




Baffinland Iron Mines LP
Mary River Expansion Stage 3
Definitive Study Report
Section 11 – Project Schedule

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Date	Rev.	Status	Prepared By	Checked By	Approved By	Approved By
HATCH						

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11. Project Schedule

The Basis of Schedule describes the parameters that were used to develop the schedule. It provides a common understanding for the planners to develop the schedule and the background for readers of the schedule to assist in its interpretation.

The project schedule has been aligned with the Work Breakdown Structure (WBS, refer to Section 12 of this report) and Project Execution Plan developed for the Expansion Project. The method used to develop the schedule integrates activities, relationships between activities, durations, calendars, and constraints. Primavera P6 Ver.8.2 has been used to prepare the Schedule.

The basis used for developing the project schedule is shown in Appendix A11-1

11.1 Project Background and Objective

11.1.1 General

Baffinland Iron Mines (BIM) has developed an open-pit iron ore mining operation at Mary River in northern Baffin Island, Nunavut Territory. Mining commenced in August 2014 and Baffinland shipped its first iron ore to European Markets in July 2015.

Product from the Mary River mine is high grade direct shipping iron ore, both lump (approximately 75% of product) and sinter fines (approximately 25% of product). Crushing and screening of the ore is carried out on site; no additional processing is required.

Ore produced from the mine is currently trucked approximately 100km to Baffinland's port facility at Milne Inlet. Mining, trucking and stockpiling of the ore occurs throughout the year. Ship loading and shipping of the product is only carried out during the 2-3 month open water season from late July to mid-October. Bulk resupply of fuel and consumables also occurs during the short open water season.

In 2015 Baffinland announced plans, and commenced activities to obtain permit approval, to expand production from the Mary River mine to 12Mtpa shipped through Milne Port.

The objective of the Expansion Project is to upgrade the existing facilities and equipment and the transport infrastructure from the Mine to the Port, to reduce unit operating costs and increase production to 12Mtpa.

11.2 Schedule Scope

11.2.1 Scope

The Execution Schedule has been developed for all engineering, procurement, logistics, construction, and commissioning aspects related to the Baffinland Expansion Project.

For detailed execution methodology refer to Project Execution Plan, H353004-00000-103-120-001.

11.2.2 Exclusions

The schedule does not include any schedule risk mitigation measures or contingency, other than foreseeable risks such as productivity factors and seasonal restrictions such as weather conditions and sea freight availability.

11.3 Structure and Coding

The Execution Schedule has been developed based on the Work Breakdown Structure (WBS) and Execution Packages.

11.3.1 Structure

The schedule is structured to manage the whole lifecycle of the Project. Each major phase has been setup as a separate section within the overall schedule. These sections are:

- Milestones:
 - ♦ Primary.
 - ♦ Secondary.
- Permitting.
- Procurement:
 - ♦ Detailed Engineering.
 - ♦ Contracts.
 - ♦ Purchase Orders.
 - ♦ Bulk Materials Purchase.
 - ♦ Service Contracts.
- Logistics:
 - ♦ Sea Lift – Standard Freight.
- Construction:
 - ♦ Construction Contract Packages.
- Commissioning and Ramp Up:
 - ♦ Major Ore Handling Systems.

11.4 Work Breakdown Structure (WBS)

The WBS is a logical division and sub-division of the work into a 4 level hierarchical manner. Within the WBS, the Project is divided into Areas, Facilities, and Sub-facilities or Systems.

Table 11-1: WBS at Level 1

WBS #	Description
1000	Mine
2000	Iron Ore Process Plant and Onsite Infrastructure
3000	Railway
4000	Port
5000	Other Offsite Infrastructure
6000	Construction Facilities and Support
7000	Implementation Contractor's Services
8000	Owner's Cost
9000	Contingency / Escalation / Risk

Please see Work Breakdown Structure (refer to Section 12 of this report) for full details of the WBS structure.

11.5 Level of Detail

The schedule has been developed to a Level 3 detail at packaged level. Some critical items have been broken down to further detail due to relationships and dependencies.

All critical and early procurement packages have been identified in the schedule and tied to corresponding engineering, fabrication, and construction activities.

All construction activities have been associated to an installation contract.

For reporting purposes, the schedule can be summarized either by WBS Tree or by using the defined Activity Codes in P6 library such as Construction Execution Package.

11.6 Calendars

Activity durations are based on the following calendars:

Calendar 1	5 day work week including statutory holidays – 8 hour day	Default for Engineering, Procurement, Vendor Engineering, fabrication, assembly and modularization.
Calendar 2	Construction 7 day work week (no breaks) – 12 hour day	Default for delivery, construction, and commissioning.

11.7 Schedule Development Basis

11.7.1 General

The schedule is constrained by the key dates defined in the business case, which establishes:

- Railway Commissioned and Operating December 2019.
- Ship loaders No. 2 Available to Load Ore August 2020
- All dates in the schedule are early dates; early start and early finish.

11.7.2 Permitting

Permitting dates incorporated into the schedule are as follows:

Milestone	Date
Receive Project Certificate	30-Oct-2018
Revised Land Lease	31-Oct-2018
DFO Authorization – ore dock construction	01-Jan-2019
DFO Authorization – new water crossings	01-Jan-2019
Transport Canada & CTA rail construction approvals	28-Feb-2019

11.7.3 Engineering

The Engineering schedule has been developed to meet procurement requirements for technical specifications that lead directly into bid, award and fabrication lead times, which in turn, tie into sealift shipping windows to meet construction start dates.

- Standard duration for previously existing systems and construction services is 1 month (20 days) for specifications that require revision.
- Standard duration for new equipment specifications and systems is 2 months (40 days).
- Most of the Engineering is included under contractor scope of work.
- EPCM Engineering time frames are included in the schedule for each contract package
- EPCM Engineering completion target is end of 2017.
- Commence detailed engineering to support Early Procurement November 2016.

11.7.4 Procurement and Fabrication

Procurement schedule has been developed with the following priorities

- To deliver materials, equipment and services to site to meet construction start dates.
- To obtain vendor information necessary for the completion of engineering design.
- Lead times are based on a combination of firm and budgetary quotes.
- Package award dates scheduled to meet shipping seasons to support construction .
- Following Recommendation to Award (RTA), BIM has 2 days for Commitment Approval and 1 day to sign Letter of Award.
- Assumes that Geotechnical information is available by end of April for Ore Dock bid package.
- The current fabrication, pre-assembly and delivery durations are based on a combination of vendor budget quotes, firm quotes and historical data.

The following tables list the critical scheduled contract and P.O. award dates:

Table 11-2: Contract Package Award and Mobilization Dates

Contract	Description	Award	Mobilize to Site
CC001	Early Earthworks	Feb-17 (A)	Mar-17 (A)
CC002	Earthworks North	5-May-17	2017 Sea Lift
CC003	Earthworks South	12-May-17	2017/18 Sea Lifts
CG001	Ore Dock–Stage 1 (Piling)	5-Jun-17	2017 Sea Lift
	Ore Dock–Stage 2 (Balance)	18-Aug-17	2018 Sea Lift
CM001	Ore Processing–Stage 1 (Engineering)	21-Apr-17 (A)	N/A
	Ore Processing–Stage 2 (Balance)	15-May-17	2018/19 Sea Lifts
CX001	Wrap Around MEIP	7-Jul-17	2017/18 Sea Lifts
TM001	Fuel Storage and Distribution	31-Mar-17 (A)	2017 Sea Lift
TR001	Rail System-Stage 1 (Tie Testing & Selection)	25-May-17	N/A
	Rail System-Stage 2 (Supply and Install)	31-Aug-17	2018 Sea Lift

Contract	Description	Award	Mobilize to Site
TX001	Construction Camp	31-Mar-17 (A)	2017 Sea Lift
TX002	Permanent Accommodation Camps	13-Apr-17 (A)	2017 Sea Lift

Table 11-3: Supply Package Award, Lead Time and Delivery Dates

Package	Description	Award	Lead Time (*)	Sea Lift
PR001	Locomotives	26-May-17	66 weeks	2018
PR002	Ore Wagons	26-May-17	55 weeks	2018
PM100	Mobile Equipment – Mine Production	14-Jul-17	54 weeks	2018
PM007	Jaw Crusher Upgrades	22-Sep-17	32 weeks	2018
PE002	Power Generation	22-Dec-17	28 weeks	2018
PC001	Pre-Cast Concrete	14-Apr-17	22 weeks	2017
PM201	EPCM Vehicles	26-May-17	13 weeks	2017
BE001	Power Distribution Cable	28-Apr-17	12 weeks	2017/18
PM200	Mobile Equipment	12-Jan-18	12 weeks	2018
PE001	E-Houses	13-Apr-17	11 weeks	2017

11.7.5 Logistics

Material deliveries are all scheduled during the annual shipping windows meaning that some equipment and materials will need to be shipped as much as 9 months prior to when it is needed for installation.

Freight Delivery to Consolidation Hub June 1 to August 31.

Sealift Access to Milne Port August 1 to October 05. (Possible access window is July 25 to October 15, but for the purpose of the PFS level planning the window has been restricted.)

2017 Key Deliveries:

- Port and Mine Site Construction Camps and Sewage Treatment Plants.
- Fuel Storage Tanks:
 - ♦ 15 ML tank components.

- ♦ Jet A tank (pre-assembled) and x 3 ML tank (2 pieces to site).
- Construction Buildings and Facilities.
- Pre-Cast Concrete.
- Contractor Equipment:
 - ♦ Construction Camp Installation Contractor.
 - ♦ Earthworks Contractors.
 - ♦ Piling Contractor.
 - ♦ Site Services Contractor.

2018 Key Deliveries:

- Specialty Freight (Heavy Lift Vessels).
 - ♦ Stacker.
 - ♦ Pre-assembled Rail Car Dumper.
 - ♦ Crushing Plant Module.
 - ♦ Screening Plant Modules.
 - ♦ Yard Conveyors, Transfer Towers, Drive Houses.
- Ore Dock Installation Contractor plus Equipment/Materials/Sheet Piling.
- Railway Panels.
- Power Generators.
- Bridges.
- Buildings.
- Pre-Cast Concrete.
- Mine Production Heavy Equipment.
- Rolling Stock.
- Contractor Equipment:
 - ♦ Materials Handling Installation Contractors.
 - ♦ Railway Installation Contractor.
 - ♦ Buildings Installation Contractor.
 - ♦ Wrap Around MEIP Contractor.

2019 Key Deliveries:

- Specialty Freight (Heavy Lift Vessels):
 - ♦ Ship loader.
 - ♦ Reclaimer.

11.7.6 Construction

Construction schedule bases and assumptions are as follows:

- Construction schedule is based on 7 days/week, 12 hours/day calendar.
- Christmas shutdown for 2 weeks for non-critical activities.
- No allowance for weather days or other risks.
- All freight for first shipments to site must be delivered to the Canadian Consolidation Hub (CCH) by July 1 of each year.
- First shipment arrives on site August 1st of each year.
- Freight deliveries are dispersed throughout open water season with the final shipment arriving October 1 of each year.
- CM001 Package
 - ♦ Schedule generally based on details provided by ThyssenKrupp.
 - ♦ Lead time for rotary car dumper equipment delivery is 60 weeks per advice from Sandvik.
 - ♦ Assumed design revised to locate No.2 Yard Conveyor Drive House (and Surge Hopper, if possible) above high water mark to allow piling to be completed earlier.
- TX003 Package - Based on schedule provided by Bird Construction.
- PM007 Package
 - ♦ Schedule allows for additional time to repair/refurbish jaw crusher units in conjunction with relocation.
 - ♦ 4 weeks allocated in the schedule vs. 2 weeks specified by Masaba for basic relocation and modification without any repair/refurbishment.
- TR001 Package
 - ♦ Production Rates are based on 800 meters/day.
 - ♦ Schedule is NOT based on current bid received.
 - ♦ Ballast to be supplied and delivered to laydown areas in advance (*Ballast consumption by TR001 is three times faster than what CC002 can produce per day*).

- ♦ Mobilise to site in 2018 sealift and ship all material and equipment to site.
- ♦ Commence welding of rail into 500m lengths to prepare for track laying starting 1 March 2019.
- ♦ Need to construct rail arrival and departure yard to a large extent except around dumper, so as to allow construction trains to operate.
- CC002 and CC003 Packages
 - ♦ Schedule is based on work through winter, although current bids received have all made adjustments to their working schedule. Any changes will be adjusted after final negotiation.
 - ♦ Work can only start after accommodation is available at the Port and the Mine.
 - ♦ Work can only start on the permitted areas.
 - ♦ Bridge construction is impacted by the revised DFO permit date. The 3 bridges that are impacted are now scheduled for construction in the winter months, between Jan 2019 and April 2019. The bridge at KM86 not impacted by the revised DFO date will commence November 2018.
 - ♦ Culvert construction is not subject to DFO Authorization.
 - ♦ Will require three teams to work simultaneously on the permit dependant work for this area to pull schedule back.
- TX001 Package
 - ♦ Based on revised schedule submitted by Horizon north including progressive handover of rooms.
 - ♦ Assumes all utilities related to sewer, water and power will commissioned within these timeframes.
 - ♦ Contractor will provide all the beds required for their workforce.
- TX002 Package
 - ♦ Based on key milestones given to contractors.
 - ♦ Core facilities + 500 beds available for occupancy by December 1st, 2017.
 - ♦ Remaining 300 beds turned over at a rate of 100 beds per month thereafter.
 - ♦ Assumes 60 beds can be given to the contractor for their construction workforce.
 - ♦ Assumes all utilities related to sewer, water and power will be commissioned within these timeframes.

- On-Site construction labour requirements have been minimized by maximizing pre-assembly and pre-casting opportunities as much as possible at off-site module fabrication yards and suppliers.
- Early Earthworks contractor will utilize existing on site equipment and bed space.
- 15 ML, 3 ML and 750kl Jet. A fuel tank installation to occur during 2017 open water and be filled in same season – storage capacity needed for construction fuel.
- Port and Mine Site Construction camps will be first to site in 2017 sealift to allow for expedited installation as these are critical to mobilizing major earthworks contractors.
- Ship loader 2A will be off-loaded, installed and wet commissioned before the end of the 2019 shipping season.
- The following activities must completed in summer:
 - ◆ Reclaim berms earthworks construction (compaction).
 - ◆ Rail track welding (spring and fall).
- The following activities must be completed while the river and earthworks are still in a frozen estate with sub-zero temperature:
 - ◆ Rail Car Dumper Deep Excavation
 - ◆ Rail Car Dumper Backfill
 - ◆ Rail Alignment Deep Excavations
 - ◆ Bridge Installation (ice access)
 - ◆ Heavy and wide load movement to the mine site
- The following materials and equipment will be backhaul offsite:
 - ◆ All Contractor Equipment and Support Facilities used during construction.
 - ◆ All additional support structures used to stabilize pre-assembled modules during transportation.
 - ◆ All decommissioned and unused portions of the existing crusher spreads.
 - ◆ All decommissioned and unused Ore Haul Trucks (B-Trains).
 - ◆ All decommissioned and unused materials handling equipment (feeders, conveyors, etc.).
 - ◆ All temporary camp facilities including both currently existing camps and new camps brought to site for construction.

Key production rates:

- Rail embankment earthworks – 6000 to 8,000 m³ of placed material per 24 hour day (double shift operations).
- Infrastructure Earthworks – 3,000 to 3,500 m³ of placed material per 24 hour day (double shift operations).
- Rail panel placement applicable to TR001 – average 775 meters per day.

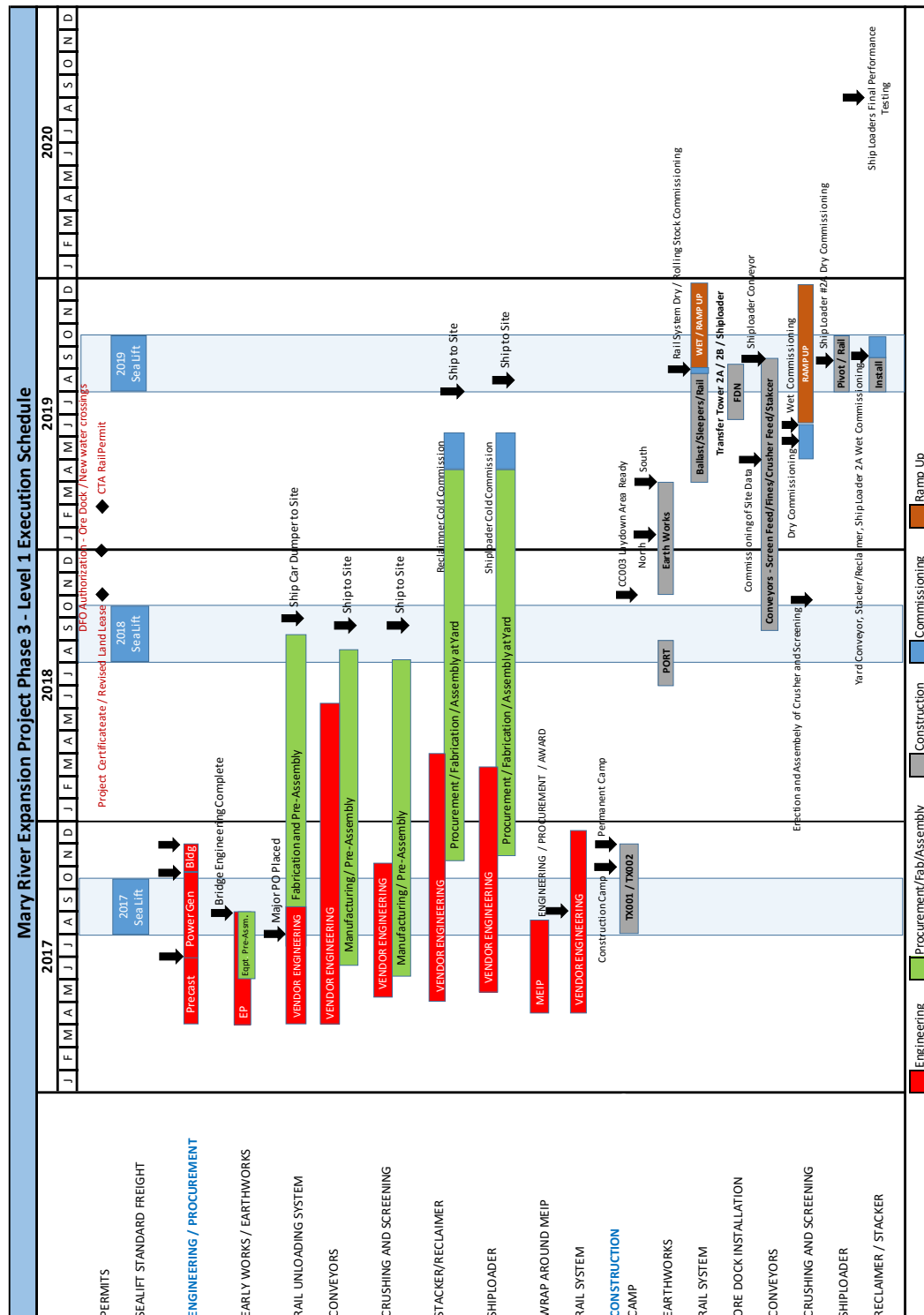
11.7.7 **Commissioning and Ramp Up**

Commissioning follows construction completion, including pre-operational testing. The sequence of the commissioning activities are as follows:

- Crushing and Screening plants commissioned as independent system apart from rail unloading station and yard conveying and stacking system.
- Port yard conveying stacking system commissioned after crushing and screening, but independently of reclaiming and Ship loading aspects of the equipment.
- Rail Ore Unloading station to be commissioned with complete rail system.
- Rolling Stock to be pre-assembled and pre-commissioned to the fullest extent possible.
- Feed conveyor from ore unloading station to screening plant to be commissioned with ore unloading system after crushing and screening system.
- Ship loaders will be wet commissioned by October 2019.
- Mine Production equipment to be pre-assembled and pre-commissioned to the fullest extent possible while still allowing for equipment to be transported from Port Site to Mine Site.

11.8 **Schedule Outcome**

The level 1 summary schedule for the Project is shown in Table 11-1.



Level 1 to Level 3 project schedules may be found in Appendices A11-2 to A11-4.

11.8.1 Key Dates

The list of Milestones for the Expansion Project is as follows:

Milestones	
Primary Milestones	
First Ore Crushed, Screened, and Stacked	23-May-19
First Ore on Train	25-Aug-19
First Ore on Ship	27-Sep-19
12 MTPA Production Rate Achieved	30-Nov-19
Final Performance Test Complete	13-Sep-20
Secondary Milestones (Construction Completion)	
Crushing and Screening	8-May-19
Rail System	9-Aug-19
Yard Conveyor, Stacker/Reclaimer	13-Aug-19
Ore Dock	25-Jun-19
Ship loader 2A	12-Sep-19
Ship loader 2B	24-Oct-19
Mine Site Ore Handling	30-Nov-19
Permitting	
Receive Project Certificate	30-Oct-18*
Revised Land Lease	31-Oct-18*
DFO Authorization - ore dock construction	01-Jan-19*
DFO Authorization - New water crossings o/s exist permits	01-Jan-19*
Transport Canada and CTA Rail Construction Approvals	28-Feb-19*

11.8.2 Critical Path

The critical path is defined as the sequence of activities that must be completed on schedule for the entire project to be completed on schedule. This is normally the longest duration path through the schedule. The Critical Path will change as the project evolves and activities are completed ahead or behind schedule.

The critical and near critical paths of this expansion project are mostly constrained by the open water delivery windows.

Level 1 to Level 3 critical path project schedules may be found in Appendices A11-5 to A11-7.

Below are the critical activities related to each windows:

- 2017
 - ♦ CC001 Completion of Early Earthworks to begin installation of camps in August to provide beds to start earthworks program.
 - ♦ TX001 Award and Completion of Construction Camps.
 - ♦ TX002 Award and Completion of Construction Camp
 - ♦ CC002 Contract Award & Mobilization to CCH
 - ♦ CC003 Contract Award & Mobilization to CCH
 - ♦ CM001 Contract Award, Vendor Engineering
 - ♦ CX001 Contract Award & Mobilization to CCH
 - ♦ TM001 Contract Award, Engineering, Fabrication & Delivery to CCH
 - ♦ TX001 Contract Award & Delivery to CCH
 - ♦ PC001 PO Award, Engineering, Manufacturing & Delivery to CCH
- 2018
 - ♦ CC003 Bridge Engineering, Fabrication and Delivery to CCH
 - ♦ CM001 Contract Award, Engineering, Manufacturing and Delivery of;
 - Car Dumper
 - Conveyors
 - Screening and Crushing Building
 - ♦ PE002 PO Award, Engineering, Manufacturing and Delivery to CCH
 - ♦ PM001 PO Award, Engineering, Manufacturing and Delivery to CCH
 - ♦ PR001 PO Award, Engineering, Manufacturing and Delivery to CCH

- ♦ CC002 Rail Earthworks
- 2019
 - ♦ CC003 Bridge Construction
 - ♦ CG001 Causeway, Yard Conveyor, Ship Loader and Transfer Tower foundations
 - ♦ CM001 Installation of Conveyors
 - ♦ CM001 Delivery and installation of Reclaimer and Ship loader
 - ♦ PM007 Decommissioning, Relocate and Modify Jaw Crushers No. 2&3
 - ♦ TR001 Rail System
 - ♦ CX001 Installation of Rail Office Building and Power Generation and Distribution
- Commissioning of:
 - ♦ Crushing and Screening
 - ♦ Railway
 - ♦ Port Stockpile Stacker/Reclaimer
 - ♦ Ship Loader No. 2A

11.8.3 Manpower Planning

An assessment of the manpower on site during construction has been made which is driven by information contained in submitted bid submissions and awarded contracts.

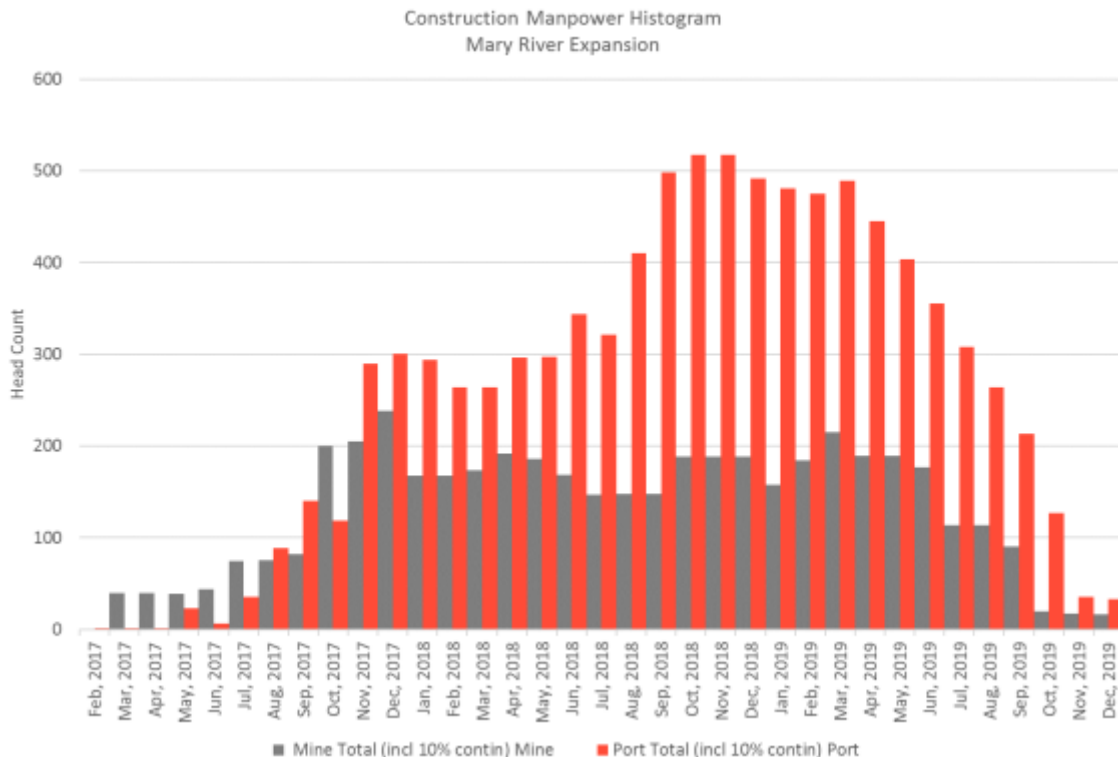


Figure 11-2: Construction Workforce Requirements (Appendix A11-9)

The figure shows workforce peaks aligning with the annual seal lift. To provide accommodation for this work force, camps will be established per:

- Mine – an 800 man camp will be built to house operations and construction workforces.
- Port – a 380 man camp will be constructed during the 2017 sea lift, supplemented by relocating 90 rooms (from the existing MSC camp) from Mine to Port.

When the proposed camp size is reconciled against expected construction work force size, insufficient port camp space is currently forecast. Excess camp capacity at the Mine (the 800 man camp has been purchased but not installed) suggests the shortfall in rooms forecast for 2018 at Milne may be accommodated by diverting 90 of the excess mine rooms for installation at Milne Port. Figures Figure 11-3 and Figure 11-4 have already been updated to reflect 90 rooms moving from Mine to Port.

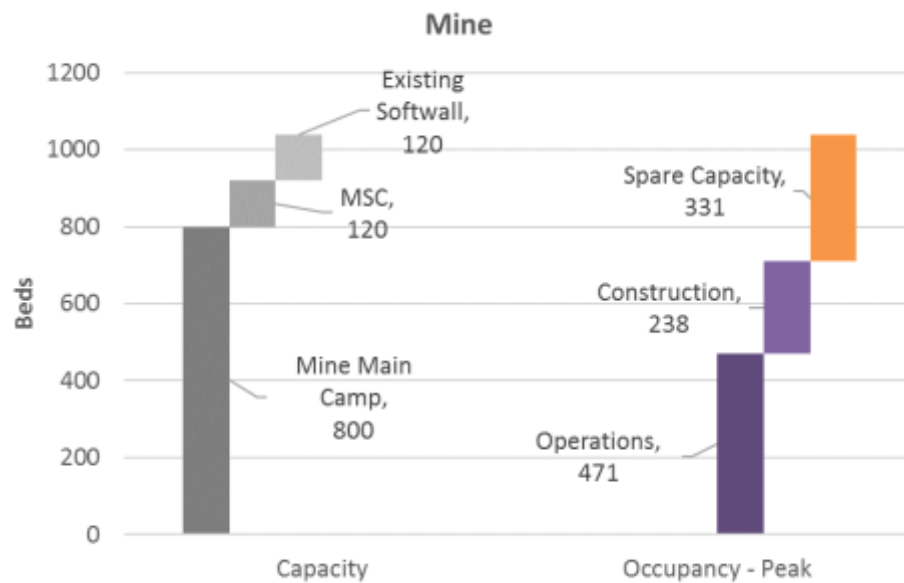


Figure 11-3: Mine Camp Capacity and Usage

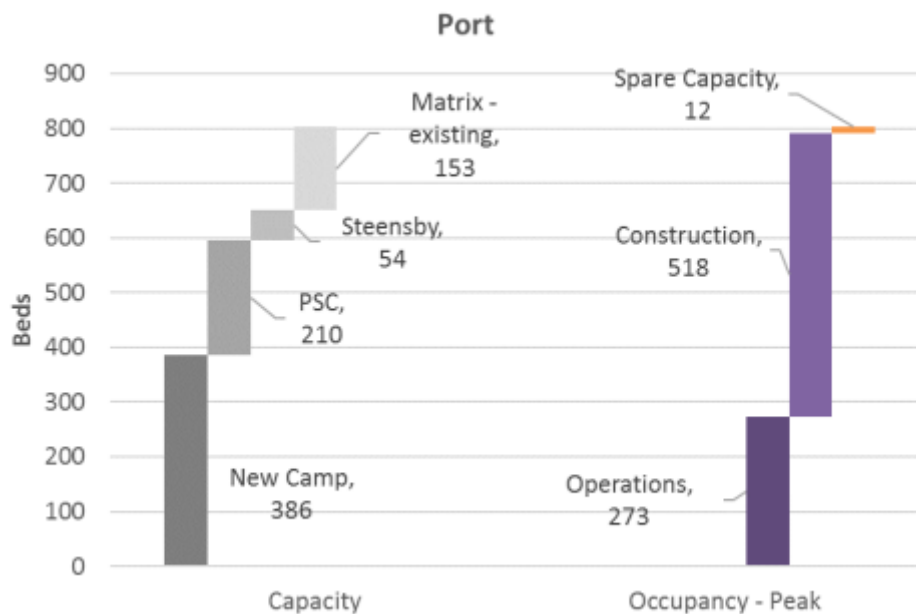


Figure 11-4: Port Camp Capacity and Usage

11.8.4 Execution Schedule Challenges and Concerns

- The following packages are critical to meet 2017 see lift dates;

- ♦ CC002 Award and Mobilization to CCH in 2017
- ♦ CC003 Award and Mobilization to CCH in 2017
- ♦ CX001 Award and Mobilization to CCH in 2017
- ♦ TM001 Award, Vendor Engineering, Fab & Delivery to CCH in 2017
- ♦ TX001 Award, Supply and Delivery to CCH in 2017
- ♦ PC001 Award, Vendor Engineering, Manufacture and Delivery to CCH in 2017
- ♦ BE001 Award, Manufacture and Delivery to CCH in 2017
- ♦ PE001 Award, Manufacture and Delivery to CCH in 2017
- ♦ ZL001 Award, Sea Lift Standard Freight
- ♦ YH002 Award of EPCM services for execution
- Design and Manufacture of rail unloading basement precast concrete is critical/late for 2017 sea lift;
 - ♦ Interface and loads need to be confirmed for CM001
 - ♦ Engineering design completed
 - ♦ Precast concrete detailed and manufactured by vendor
 - ♦ And delivered to CCH – the earliest delivery is September 19, 2017
 - ♦ Bridge Construction is driven by revised DFO Authorization for new water crossing – 01 January 2019. This will require all four bridges to be constructed at the same time to ensure winter construction (four crews required)
- CTA Approval obtained 28 February 2019 which will allow track construction to commence. It leaves less than six months to complete the construction.
- Must commence with welding of rail into 500m lengths in summer/fall of 2018 with all equipment and material to site in 2018 sealift (will this be possible?).
- The followings are critical to achieve first ore on ship in 2019.
 - ♦ Causeway construction (starts date limited by ocean ice)
 - ♦ Piling for conveyors and ship loaders
 - ♦ Installation of conveyors and ship loader pivot
- Due to the above limitation, it may only be possible to start loading with one ship loader at the end of 2019 shipping season.

11.9 Cash Flow Projections

Cash flows have been established to identify:

- Commitments
- Invoice Incurred cash flows
- Paid cash flows.

Detailed calculations are contained in Appendix A 11-8. A summary cash flow curve is presented in Figure 11-5.

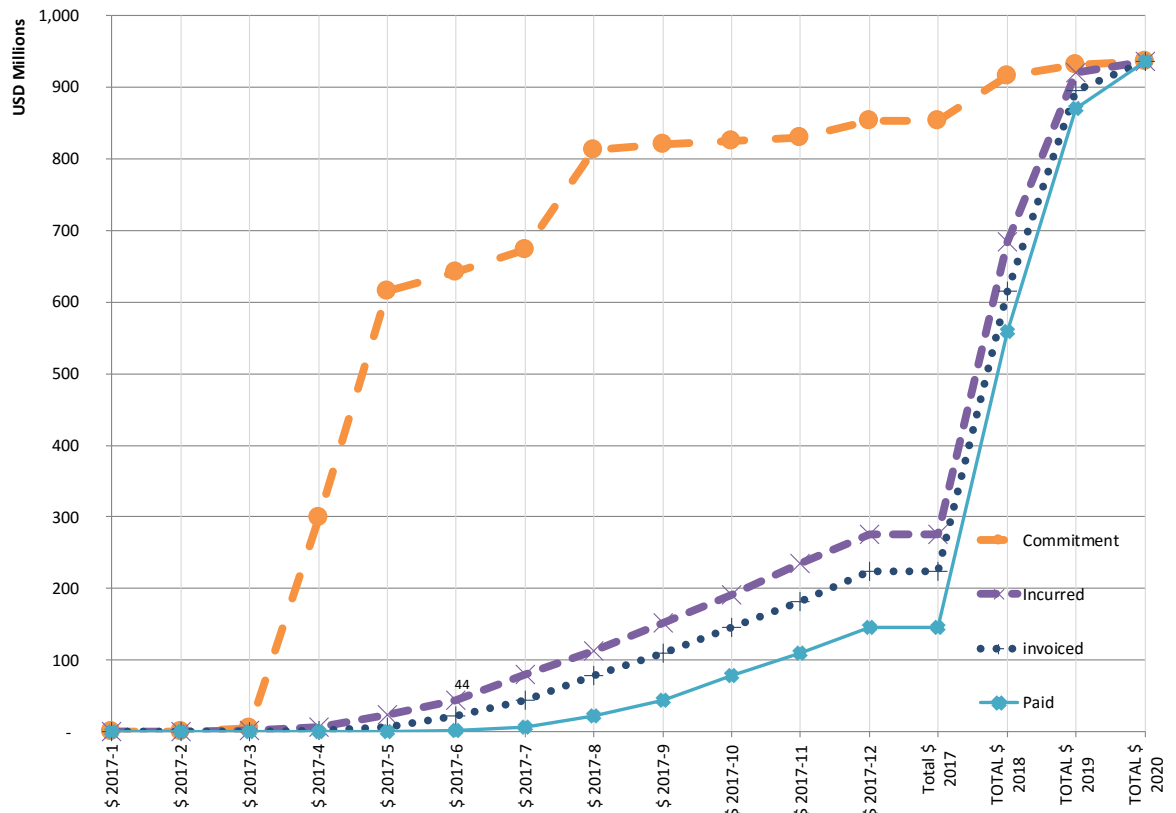


Figure 11-5: Project Capital Cash Flows

11.10 Reference Documents

Document Number	Title	Revision	Date	Appendix Number
H353004-00000-610-610-0001	Basis of Schedule	A	2017-04-19	A11-1
H353004-00000-103-120-0002-AP0E2	P6 Level 1 Schedule	A	2017-04-18	A11-2
H353004-00000-103-120-0002-AP0E3	P6 Level 2 Schedule	A	2017-04-18	A11-3
H353004-00000-103-120-0002-AP0E4	P6 Level 3 Schedule	A	2017-04-18	A11-4
H353004-00000-103-120-0002-AP0E5	P6 Level 1 Critical Path	A	2017-04-18	A11-5
H353004-00000-103-120-0002-AP0E6	P6 Level 2 Critical Path	A	2017-04-18	A11-6
H353004-00000-103-120-0002-AP0E7	P6 Level 3 Critical Path	A	2017-04-18	A11-7
H353004-00000-620-076-0001	Detailed Cost Profiles		14/4/2017	A11-8
H353004-00000-610-076-0002	Construction Manpower – Calculation			A11-9