

Production Systems Readiness Report

✓ PRODUCTION READY

Project: Crop Intel — BNSF API Integration & Market Intelligence Platform

Date: February 2, 2026

1. Executive Summary

This report confirms that the **Crop Intel** application has successfully met all technical requirements for production deployment. The primary objective of establishing a secure, real-time integration with the **BNSF Railway Carload Rates API** has been achieved.

The system now utilizes industry-standard Mutual TLS (mTLS) authentication to retrieve live rail freight pricing, providing the application with high-precision market intelligence data. A robust fallback mechanism is also in place to ensure business continuity in the event of external service interruptions.

2. Technical Validation Results

A comprehensive production readiness test suite was executed to validate the core components of the application.

2.1 Integration Performance

Component	Status	Verification Detail
BNSF Carload Rates API	✓	Passed. Successfully retrieving live rates from <code>api.bnsf.com:6443</code> .
Authentication (mTLS)	✓	Passed. Handshake validated using Sectigo-issued client certificates.
Freight Accuracy	✓	Passed. Verified live rates (e.g., \$1.60/bu) against expected tariff benchmarks.
Tariff Fallback System	✓	Passed. Logic verified against BNSF Tariff 4022 (2025/2026 data).
Environment Integrity	✓	Passed. All API keys (Gemini, Google Maps) verified and active.

2.2 Functional Benchmarks

A live test of the Texas-to-California corridor yielded the following results:

- **BNSF Live API Rate:** \$1.60 / bushel
- **System Fallback Rate:** \$1.40 / bushel
- **Response Latency:** Under 800ms

3. Security & Compliance

The application adheres to strict security protocols for handling sensitive logistics data and credentials.

- **Credential Management:** All certificates and API keys are stored in encrypted environment configurations and excluded from source control.
- **Authentication:** Mutual TLS (Certificate-based) ensures that only authorized application instances can communicate with BNSF infrastructure.
- **Certificate Lifecycle:** Client certificates are valid through **December 16, 2026**. A renewal scheduled for November 2026 has been documented.

4. Operational Readiness

The application has been optimized for production runtime performance.

- **Build Quality:** Production bundles are fully optimized and pass all linting/TypeScript safety checks.
- **Error Handling:** Graceful degradation logic ensures the user interface remains functional even if the BNSF API returns errors or timeouts.
- **Monitoring:** Integrated request tracking (X-Request-ID) allows for end-to-end debugging of API transactions.

5. System Maintenance & Support

Item	Frequency	Responsibility
API Key Rotation	Every 90 Days	Engineering Team
Certificate Renewal	Prior to Dec 2026	IT Operations
Tariff Data Update	Annually (Oct)	Business Analyst

6. Conclusion

Based on the verified integration success and the successful execution of all production-readiness tests, the **Crop Intel** application is cleared for deployment to the production

environment.

Technical Lead

Crop Intel Development Team

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