

# NOTICE

Please note that this response from Concourse for CRFP 0313 DEP26\*1 was received in the Purchasing Division prior to the bid opening date and time, on 09/04/2025. Due to human error this responses was moved with bids for DNR to open on 09/09/2025, but was time stamped prior to the bid opening of 09/04/2025.

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## Technical Proposal for AML Construction

West Virginia Department of Environmental Protection  
RFP Reference: CRFP 0313 DEP260000001

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Bid Opening Delayed  
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This technical proposal provides comprehensive details on the system architecture, technical implementation, and infrastructure design for the AML Construction Management System. For business approach, pricing, and company information, please refer to our main proposal document.

### Executive Technical Summary

The AML Construction Management System is architected as a modern, cloud-native platform designed to handle the unique technical challenges of managing Abandoned Mine Land projects. Our technical approach leverages enterprise-grade technologies to deliver a scalable, secure, and highly available system that can support over 160 concurrent users across multiple field locations while maintaining subsecond response times and 99.9% uptime.

The platform is built on a microservices architecture that ensures modularity, scalability, and maintainability. Each core component operates independently, allowing for continuous deployment and updates without system-wide impacts. This architecture supports the complex workflows required for AML projects while providing the flexibility to adapt to evolving regulatory requirements and operational needs.

### System Architecture

#### Core Architecture Components

The system employs a three-tier architecture with clear separation of concerns:

- **Presentation Layer:** Progressive Web Application (PWA) supporting desktop and mobile devices with offline capabilities. Built using modern JavaScript frameworks optimized for government accessibility standards and cross-browser compatibility.
- **Application Layer:** RESTful API services implementing business logic with horizontal scaling capabilities. Microservices architecture allows independent scaling of high-demand components such as document processing and reporting engines.
- **Data Layer:** Distributed database architecture with primary-replica configuration for high availability. Separate data stores for transactional data, document storage, and analytical workloads to optimize performance.

#### Infrastructure Design

The infrastructure leverages cloud-native technologies deployed across multiple availability zones to ensure resilience and disaster recovery capabilities:

- **Load Balancing:** Application load balancers distribute traffic across multiple application instances with health checks and automatic failover
- **Auto-Scaling:** Dynamic scaling based on CPU utilization, memory usage, and request volume to handle peak loads during report generation and data imports
- **Content Delivery Network (CDN):** Global edge locations for static asset delivery, reducing latency for field users accessing the system
- **Container Orchestration:** Kubernetes-based deployment for application containers with automated rollout and rollback capabilities

## Integration Architecture

### External System Integration

The AML Construction Management System integrates seamlessly with existing DEP systems and third-party applications through a robust integration framework:

- **wvOASIS Integration:** Bidirectional data synchronization for financial transactions, vendor management, and procurement workflows using secure API endpoints and batch processing for large data volumes
- **AutoCAD Integration:** Direct file import/export capabilities supporting DWG, DXF, and PDF formats with automated metadata extraction and version control
- **ArcGIS Integration:** Real-time geospatial data synchronization supporting feature services, map services, and geoprocessing workflows for site analysis and environmental monitoring
- **DLRNET/AMLNET Migration:** Custom ETL (Extract, Transform, Load) pipelines for legacy data migration with data validation, cleansing, and mapping to new schema structures

### Integration Security

All integrations implement industry-standard security protocols including OAuth 2.0 for authentication, TLS 1.3 for data in transit, and API rate limiting to prevent abuse. Integration points are monitored continuously with alerting for anomalous activity or failed connections.

## Security Implementation

### Security Architecture

The security architecture implements defense-in-depth principles with multiple layers of protection:

- **Network Security:** Virtual Private Cloud (VPC) with public and private subnets, network access control lists (ACLs), and security groups restricting traffic to authorized sources
- **Application Security:** Web Application Firewall (WAF) protecting against OWASP Top 10 vulnerabilities, input validation on all user inputs, and parameterized queries preventing SQL injection
- **Data Security:** AES-256 encryption for data at rest, TLS 1.3 for data in transit, and field-level encryption for sensitive data elements such as personally identifiable information
- **Identity and Access Management:** Integration with Active Directory for single sign-on (SSO), multi-factor authentication (MFA) enforcement, and role-based access control (RBAC) with least privilege principles

### Compliance Implementation

The system meets or exceeds all required compliance standards through automated compliance monitoring and reporting:

Compliance Standard	Implementation Details
<b>FedRAMP Moderate Controls</b>	Implementation of all 325 security controls with continuous monitoring and annual assessments
<b>NIST 800-53 Framework</b>	Full implementation of security control families including access control, audit and accountability, and system and communications protection
<b>Section 508 Accessibility</b>	WCAG 2.1 AA compliance with screen reader support, keyboard navigation, and high contrast modes
<b>FIPS 140-2 Cryptography</b>	Use of validated cryptographic modules for all encryption operations

## Database Design

### Database Architecture

The database design optimizes for both transactional performance and analytical capabilities:

- **Primary Database:** PostgreSQL with multi-master replication across availability zones for high availability and automatic failover
- **Document Storage:** Object storage for large files with versioning, lifecycle policies, and integration with CDN for optimized delivery
- **Time-Series Data:** Specialized time-series database for audit logs, system metrics, and environmental monitoring data with efficient compression and querying
- **Search Infrastructure:** Full-text search capabilities across all data types with faceted search, relevance scoring, and auto-complete functionality

### Data Model Optimization

The data model is optimized for AML project workflows with normalized structures for transactional integrity and denormalized views for reporting performance. Partition strategies ensure query performance remains consistent as data volumes grow, with automated archival of historical data based on retention policies.

## Performance Engineering

### Performance Optimization

The system is engineered to deliver exceptional performance under all operating conditions:

- **Response Time Targets:** Page load times under 2 seconds for 95th percentile, API response times under 200ms for standard queries, and report generation within 30 seconds for standard reports
- **Scalability Design:** Horizontal scaling supporting 10x current user load without architecture changes, database sharding strategy for datasets exceeding 10TB, and asynchronous processing for long-running operations
- **Caching Strategy:** Multi-layer caching including browser cache, CDN cache, application-level cache, and database query cache with intelligent cache invalidation
- **Resource Optimization:** Lazy loading of resources, image optimization with responsive formats, and code splitting for reduced initial load times

## Performance Monitoring

Comprehensive performance monitoring provides real-time visibility into system health with application performance monitoring (APM) tracking transaction traces, synthetic monitoring simulating user workflows, and custom dashboards for key performance indicators.

## Development Methodology

### Development Standards

Our development process follows industry best practices ensuring code quality and maintainability:

- **Code Standards:** Enforced coding standards with automated linting, peer code reviews for all changes, and comprehensive unit test coverage exceeding 80%
- **Version Control:** Git-based version control with feature branching strategy, protected main branches requiring approval, and semantic versioning for releases
- **Continuous Integration/Continuous Deployment (CI/CD):** Automated build pipelines with security scanning, automated testing including unit, integration, and end-to-end tests, and blue-green deployments for zero-downtime updates
- **Documentation:** Inline code documentation, API documentation with interactive examples, and architectural decision records (ADRs) for key decisions

### Quality Assurance

Quality is built into every phase of development through automated testing frameworks covering unit, integration, and system tests, performance testing validating response times under load, security testing including penetration testing and vulnerability scanning, and user acceptance testing with DEP stakeholders.

## Infrastructure Operations

### DevOps Implementation

The DevOps approach ensures reliable and efficient operations:

- **Infrastructure as Code:** All infrastructure defined in version-controlled templates with automated provisioning and configuration management
- **Monitoring and Alerting:** Comprehensive monitoring of all system components with intelligent alerting based on anomaly detection and escalation procedures
- **Log Management:** Centralized logging with full-text search capabilities, log retention based on compliance requirements, and automated log analysis for security events
- **Backup and Recovery:** Automated daily backups with point-in-time recovery, cross-region backup replication, and regular disaster recovery drills

### Service Level Objectives

The system is designed to meet stringent service level objectives including 99.9% uptime availability (excluding planned maintenance), Recovery Time Objective (RTO) of 4 hours, Recovery Point Objective (RPO) of 1 hour, and 24x7 monitoring with 15-minute response time for critical issues.

## Data Migration Strategy

### Migration Approach

The data migration from legacy DLRNET/AMLNET systems follows a systematic approach ensuring data integrity and minimal disruption:

- **Data Assessment:** Comprehensive analysis of existing data structures, volumes, and quality with identification of data cleansing requirements
- **Migration Design:** Detailed mapping of legacy fields to new schema with transformation rules for data standardization and validation logic ensuring data quality
- **Migration Execution:** Phased migration approach with pilot migrations for validation, parallel run periods comparing legacy and new systems, and automated reconciliation reports
- **Validation and Cutover:** Comprehensive data validation at multiple checkpoints with user acceptance of migrated data and coordinated cutover with rollback procedures

## Disaster Recovery and Business Continuity

### Disaster Recovery Architecture

The disaster recovery strategy ensures business continuity under all scenarios:

- **Multi-Region Deployment:** Active-passive configuration across geographic regions with automated failover capabilities and data replication ensuring consistency
- **Backup Strategy:** Multiple backup types including full, incremental, and continuous with encrypted backups stored in separate regions and regular restoration testing
- **Incident Response:** Documented incident response procedures with defined roles and responsibilities and automated runbooks for common scenarios
- **Business Continuity Testing:** Quarterly disaster recovery drills with annual full-scale business continuity exercises and continuous improvement based on lessons learned

## Technical Innovation

### Advanced Features

The system incorporates innovative features enhancing operational efficiency:

- **Machine Learning Integration:** Predictive analytics for project timeline estimation, anomaly detection for unusual cost patterns, and intelligent document classification and routing
- **Mobile-First Design:** Responsive design adapting to all screen sizes with offline synchronization for field operations and native mobile app capabilities through PWA
- **Real-Time Collaboration:** Live document co-editing with conflict resolution, real-time notifications for critical events, and integrated communication tools
- **Advanced Analytics:** Customizable dashboards with drag-and-drop widgets, predictive analytics for resource planning, and geospatial analytics for site visualization

## Technical Support Model

### Support Infrastructure

Our technical support model ensures continuous system availability and rapid issue resolution:

Support Component	Description
<b>Tiered Support Structure</b>	Level 1 support for user inquiries and basic troubleshooting, Level 2 support for advanced technical issues, and Level 3 support for system architecture and code-level fixes
<b>Support Channels</b>	24x7 phone support for critical issues, online ticketing system with SLA tracking, remote desktop support for complex troubleshooting, and dedicated account technical manager
<b>Knowledge Management</b>	Comprehensive knowledge base with searchable articles, video tutorials for common operations, and automated chatbot for instant answers
<b>Proactive Support</b>	System health monitoring with predictive alerts, regular optimization recommendations, and quarterly technical review meetings

## Technical Training Program

### Training Approach

Our comprehensive training program ensures successful system adoption:

- **Administrator Training:** System architecture and components overview, configuration and customization procedures, monitoring and troubleshooting techniques, and backup and recovery operations
- **Developer Training:** API documentation and integration guidelines, customization framework and best practices, development environment setup, and code deployment procedures
- **End User Training:** Role-based training modules, hands-on exercises with real scenarios, certification program for power users, and ongoing webinar series for new features

### Training Resources

Comprehensive training materials support continuous learning including interactive e-learning modules, recorded training sessions for reference, quick reference guides and cheat sheets, and sandbox environments for practice.

## Future Technology Roadmap

### Planned Enhancements

Our technology roadmap ensures the system evolves with DEP's needs:

- **Year 1 Enhancements:** Advanced workflow automation with AI-powered routing, enhanced mobile capabilities including biometric authentication, and expanded integration with federal reporting systems
- **Year 2 Enhancements:** Blockchain integration for immutable audit trails, augmented reality features for field inspections, and advanced predictive analytics for project planning
- **Continuous Innovation:** Quarterly feature releases based on user feedback, adoption of emerging technologies as they mature, and partnership with DEP for custom innovation initiatives

## Technical Summary

The AML Construction Management System represents a state-of-the-art technical solution designed specifically for the unique requirements of Abandoned Mine Land project management. Our architecture provides the scalability to grow with your needs, the security to protect sensitive information, and the reliability to support mission-critical operations.

The technical approach balances innovation with proven technologies, ensuring a stable platform that can evolve with changing requirements. Our commitment to technical excellence extends beyond deployment, with continuous optimization and enhancement ensuring the system remains at the forefront of government technology solutions.

For detailed pricing information and implementation timelines, please refer to our main proposal document. Our technical team stands ready to discuss any aspect of this technical proposal and demonstrate how our solution will transform AML project management for the West Virginia Department of Environmental Protection.

## Live Demo

**Technical Demo Environment:** Our technical demonstration showcases the system's architecture, performance capabilities, and integration features in a live environment.

**Demo URL:** <https://aml-construction-management.vercel.app>

The technical demo includes API documentation with interactive testing, performance metrics dashboards, security scanning results, and integration endpoint demonstrations.