



# **LAND FUNCTION**

## **STANDARD OPERATING PROCEDURES**

Operational Guidelines and Best Practices

Document ID: LFS-SOP-01

Version 1.0

**LAND FUNCTION STANDARD™**

# Chapter 1

## Purpose and Scope

### 1.1 Purpose

The purpose of this document is to establish standardized procedures for conducting Land Function assessments in reclaimed landscapes.

The procedures ensure that evaluations of terrain integrity, hydrologic function, and biological recovery are performed consistently using repeatable methods.

By standardizing field and analytical procedures, the Land Function Standard™ allows practitioners to produce assessments that are scientifically defensible and comparable across different reclamation sites.

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### 1.2 Scope

The procedures defined in this document apply to:

- surface mining reclamation projects
- quarry and aggregate operations
- waste rock and tailings facilities
- legacy mine reclamation sites
- industrial land disturbance reclamation

The SOP provides guidance for field practitioners, environmental auditors, regulatory inspectors, and certification assessors.

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## Chapter 2

# Roles and Responsibilities

## 2.1 Certified Land Function Practitioner

Certified practitioners are responsible for conducting field assessments according to the procedures defined in this document.

Their responsibilities include:

- performing site inspections
  - documenting field observations
  - collecting environmental evidence
  - interpreting landscape behavior
  - preparing reclamation assessment reports
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## 2.2 Assessment Team

For large or complex sites, assessments may be conducted by teams consisting of specialists in areas such as:

- geomorphology
- hydrology
- soil science
- ecology
- geospatial analysis

Team-based assessments allow for comprehensive evaluation of landscape systems.

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## 2.3 Independent Review

Assessment results may be reviewed by independent auditors or regulatory authorities to verify compliance with the Land Function Standard™.

Independent review enhances transparency and credibility of assessment outcomes.

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## **Chapter 3**

# **Pre-Assessment Procedures**

### **3.1 Site Documentation Review**

Before conducting field assessments, practitioners should review available documentation describing the site.

Relevant documents may include:

- mine plans
- reclamation design documents
- environmental impact assessments
- soil salvage and placement records
- vegetation establishment plans

This information provides important context for interpreting field observations.

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### **3.2 Geospatial Data Preparation**

Practitioners should review geospatial data to understand terrain structure and hydrologic patterns prior to field inspection.

Recommended datasets include:

- digital elevation models (DEMs)
- satellite imagery
- aerial imagery

- drainage network maps
- watershed boundaries

Preliminary analysis can help identify areas requiring detailed field inspection.

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### **3.3 Assessment Planning**

Assessment planning should identify:

- site access points
- observation transects
- terrain features requiring inspection
- monitoring locations

Proper planning ensures that field observations capture representative conditions across the landscape.

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## **Chapter 4**

### **Field Inspection Procedures**

#### **4.1 Site Entry and Initial Observation**

Upon arriving at the site, practitioners should perform a general visual survey to understand overall landscape conditions.

Initial observations should include:

- terrain geometry
- drainage patterns
- vegetation distribution

- evidence of erosion or instability

This initial overview helps guide detailed field inspection.

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## **4.2 Terrain Integrity Inspection**

Practitioners evaluate terrain stability by examining:

- slope gradients
- spoil pile stability
- evidence of slumping or mass movement
- erosion features such as rills or gullies

Stable terrain typically exhibits minimal active erosion and gradual slope transitions.

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## **4.3 Hydrologic Inspection**

Hydrologic assessment focuses on how water moves through the landscape.

Key observations include:

- drainage pathways
- channel stability
- runoff distribution across slopes
- sediment transport features

Balanced hydrologic systems distribute water without producing excessive erosion.

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## **4.4 Soil and Vegetation Inspection**

Practitioners evaluate soil conditions and vegetation development by observing:

- soil structure and aggregation

- organic matter accumulation
- vegetation density and coverage
- plant species composition

Healthy soil and vegetation systems indicate biological recovery.

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## **Chapter 5**

# **Evidence Collection**

### **5.1 Photographic Documentation**

Photographs should be taken to document key site features including:

- terrain structures
- erosion features
- drainage pathways
- vegetation conditions

Photographs must include location coordinates and observation descriptions.

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### **5.2 Field Notes**

Detailed field notes should record:

- terrain observations
- hydrologic observations
- soil conditions
- vegetation characteristics

These records provide the foundation for final assessment interpretation.

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## **Chapter 6**

# **Analytical Review**

### **6.1 Integration of Field and Analytical Data**

Assessment results should integrate:

- field observations
- geospatial analysis
- AI-assisted terrain and vegetation analysis

Combining these sources allows practitioners to evaluate landscape behavior comprehensively.

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### **6.2 Interpretation**

Practitioners interpret collected evidence to determine whether the reclaimed landscape demonstrates:

- stable terrain integrity
- balanced hydrologic behavior
- sustained soil and vegetation development

Interpretation must consider patterns across the entire site rather than isolated observations.

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## **Chapter 7**

# Reporting

Results of Land Function assessments are documented using the Land Function Reclamation Report (LFS-RR-01).

The report includes:

- site description
  - field observations
  - photographic documentation
  - analytical data summaries
  - final evaluation conclusions
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## Chapter 8

# Assessment Quality Assurance

## 8.1 Purpose

Quality assurance procedures ensure that Land Function assessments are conducted consistently, accurately, and in accordance with the Land Function Standard™.

Because reclamation evaluations may influence regulatory decisions and certification outcomes, it is essential that assessments follow standardized practices that produce reliable and repeatable results.

Quality assurance procedures provide a framework for maintaining professional and technical standards during field assessments and analytical review.

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## 8.2 Standardized Assessment Methods

All practitioners conducting Land Function assessments shall follow the procedures described in this document.

Standardization ensures that:

- field observations are recorded consistently
- analytical methods are applied uniformly
- interpretation of landscape behavior follows the principles defined in the Land Function Technical Manual

Deviation from standard procedures should be documented and justified within the assessment report.

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## **8.3 Documentation Requirements**

Complete documentation is required for every assessment conducted under the Land Function Standard™.

Required documentation includes:

- field observation records
- photographic documentation
- geospatial analysis outputs
- analytical interpretations
- final assessment conclusions

Documentation must be sufficient to allow independent reviewers to understand how the assessment was conducted and how conclusions were reached.

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## **8.4 Independent Verification**

Independent verification may be conducted by:

- regulatory authorities
- environmental auditors

- Land Function certification reviewers

Verification confirms that the assessment followed the procedures described in this SOP and that conclusions are supported by documented evidence.

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## **Chapter 9**

# **Monitoring and Reassessment**

### **9.1 Purpose**

Environmental systems evolve over time. Monitoring ensures that reclaimed landscapes continue to demonstrate stable environmental processes following the initial assessment.

Monitoring allows practitioners to identify emerging landscape changes and evaluate whether the reclaimed system remains functional.

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### **9.2 Monitoring Intervals**

Monitoring intervals may vary depending on site conditions and regulatory requirements.

Typical monitoring periods may include:

- initial post-reclamation assessment
- early vegetation establishment monitoring
- multi-year landscape stability monitoring

Monitoring should capture seasonal environmental responses including precipitation events and vegetation growth cycles.

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### **9.3 Monitoring Indicators**

Monitoring activities should evaluate the same environmental indicators used during the original land function assessment.

Indicators include:

- terrain stability
- drainage behavior
- erosion activity
- soil development
- vegetation establishment

Consistent monitoring allows practitioners to track environmental trends over time.

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## **Chapter 10**

# **Corrective Action Procedures**

### **10.1 Identification of Landscape Instability**

Monitoring or field inspections may identify conditions suggesting that portions of a reclaimed landscape are not functioning as intended.

Examples may include:

- developing erosion channels
- unstable slopes
- poor vegetation establishment
- drainage concentration

When such conditions are observed, corrective measures may be required.

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## **10.2 Corrective Measures**

Corrective actions may include:

- terrain regrading
- stabilization of erosion features
- installation of drainage controls
- soil amendment
- additional vegetation establishment

Corrective actions should address the underlying causes of instability rather than only the visible symptoms.

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## **10.3 Follow-Up Assessment**

Following corrective action, practitioners should perform follow-up assessments to evaluate whether the intervention successfully restored landscape stability.

Follow-up assessments follow the same procedures described in this SOP.

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# **Chapter 11**

## **Certification Support**

### **11.1 Certification Process**

Land Function assessments conducted under this SOP may support certification of land function recovery.

Certification is granted when evidence demonstrates that the reclaimed landscape exhibits:

- stable terrain integrity

- balanced hydrologic behavior
- sustained soil and vegetation development

Certification procedures are described in the Land Function Certification Guide (LFS-CG-01).

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## **11.2 Certification Documentation**

Certification documentation may include:

- final assessment report
- monitoring records
- photographic evidence
- analytical data summaries

These records provide evidence supporting certification decisions.

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# **Chapter 12**

## **Continuous Improvement**

### **12.1 Adaptive Management**

Reclamation practices may evolve as monitoring results and environmental observations provide new insights into landscape behavior.

Adaptive management allows practitioners to refine reclamation methods based on observed environmental responses.

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### **12.2 Standard Updates**

The Land Function Standard™ may be updated as:

- analytical technologies improve
- monitoring methods evolve
- additional environmental research becomes available

Periodic review ensures that the standard remains scientifically and operationally relevant.

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## Chapter 13

### Summary

The Land Function Standard Operating Procedures establish a structured methodology for conducting land function assessments in reclaimed landscapes.

Through standardized field inspection, environmental evidence collection, analytical evaluation, and documentation procedures, the SOP ensures that reclamation performance can be evaluated consistently across different sites and practitioners.

By integrating field observation with analytical tools and monitoring programs, the Land Function Standard™ provides a comprehensive framework for determining whether reclaimed landscapes demonstrate stable environmental processes.

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## Appendix A

### Field Assessment Checklist

The following checklist provides a standardized reference for conducting Land Function field inspections. Practitioners may use this checklist to ensure that all critical landscape indicators are evaluated during site assessments.

#### Terrain Integrity Checklist

- Slope gradients appear stable

- No evidence of slope failure or slumping
  - Minimal rill or gully formation
  - Surface roughness promotes runoff dispersion
  - Spoil or reconstructed landforms remain structurally stable
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### **Hydrologic Function Checklist**

- Drainage pathways are continuous
  - Water flow is distributed across terrain
  - No excessive runoff concentration
  - Channels appear stable and non-eroding
  - Sediment transport appears limited
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### **Soil and Vegetation Checklist**

- Soil aggregation and structure are present
  - Organic matter accumulation observed
  - Vegetation coverage is adequate
  - Plant species appear adapted to site conditions
  - Root systems contribute to soil stability
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## **Appendix B**

# **Photographic Documentation Standards**

Photographic records provide visual evidence supporting assessment conclusions.

Each photograph should include:

- date and time
- geographic coordinates
- direction of view
- description of observed conditions

Recommended photograph categories include:

- landscape overview
- terrain stability indicators
- drainage features
- erosion features
- vegetation establishment

Photographs should be archived as part of the official Land Function assessment record.

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## Appendix C

# Geospatial Analysis Data Requirements

Geospatial analysis supports field observations by providing spatial context for landscape conditions.

Recommended datasets include:

- Digital Elevation Models (DEM)
- high-resolution satellite imagery
- aerial imagery
- watershed boundary datasets
- drainage network models

These datasets assist in identifying terrain features and hydrologic patterns relevant to land function assessment.

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## Appendix D

### AI-Assisted Analysis Methods

AI-assisted analytical tools may be used to improve efficiency and accuracy of landscape evaluation.

Typical applications include:

- automated drainage network extraction
- terrain slope analysis
- vegetation classification from satellite imagery
- detection of erosion features

AI analysis should always be interpreted alongside field observations to confirm environmental context.

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## Appendix E

### Reference Framework

The Land Function Standard™ integrates principles from multiple environmental science disciplines including:

- geomorphology
- hydrology
- soil science

- ecology
- environmental monitoring

These disciplines provide the scientific foundation for evaluating landscape recovery following disturbance.

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## Glossary

### Land Function

The capacity of a landscape to maintain stable environmental processes following disturbance.

### Terrain Integrity

The structural stability of reconstructed landforms.

### Hydrologic Function

The movement and distribution of water across a landscape without causing destructive erosion.

### Soil and Vegetation Response

The recovery of biological and physical soil conditions supporting ecosystem development.

### Reclamation

The process of restoring disturbed land to a stable environmental condition.

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## References

References may include relevant environmental science literature, reclamation research, and monitoring frameworks used in landscape assessment.

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## End of Document

Land Function Standard™

Standard Operating Procedures

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