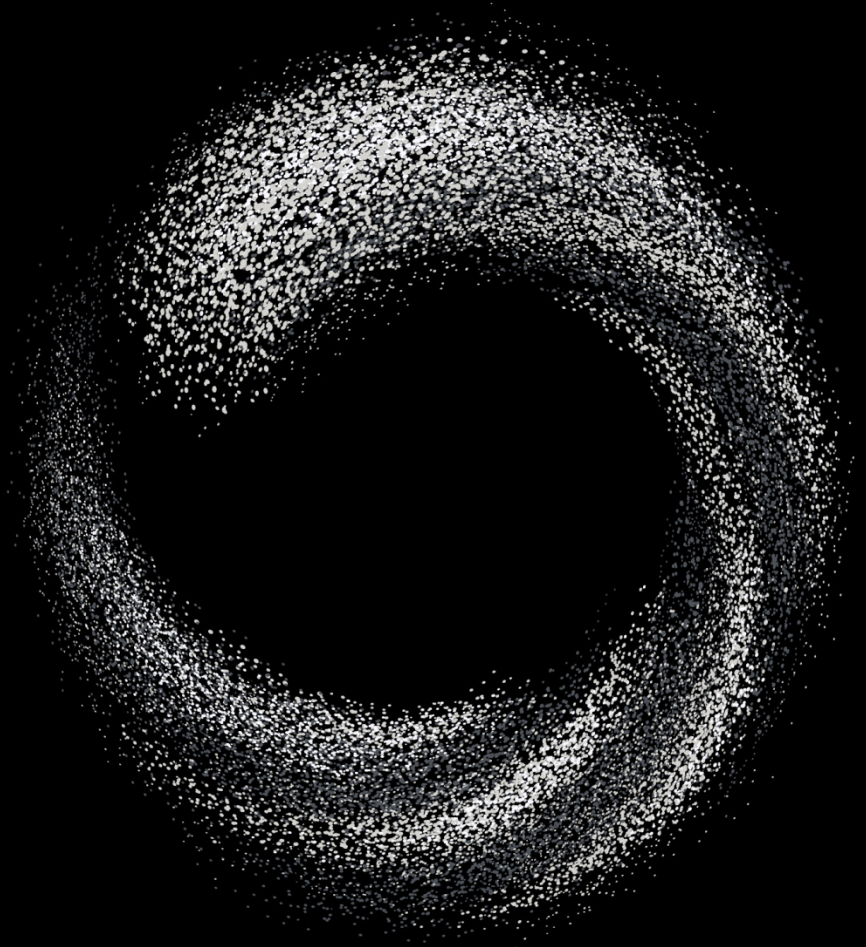


TOC Europe 2016  
Bulk Ports & Technology

***The Evolution of  
Containerized  
Bulk Handling***

Joel G. Shirriff , P.Eng.  
Vice President & Global Practice Lead – Terminals & Transportation



AUSENCO IS A GLOBAL, DIVERSIFIED  
ENGINEERING AND PROGRAM MANAGEMENT  
COMPANY PROVIDING SERVICES ACROSS THE  
ENERGY AND RESOURCES SECTORS.





## 28 offices, 18 countries

### North America

Burlington, Canada  
 Calgary, Canada  
 Concord, USA  
 Halifax, Canada  
 Houston, USA  
 Montréal, Canada  
 Reno, USA  
 Toronto, Canada  
 Vancouver, Canada

### South America

Belo Horizonte, Brazil  
 Lima, Peru  
 Mendoza, Argentina  
 Salta, Argentina  
 Santiago, Chile

### Africa

Johannesburg,  
 South Africa

### Middle East

Jeddah, Saudi Arabia

### Australia/ South Pacific

Apia, Samoa  
 Brisbane, Australia  
 Honiara, Solomon Islands  
 Nuku'alofa, Tonga  
 Perth, Australia  
 Port Moresby, PNG  
 Port Vila, Vanuatu  
 Sunshine Coast, Australia  
 Suva, Fiji

### Asia

Jakarta, Indonesia  
 Mumbai, India  
 Kuala Lumpur, Malaysia

# What is containerized bulk handling?

Historically this has meant using conventional ISO containers and either loading them with conveyors with baffles or tipping them on end. While it makes use of underutilized empty container movement, it is still not a very efficient operation.



# Modern containerized bulk handling

Specialty containers with removable top lids to move bulk cargo from source to destination in a safe and economic manner, and rotary spreaders to load containers directly into ships.



# Typical sequence of containerized logistics

Modern containerized bulk systems have been used in Australia for years and we have seen a growing interest in South America and Africa using a simple application method.

- Direct loading & sealing of the container at the mine
- Movement of the containers - mine to port by truck or by train (or both)
- Offloading of the containers at the port facility
- Using containers in place of bulk cargo storage
- Direct unloading of container into ship's hold with rotary spreader unit

# Typical containerized bulk equipment

Customized containers  
being transported by  
highway truck or rail



Direct discharge of  
cargo into ship's hold



# The evolution of containerized bulk

Containerized bulk handling is not a “one size fits all” solution, and just buying the equipment is not enough. This needs to be integrated into a holistic logistics system.

- Make use of existing infrastructure where possible
- Maximize payload of containers to match cargo and transport rules
- Bi-modal transfer of containers at a Transfer Station (truck from the product source - transfer to rail) for movement to the port
- Offloading of containers at port, and dumping into conventional bulk storage facility for storage, reclaim and ship loading
- Retain capacity for container storage on site and direct loading of containers into ships if the bulk system is out of service
- Optimize the overall logistics network with simulation modelling

# Options for an integrated container system



# Benefits of containerized logistics

- Cargo is sealed in the container until it arrives at port
  - Minimizes potential for cargo loss through spillage or theft
  - Maintains quality of cargo with no contamination, added moisture, etc.
  - Avoids re-handling of bulk cargo at intermodal facilities (truck - rail)
  - Minimizes risks of environmental impact on route or from bulk handling
- Containers can be used as temporary covered storage
- Direct unloading of containers into a ship with rotary spreader unit allows for utilization of general cargo berths as an alternative to permanent bulk storage and ship loading facilities
- Assets are fully mobile and transferrable to other sites and the system is easily expandable

# Where containerized bulk should be applied

- Use for high value or environmentally sensitive bulk cargo
- Logistics routes where single mode transport is not possible
- Small throughput volume cargos that can't support the construction of a dedicated bulk export facility
- Where existing container facilities exist and are underutilized
- A logical replacement for open top bulk trucking to reduce costs and provide a more environmentally sensitive solution
- Can be applied to greenfield installations or retrofit to existing logistics
- Integrate into a multi user export facility to simplify product integrity and segregation of inventories

# Case Study: Las Bambas Logistics



## Project details

<b>Offering</b> Transport Logistics	<b>Commodities</b> Copper Concentrate
--	--

<b>Location</b> Peru	<b>Client</b> MMG
-------------------------	----------------------

<b>Timeframe</b> 2014 - 2016	<b>Solution phase</b> Create (EPCM)
---------------------------------	--

<b>Project value</b> US\$100M	<b>Services</b> Consulting - EP
----------------------------------	------------------------------------

*Complete logistics system design from the Mine load-out to Matarani Port, for a project located near Cusco at 4,300 m above sea level.*

*The system was totally integrated with the Client's requirements.*

*The system includes a 420 km truck haul, a Transfer Station, and a 310 km rail haul to Port.*

# Las Bambas logistics – scope of work

The Las Bambas logistics required an integrated solution for containerized bulk handling of 1.5 Mt/y of copper concentrate from the mine site to a third party export facility in Matarani.

- Definition, selection and optimization of the transport system logistics
- Design of container loading and lid handling facility at the mine
- Procurement of bulk containers and rotary spreader unit
- Procurement of truck tractors and trailers for contractor use
- Optimization of logistics, storage and handling systems at Pillones transfer station (transfer from trucks to trains)
- Procurement of locomotives and wagons for Peru Rail
- Optimization of container receiving and unloading system at Matarani including conveying to conventional bulk handling system

# Optimization of the entire supply chain



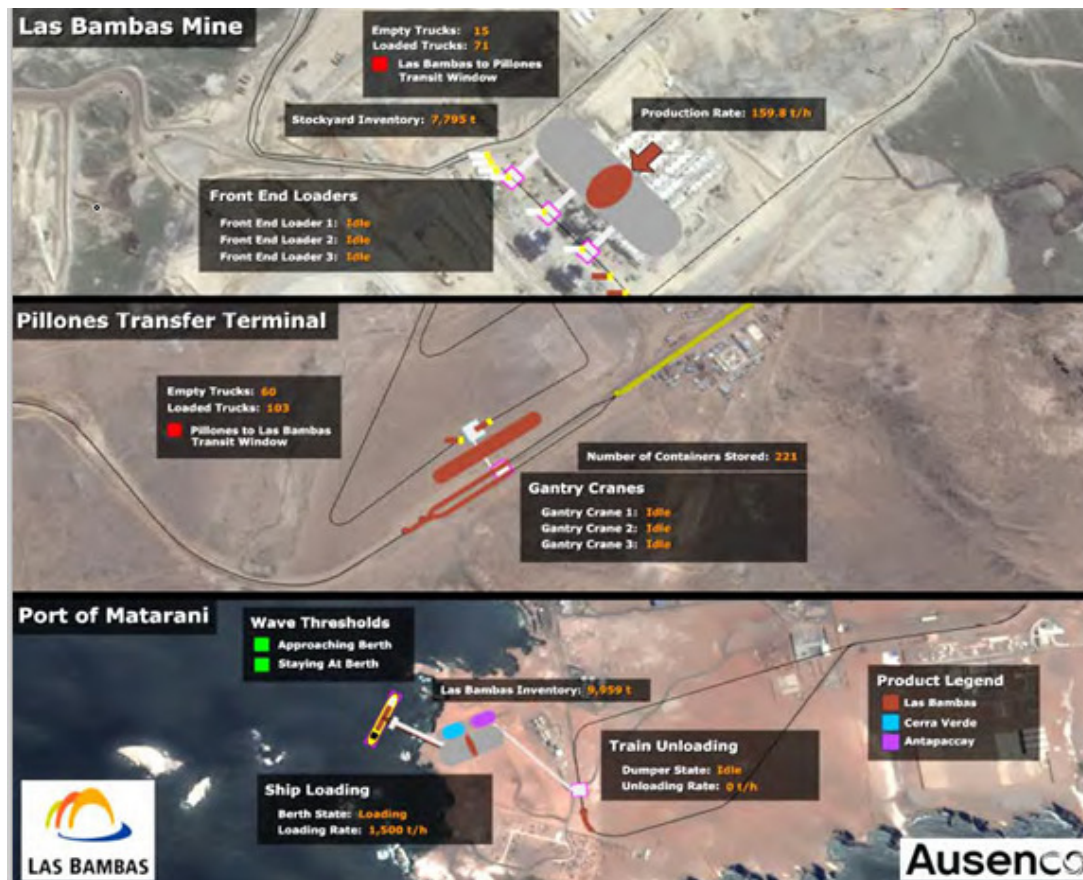
Included each component & the transport network from the mine to the port.

- Review of the 420 km heavy haul road geometry, design speeds & speed limits
- Social and community factors along the route
- Environmental / weather impacts on year round truck operations
- 310 km rail network infrastructure and capacity
- Proposed a rail operating plan and defined operating factors, limits & restrictions

## **KEY OUTPUTS:**

- Required truck, container, and railcar fleet sizes
- Identification of system limits, potential bottlenecks and then optimization of logistics

# Simulation at each critical location



- Identified limitations and removed bottlenecks at all operations on the logistics chain including the mine, transfer station & port
- Covered all equipment & infrastructure
- Modelled up to 130 loaded and empty trucks per day through the facilities
- Included location limits, maintenance restrictions, random breakdowns & weather delays

# Container specifications

A total of 1,200 containers were required for the complete logistics system

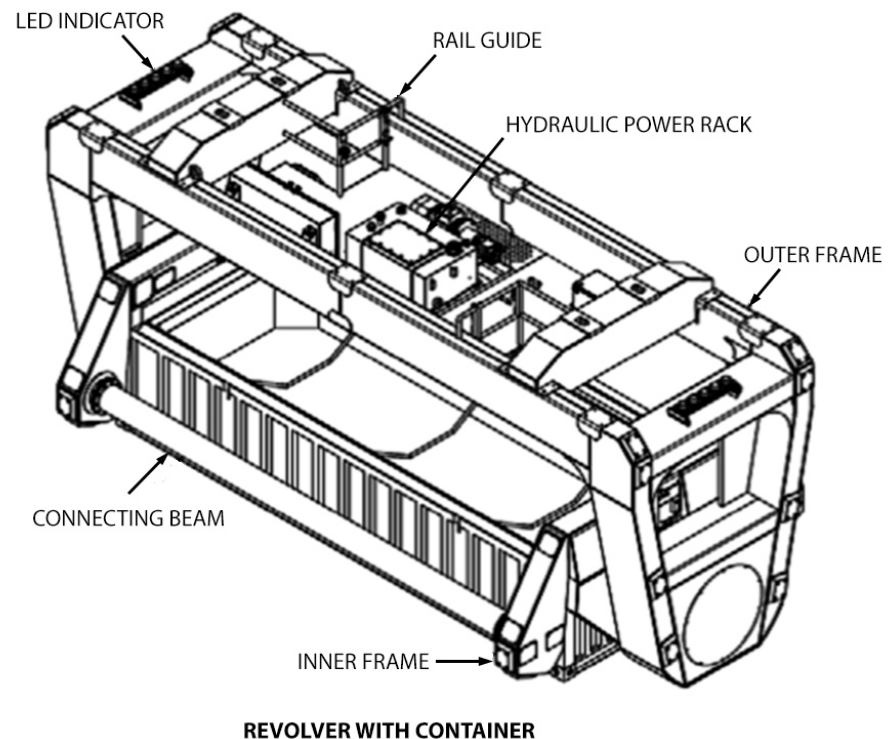
- Custom container design to maximize net payload / truck
- Non-ISO dimensions (4.0m x 2.4m x 1.85m)
- Gross payload of 17.5t
- Fully removable lid with 4 corner lock system
- BK2 – compliant rating
- Interior coating for release of concentrate when dumped



# Rotary spreader specifications

The rotary spreader for the container discharge system needed to be compatible for use in direct-loading of ships as a back-up contingency system.

- Custom design to suit the non-ISO containers
- Integrated lid lifter
- Flexible mounting for use by cranes and forklifts
- Back-up diesel power supply to enable use by harbor and/or ship's cranes



# Truck tractor and trailer specifications

Tractor trailer units were purchased by Las Bambas and provided to local contract hire trucking companies to ensure consistency in the service.

- Custom trailer unit to transport two containers
- Tri-axle trailer design
- Off road suspension due to poor road conditions
- Tractor and trailer equipped with “super single” tyres to maximize allowable axle loads and achieve 52.8 t GVW
- Tractor required to be light as possible to maximize load



# Locomotive and wagon specifications

New locomotives and rolling stock required for the project were purchased by Las Bambas with operations contracted to Peru Rail.

- Peruvian standards for supply of all locomotives & rolling stock
- Custom wagon design to maximize payload per wagon & per train
- Utilized proven wagon manufacturers in China to reduce total costs



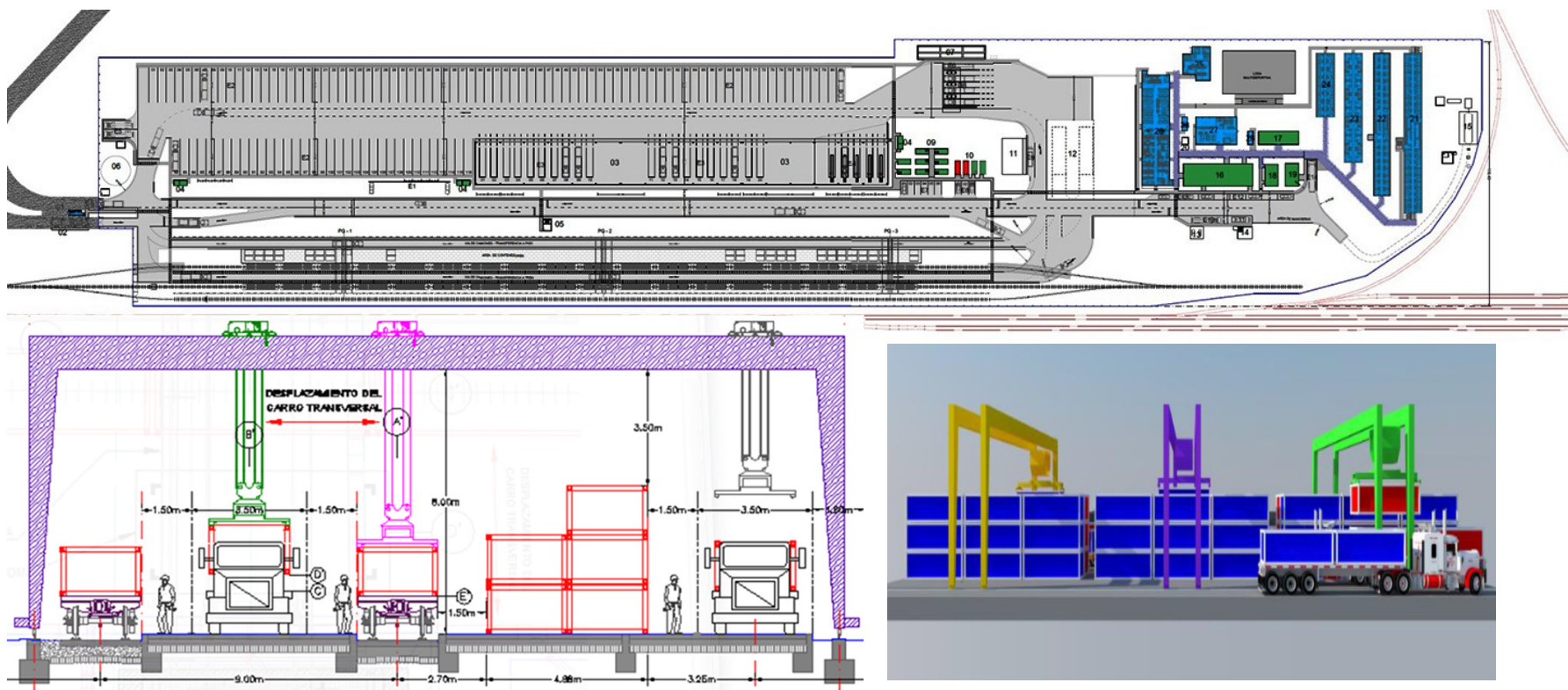
# Container loading facility at mine site

The new system integrated container loading and a means of handling the container lids with a loadout facility that was under construction.



# Transfer facility at Pillones

The Peru Rail facility was optimized to provide enough space to receive, unload and store trucks overnight, store containers, and additional rail tracks added for storage and loading of trains with gantry style cranes.



# Train receiving & container discharge at port

Matarani Port “Berth F” facilities are currently being developed and commissioned for rail receipt of Las Bambas concentrate. The system was modified on a “fast-track” basis to accommodate container handling and unloading, bulk storage and ship loading.



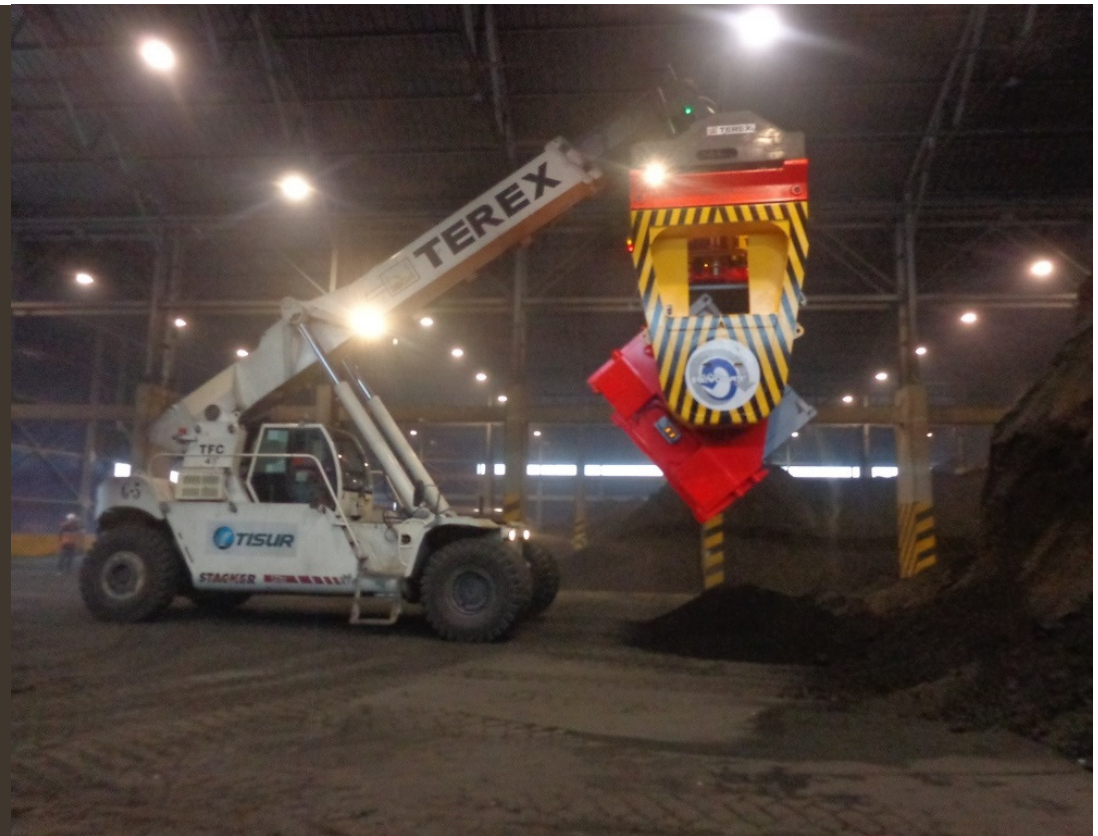
# Options for container receiving & discharge at port

The new system is versatile and allows the handling of containers received by rail and/or truck.

Containers can be dumped and stockpiled in existing sheds with mobile equipment.

This versatility allowed early export shipping prior to completion of the new berth facilities.

Containers can also be stored on-site for direct unloading into a ship's hold.



# Benefits of the containerized system

Ausenco proved that a customized logistics solution was a benefit to the Las Bambas project.

Key benefits included:

- Reduced capital and operating costs for truck fleet
- Reduced rail operating costs compared to conventional bulk
- Elimination of a bulk transfer at Pillones with associated costs and concerns
- Reduction in port charges and increased port versatility with options for:
  - Storing cargo in bulk or in containers
  - Direct unloading to vessel using available cranes at container dock
- Reduced trucking risks on the haul road and through local communities
- Reduced environmental risk due to spills & losses during handling, transfer and transport.

# Questions?

## Contact Information:

[joel.shirriff@ausenco.com](mailto:joel.shirriff@ausenco.com)

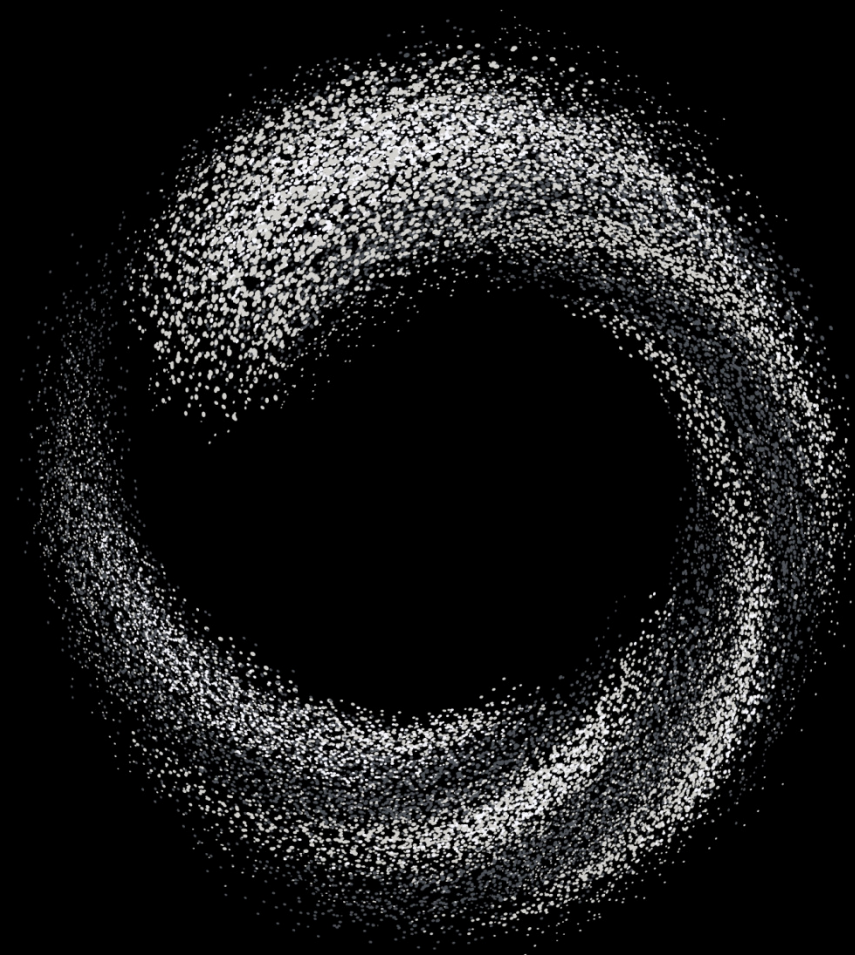
**North America Headquarters**

**855 Homer St.**

**Vancouver, BC V6B 2W2**

**+1 604 684 9311**

**[www.ausenco .com](http://www.ausenco.com)**



**Ausenco**