Content Standard, Part 5 Governmental Unit and Other Geographic Area Boundaries~~

2.4 Code of Federal Regulations⁸

~~30 CFR Part 700 et seq., 30 CFR Parts 800 et seq.~~

2.5 Surface Mining Control and Reclamation Act of 1977⁸

~~Section 519(e) Public Law 95-87 August 3, 1977~~

3. Terminology

3.1 Except as listed or noted below, all definitions are in accordance with Terminology ~~D653~~. *Definitions:*

~~NOTE 1—The terms defined here are consistent with terms defined in 30 CFR Part 700 et seq., 30 CFR Part 870—887.15, though not verbatim.~~

3.1.1 For definitions of common technical terms used in this standard, refer to Terminology ~~D653~~.

~~NOTE 2—Terminology and definitions for identifying geographical features and describing the data model have been adopted from the Federal Geographic Data Committee Standards (FGDC) Spatial Data Transfer Standard (ANSI INCITS 320-1998 (R2003)) and the FGDC Framework Data~~

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

Content Standard (FGDC Project 1574-D) Information Technology — Part 5 Governmental unit and other geographic area boundaries.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *Abandoned Mine Land (AML)*, *n*—as specified in SMCRA Sections 404 (coal), 409 (non-coal), and 411 (non-coal) and cross referenced in additional sections on eligible lands, consists of those lands and waters which were mined for coal and other minerals or impacted by processing operations prior to the enactment of SMCRA and abandoned or left in an inadequate condition of reclamation and for which there is no continuing reclamation responsibility under state or other federal laws for mitigation of adverse impacts to human health and safety or environmental resources.

3.2.2 *AML Keyword*, *n*—a defined category of AML problem types and coded values, such as clogged stream-CS, dangerous highwall-DH, or dangerous slide-DS. AML keywords are also referred to as AML hazards, features, and problems. Refer to [Table 1](#) for AML keywords and coded values.

3.2.3 *AML Keyword Feature*, *n*—a point, line, or polygon defining the location of a specific on-the-ground feature that meets the definition of one of the AML keywords as described in the OSMRE AML Inventory Manual. Refer to [keywords, Table 1](#) for AML keywords and coded values.

3.2.3.1 Discussion—

Refer to [Table 1](#) for AML keywords.

3.2.4 *AML Planning Unit (PU)*, *n*—a closed polygon defining the boundary of an area of land identified by unique numbers and names. In general, PUs east of the Mississippi River have historically corresponded to subdivision(s) of Water Cataloging Units (WCU) or watersheds; PUs west of the Mississippi River have been defined in a number of ways, including quadrangles, grazing districts, townships, counties, or entire WCU.

3.2.5 *AML Problem Area (PA)*, *n*—a closed polygon subdivision of an AML PU that contains one or more AML Keyword Features together with impacted land or water resources or both, identified by unique numbers and names.

3.2.6 *AML problem area description (PAD)*, *n*—a collection of quantitative and qualitative data relating to sites contained within a PA subdivision of an AML PU that contains one or more Keyword Features together with impacted land or water resources or both.

3.2.7 *AML problem area ID*, *n*—a unique alpha-numeric identifier assigned to an AML PA, prefixed with state or tribal abbreviation-PA.

3.2.8 *AML problem type*, *n*—a specific on-the-ground feature that meets the definition of one of the AML keywords as described in the OSMRE AML Inventory Manual. Refer to [keywords, Table 1](#) for AML keywords and coded values.

3.2.8.1 Discussion—

Refer to [Table 1](#) for AML problem types.

3.2.9 *AML problem type priority*, *n*—the priority status of the AML problem type as described in the OSMRE AML Inventory Manual. Refer to [Table 2](#) for AML problem type priority descriptions.

3.2.10 *AML program area*, *n*—a coded value representing a defined programmatic category of reclamation under the SMCRA, for example, SGA = Pre-SMCRA Coal State/Tribe Program. Refer to [Table 3](#) for AML program area descriptions and coded values.

3.2.9 *AML project site*, *n*—a closed polygon defining the boundary of an area of land within which the RA has initiated an AML reclamation project. The AML project site may cross into other AML PAs and may contain within its spatial boundary one or more AML Keyword Feature.

3.2.10 *attribute*, *n*—a defined characteristic of a feature.

3.2.11 *attribute value*, *n*—a specific quality or quantity assigned to an attribute.

3.2.12 *domain*, *n*—a finite list or range of permissible values for a specified attribute. Domain tables may include units of measure, types, styles, status, names, methods, materials, dispositions, sources, dimensions, or data classes.

3.2.15 *Enhanced AML Inventory System (e-AMLIS)*, *n*—a national database of AML PAs and associated qualitative and quantitative information developed and maintained by OSMRE and state and tribe RAs in accordance with SMCRA Title IV mandates.

3.2.13 *feature*, *n*—a geographical representation of either a discrete real-world phenomenon, such as a building, or an abstract concept, such as a governmental boundary.

3.2.14 *feature class*, *n*—a logical group of related feature types.

3.2.15 *line*, *n*—a connected series of x, y coordinates that specifies a geographic location.

3.2.16 *point*, *n*—a one-dimensional geometric object that specifies a geographic location.



TABLE 1 AML Keywords

Priority 1 and 2 Keywords			Units	
Abbreviation	Problem Type	Inch-Pound (English)	SI [Metric]	
CS	Clogged Streams	Miles	Kilometers	
CSL	Clogged Stream Lands	Acres	Hectares	
DH	Dangerous Highwalls	Feet	Meters	
DI	Dangerous Impoundments	Count	Count	
DPE	Dangerous Piles and Embankments	Acres	Hectares	
DS	Dangerous Slides	Acres	Hectares	
GHE	Gases: Hazardous/Explosive	Count	Count	
UMF	Underground Mine Fires	Acres	Hectares	
HEF	Hazardous Equip & Facilities	Count	Count	
HWB	Hazardous Water Bodies	Count	Count	
IRW	Industrial/Residential Waste	Acres	Hectares	
P	Portals	Count	Count	
PWAI	Polluted Water: Agricultural & Industrial	Count	Count	
PWHC	Polluted Water: Human Consumption	Count	Count	
S	Subsidence	Acres	Hectares	
SB	Surface Burning	Acres	Hectares	
VO	Vertical Openings	Count	Count	

Priority 3 and 403(b) Keywords			Units	
Abbreviation	Problem Type	Inch-Pound (English)	SI [Metric]	
SA	Spoil Area	Acre	Hectare	
BE	Bench	Acre	Hectare	
PI	Pits	Acre	Hectare	
GO	Gobs	Acre	Hectare	
SL	Slurry	Acre	Hectare	
HR	Haul Road	Acre	Hectare	
MO	Mine Opening	Count	Count	
SP	Slump	Acre	Hectare	
H	Highwall	Feet	Meter	
EF	Equipment/Facility	Count	Count	
DP	Industrial/Residential Waste	Acre	Hectare	
WA	Water Problems	Gallons	Liter	
O	Other	Count	Count	
WS	403(b) Water Supplies	Count	Count	

Priority 4, 5, "F", and "H" Keyword			Units	
Code	Description	Inch-Pound (English)	SI [Metric]	
P4 COAL	CNF Conservation Facilities	Count	Count	
P4 COAL	O Other	Count	Count	
P4 COAL	RCF Recreational Facilities	Count	Count	
P4 COAL	ROD Roads	Feet	Meters	
P4 COAL	SGE Pre-SMCRA Coal Research	Count	Count	
P4 COAL	SMR Surface Mining Reclamation	Acres	Hectares	
P4 COAL	STR Public Infra-Structure	Count	Count	
P4 COAL	UTL Public Utilities	Count	Count	
P4 COAL	WQC Water Quality Control	Count	Count	
P5 COAL	CNF Conservation Facilities	Count	Count	
P5 COAL	HST Historic Purpose	Count	Count	
P5 COAL	OSB Open Space Benefits	Count	Count	
P5 COAL	UTL Public Utilities	Count	Count	
P5 COAL	RCT Recreation Purpose	Count	Count	
P5 COAL	ROD Roads	Feet	Meters	
PF - 411(f)	UTL Public Utilities	Count	Count	
PF - 411(f)	STR Public (Infra) Structure	Count	Count	
PF - 411(f)	ROD Roads	Feet	Meters	
PF - 411(f)	RCF Recreational Facilities	Count	Count	
PF - 411(f)	CNF Conservation facilities	Count	Count	
PF - 411(f)	O Other	Count	Count	
H - 411(h)	H1 411(h) Non-Mining Expenditures	Count	Count	
H - 411(h)	H2 411(h) Non-Mining Expenditures	Count	Count	

3.2.17 *polygon, n*—a two-dimensional closed geometric shape that specifies a geographic area.

3.2.18 *reclamation, n*—those actions taken to mitigate adverse affects of mining operations.

3.2.19 *regulatory authority, n*—entity(s) with jurisdiction over the regulation of coal or non-coal mining, or both, and reclamation operations or mitigation of AML problems, or both, under a program approved by the Secretary of the United States Department of the Interior (DOI); both.



~~3.2.23 SMCRA Entities, n—State and tribal regulatory authorities established under SMCRA and recognized by a national governmental agency for the purpose of regulating a land area where coal mining operations and reclamation are conducted.~~

~~3.2.23.1 Discussion—~~

~~A description of SMCRA governmental divisions helps in identification and organization of AML data.~~

~~3.2.23.1 Office of Surface Mining Reclamation and Enforcement (OSMRE), n—OSMRE is a federal government division established under Title II of the SMCRA within the United States Department of Interior (DOI). The SMCRA provides OSMRE a legal basis for assigning primary responsibility for regulation of coal mining operations and reclamation of abandoned mine land to the states and Indian tribes. Coal resource states or tribes that have been granted regulatory authority, known as “primacy,” have the exclusive jurisdiction of the implementation of SMCRA. In the coal states that do not have primacy and some federal and Indian lands, OSMRE issues the coal mine permits, conducts the inspections, and handles the enforcement and reclamation responsibilities.~~

~~3.2.23.2 state, n—A State of the United States of America recognized by the DOI Secretary that has assumed full regulatory authority over the administration grants for the reclamation of AML problem types.~~

~~3.2.23.3 tribe, n—Any Indian tribe, band, group, or community having a governing body recognized by the DOI Secretary that has assumed full regulatory authority over the administration grants on Indian lands for the reclamation of AML problem types.~~

~~3.3 Acronyms:~~

~~3.3.1 ACSI—Appalachian Clean Streams Initiative~~

~~3.3.1 AMD—Acid Mine Drainage~~

~~3.3.2 AML—Abandoned Mine Lands~~

~~3.3.3 DOI—Department of Interior~~

~~3.3.5 e-AMLIS—Enhanced Abandoned Mine Land Inventory System~~

~~3.3.6 FGDC—Federal Geographic Data Committee~~

~~3.3.7 FRP—Federal Reclamation Program~~

~~3.3.4 GIO—Geographic Information Officer~~

~~3.3.5 GIS—Geographic Information System~~

~~3.3.6 ID—Identifier~~

~~3.3.11 NAD—North American Datum~~

~~3.3.12 OSMRE—Office of Surface Mining Reclamation and Enforcement, U.S. Department of the Interior~~

~~3.3.7 P—Priority~~

~~3.3.8 PA—Problem Area~~

~~3.3.9 PAD—Problem Area Description~~

~~3.3.10 PU—Planning Unit~~

~~3.3.11 RA—Regulatory Authority~~

~~3.3.12 RAMP—Rural Abandoned Mine Program~~

~~3.3.19 SI—International system of units~~

~~3.3.20 SMCRA—Surface Mining Control and Reclamation Act of 1977 as amended~~

~~3.3.21 USGS—United States Geological Survey~~

~~3.3.13 WCU—Water Cataloging Units~~

~~3.3.14 WGS—World Geodetic System~~

4. Significance and Use

~~4.1 This practice addresses AML PAs, PUs, Keyword Features, and Project Sites relative to SMCRA. Sites. This practice is significant as it provides for uniformity of geospatial data pertaining to the geographic location and description of AML sites located throughout the United States.~~

~~4.2 This geospatial data standard will help ensure uniformity of data contributed by each RA and assist organizations in efforts to create, utilize, and share geospatial data relative to SMCRA. data. Use of this standard will result in organized and accessible data to support programmatic decisions and work plan development, increased awareness of AML problems throughout the United States, problems, and better communication between RA and federal offices, RA, the public, industry, and other interested parties.~~

~~4.3 The geospatial data may be served as a layer in a national dataset and map service.~~



5. Procedure

5.1 *Introduction*—The individual location and attribute characteristics listed in this section and in [Tables 4-2-75](#) represent the minimum data elements necessary to develop and maintain these geospatial datasets. Geospatial data and descriptions may be obtained from state, tribal and federal RAs. The use of this standard's minimum data elements will help ensure uniformity of the geospatial data developed and maintained by RAs.

5.2 *Coordinates and Related Data*—Coordinates and related geospatial data allow AML PAs, PUs, Keyword Features, and Project Sites to be accurately positioned on the earth's surface in a variety of recognized datums, grid systems, and geographic projections. The data are compiled from federal, state, and tribal resources that may utilize different datum, coordinate, and projection systems. All data will have identified datum, coordinate, and projection systems with associated precision or accuracy values, or both, and will be re-projected to match the spatial reference parameters utilized in a national dataset. ~~ANSI INCITS 61-1986 (R2002) contains additional guidance on representation of coordinates.~~

5.3 ~~A designee within the OSMRE will serve as the data steward for the national SMCRA dataset that complies with this standard. This designee will coordinate with individual RAs for submission of state or tribal data that adhere to this standard.~~

5.3.1 *X-Coordinate*—Universally longitude, however, most coordinate systems are convertible to longitude.

5.3.2 *Y-Coordinate*—Universally latitude, however, most coordinate systems are convertible to latitude.

5.3.3 *Size Measurements*—Distance in feet or meters, or land area in acres or hectares, derived from the X and Y coordinate positions for length and width of AML PAs, PUs, Keyword Features, and Project Sites.

5.3.4 *Character Limitation*—Use no special characters or blanks in the layer name.

5.3.5 *Consistent and Unique Naming Conventions*—Use consistent and unique layer names.

5.3.6 *Origin of AML PAs, PUs, Keyword Features, and Project Sites Geometry*—The feature geometry and attributes must originate from the best data available to the RA.

5.3.7 *Geometry Type*—Required geometry is point, line, or polygon.

5.3.8 *Data Type*—Data can be provided as a shapefile, coverage, geodatabase feature class, or xml record set. RAs are strongly encouraged to adopt geodatabase methods where practicable to maximize efficiency and maintain data integrity.

5.3.9 *Datum and Projection*—Datum (for example, NAD27, NAD83, WGS84) and projection (for example, Lambert Conformal, Transverse Mercator) specified in metadata record; provide the projection file, if available.

5.3.10 *Metadata*—Metadata documentation meets FGDC standards such as FGDC-STD-001 and is in .txt, .xml, or sgm format. Metadata is generally created in an FGDC text format; data in shapefile or coverage format can generate metadata documentation in .xml format.

5.3 *AML Problem Area Attributes*—Attributes associated with a PA polygon contribute to the unique identity of the site and help in analysis and retrieval of additional information. Minimum attributes for AML PA data are listed in [Table 42](#).

5.3.1 *Introduction*—The data set is subject to change as a result of actions that may change the feature geometry or attribute data. If detailed AML PA information is needed, the appropriate RA should be contacted for additional information.

5.3.2 *Object ID*—A GIS-managed value that uniquely identifies a record or feature geometry.

5.3.3 *Problem Area Name*—The common name for the AML PA; the unique identifier assigned by the RA defining the AML PA.

5.3.4 *Problem Area Number*—The numeric identifier for the AML PA; the unique number assigned by the e-AMLIS or the RA defining the AML PA.

5.3.5 *National AML Problem Area ID*—A unique ID assigned to an AML PA, ~~prefixed with state or tribal PA~~; this unique identifier helps in organization, retrieval, and analysis of individual ~~state or tribal~~ data combined into the nationwide national data set.

5.3.6 *Contact*—The contact information for the RA responsible for overseeing the reclamation of AML problems and for creating or maintaining AML data.

5.3.7 *Edit Date*—Represents the last time the record was updated or changed.

5.3.8 *Calculated Area*—The calculated area of the AML PA as determined from polygon data.

5.3.9 *Reported Area*—The area of the AML PA as reported by the RA.

5.4 *AML Planning Unit Attributes*—Individual location characteristics, or attributes, are information about a particular PU polygon. Each attribute associated with a PU polygon contributes to the unique identity of the site and helps in analysis and retrieval of additional information. Minimum attributes for AML PU data are listed in [Table 53](#).

5.4.1 *Introduction*—The data set is subject to change as a result of actions that may change the boundary area or change feature attribute data. If detailed AML PU information is needed, the appropriate RA should be contacted for additional information.

5.4.2 *Object ID*—A GIS-managed value that uniquely identifies a record or feature geometry.

5.4.3 ~~State/Tribe~~ *AML Planning Unit Name*—The common name for the AML PU; the unique identifier assigned by the RA defining the AML PU.

5.4.4 ~~State/Tribe~~ *AML Planning Unit Number*—The numeric identifier for the AML PU; the unique number assigned by the RA defining the AML PU.