DIVESCALE CASE STUDY · 2026

Python | LangChain | React

AI-POWERED INCIDENT PREVENTION

Safety Operations

Transforming fragmented safety knowledge into actionable point-of-work guidance for industrial teams.

HSE / EHS | INDUSTRIAL SAFETY | MANUFACTURING | OIL & GAS | CONSTRUCTION | ENTERPRISE

DOMAIN

HSE / Industrial Operations

THE CHALLENGE

Safety Knowledge Is Fragmented

Industrial safety operations generate enormous volumes of procedural documentation which includes standard operating procedures, incident reports, site manuals, expert notes, checklists, and regulatory filings. Over time, this material accumulates across shared drives, legacy systems, email threads, and physical binders. The result is a graveyard of critical information that is technically stored but practically unreachable.

When a field worker needs to know the correct lockout-tagout sequence for a specific piece of equipment, or when a safety manager needs to verify whether a near-miss from last year matches current conditions, the search begins across disconnected sources. The knowledge exists, but the system to retrieve it does not.

Meanwhile, experienced professionals retire, taking unwritten expertise with them. Incidents that should have been prevented recur because the lessons learned from previous events were never connected to the procedures workers follow daily. The cost is measured in injuries, lost time, regulatory penalties, and lives.

Scattered Documents

SOPs, PDFs, and spreadsheets live across legacy systems, shared drives, and email threads. Real-time retrieval is impossible.

Knowledge Drain

Unwritten expertise retires with the workforce. Decades of operational know-how leave the organization without being captured.

Repeat Incidents

Valuable lessons from past near-misses are forgotten. Preventable incidents recur because no system connects history to current work.

THE COST

What Fragmentation Means in Practice

When safety knowledge is fragmented, the impact is not theoretical. Safety professionals spend 30-50% of their working hours on administrative tasks: searching for documents, preparing reports, and reconciling conflicting instructions. Incident reporting that should take minutes consumes hours. Toolbox talks that should be brief require half a day of preparation.

The financial cost is equally severe. The average medically consulted injury costs $43,000. A fatal incident costs $1,460,000. Total workplace injury costs in the United States reached $176.5 billion in 2023. Every dollar invested in safety programs returns $4 to $6 in prevented losses, yet most organizations cannot deploy those programs effectively because their knowledge infrastructure is broken.

30-50%	$43K	$176.5B	$1.46M
ADMIN WORKLOAD	AVG INJURY COST	NATIONAL COST 2023	FATAL INCIDENT COST

Incident Reporting Time

Traditional process averages 2 hours per report. With structured digital workflows, the same report is completed in 30 minutes - a 75% reduction that frees safety staff for preventive work.

Toolbox Talk Preparation

Preparing site-specific safety briefings traditionally requires 1-2 hours of document gathering. The platform reduces this to 15 minutes by surfacing relevant knowledge automatically - an 87% time savings.

HOW IT WORKS

From Raw Documents to Field Guidance

The platform closes the gap between institutional knowledge and frontline execution through a four-stage pipeline: ingest, structure, validate, and prevent.

Ingest

Raw SOPs, PDFs, video transcripts, and site images are uploaded in bulk.

Structure

AI builds the industrial knowledge graph, linking every step to context.

Validate

SMEs review, approve, and resolve conflicts before knowledge reaches the field.

Prevent

Point-of-work guidance warns of hazards and confirms required controls in real time.

INPUT

SOPs, incident reports, site images, expert notes, checklists, and regulatory filings.

OUTPUT

Task-specific knowledge cards, natural language answers, PPE recommendations, and stop-work triggers.

FEATURE DEEP DIVE

Knowledge Intelligence Layer

At the core of the platform is a semantic knowledge graph that maps every procedural step to historical incidents, site hazards, and expert annotations. Instead of searching for documents, users query relationships.

BEFORE

Disconnected Documents

SOPs existed in PDFs. Incident reports lived in separate databases. Expert notes were in email threads. No system connected them.

PAIN

No Cross-Referencing

When a procedure changed, there was no way to know which incidents it affected. When an incident occurred, there was no link back to the relevant SOP.

SOLUTION

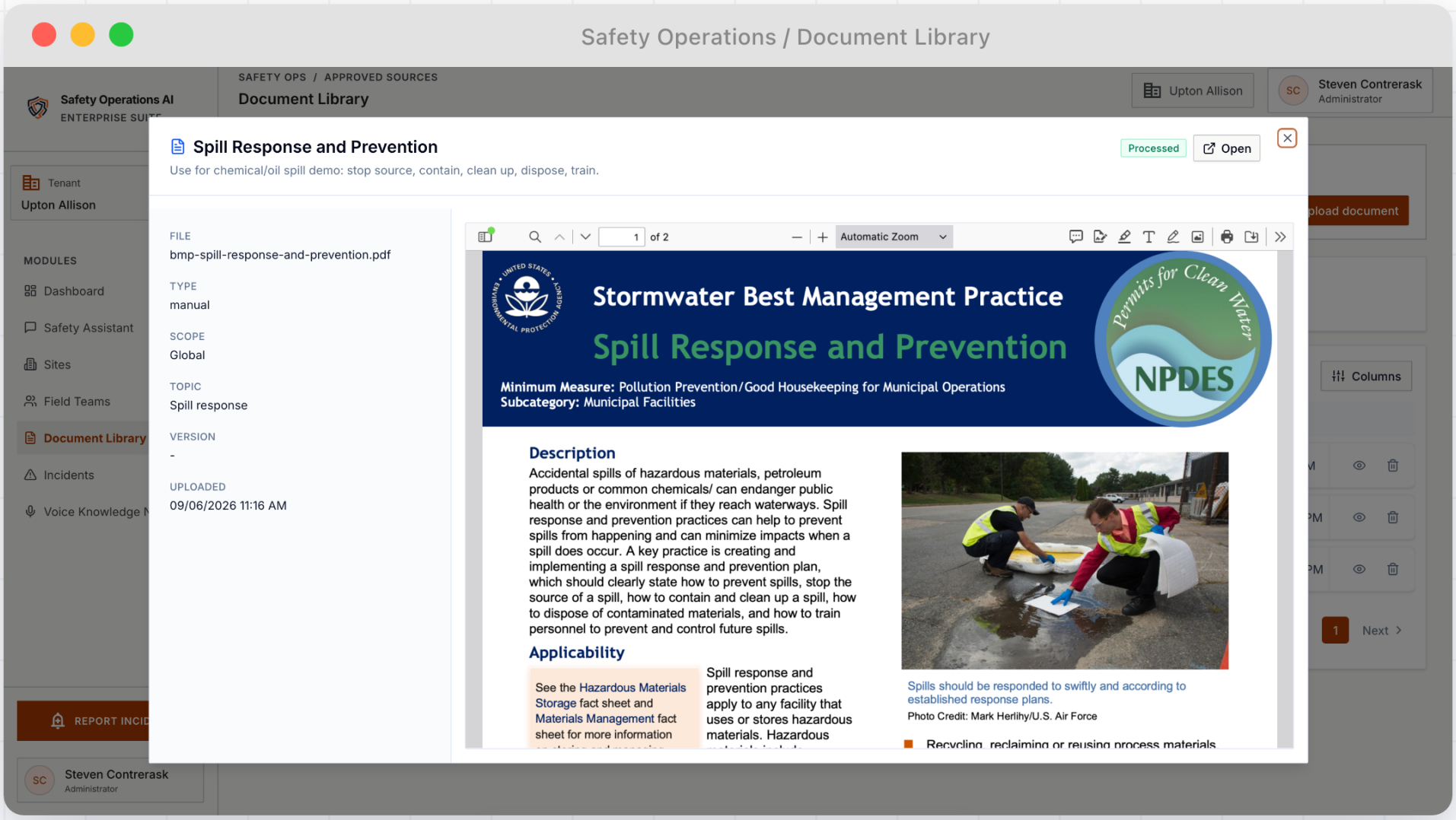
Semantic Knowledge Graph

AI ingests all documents and constructs a graph where every step, hazard, control, and incident is a node with explicit relationships.

OUTCOME

Real-Time Cross-Document Intelligence

A worker viewing a lockout procedure immediately sees the three related near-misses from the past two years and the SME note that modified the sequence.



FEATURE DEEP DIVE

Field Worker Copilot

Safety guidance is only valuable if it reaches the worker at the moment of need. The Field Worker Copilot delivers task-specific knowledge cards that warn of site hazards and confirm required controls - all accessible through natural language queries from any device.

BEFORE

Binders and Memory

Field workers carried printed binders with outdated instructions. When conditions changed, the binder did not. Workers relied on memory and word of mouth.

PAIN

No Real-Time Hazard Awareness

A worker starting a maintenance task had no immediate way to know that a similar task resulted in a serious near-miss on the same equipment last month.

SOLUTION

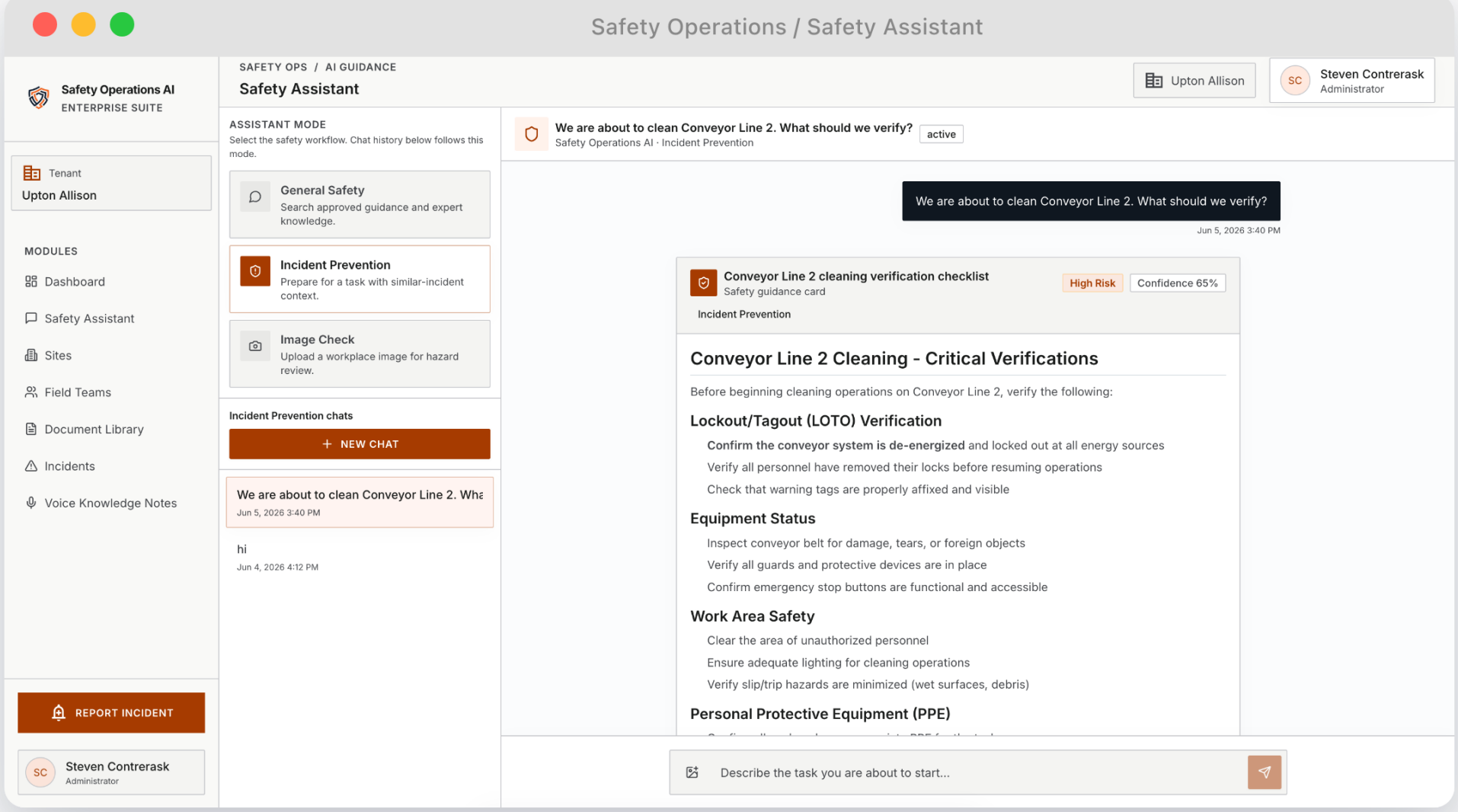
Point-of-Work Digital Guidance

Task-specific knowledge cards surface automatically based on the work order. Natural language queries let workers ask "What PPE do I need for tank cleaning?" and receive instant, sourced answers.

OUTCOME

Informed Decisions at the Edge

Workers arrive prepared, execute with verified guidance, and report deviations in real time. The gap between policy and practice closes.



FEATURE DEEP DIVE

SME Approval & Conflict Detection

Not all knowledge is equal. Some procedures are critical and must be verified by subject matter experts before they reach the field. Some documents contradict each other. The platform automates expert review and flags conflicts before they create risk.

BEFORE

Manual Review Cycles

Expert review happened through email chains and spreadsheet trackers. Approvals were lost, versions were confused, and contradictory procedures were published without detection.

PAIN

Contradictory Instructions in the Field

Two site manuals prescribed different lockout sequences for the same equipment. Workers followed the wrong one because there was no mechanism to detect the conflict.

SOLUTION

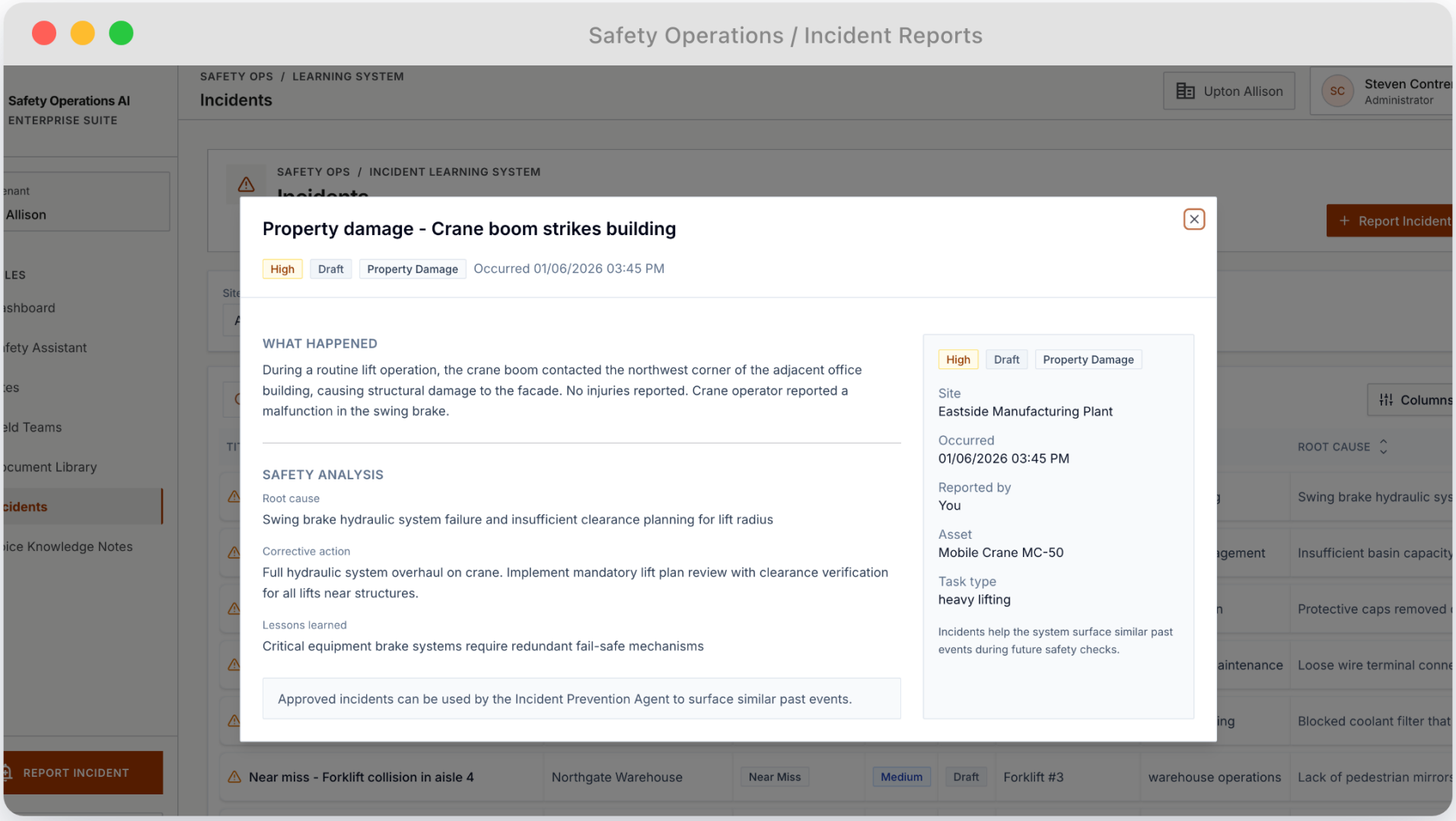
Automated SME Workflows

Knowledge objects flow through structured approval pipelines. The conflict detection engine automatically flags contradictory instructions between different SOPs or site manuals.

OUTCOME

Verified, Consistent Knowledge

Every procedure in the field has been reviewed by the right expert. Conflicts are resolved before publication. The organization speaks with one voice on safety.



FEATURE DEEP DIVE

Source Traceability & Audit

Regulators and internal auditors require proof: proof that a procedure came from an approved source, proof that a worker saw the correct version, proof that a change was reviewed and authorized. The platform provides regulatory-grade traceability for every interaction, approval, and field query.

BEFORE

No Audit Trail

When an auditor asked, "Where did this procedure come from?" the answer was often a guess. Version history was lost in file names and email attachments.

PAIN

Regulatory Inspection Failures

Organizations failed inspections not because they lacked procedures, but because they could not prove those procedures were current, approved, and followed.

SOLUTION

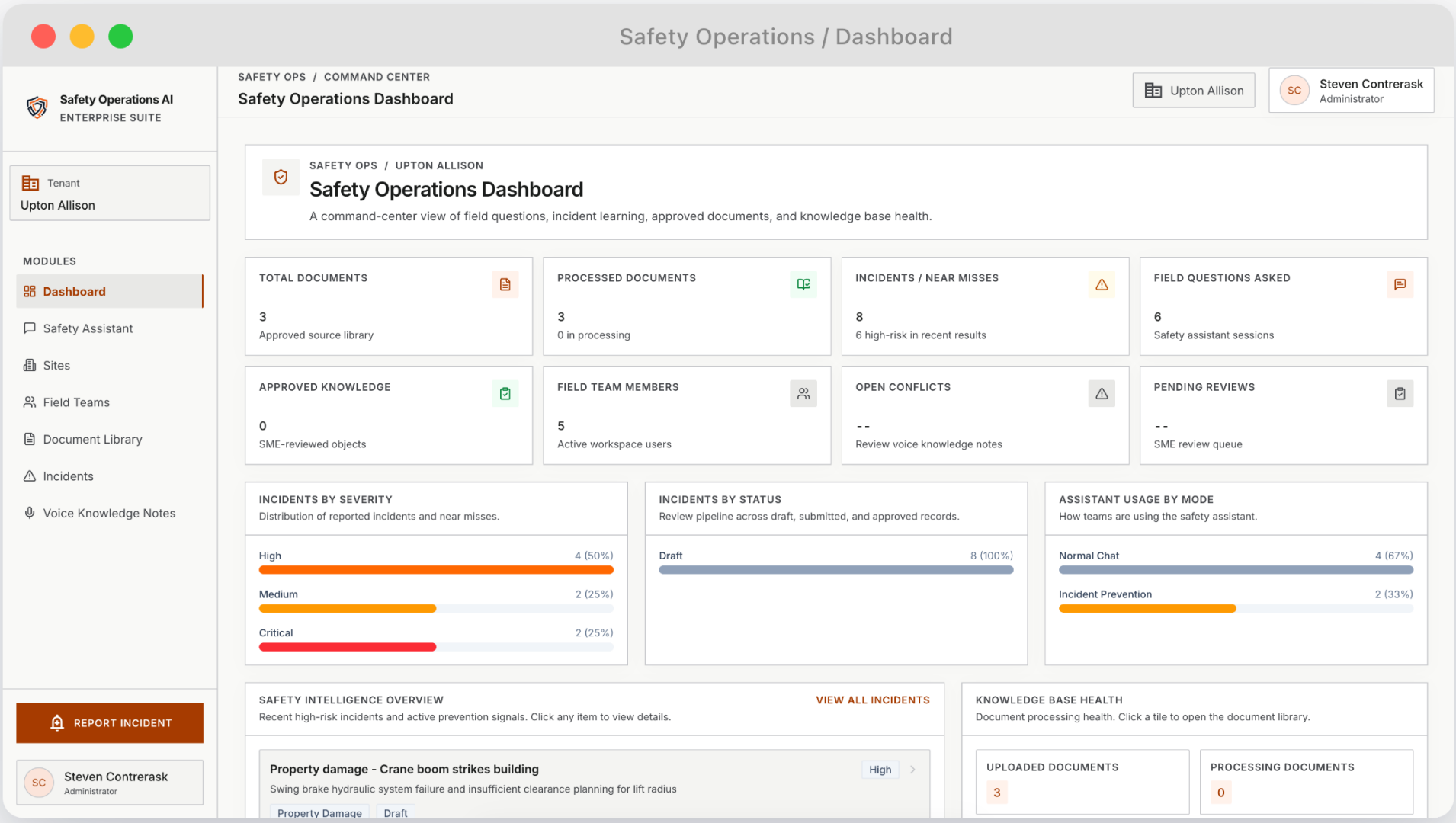
One-Click Source Links

Every knowledge object carries deep links back to the original source PDF, including page numbers and paragraph references. Comprehensive audit logs record every interaction.

OUTCOME

Regulatory-Grade Compliance

Auditors trace any answer to its original source in seconds. Compliance teams generate reports automatically. The organization is always inspection-ready.



FEATURE DEEP DIVE

Role-Based Access & Multi-Tenant Cloud

Enterprise safety operates across boundaries: sites, countries, business units, and contractor teams. The platform provides granular control over who can view, edit, or approve safety knowledge - with complete data isolation between tenants.

BEFORE

Flat Permissions

Everyone had access to everything, or no one had access to anything. Site-specific knowledge leaked across boundaries. Contractors saw internal procedures they should not.

PAIN

Cross-Site Data Contamination

A procedure from a refinery appeared in a manufacturing plant's search results. A contractor's change to a shared document affected every site using it.

SOLUTION

Granular RBAC + Tenant Isolation

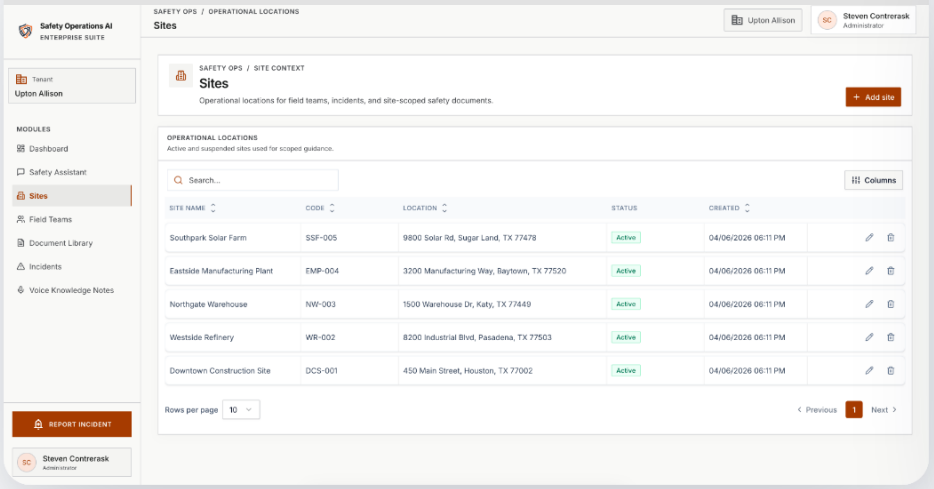
Every user, document, and knowledge object belongs to a role, a site, and a tenant. Permissions are enforced at the query level. Data never crosses tenant boundaries.

OUTCOME

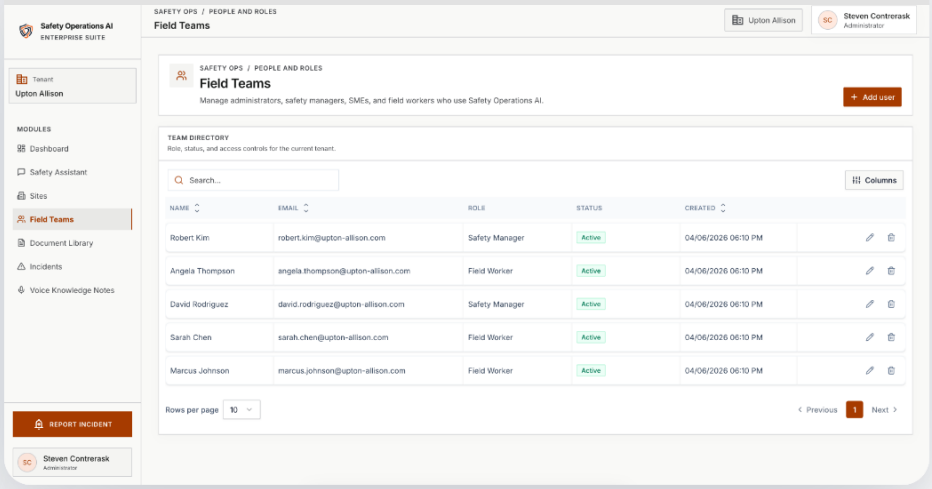
Enterprise Security at Scale

Global deployments maintain strict isolation. Site managers see only their site's knowledge. Corporate teams see aggregated analytics without accessing sensitive site data.

Safety Operations / Sites



Safety Operations / Field Teams



VERIFIED IMPACT

Measurable Operational Change

The platform's impact is measured in time saved, incidents prevented, and compliance achieved. Below are the operational metrics that matter to safety leaders and finance teams.

75%
REDUCTION IN INCIDENT REPORTING TIME

70%
REDUCTION IN AUDIT/INSPECTION TIME

60%
LESS TIME ON INCIDENT DOCUMENTATION

87%
FASTER TOOLBOX TALK PREPARATION

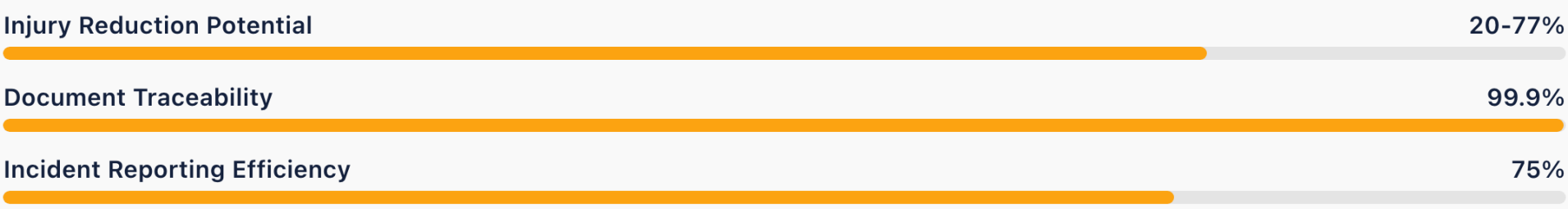
20-77%
INJURY REDUCTION ACHIEVABLE

$4-$6
SAVED PER $1 INVESTED IN SAFETY

Compliance & Cost Metrics

Metric	Before	After	Improvement
Incident reporting time	2 hours	30 minutes	75% faster
Toolbox talk prep	1-2 hours	15 minutes	87% faster
Audit/inspection management	Manual compilation	Automated reports	70% less time
Document traceability	Unknown sources	99.9% traceable	Full provenance
Safety admin workload	30-50% of hours	10-15% of hours	Reclaimed for prevention

Safety Program Performance



Source: National Safety Council, OSHA, Bureau of Labor Statistics, peer-reviewed EHS research.

TECHNOLOGY

Stack & Architecture

The platform is built on a modern, open-source-first stack designed for reliability, security, and scale. Every component is selected for its operational maturity and its ability to run efficiently on standard infrastructure.

Python
Core backend runtime

PostgreSQL
Primary database + pgvector

SQLAlchemy
ORM & data modeling

LangChain
LLM orchestration

Google Vision
Image analysis & OCR

OpenRouter
Unified LLM gateway

Redis
Caching & session store

Celery
Background job processing

S3
Object storage

React
Frontend UI framework

TypeScript
Type-safe development

TanStack Query
Server state management

Tailwind CSS
Utility-first styling

Zustand
Client state management

Docker
Containerized deployment

DIVESCALE

Safety is not a document. It is a living system.

The Safety Operations AI platform transforms static safety knowledge into active protection - connecting every worker to verified guidance, every procedure to its history, and every decision to its source.

-75%
INCIDENT REPORT TIME

-70%
AUDIT TIME

-60%
DOCUMENTATION TIME