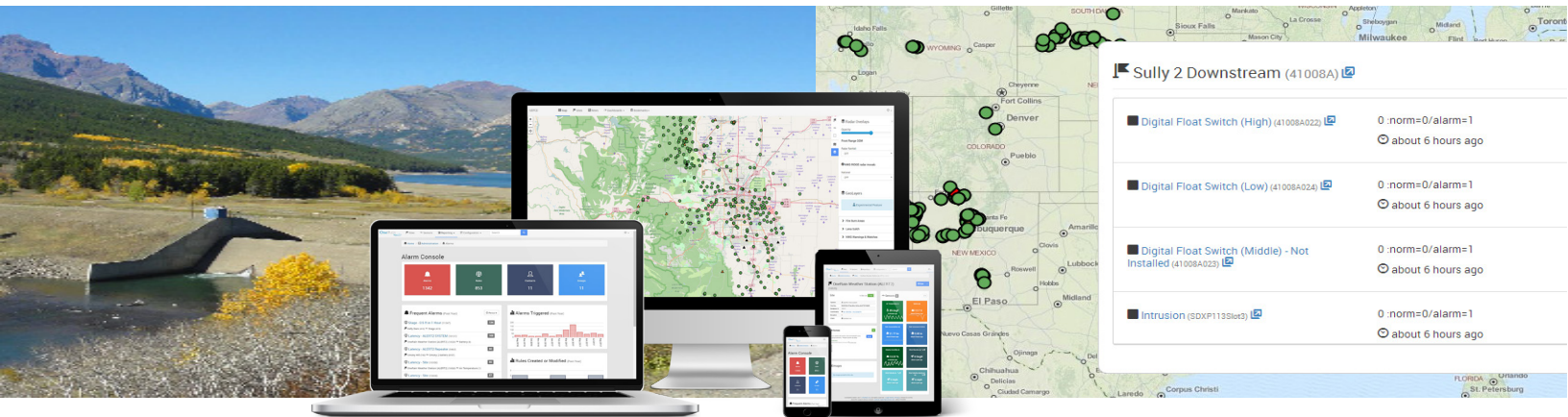


Remote Dam Safety Monitoring

National Monitoring Center: Bureau of Indian Affairs



The National Monitoring Center is the key in providing significantly enhanced public safety to populations downstream from Bureau of Indian Affairs high-risk, significant-hazard dams.

EARLY WARNING SYSTEM (EWS)

The Bureau of Indian Affairs (BIA) is responsible for 910 dams on Indian reservations; of which 137 are classified as high- and significant-hazard. Built several decades ago, many of the dams are not aging well and pose dam safety risks. As part of the Bureau of Indian Affairs' Safety of Dams program, BIA built and operates the National Monitoring Center, a 24/7/365-manned emergency operations center in Montana to ensure the safety of downstream communities. The dams are scattered on tribal lands throughout the western U.S.

The National Monitoring Center (NMC) Early Warning System is built upon the integrated real-time monitoring instrumentation, telemetry and centralized enterprise data collection services infrastructure developed by **OneRain**. Since 2003, OneRain has been working in partnership with the BIA's Safety of Dams program supporting and continually enhancing the EWS in all aspects.

AUTOMATED REAL-TIME MONITORING

With the majority of the dam sites located on tribal lands in geographically challenging and very remote locations, getting critical information and timely real-time data to support the BIA's Safety of Dams mission presented a significant challenge.

To meet this challenge, OneRain developed the **StormLink®** family of real-time satellite telemetry products to quickly and reliably relay high-quality data from these remote sensing sites. OneRain then worked together with the BIA and its partners to design a user-friendly, multi-tenant, web-based data hosting platform for use by the NMC. This project formed the genesis of OneRain's **Contrail®** enterprise software platform, which today provides 24/7 web visualization and decision support for dam monitoring networks, as well as for other flood early warning and water management applications.

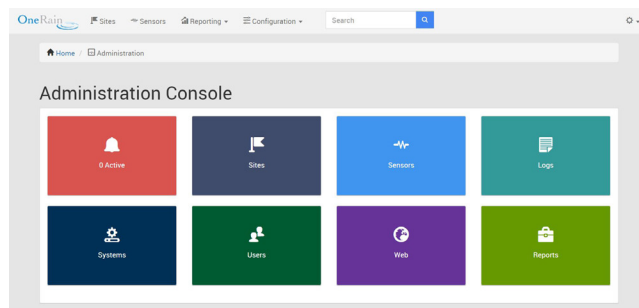
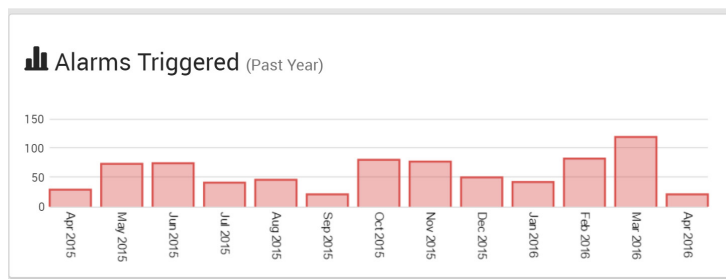
TIMELY, RELIABLE AND ACCESSIBLE DATA

OneRain's **StormLink** real-time satellite systems relay data from sensing sites and from local line-of-sight ALERT/ALERT2 or SCADA systems to OneRain's industrial data center where its decision-support software, **Contrail**, continually collects and monitors rainfall, water level, stage height, flow rate data and more, in real time. Data are incorporated from other available external sources such as USGS, NWS, METAR, Automata, HADS, and other platforms. Authorized users from the NMC can access and manage their network information anytime, from anywhere they have Internet access.

Within just 20 seconds of a triggered event, StormLink data are delivered to Contrail. A OneRain proprietary handshaking protocol between the StormLink satellite messaging terminal and **Contrail** guarantees data delivery.

Experts measuring rainfall and its consequences™

OneRain and the NMC's emergency personnel currently monitor more than 2,637 sensors for more than 112 high-hazard dams in real time.



ADVANCED WARNINGS WITH EAP NOTIFICATIONS

All the hydrometeorological gauge data are automatically processed, validated and archived centrally into **Contrail®** in real time for web-based dissemination, visualization, monitoring and alerting. BIA and NMC staff have 24/7 secure web-based access to the system where they can view up-to-the-minute current conditions and status indicators on high resolution maps, dashboards, charts, graphs and tables.

Advanced Custom Alarms and Timely Alerts

BIA and NMC use advanced customized rules, created in Contrail, to alert designated officials and emergency personnel of possible hazardous and flood-threatening conditions.

Alarm events are triggered based on the combined results of one or more rule conditions and on incoming data from multiple sensors at multiple sites. Rules are also based on alarm trigger history (alarm escalation). For example: if the stage height is near a bank full threshold, and it has rained more than 0.5-inches upstream in the last half hour, then an alarm is triggered.

Contrail's alert notification system supports sending messages to cell phones, email, and text pagers. Depending on delivery method, alarm notifications provide very detailed information and include instructions for what actions to take, links to the specific site information, documents, as well as Emergency Action Plans (EAP). Different messages can be delivered to different people, all from the same triggered event. For escalated alarm events, notifications can be sent to different individuals.

"The quality and availability of the data is crucial in decision making when lives are on the line. The real-time water level information and alerts allows NMC personnel to mobilize flood protection measures in advance."

TOTAL SYSTEM PERFORMANCE AND RELIABILITY

Key to the success of the NMC's program is knowing how well the instrumentation and sensors are performing at all times. Contrail provides built-in On-Demand reports and Analytics specifically designed for evaluating and diagnosing hardware problems. Contrail Analytics tracks overall system performance and provides essential information to help users plan predictive maintenance. The program includes daily system performance analysis of the hydromet sensor network using integrated Contrail tools that monitor activity and detect outages automatically.

Maintenance Operations Program

Additionally, BIA, with OneRain, has an excellent ongoing preventive, proactive and routine maintenance schedule in place for the monitoring instrumentation for ensuring that the flood warning network provides accurate, reliable information during a hydrological event.



StormLink® Satellite Telemetry transmits real-time data to Contrail® on Annette Islands Reserve, Alaska, home of the Metlakatla Indian Community