



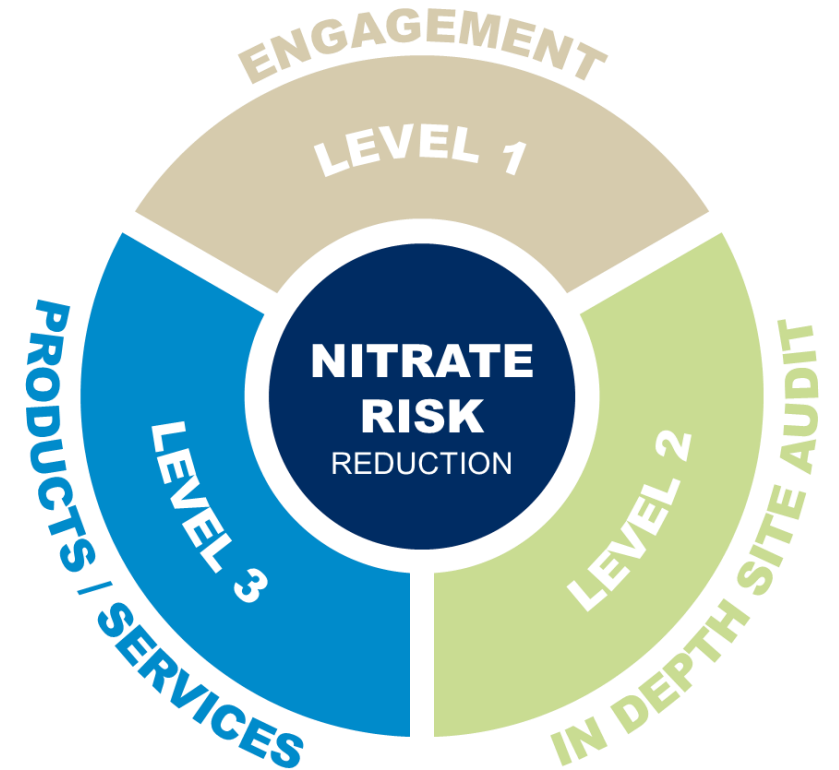
# **RISK MITIGATION OF NITRATES AND AMMONIA IN GROUND WATER**

# Nitrate leaching risk mitigation

RISK MITIGATION

MANAGEMENT APPROACH

- The causes of Nitrate in groundwater in a mining operation is typically derived from the ammonium nitrate based explosives consumed, although it can also be present in the rock itself.
- The actual pathway of the nitrates into the groundwater is varied and must be assessed prior to implementing any “product solution”.
- Sites should develop a Nitrate Management plan to ensure all potential pathways are being actively managed, with in house procedure upgrades and specialist training aligned with Industry Codes of Practice.
- Orica can assist customers to assess their Nitrate risk potential and then to manage, based on a 3 stage approach.



- **Level 1** – Introduce best practice awareness.
- **Level 2** – Option for a comprehensive Site Audit by Orica Technical Service Specialists.
- **Level 3** – If required, an option for Customers to change their service level with Orica and/or the products they are using.

# Nitrate leaching risk mitigation

RISK REDUCTION

SUPPORT FRAMEWORK



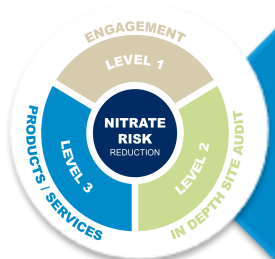
## Customer Engagement

- Site Nitrate Risk Awareness Self Assessment.
- Culture aligned with BC MECCS Technical Guidance 9<sup>1</sup>.
- Enhance current practices.



## Technical Service - Site Audit

- In Depth Audit of Site Nitrate Risk Factors.
- Recommendations for Procedures/Services/Products.



## Customer Options - Products/Services

- Blasting and operational practices aligned with BC MECCS TG9.
- Protect Product Range to further Nitrate Risk Reduction.

<sup>1</sup>British Columbia Ministry of Environment and Climate Change Strategy Technical Guidance 9 environmental Management Act “Guidance on Preparing Nitrogen Management Plans for Mines using Ammonium Nitrate Fuel Oil Products for Blasting” Version 1.0 February 2018

# Customer engagement – Site self-assessment



## LEVEL 1: NITRATE RISK SITE SELF-ASSESSMENT

CUSTOMER SITE  
ADD REPORT DATE



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## NITRATE RISK SITE SELF-ASSESSMENT

The Orica Nitrate Risk Reduction Site Self-Assessment guide is an essential part of the Nitrate Risk Reduction (NRR) framework in Surface and Underground blasting. It is designed as a tool to facilitate awareness of potential contributors to Nitrate content in mine waters - surface runoff and underground - as a consequence of blasting operations.

Users of this guide can select a compliance rating for key systems and practices employed at a particular mine site, or specific mine area, that may contribute to increased nitrate content. On completion of the Site Self-Assessment template and subsequent gap analysis, industry recommended best practice may be employed as a useful way to reduce nitrate leaching where gaps are identified.

Depending on the service level provided at your site, an Orica specialist can assist in the Site Self-Assessment process at your discretion. Advice of further nitrate risk reduction management services ranging from a comprehensive in-depth Site audit to a complete product and service offer can also be provided upon request. Please discuss any further nitrate risk reduction requirements with an Orica Technical Services representative or your Orica Account Manager.

### PLANNING

#### Blast Management

Does the Blast Management Plan include Nitrate Risk Reduction (NRR) management guidelines?

- Yes
- No

*Industry Recommended Best Practice (IRBP) Site has a Blast Management Plan that includes NRR guidelines*

Are blast risk assessments conducted & do those risk assessments consider the potential for post blast Nitrate contamination?

- Never
- Often
- Sometimes
- Always

*IRBP Pre-blasting risk assessment is undertaken to investigate the potential for nitrate contamination*

### REGULATORY REQUIREMENTS

#### License Conditions

Are there mandatory water emission regulatory requirements for the mine (nitrate, ammonia, other chemical species)?

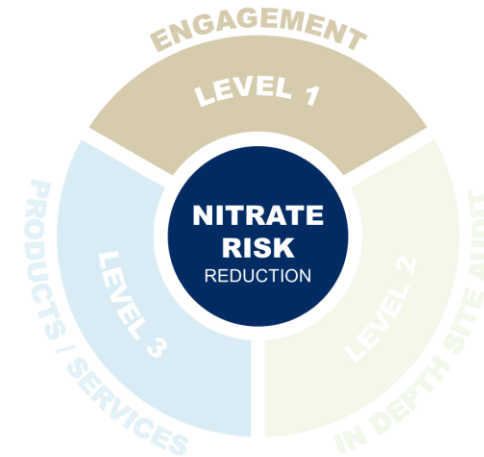
- Yes
- No

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Completed by the customer, or in conjunction with an Orica Technical Services representative.

Targeted questions aligned with Industry best practice for Nitrate Risk Reduction.

Findings may be sufficient to address Nitrate leaching risk and once implemented, reduce nitrate levels being measured.



# In-depth site audit



**NITRATE RISK REDUCTION**

LEVEL 2 SITE AUDIT REPORT  
{INSERT CUSTOMER}  
AUTHOR {INSERT NAME}  
Add Report Date

**ORICA**

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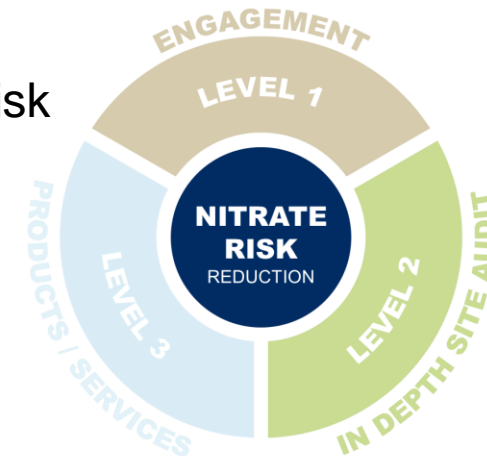
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General

Technical Services and PPIS Specialists in Nitrate Risk partnering with the customer to carry out comprehensive site audit to understand nitrate pathways:

- Geology
- Mining Method
- Blasting Method/Pattern
- Bulk product selection and quality
- Loading Practices
- Nitrate Hygiene in the bulk site and on bench



Outcome: Site specific recommendations and a tailored Nitrate Risk Reduction strategy.

# Customer options: Products and/or services



## Option to adopt Total Load Service

- Upgraded services
- Blast crew trained in Industry best practice and aligned with Site Audit recommendations



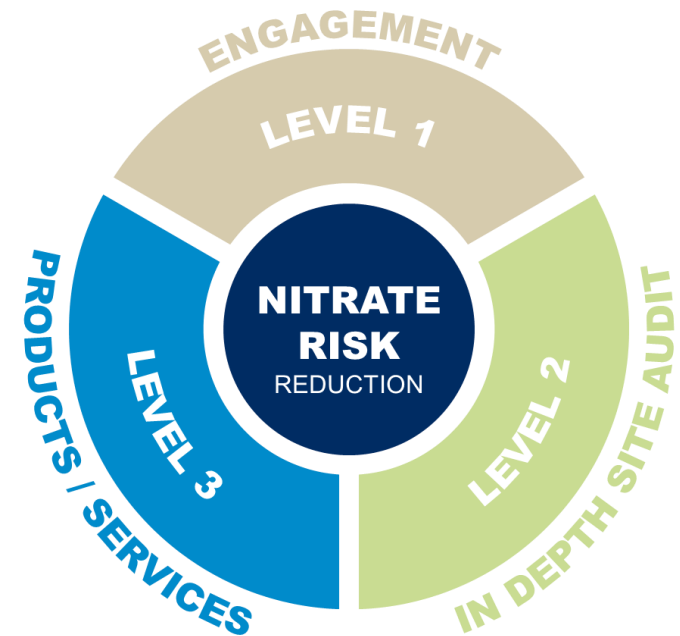
## Option for campaign loading

- Ideal option for specific nitrate risk domains of a mine.
- Blast design, loading practises and product selection controlled by Orica Specialists.



## Fortis™ Protect product range option

- Increased sensitivity and robustness
- Increased viscosity
- Maintains blasting performance



**FOR MORE INFORMATION, PLEASE CONTACT  
YOUR LOCAL ORICA REPRESENTATIVE OR  
[CLICK HERE TO SUBMIT YOUR ENQUIRY.](#)**