From:	Nolan Jenkins
To:	"RoyLewis@nalcorenergy.com"; markturpin@lowerchurchillproject.ca
Cc:	Don Strickland; Jose Daniel Botero; Hernandez Garcia,David.; "Ibanez-de-Aldecoa,Rafael."
Subject:	CH0009 - Conveyor Information
Date:	Thursday, November 20, 2014 7:51:23 AM
Attachments:	_.png _.png Annex A13-1 - Execution Plan North and South Dams- Conveyors - Nov 20, 2014.pdf Lower Churchill N&S Dams - Schedule (with Conveyor 12Nov14).pdf

Roy / Mark:

As requested, please see attached additional information for the “Conveyors – Horizontal Placement Method” option. We will be discussing this in much more detail at our presentation tomorrow.

Regards,

Nolan

LOWER CHURCHILL PROJECT – MUSKRAT FALLS

PACKAGE CH0009 CONSTRUCTION OF NORTH AND SOUTH DAMS

CONSTRUCTION METHODOLOGY AND EXECUTION PLAN – CONVEYOR OPTION – HORIZONTAL PLACEMENT METHOD

ANNEX A13-1

TABLE OF CONTENTS

1. OVERVIEW 5
2. CLARIFICATIONS 6
3. GENERAL CONSTRUCTION SCHEDULE 7
4. INITIAL PLANNING AND TEAM IMPLEMENTATION 9
5. MOBILIZATION AND INFRASTRUCTURE SETUP 11
6. EQUIPMENT RESOURCES 16
7. SURVEY AND SURVEY CONTROLS 19
8. ENVIRONMENTAL MANAGEMENT 21
9. HEALTH AND SAFETY MANAGEMENT 23

10. QUALITY MANAGEMENT PROGRAM 29
11. PROJECT CONTROLS 30
12. QUANTITY MEASUREMENT AND PROGRESS ESTIMATES 33
13. DAILY EXECUTION OF WORK, PLANNING AND COORDINATION 34
14. MANPOWER SUMMARY 36
15. WORK TO BE SUBCONTRACTED 38
16. EQUIPMENT MAINTENANCE SYSTEM 40
17. TEMPORARY FACILITIES – HEAT, LIGHT, COMPRESSED AIR, INDUSTRIAL WATER 41
18. AGGREGRATE PROCESSING AND CRUSHING 42
19. TEMPORARY BRIDGE DESIGN AND INSTALLATION 44
20. PERMANENT ACCESS ROADS AND ACCESS ROAD TO LAYDOWN C1 47
21. UPSTREAM & DOWNSTREAM COFFERDAM (2015) 49
22. TEMPORARY STOCKPILE OF ZONE 3 CLASS 2 AND CLASS 1 51
23. EXISTING COFFERDAM REMOVAL 52
24. RCC COFFERDAM REMOVAL 53
25. TAILRACE ROCK EXCAVATION AND UNDERWATER EXCAVATION 54
26. TAILRACE PLUG REMOVAL 59
27. ROCK BOLTS AND ROCKFALL NETTING 60
28. UPSTREAM COFFERDAM 61
29. DOWNSTREAM COFFERDAM 65
30. INTAKE COFFERDAM 66
31. RCC TRIAL SECTION 67
32. ADVANTAGE OF USING THE SPLIT-LEVEL PLACEMENT METHODOLOGY TO PERFORM THE NORTH DAM 69
34. NORTH DAM (2016) 76
35. NORTH DAM (2017) 88

36. SOUTH DAM 89

37. DEMOBILIZATION 91

TABLE OF FIGURES

Figure 1: RCC Conveyors at La Breña II Dam, Spain 5
Figure 2: Muskrat Falls Bulk Excavation Project 6
Figure 3: O'Connell-Dragados Team Member Discussing Schedule 7
Figure 4: Craft Dry Room Facility, Muskrat Falls, NL 12
Figure 5: Concrete Plant (La Breña II Dam, Spain) 14
Figure 6: 6 x 1000 t Silos at La Breña II Dam, Spain 15
Figure 7: Sherwood Pond Mine Development, Labrador City, NL 16
Figure 8: Surveyor at the Soldier's Pond Site, NL 19
Figure 9: Soldier's Pond Site, NL 21
Figure 10: Trench with Rock Check Dam, Sandy Pond, Long Harbour site, NL 22
Figure 11: Pre-shift Meeting, Bulk Excavation Site, Muskrat Falls, NL 24
Figure 12: RCC Density Measurement (Porce II Dam, Colombia) 29
Figure 13: P6 Scheduling 32
Figure 14: Haul Trucks being Loaded, Muskrat Falls, NL 33
Figure 15: Encino Dam 34
Figure 16: Equipment Working at the Muskrat Falls Site. 36
Figure 17: Drill holes ready for Blasting at Muskrat Falls site 38
Figure 18: Welding Facility at the Muskrat Falls site 40
Figure 19: Aggregate Production for the La Breña II Dam 42
Figure 20: Spillway Bridge, Long-Sault Rapids, ON (Algonquin Bridge) 45
Figure 21: Site Roads at Muskrat Falls 47
Figure 22: Foundation Prep of Main Dam, Wuskwatim, MB 49
Figure 23: RCC Cofferdam to be Removed 53
Figure 24: Underwater Excavation, Wuskwatium Generating Station, MB 54
Figure 25: Blast at Muskrat Falls, NL 56
Figure 26: Downstream Rock Plug Removal, Wuskwatim Generating Station, MB 59
Figure 27: Rock Bolts being Installed, Muskrat Falls, NL 60
Figure 28: Building River Closure, Wuskwatim, MB 61

Figure 29: Earthfill Dam construction, Mont Wright, QC. 63
Figure 30: Earthfill Cofferdam Construction, Muskrat Falls, NL 65
Figure 31: General View of the Test Section at Portugues Dam, PR, USA..... 68
Figure 32: Split-level Placement Method Implemented at La Brena II Dam in Spain (2007-2008) 71
Figure 33: Dragados' Proprietary Formwork System for RCC Construction..... 72
Figure 34: Creter-crane Type Machine, fed by Agitator Trucks, being used for RCC Dam Construction..... 74
Figure 35: Foundation Clean-up (La Breña II Dam, Spain) 76
Figure 36: Dental Concreting of Uneven Foundation (Wuskwatim Generating Station, MB) 77
Figure 37: Downstream Formwork (La Breña II Dam, Spain) 78
Figure 38: Upstream Formwork (Portugues Dam, PR, USA)..... 79
Figure 39: Concrete Plant and Conveyors at Enciso Dam, Spain, currently under construction . 80
Figure 40: Transverse Joint Cutting with Vibrating Plate (Portugues Dam-Test Section, PR, USA) 81
Figure 41: Vibrating GERCC (Portugues Dam-Test Section, PR, USA)..... 82
Figure 42: GERCC after Vibration (Portugues Dam-Test Section, PR, USA)..... 82
Figure 43: Beni Haroun Precast Gallery 83
Figure 44: Green Cutting with Water Blasting (Portugues Dam-Test Section, PR, USA)..... 85
Figure 45: Excess Water Removal with Vacuum Truck (Porce II Dam, Colombia) 85
Figure 46: RCC Conveyors at La Breña II Dam, Spain..... 86
Figure 47: Earthfill Dam Construction, Mont Wright, QC..... 89

1. OVERVIEW

The following construction methodology, sequence, and procedures is intended to provide a summary of the primary construction activities and identify the main equipment, infrastructure setup, planning methods, work procedures, and project interfaces to be incorporated into the project. Specific items, including quality management, environmental protection and risk management, among others are further detailed in their respective sections of the Form of Tender and are not repeated in their entirety in this section. Various "backup" systems, redundancy measures, and risk management methods are also described in this section.

Figure 1: RCC Conveyors at La Breña II Dam, Spain

2. CLARIFICATIONS

During the preparation of this tender submittal certain assumptions and variations to the tender documents were made. These have been included within the submittal under Appendix A17 Exceptions. These clarifications form part of this submittal and modify various technical and commercial aspects.

Figure 2: Muskrat Falls Bulk Excavation Project

3. GENERAL CONSTRUCTION SCHEDULE

We have included our project tender schedule in Appendix A9 Schedule.

We have developed our preliminary schedule with extensive input from our construction and engineering teams. Our team will take a straightforward approach to keeping work on schedule and ensuring that our subcontractors stay on schedule. Our management approach is designed to avoid the necessity for schedule recovery from the start by maintaining progress and achieving milestones as planned.

The H.J. O'Connell Construction Limited (O'Connell) and Dragados Canada, Inc. (Dragados) team will apply stringent scheduling strategies and protocols from the outset that will ensure that we accurately identify key activities, monitor progress accurately and update the schedule on a routine basis. Our team will integrate input from all of our stakeholders to ensure that our schedule is complete and addresses the project's needs.

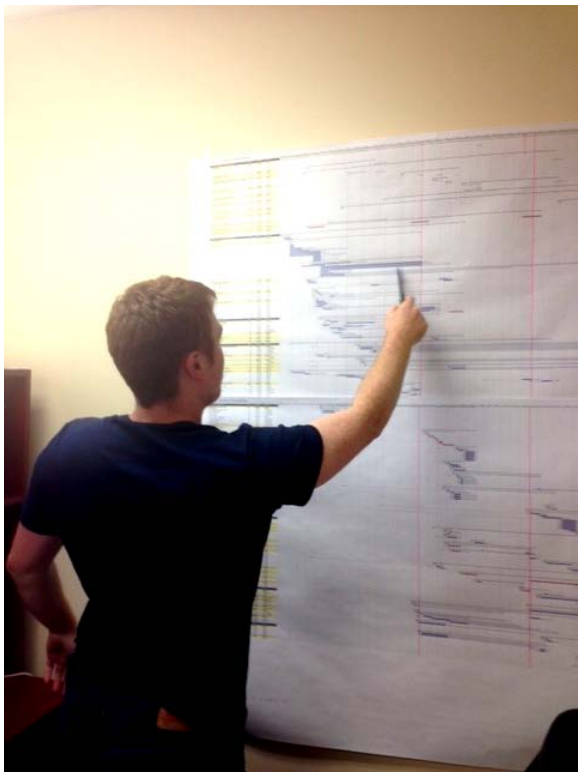


Figure 3: O'Connell-Dragados Team Member Discussing Schedule

The subcontractors will be incorporated into our schedule and specific schedule commitments and performance requirements will be reviewed and identified within our contracts. This builds schedule accountability into each subcontract as a contractual obligation.

The schedule submitted is *NOT* based entirely upon Exhibit 9 Work and Milestone Schedule but rather an adjusted schedule on the basis of the Construction Methodology. The noted changes are:

- M23 – Start of Foundation Preparation for North Dam
- M24 – Start of Placement of RCC

The new dates are:

- M23: 01-Aug-2016 versus 01-Jul-2016
- M24: 12-Sept-2016 versus 01-Aug-2016

These dates are achievable for our construction methodology. There is no affect on the overall completion date.

Our plan is to work a 14 day on 7 day out rotation schedule on a single shift (10 hours per day) in 2015 and a 14 day on, 7 day out rotation on a double shift basis (20 hours per day or 24 hours per day during RCC placement) in 2016 and 2017. There will be multiple crews that will overlap for the crews that are out on turnaround.

Our plan is to work a 14 day on and 7 day out rotation schedule with a single shift (10 hours per day) for the majority of the work in 2015. The crushing operation and support will be carried out on a separate 14 day on and 7 day out rotation schedule with two shifts per day and will include the necessary supervision to manage the additional shift.

4. INITIAL PLANNING AND TEAM IMPLEMENTATION

Upon the award of the contract on January 15, 2015 the core of the project management team will be established and assigned to the project on a full time basis. The initial goals/activities by this group will include:

- Initial project planning
- Mobilization (equipment and materials) and infrastructure setup
- Procurement of major items
- Project systems and controls setup
- Hiring of other team/staff members
- Commercial orders (suppliers and subcontractors)

This group will include as a minimum the:

- Project Manager
- Deputy Project Manager/Construction Manager
- General Superintendent
- Equipment/Maintenance Manager
- Health and Safety Manager
- Quality Assurance Manager
- Business Manager
- Human Resources Manager
- Project Engineer
- Schedule Engineer
- Senior RCC Engineer
- Enviromental Manager
- Coordinator

Senior RCC Engineer This group will include as a minimum the:

After initial planning activities are completed, this group shall also be responsible for the project implementation and mobilization phase and will put in place the measures and infrastructure required to execute the work in accordance with the schedule provided. They will initiate site hiring to complete the initial infrastructure installation.

The primary responsibilities of the group will be the establishment of:

- Company interface arrangement;
- Prepare project transition documents and meetings. This takes the tender information from the project estimate team to the project execution team;
- Draft, submit and have approved the Site Specific Safety Plan;
- Draft, submit and have approved the Site Specific Environment Plan;
- Draft, submit, and have approved the Site Specific Quality Plan (per ISO 9001 requirements). Begin preparation of project specific work plans, procedures, inspection requirements, verification forms, etc.;
- Set up and have approved the Project accounting system (both for internal and Company account requirements);
- Setup, submit, and have approved the drawing control, document control, and records system that is compliant with the Company's stipulations;
- Compile, submit, and have approved the project baseline construction schedule;
- Negotiate, finalize and prepare the necessary subcontracts and supplier purchase orders required for the initial stage and on-going work;
- Establishment of staffing schedule for other project team members;
- Establishment of the project reporting requirements, setting up and submitting for approvals the project reports, finalize the daily, weekly, and monthly report formats;
- Finalize the RCC batch plant equipment, setup, delivery details, operational aspects, and procedures and submit to be approved;
- Meet with the following:
    - Local Business to explain the project scope, supply requirements, and further identify business opportunities not identified during the time of tender
    - Aboriginal community/groups
    - Hiring Group
    - Union Groups

  Meetings would establish the contacts, proper channels for various activities, introduce the primary contacts within the project team and their respective responsibilities.

- Prepare the project "markup" package and work assignments, request and execute the markup meeting and complete any jurisdictional claims and final assignment. The

markup package/presentation is to include a detailed description/scope of the work to be carried out to deliver the project;

- Human Resources to prepare skills requirements/list, then inventory availability from within the Aboriginal Community, local area, Labrador region and union locals; and
- Submit project bonding and insurance documents to the Company and other documents that may be required by Federal and Provincial authorities.

Within 4-6 weeks of contract award additional staff to round out the Project Team will be put in place and will include:

- Safety Advisors
- QC Engineers and Inspectors
- Field Engineers
- Maintenance Superintendents
- Maintenance Planners
- Superintendents
- Travel Coordinator
- Clerks

The complete project team will increase from those identified above to reflect the manpower histogram and Organization Chart in Appendix A1-8.1/8.2. A list of proposed staff for each position, complete with their alternates, is attached complete with resumes in Annex A1-9.

5. MOBILIZATION AND INFRASTRUCTURE SETUP

In April and May 2015 we plan to complete the following activities:

- Set up the office for 2015 (8 trailers in the Company Laydown) with required water and sewer systems. Power will be supplied by Owner.
- Setup a Maintenance Facility (i.e. Welding Shop) complete with all tooling. Sea cans will be setup for storage and warehouse requirements.
- Set up Maintenance lunchroom and washroom facilities.
- Mobilization of equipment and assembly of large equipment.
- Set up smaller site office complete with lunchroom, washroom and dryroom facilities.

Figure 4: Craft Dry Room Facility, Muskrat Falls, NL

A drawing of the Contractor's Temporary Infrastructure requirements is included in Annex A13-4.

In May and June 2016 we will mobilize the following additional items required for construction:

- Main Office and Lunch Rooms

  The main office setup will be expanded by 4 offices to accommodate the additional staff. Similarly, the extra lunch rooms, dry rooms and wash cars will be required for the additional craft

- RCC Batching Plants

  Two batching plants with two twin shaft mixers each will be set up in Area J to take advantage of the power supply available from the Company and to be in close proximity to the RCC aggregates. The plants will each have a capacity of 200 m^3 per hour of production each, and have a backup power system on standby. It will be a fully automated portable wet-mix batching establishment. An in-line aggregate storage bin with four (4) separate compartments for the various aggregates is included. Cement storage for type GU Cement and Flyash will also be provided.

  The following is a general list of equipment to be included in the batching plants:

  - Two Arcen twin shaft mixers, 3 m^3 each.

- Aggregate storage bin with four compartments and 400 tonne capacity
- Aggregate scales
- Belt conveyor
- Cement and fly ash storage silos
- Cement and fly ash scales
- Ice and water scales
- Power panel
- Prewiring
- Aggregate handling system
- Computerized batch control system
- Dust collection system for mixers
- Rotary screw air compressor
- Admixture system
- Modular control room
- Water chiller
- Generator (backup power) Trailer
- 980 CAT Loader

A waterline will be established from the river to the plant. An ice flakes plant and a water heating plant will be added. These plants will be also setup in Area J.

Our proposal is based on utilizing power supplied by the Owner.

Figure 5: Concrete Plant (La Breña II Dam, Spain)

Refer to Annex A13-5 for a general arrangement of the RCC Plant setup, aggregate stockpiles, etc.

- Cement Silo Setup

  There will be six silos installed for cement and flyash storage. Each silo will hold 1000t for a total of 6000t. These will be set up on concrete foundations adjacent to the RCC Plant. The silos will be delivered in pieces and will take approximately one week to set up per silo. The setup crew will generally consist of:

  - 1 – Foreman
  - 1 – 80T Crane
  - 4 – Ironworkers
  - 2 – Labourers

Figure 6: 6 x 1000 t Silos at La Breña II Dam, Spain

- Conventional Concrete Plant Setup

  The concrete plant will consist of:

  - Concrete Plant for CVC (60m^3/hour)
  - Concrete heating for CVC
  - Water chilling plant for RCC

  The plant will be set up in the back end of Area B.

Again our proposal is based on utilizing power supplied by the Owner to operate the conventional concrete plant.

RCC batching plant specifications and layouts can be found in Annex A13-12.

- Two (2) x 24" Conveyors

  These conveyors will transport the RCC from the Plants to the Dam. The two 24" lines will be set up downstream the RCC Dam getting into the Dam through block 13.

6. EQUIPMENT RESOURCES

The equipment allocated for this project will be a combination of existing owned equipment, new purchased equipment and third party rental equipment.

Figure 7: Sherwood Pond Mine Development, Labrador City, NL

The table below is the anticipated type and quantity of equipment required for this project.

Table 1: Equipment Summary Table

Item	Description	Quantity
1	420 Backhoes	6
2	35t Excavators	6
3	45t Excavators	3
4	75t/90t Excavators	4

Item	Description	Quantity
5	120t Excavator	1
6	35t/40T Trucks	20
7	75T Off-highway Trucks	5
8	D5/D6 Size Dozer	5
9	D8 Size Dozer	5
10	Cat 980/988 Size Loader	6
11	140H Size Grader	1
12	10T/12T Compactors	6
13	Crushing Setup	1
14	Screening Plants	1
15	RCC Plants	2
16	Mobile Concrete Plant	1
17	Rock Drills	5
18	Clearing Harvestors	1
19	Welding Shop	1
20	Office Trailers	12
21	Lunch Rooms	6
22	Fuel Truck	2
23	Welding Truck	1
24	Mechanic Truck	1

Item	Description	Quantity
25	Pickups	50
26	Stadium Light Towers	5
27	Standard Light Towers	12
28	IT38 Tool Handler	1
29	48 Passenger Buses	5
30	40T Crane	1
31	80T Crane	1
32	120T Crane	1
33	Grout Plants	2
34	Conveyors	2

7. SURVEY AND SURVEY CONTROLS

Initial control point/monument information will be obtained from the Company's project control system. These points will be utilized to setup and maintain a project control system. The project control points will be maintained in AutoCAD in a project survey control drawing(s). Each project control point established will be cross referenced and checked back to two (2) independent setups at two (2) independent project control points. The Northing, Easting, elevation, and control information (type and description) will be provided to the Company. Project control setup will be carried out utilizing a total station arrangement providing the necessary accuracy and precision. Project control points and the Company project points would be marked and protected from construction activity damage. As part of the Quality Control requirements under the project procedures for "Survey" these points would be periodically checked to ensure conformance to the established/assigned data.

Figure 8: Surveyor at the Soldier's Pond Site, NL

After the project control is established we plan to complete a joint survey (Contractor/Company) of all excavation and fill areas to verify the current "original ground conditions". Should removal of materials occur on a cost plus basis or for any other reason, surveys will be completed at each stage to identify, as required, the associated quantities.

All layouts, drawings, modeling, control calculation, quantity work, as-builts, etc. will be performed using AutoCAD Civil 3D in conjunction with Terramodel software programs. Field survey would be carried out using a combination of GPS setup with Base Station, Total Stations,

and Standard Autolevels. Where applicable, lasers will be utilized to control excavation limits and in particular lift heights on dam structures (in conjunction with standard survey stakes and grades).

Calibration of all survey instrumentation and tools will be carried out in accordance with the Quality Control procedures. These procedures will take into account the manufacturers specifications and requirements, project requirements and requirements under the contract specifications. Calibration certifications, site check records and maintenance records will be maintained on site in accordance with the project document control requirements.

Survey control and verification will be the primary responsibility of the survey department including initial layout, “lines and level” checks, as-built final surveys, etc.

Calculations of co-ordinates and controls will be verified independently by a second person to ensure the location information provided in the field is correct.

8. ENVIRONMENTAL MANAGEMENT

The team will put in place measures to minimize impacts to the environment and adhere to the requirements of the contract documents and federal and provincial regulatory requirements. The following specific requirements will be addressed in project planning and or site procedure preparation to supplement our environmental program requirements:

Figure 9: Soldier's Pond Site, NL

- Silt fence
- Dewatering work areas
- Wildlife encounters
- Fueling/transfer procedure
- Spill procedures and on-site spill kits
- Site waste disposal procedures
- Excavation in water and placement of fills in water
- Borrow pit development
- Stripping and grading
- Aggregate management and crushing
- Batch plant operations

- Dust control

Figure 10: Trench with Rock Check Dam, Sandy Pond, Long Harbour site, NL

Typically all of the constructions activities executed on the project will have formal work procedures prepared covering all aspects of the work to be completed. Included in the procedures for each work element are environmental measures to be undertaken, the risks and required measures to mitigate. These are reviewed prior to work starting to determine the measures to be carried out before work commences. At the beginning of the project (and updated throughout the project as required) an environmental assessment is made and documented. The work activities are identified, permitting requirements, environmental risks documented and measures to mitigate are summarized. This will form a part of the project planning and execution information. Please refer to Appendix A6 Environmental Questionnaire for additional information

9. HEALTH AND SAFETY MANAGEMENT

While all of the principals of the Joint Venture have been consistent leaders in safety performance in their respective areas of endeavor throughout North America, the O'Connell Occupational Health and Safety Management System will direct the Health and Safety Program on the Lower Churchill Project. The OHS Management system that will be implemented at the Lower Churchill Project will meet and in most cases surpass all legislative and Company requirements and meet the criteria for COR Equivalency from the Newfoundland & Labrador Construction Safety Association.

The Joint Venture recognizes that the health and safety of its employees and the protection of the environment is as much a value in achieving corporate objectives as the productivity of its workforce and the quality of its work. With the belief that all incidents are preventable, the Company and management of the Joint Venture are committed to transferring their vision of Zero Harm to all workers at all levels of the organization. Through a cooperative attitude and the empowerment of workers to be pro-active safety leaders, the vision of an incident free workplace is seen as both a realistic and obtainable goal.

Using best management practices, senior management shall exercise leadership by establishing and realizing goals and objectives that achieve optimum health and safety results. Based on the principle that all undesired incidents can be prevented, the Joint Venture is committed to realizing an incident free workplace for its employees.

The Joint Venture Management Team has the responsibility for, and is committed to, providing a safe work environment where hazards are identified and controlled. Our goal of "zero incidents" is based on the following principles:

- Nothing is so urgent or important that we cannot take the time to do it safely.
- Safety is the first consideration in everything we do.
- Everyone has the right to a safe environment.
- Identification and mitigation of risk is everyone's responsibility.
- All incidents are preventable.
- All employees must be involved and supportive of the safety program.
- Working safely is a condition of employment.

The Joint Venture Health and Safety Program will manage the health and safety of all subcontractors in the same manner that we will manage our own system. All subcontractors will be held to the same standards of safety excellence that we expect from ourselves.

The Joint Venture recognizes that the prevention of accidents and incidents in the workplace is a responsibility that must be shared by both the Company and the workers. The establishment of an effective and functional Project Joint Occupational, Health and Safety (JOHS) Committee, will facilitate the promotion of a pro-active safety culture throughout the operation.

A senior manager and a representative selected by the committee members representing the workers will sit on the Project JOHS Committee. The Joint Venture itself will have in place an effective JOHS committee (separate from any project committee), the chairs of which, will sit on the "Project" JOHS Committee. Membership on the project JOHS Committee will also include representation from the Company if desired. All members of the Joint Occupational, Health and Safety Committee shall be appropriately trained as per applicable legislative requirements.

Figure 11: Pre-shift Meeting, Bulk Excavation Site, Muskrat Falls, NL

The Joint Venture will work cooperatively with the Project JOHS Committee. As a functioning entity, the committee shall be consulted and involved in all aspects of the development, implementation and maintenance of the Health and Safety Program.

Prior to working on the Lower Churchill Project all employees shall be required to attend and complete the comprehensive project orientation and induction training. At the time of hiring it

will be ascertained that all employees are appropriately trained to perform the tasks for which they are hired. In addition, all employees, staff and craft included, will undergo a medical examination complete with a drug and alcohol test prior to being approved for work on the Project.

We will evaluate the safety training and certifications of employees prior to and upon hiring and will coordinate the safety training for all employees either in-house or through external accredited training providers. We will maintain accurate training records and will require employees cleared through the applicable union halls to provide their necessary safety training certifications as a condition of employment.

Management and supervisors will receive the appropriate training to allow them to fulfill their responsibilities pursuant to legislative requirements.

The Joint Venture acknowledges its responsibility to ensure the health safety and welfare of the workers on the Lower Churchill Project. The Joint Venture believes that a healthy and safe workplace begins with a well-informed workforce who not only are aware of the hazards of their jobs and their workplace, but who also know how to control those hazards. The Joint Venture will develop, implement and maintain Safe Operating Procedures, designed to train and guide their workers in the safest possible methods to perform their specific duties. Safe Work Practices shall be included as part of the Safe Operating Procedures.

The Joint Venture recognizes a hazard as a condition, substance, behavior or practice with the potential to cause loss due to injury, illness or property damage. The ability to adequately recognize, evaluate and control these hazards strengthens a company's HSE management system. Work can be done safely even in the presence of significant hazards when the hazards have been systematically identified and evaluated and effective controls developed, implemented and maintained.

The Joint Venture will conduct job safety analysis (JSA) to evaluate all the tasks to determine the safest and most efficient way to complete the specific job. JSA's identify the hazards in each task of the job and determine control measures for those hazards.

The risk identification team will consist of supervisory personnel, workers immediately involved and familiar with the task, and a representative from the safety department. If necessary an expert in a particular field may be called upon to provide assistance. A Safety Task Analysis will

be conducted by supervisory personnel with their crews to review task related hazards and controls prior to the start of shift and when tasks are changed.

Before each shift the supervisors (including foremen) on the project participate in a cross-shift meeting to review the activities completed/ongoing from the previous shift and plan the upcoming shift. During the session (twice daily on double shift) issues related to safety are reviewed and identified to be communicated to the workers at the beginning of the shift. Prior to starting their shift, all employees will complete their "Stop and Think" and "Tailgate Meeting" and conduct a safety inspection of their workplace to identify any hazards that may pose a potential risk to their health and safety. Employees will take corrective action to control those hazards and reduce the risk to an acceptable level. Employees operating equipment shall conduct and document a pre-start inspection of their equipment or vehicle.

The Joint Venture's supervisory personnel shall conduct inspections of their workplaces as part of their daily responsibilities. Management inspections of the workplace shall be conducted on a weekly basis. A management inspection team shall consist of supervisory personnel and worker representatives from the trades' crafts working in that area.

In the event of an incident an effective Incident Investigation shall be conducted that will identify the root cause and recommend corrective action to prevent recurrences. The appropriate department/area manager will lead all major and serious incident investigations. Safety personnel will provide support to supervisors and line management for minor and serious incident investigations and participate on the senior management team for the investigation of major incidents or those with major potential. When an injury, incident or condition is serious, the supervisor will immediately notify a worker representative on the JOHS Committee and allow them the opportunity to participate in the investigation.

An Emergency Response Plan will be developed for the project to ensure effective control and response to a variety of emergency situations that may possibly occur. The Emergency Response Plan will be designed to ensure the most efficient and effective use of both the Joint Venture's and the Company's resources. A site emergency response team will be formed from amongst the employees who will receive regular training in current emergency response techniques, including first aid and initial fire fighting techniques. The emergency response procedures and protocols will be communicated to all employees and site visitors and will be posted in high traffic areas of all projects and sites.

In the event of an injury the safety department will be responsible for administering the disability management program for all project employees and shall implement a process of communication with the injured or ill worker during the initial stages of recovery and during the subsequent return to productive employment. The process shall be designed to assist workers to return to work at a pace and in a position, which is appropriate to their level of recovery. As part of their orientation workers will be made aware of the procedures to follow in the event they are injured on the job.

The Joint Venture will implement an effective communications system that will benefit all aspects of the project by allowing the free flow of health and safety information. The first exposure that new workers, contractors and visitors will have to the project will be their orientation training session. Through this method of instruction we will communicate to all personnel the information required to perform their duties in a safe and healthy manner.

Health and safety information will also be communicated to workers during safety meetings. These meetings could take the form of a pre-shift task assignment, a job safety analysis or a weekly "Tool Box "meeting. Tool Box topics will be developed and issued by the safety department. Workers will be encouraged to step forward and lead/participate in the weekly tool box meetings.

Health and Safety information that has to be communicated to employees in a timely manner will be communicated through a written safety memo, notice or alert, that will be forwarded to all supervisory staff to be included in their next safety meeting and will be posted on the health and safety notice boards. These notices will also be sent out electronically. Safety Notice Boards will be established at high traffic locations and lunchroom areas to further support safety communications initiatives. Safety banners, posters and signs will be placed in facilities and work areas to further communicate safety information to personnel. Universal hazard identification and warning signage will be utilized in the appropriate work areas to warn workers of potential hazards and communicate appropriate control measures.

All workers will be informed of the names of the members of the JOHS Committee. All committee members will be trained to communicate with workers in order to address their concerns and inform them of any relevant information that may help protect their health and safety. The minutes of all JOHS Committee meetings shall be posted on the safety notice boards.

The findings of formal safety inspections and ensuing recommendations or directives will be posted on the safety notice boards to inform the workforce of the identified hazards and subsequent controls.

As part of the Safety Orientation and ongoing training initiatives all project employees will be aware of their responsibilities and the procedures for reporting accidents and incidents. The findings of accident/incident investigations, including root causes and ensuing recommendations will be communicated to employees in a timely manner.

In the event of a serious incident, the Emergency Response Plan may be activated. Depending on the level of the emergency, external agencies may have to be contacted to provide assistance. All personnel will be trained in their roles and responsibilities, including who will be responsible for contacting any outside sources.

Our safety philosophy is based on the principles of ethical conduct, mutual trust and teamwork. To ensure continuous improvement of our safety program, we challenge, test and evaluate, as well as solicit input from site personnel to continually raise our standards of safety excellence. Documents and data containing information pertinent to the operation and performance of the health and safety program will be identified and controlled. The senior management team shall review the health and safety program on a regular basis to ensure its continued suitability, adequacy and effectiveness.

Please refer to Appendix A5 Health and Safety Questionnaire for additional information including a copy of the safety program that would, in conjunction with the Company's plan, form the basis of the program to be implemented.

10. QUALITY MANAGEMENT PROGRAM

The Joint Venture will implement and maintain a full Quality Assurance and Control Program in support of the Company provided laboratory testing facility and third party Quality Control.

Field inspection for activities such as concrete pours, rock bolting and grouting, foundation preparation and preparation and sign off of the necessary documentation will be carried out by staff Quality Control engineers.

Procedures, method statements, checklists, certifications and other documentation will be prepared for all necessary operation. Any testing records received from the Company's Quality Control lab will be integrated into the final as-built turnover documents prepared by our Quality Department.

Figure 12: RCC Density Measurement (Porce II Dam, Colombia)

For this project, the Quality Management System (QMS) currently employed by O'Connell will serve as the foundation for our program. Refer to Appendix A7 Quality Questionnaire (No Design) for additional details.

11. PROJECT CONTROLS

Following award the project team would immediately establish the project controls and the necessary interface with the Company's systems and requirements. Systems (along with report frequency, identification systems, filing methods, transfer and posting methods, electronic funds transfer for invoice payment, etc.) will cover:

- Cost and accounting
- Survey controls
- Documentation, drawings, correspondence may include:
    - job reports
- Report schedule
- Project numbering system
- Electronic transfer and posting system
    - QC records
    - QC inspector qualifications
    - Letters, correspondence, emails, faxes
    - Construction drawings
    - Shop drawings
    - Schedules
    - Mill and conformance certificates (cement, flyash, waterstop, additives, etc.)
    - Batch plant certification
    - Batch plant records/logs and tickets
    - Mix designs & trial batch records
    - Field inspection signoff records
    - Concrete pre concrete inspection checklist (sample in Annex A13-6)
    - Laboratory cylinder test report – compressive strength
    - Concrete field test reports
    - Concrete material(s) mill certificates
    - Grouting records
    - Survey as-builts
    - Equipment calibration certificates
    - Crane certifications and inspections
    - Rock bolt testing records

- Subcontractor protocols

It is intended to use current in-house accounting and cost control systems for the management of cost control and accounting systems. We would meet with the Company and identify the required reporting needs and format according to the requirements outlined in Exhibit 3 Civil Work – Coordination Procedures. With this information, we will to the extent possible, develop custom reporting formats, export formats, and summaries to meet the needs of the Company and permit electronic transfer and upload into the Company's systems where possible.

Costing and scheduling information would be tied to a common code/numbering and identification system (a work breakdown structure (WBS)). Utilizing the agreed WBS we will establish the costing protocols consistent with the Company's system for reporting and monitoring. Coding system and WBS would then be the basis for the financial accounting and job costing modules.

Change Orders will be issued for any Company or Contractor identified changes to the Issued for Construction drawings and specifications, changes in field conditions, etc. The Contractor will work with the Company to identify the cost and/or schedule impacts of the Change Request prior to the issuance of a Change Order.

Scheduling will be carried out using Primavera. Construction activities will be tracked based on the WBS utilizing the unique code assigned to each activity. Report and schedule structures will be summarized/presented at any detail level required.

With respect to documentation and correspondence control, all documents, drawings, procedures, etc. will be numbered as specified in the Joint Venture's QA procedures and adhere to any numbering system identified by the Company. Typically all documents will be recorded in an Excel database format.

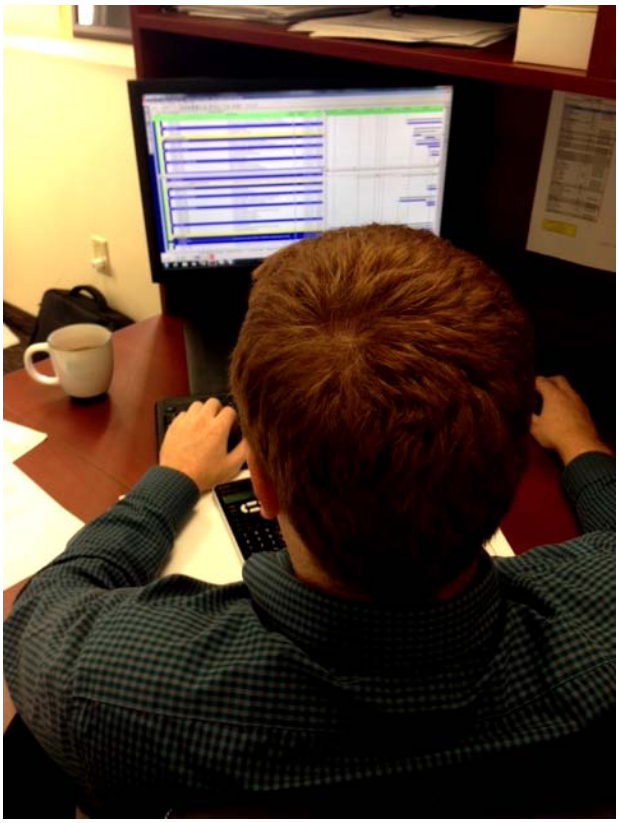


Figure 13: P6 Scheduling

All maintenance will be tracked and recorded by the company's "maintenance control system". All planned maintenance tasks will be scheduled at regular planned maintenance (PM's) intervals as per the manufacturer's recommendations and/or equipment specifications. All maintenance checks at defined intervals (as determined by equipment hour meeting meetings) will include a full checklist meeting or exceeding those recommended by the manufacturer.

12. QUANTITY MEASUREMENT AND PROGRESS ESTIMATES

Progress Estimates will be prepared monthly and agreed upon with the Company. Estimates will be prepared electronically using an approved progress form. The cutoff will be 25th of each calendar month. Review of each estimate will be completed within 15 days. All necessary documentation and backup will be submitted as required including:

- Invoices
- Payroll hours
- Subcontractor progress estimates/invoices
- Equipment hour records
- Accounting records and verifying backups
- Survey and quantity calculations

Figure 14: Haul Trucks being Loaded, Muskrat Falls, NL

Submittals for changes, additional work, or deletion per normal contract procedures

13. DAILY EXECUTION OF WORK, PLANNING AND COORDINATION

To ensure the work is planned, coordinated and executed in the most effective and safe manner the normal operational requirements of the Joint Venture include:

- Daily Cross Shift Meetings – This will bring together carryover information from the previous shift (i.e. what was completed and what remains outstanding). It also plans the requirements for work in the upcoming shift, safety, material and equipment needs and co-ordination, equipment maintenance planned and change-out and downtime, subcontractor requirements (support) and schedules;
- Internal Planning Weekly Meetings by Area/Discipline;
- Internal Weekly Schedules – Two and/or three week look-a-head, and rolling;
- Internal General Weekly Meetings – all areas (includes sub-contractors); and
- Coordination Meetings with other contractors (if required)

Figure 15: Encino Dam

The primary key to the successful integration of contractors and subcontractors is to ensure good communication and timely and accurate information flow between all parties. The Joint Venture will work with the Company to establish project procedures (and adhere to those in

place), meeting schedules, documentation processes, and other protocols to ensure effective communication and transfer of information, ultimately leading to successful collaboration and integration of all concerned as it pertains to the project work program.

During the course of the project work, weekly, monthly, or daily coordination meetings as required, will be held to review, discuss, and co-ordinate the work program and contractor interfacing. A correspondence and documentation protocol and contact list will be established, ensuring a mechanism is in place to control the flow of documents and ensure those required to have select information would receive it and that this information is properly files and easily retrievable.

Typically, prior to each phase of the work, critical component construction, and critical equipment lift/installation, a co-ordination planning session and/or meeting will occur involving all the required parties. The activities, work plans, scheduling, safety requirements, QA measures, contractor interfacing issues, etc. will be reviewed and understood by all before proceeding with the work.

Project scheduling will occur in an on-going manner. These will be updated on a weekly basis (or more often if needed) showing key dates, milestones, material delivery requirements, documentation requirements, methodologies and procedures, anticipated QA and QC requirements, specialty technicians or consultants, hold points, advanced testing and certification requirements, shop drawings, etc. and will be completed to ensure the requirements of all working on the project site are understood and accounted for.

14. MANPOWER SUMMARY

It is anticipated that there will be approximately 1,400,000 person hours of work associated with the execution of the project including administrative, craft, maintenance and subcontractor personnel. Onsite staff is expected to peak at around 75 persons while the craft/hourly (including subcontractors) is expected to peak at approximately 600 persons (including those on rotations).

The staffing and management for the Project will be secured for the most part from the full time experienced team currently available from the partner companies. The majority of this team are staff that currently resides in the province of Newfoundland & Labrador. The remainder will be relocated from existing operations elsewhere in Canada.

Figure 16: Equipment Working at the Muskrat Falls Site.

With respect to the hourly/craft positions, our proposal assumes that the majority of the necessary trade persons with the skills required for the various work components are available

in the Province of Newfoundland & Labrador through the associated union halls and will work under the Site Labour Agreement to be negotiated by the Company.

It is anticipated that all of the non-local persons will avail of the Company supplied camp accommodations.

15. WORK TO BE SUBCONTRACTED

The following is a list of the major work components that may be subcontracted during the project execution:

- Crushing of aggregate on site
- Rock drilling and blasting
- Conventional concrete supply
- Jet grouting
- Rock pressure grouting
- Precast concrete
- Tree clearing
- Tandem owner operators

Figure 17: Drill holes ready for Blasting at Muskrat Falls site

Subcontractors will be incorporated into the daily planning and work activities on the site. They will be required to operate under all health, safety, environment and labour agreement requirements.

Subcontractors will be evaluated on the basis of local and Aboriginal content, their ability to provide the necessary resources to satisfy the project schedule milestones, satisfy safety and quality standards established for the Project, commercial terms, etc. Subcontractors will be selected on the basis of overall best value for the Project.

16. EQUIPMENT MAINTENANCE SYSTEM

To optimize/maximize equipment availability, reduce downtime and minimize unplanned interruptions all equipment will be scheduled for regular preventative maintenance. Maintenance planning will be carried out on site and scheduling will be incorporated with project work planning to permit scheduling down time/change out.

All equipment (not including small tools) arriving on site will be included in the maintenance control system (MCS). All hours worked (meter hours) will be recorded daily and tracked by a Maintenance Planner at site.

Figure 18: Welding Facility at the Muskrat Falls site

Scheduled maintenance will be carried out at site and will be coordinated with the operations team to ensure minimal downtime. Coordination occurs formally on a daily basis in the job pre-shift meetings. Maintenance schedules are posted in advance to allow production crews to plan for this occurrence.

17. TEMPORARY FACILITIES – HEAT, LIGHT, COMPRESSED AIR, INDUSTRIAL WATER

A compressed air system will be provided in the Maintenance Facility.

Temporary heat is included in the Maintenance Facility and all offices, lunchrooms, washrooms will be heated.

Water supply for use during construction as required will be drawn by pump from the river or drilled wells.

Our proposal is based on utilizing power provided by the Company at no cost to the Contractor.

A layout of proposed laydown areas and waste disposal areas is included in Annex A13-5.

18. AGGREGRATE PROCESSING AND CRUSHING

Crushing and screening will utilize the services of an experienced subcontractor.

The crushing plant setup will consist of:

- 1 - Metso C140 Jaw Crusher
- 1 - Metso HP6 Cone Crusher
- 1 - Metso Barmac B9100SE VSI Crusher
- 1 – Incline screen
- 1 – Flat screen
- 1 – High frequency screen
- 1 – Flat screen with spray nozzles
- 1 – Washing screw

The plant will be fed with a Cat 775 off-highway truck and the material will be stockpiled with either a stacker or a Cat 988 size loader. We will utilize power from the Company for the crushing. Power generation by generators has not been included in our proposal but we have made allowance for backup diesel generators in the event of a power failure.

Figure 19: Aggregate Production for the La Breña II Dam

This plant will be set up in the transmission line right-of-way area. Rock from the stockpile in Area A will be utilized to make the laydown for the crushing plant. The initial crushing will produce product for the roads, etc. This will help establish some area from where the rock is currently stored and our intent is to store the RCC aggregates in this area as stockpiled rock is crushed and more area becomes available. If this is not possible, then the aggregates will have to be stockpiled in the transmission line corridor.

A power screening plant will be set up in GD8.

A crushing procedure will be prepared, including the environmental requirements related to the operation. Final testing of materials will be as carried out on site by the Company QC laboratory personnel.

19. TEMPORARY BRIDGE DESIGN AND INSTALLATION

The temporary bridge across the spillway approach channel will consist of one 80m span and one 20m (+/-) span as illustrated on the attached drawing in Annex A13-7. The 20m span may be a truss system or steel girder system.

The south access ramp for the temporary bridge will be constructed with rock fill from the existing rock stockpile. The material will be loaded with a 90t excavator in to 75T off-highway trucks and placed with a Cat D8 dozer. A 10t compactor will be utilized for compaction.

The south abutment will be established in an area of competent rock with minimal overbreak. This may require some realignment of the bridge. It will consist of a concrete retaining wall structure on the edge of the spillway channel. The area between the south abutment and the transition dam will be filled with rock fill. The existing bank in-situ rock will be structurally secured with rock bolts.

An intermediate pier will be established on the north edge of the spillway channel. This will consist of structurally securing the existing rock with rock bolts. A concrete foundation will be poured. A steel pier will be designed and fabricated off site which will be bolted to the concrete. When the bridge is eventually removed, the steel pier will be unbolted and removed. The concrete abutments and retaining wall will be installed outside of the limits of the spillway approach channel and therefore will remain in place.

Figure 20: Spillway Bridge, Long-Sault Rapids, ON (Algonquin Bridge)

We will require temporary closure of all gates to allow for calm water with no flow so that divers can be utilized to unbolt or cut the steel pier from its foundation. A crane will lift the steel from the water. Alternatively, the water could be lowered to elevation +10m to allow removal of the steel structure in the dry.

The existing RCC cofferdam will be utilized for the north abutment.

The bridge will utilize Mabey Universal panels or equivalent in a double-double reinforced configuration for the 80m span and single double configuration for the 20m span. The width will be 5m with a wooden deck. Concrete for the abutment and pier foundation will be obtained from a local supplier in Goose Bay or from the existing on-site concrete batch plant (if available).

The bridge will be assembled on rollers on the access ramp and pushed across the channel with a launching nose into position. It is imperative that the access ramp and bridge line up in a straight line to facilitate launching of the bridge.

The assembly crew will primarily consist of:

- 1 – 80T crane
- 1 – Cat 336 excavator

- 1 - Foreman
- 4 – Ironworkers
- 2 – Labourers

The bridge will have a 75T capacity, but will have the potential for higher capacities for future shorter spans.

The upstream spillway bridge will be removed in the same manner in which it was launched. A nose section will be installed and the bridge will be placed on rollers. The bridge will be pulled back on the south access ramp and dismantled. A section of this bridge will be utilized for temporary access across the powerhouse tailrace when the rock plug is removed. The final disassembly and storage will be done on site. There will be additional costs to the Company should the bridge have to be transported off of the project site.

During the dismantling of the bridge the steel section only of the intermediate pier will be removed as explained earlier.

Once the dismantling of the bridge is complete, the access ramp will be removed. The material will be excavated with 75t excavator and loaded into 40T articulated trucks. A 35t excavator will assist with machine cleaning. The material will be hauled and stockpiled adjacent to the South Dam for utilization in its construction.

20. PERMANENT ACCESS ROADS AND ACCESS ROAD TO LAYDOWN C1

Overburden material will be excavated with a 45t excavator. The material will be either cast to the side for reuse in covering the side slopes or loaded into 40T articulated trucks and hauled to disposal.

Figure 21: Site Roads at Muskrat Falls

Ditch excavation will be completed with a 35t excavator. The material will either be cast and spread or loaded into 40T articulated trucks and hauled to disposal.

Filter fabric will be placed with labourers with the assistance of a 35t excavator. The excavator will be utilized to place the rock fill protection. The rock fill for the protection will be selectively excavated from the existing rock stockpile.

Culvert locations will be excavated with a 35t excavator. The culvert will be placed with the 35t excavator and backfill will be completed with labourers with the assistance of a 35t excavator.

Guide rail posts will be excavated with a Cat 420 size backhoe. Posts will be placed and backfilled with labourers. Ironworkers will be utilized to install the guide rail, fence and gates.

We have based our proposal on the utilization of rock fill from the existing rock stockpile for the approved compactable material. There will be additional costs to the Company should the Company require something different.

The rock fill will be excavated from the stockpile with a 75t excavator and loaded in to 75T off-highway trucks. The material will be placed with a Cat D8 size dozer and compacted with a 10t compactor.

Class A, B and C material will be crushed from the existing rock stockpile with the crushing setup noted in section 18.

The materials will be loaded with Cat 980 size loader in to 40t articulated trucks. The material will be placed with a Cat D6 size dozer and Cat 140H grader. A 10t compactor and water truck will be utilized for compaction.

21. UPSTREAM & DOWNSTREAM COFFERDAM (2015)

Overburden material will be excavated with a 45t excavator and loaded into 40T articulated trucks. The area will be machine cleaned with a 35t excavator.

Prior to the placement of fills on in-situ rock, the foundation area under Zone 1 fills will be cleaned using gas/electric pumps (for wash water), excavators, skid loaders, and labour with hand tools. Small excavators will remove the bulk of the material (using a plate attached to the bucket), then a combination of general washing, high pressure washing, and compressed air. Vacuum truck and hose will be used where conditions are suitable for removal of materials. Small machinery and hand pick up will remove all debris from rock surfaces. All rock surfaces will be thoroughly cleaned leaving no gravel, mud, silt, loose rock, or other debris. The prepared foundation areas will be viewed and signed off on the appropriate foundation inspection form, see sample in Annex A13-8.

Figure 22: Foundation Prep of Main Dam, Wuskwatim, MB

Dental concrete will be supplied by a local supplier from Goose Bay or from a plant on site. The concrete will be placed with labourers and vibrated in place. This crew will also place the dry pack and slush grout where directed. Our proposal does not include for any formwork for these items. This would be additional to the proposal.

Rock fill from the existing rock stockpile will be utilized for the Zone 3 for the starter groins and ramps. The material will be loaded with a 75t or 90t excavator in to 75T off-highway trucks. The material will be hauled on the existing haul road in front of Cofferdam 1 and placed with a Cat D8 dozer. A 35t excavator will be utilized as support in the placement. A 10t compactor will be utilized for compaction, when required.

Till pit TD7 will be utilized for the material required for Zones 1 and 1C. The pit will be cleared, grubbed and any unsuitable material removed and relocated to the outside of the developed area. Perimeter ditches will be constructed in the pit for surface water management. Zone 1 products will not be screened at the source.

The material will be excavated with a 75t excavator and hauled to site with tandem trucks and temporarily stockpiled. The excavator will remove boulders during the loading process by casting them to the side. The material will be reloaded with a 45t excavator in to 40T articulated trucks and hauled to the placement area. The material will be placed with a D6 size dozer supported with a 35t excavator. A 10t compactor will be utilized for compaction.

Zones 2A and 2C will be loaded with a Cat 980 loader into tandems and hauled to site and stockpiled. The material will be reloaded with a Cat 980 loader into 40T articulated trucks and transported to the placement area. The material will be placed with a 35t excavator and/or small dozer and compacted with a 10t compactor. A water truck will assist compaction when required.

22. TEMPORARY STOCKPILE OF ZONE 3 CLASS 2 AND CLASS 1

Approximately 30,000m3 of zone 3 class 2 and 15,000m3 of zone 3 class 3 will be hauled in 2015 to the riverside area of the RCC cofferdam and stockpiled. The material will be loaded with a 90t excavator into 75T off-highway trucks. A 75T excavator will be used to stockpile the rock blocks.

23. EXISTING COFFERDAM REMOVAL

The existing cofferdam removal will commence with the excavation of Cofferdams 2 and 3. It is not anticipated that the spillway discharge area will have to be flooded with water prior to the removal of the cofferdams as the downstream water level is expected to be below that of the spillway discharge channel elevation. If this is not the case, the area will be flooded via pumping prior to the removal of Cofferdam 2.

The work will start with the removal of Cofferdam 2. The cofferdam will be excavated with a 120t excavator and loaded into 75T trucks. Material that can be salvaged will be stockpiled or moved to placement as in the case of the expansion of Area J; otherwise the material will be hauled to a disposal area. Initially it is anticipated that approximately two thirds of the material will be excavated, in order to create a haul road for the hauling of the RCC Cofferdam should it be necessary to do so. After the RCC Cofferdam has been removed, the remainder of Cofferdams 2 and 3 will be excavated. This will be accomplished with a 75t excavator and 40T articulated trucks. A 35t excavator will assist by machine cleaning the area.

After Cofferdam 2 is sufficiently removed, the spillway approach channel will be watered up via pumping. Once complete, the excavation of Cofferdam 1 will commence. The initial excavation will take Cofferdam 1 down to one meter of elevation above the river level at that time. This will be accomplished by utilizing a 90t excavator and 40T articulated trucks. Again, any material that can be salvaged will be stockpiled. The remainder will be hauled to disposal.

After the excavation is complete to one meter above the water, the remainder of the excavation will commence with the same crew. It is expected that all of the material from this excavation will have to be hauled to disposal.

24. RCC COFFERDAM REMOVAL

The existing RCC Cofferdam will be drilled and blasted. The plan is to drill the excavation with 90mm holes and blast with a powder factor of approximately 0.5 kg/m3. This will be done one row at a time.

The material will be excavated with a 120t excavator and loaded into 75T trucks and either hauled to disposal or it will remain until it can be utilized in the upstream cofferdam as Zone 3 material. In this case the material will be loaded with a 90t excavator into 40T articulated trucks and hauled to the upstream cofferdam.

Figure 23: RCC Cofferdam to be removed

Our proposal is based on being paid for removal and placement in the upstream cofferdam. Additionally, there is no consideration for facing concrete, surface smoothing, etc. for the vertical face of the remaining section of the existing RCC Cofferdam. This would be additional to the proposal.

25. TAILRACE ROCK EXCAVATION AND UNDERWATER EXCAVATION

The tailrace excavation will commence immediately after the removal of the existing cofferdams. The existing transmission line will have to be relocated by the Company prior to this date.

The excavation will start with the construction of a temporary access road. This will be completed with a 75t excavator, 40T articulated trucks and a Cat D8 dozer with the support of a 35t excavator for slopes. The road will be capped with rock fill from the existing rock stockpile.

Figure 24: Underwater Excavation, Wuskwatium Generating Station, MB

Utilizing the Bench Blast Survey Plan prepared for each bench/blast, holes will be surveyed/positioned and the drill depth for each hole provided. Line, buffer and production hole diameter requirements will be identified and each hole will be drilled to the required depth.

Bench Blast Survey Plan will be prepared in AutoCAD drawing format. It will identify;

- Bench location and co-ordinates
- Bench depth and grade requirement
- Pattern
- Line, buffer and production hole locations, spacing and burden
- Sub-drill requirement
- Wall step/benching if applicable

- Diameter for each hole type
- Area and volume

Hole verticality will be controlled with the drill boom monitoring system and hand levels with batter arrangement or templates. The drill speed will be monitored and adjusted, following a review of the blast results, as required to control drift.

Following the drilling operation on each bench, and prior to the loading of explosives, an as-drilled survey of hole locations will be carried out. Also, each individual hole will be measured to verify grade requirements. Holes below the specified grade will be filled with stemming material to bring the bottom to the specified elevation.

In conjunction with the Bench Blast Survey Plan the blast design will be prepared. The blast design will be detailed on a 'Blast Plan Notice" form, see Annex A13-9. This form will serve as the blast notification form and will contain the design information for each individual plan. The information will be transmitted to the Company's Representative prior to (minimum 24 hours) the commencement of loading of the blast. The proposal and notification will identify:

- Blast number
- Blast schedule – date and time
- Location, structure, bench, co-ordinates
- Blast volume
- Hole pattern, depth and diameter
- Firing sequence/layout
- Explosives type and quantities
- Explosive arrangement per hole type
- Monitoring device location and distance to the blast
- Max load per delay
- Collar requirements

Blasting in each area will initially be carried out conservatively on a trial basis using light loading. Initial results will be monitored to confirm original assumptions and or adjust the Master Blasting Plan.

Final Wall drilling will be carried in all rock areas indicated on the drawings, in channel areas, and as required by the Company's Representative.

Figure 25: Blast at Muskrat Falls, NL

Final wall drilling alignment will be controlled and located using GPS/total station survey. Each individual face will be clearly marked on the rock surface. In areas where the rock is not conducive to maintaining these marks, an offset line with wire can be utilized. Typically the line will be located on the neat line for all areas. The results will be monitored and procedures adjusted accordingly.

After each blast and material excavation/muck removal, the line drilling results will be evaluated. The methods and procedures will be adjusted/corrected as required (and documented) to address issues that may arise, including actual changes to the rock conditions and geology.

Perimeter holes will be drilled at 600mm spacing

Buffer Holes will generally be based on the following pattern:

- 75mm dia. holes with spacing 1500 mm centre to centre

Production Holes pattern will be based on:

- 90 - 100 mm dia. holes with spacing and overburden varying with bench height

Production blasts will vary in size with the optimum range from 1000 to 15,000 m3 (there will be blast smaller than this depending on location, bench height, etc.).

It is anticipated the bench heights will range from 2 - 10 meters depending on topography and excavation configuration.

Explosives will be loaded as per the particular blast design plan for the blast being prepared. The blasting crew will be supervised by a qualified foreman and experienced certified blaster (meeting all provincial and federal certification and training requirements). Holes will be properly stemmed after the explosives have been placed. Blast areas ready to fire will be secured and constantly monitored until the blast occurs.

Depending on the final blasting methodology designed and selection of the explosives supplier, the typical blasting products being considered for use on this project include:

- Packaged & bulk explosives:
  - fortel plus
  - senatel powersplit
  - booster sensitive emulsion
- Initiation products:
  - nonel handidet
  - pentex booster
- Detonating cord:
  - 18 grain, 25 grain and 400 grain

Electronic detonators will not be used.

Final loading design of the first and second line of buffer holes will be governed by best results attained in the early blasts. Production holes will use a cap sensitive booster in the toe and bulk emulsion in the column.

The Master Drill and Blast Plan will take into account the vibration limits identified in the contract documents. The firing sequence, powder factor, blast confinement and free faces will

be considered to provide the required vibration control. To monitor the vibrations at critical areas a seismograph will be used. The results will be recorded, forwarded to the Company's representative and accumulated results plotted and utilized to adjust subsequent blast operations throughout the project work.

Each day when a blast is scheduled, notification with the time(s) and location, will be posted on a "Blast Notification Board" in the campsite and in the camp cookhouse. The main gate security will be notified and requested to post the notification such that all personnel/visitors coming to site will be notified. A Blast Notification board will be erected at the main gate for this purpose.

After the "Authorization for Blasting" is completed, prior to each and every blast the area affected by the blast will be secured. All personnel will be removed from the area. The proper signal procedure will be followed prior to the blast and the "All Clear" given after the blast.

In addition, the area will be monitored to ensure no wildlife wanders into the blast zone.

The rock will be excavated with a 120t excavator and loaded in to 75T off-highway trucks. The initial material will be placed in the river in order to build a working platform from which to drill and case the underwater rock. The remainder of the rock will be hauled to stockpile.

The rock excavation will be drilled, blasted and excavated to elevation 9, including the existing ramp.

A 20m wide rock plug will be left at elevation 9 to protect the powerhouse. The plug will be drilled and capped.

The underwater excavation will be drilled and cased from the rock platform on a 3.0m x 3.0m pattern with a minimum of 2 metres of subdrill. The material will be loaded with a powder factor of approximately 2.0kg/m3 and blasted sequentially. Electronic detonators will not be used.

The rock, including the access pad, will be excavated with a 120t excavator and a 90t excavator in a long stick configuration. The material will be loaded in to 75T off-highway trucks and hauled to a stockpile area. The underwater profile will be mapped to ensure no high points remain and the desired elevation is achieved. An illustration of the tailrace rock removal scheme can be found in Annex A13-4.

26. TAILRACE PLUG REMOVAL

The tailrace plug will be predrilled in 2016. In 2017 the holes will be checked and either blown out or re-drilled as needed.

The plug will be loaded with a powder factor of approximately 1.2 kg/m3. Prior to blasting, the tailrace will be filled with water via pumping. Our blasting timing sequence does not require an air bubble curtain and none has been included in our proposal.

Figure 26: Downstream Rock Plug Removal, Wuskwatim Generating Station, MB

Once the plug is blasted, the material will be excavated with a 75t excavator assisted by a 90t excavator with a long stick configuration. The material will be loaded into 40T articulated trucks and hauled to a stockpile area.

27. ROCK BOLTS AND ROCKFALL NETTING

Rock bolts and netting will be installed in areas of excavation as directed/indicated by the Company's representative. Rock bolt holes will generally be installed as the excavation proceeds on each bench. A hydraulic drill will be used to drill holes and install the rock bolts as the excavation progresses and after the area is scaled and free of loose materials. Rock bolts will be 25 mm and 35 mm diameter hollow core mechanical anchors, fully grouted.

Figure 27: Rock Bolts being Installed, Muskrat Falls, NL

Rockfall netting will be pinned in place using a combination of mesh pins and the rock bolts. Access to install anchor pins and place rockfall netting will be achieved using appropriately sized manlifts (i.e. 60' to 120' JLG's).

28. UPSTREAM COFFERDAM

The upstream cofferdam will commence when the spring freshette allows the placement of rock in the river. This has been tentatively scheduled as May 23, 2016. However this date may change depending on the spring runoff conditions.

The work will commence with the upstream groin followed in a staggered manner with the downstream groin.

The initial placement will start with the rocks that have been stockpiled in 2015. The rocks will be loaded with a 90t excavator in to 75T articulated trucks. The smaller material will be placed with a Cat D8 dozer and the larger rocks will be placed with a 75t excavator.

The remainder of the material will be hauled across the upstream and downstream bridges. We will utilize two hauling fleets on a day and night basis. The rock will be loaded with a 90t excavator in to 40T articulated trucks and placed with either a Cat D8 or 75t excavator, see Annex A13-11.

Once river closure is obtained, the dumped filters 2E and 3F will be placed. The 2E will be hauled from granular pit GD8 in tandem dump trucks and stockpiled on site. The materials will then be loaded with a Cat 980 loader into 40T articulated trucks and hauled across both the upstream bridge and the downstream bridge. The material will be placed with a Cat D8 dozer supported with a 35t excavator.

Figure 28: Building River Closure, Wuskwatim, MB

Once the dumped filters are completed, the Zone 1 dumped material will commence. Till pit TD7 will be utilized for the material required for Zones 1. The pit will be cleared, grubbed and the unsuitable material removed and relocated to the outside of the developed area. Perimeter ditches will be utilized in the pit for surface water management. Zone 1 products will not be screened at the source.

The material will be excavated with a 75t excavator and hauled to site with tandem trucks and temporarily stockpiled. The excavator will remove boulders during the loading process by casting them to the side. The material will be reloaded with a 45t excavator into 40T articulated trucks and hauled to the placement area. The material will be placed with a D8 size dozer supported with a 35t excavator.

We will utilize a fleet placing on the downstream groin and another fleet placing on the upstream groin.

The downstream placement will try to establish a minimum seal all the way across the cofferdam so manageable water may be established as soon as possible, thus allowing the commencement of the foundation preparation activities.

The upstream placement will concentrate on getting the Zone 1 to grade so that the Jet Grouting (if required) can commence. A jet grouting specialist subcontractor will be utilized for the grouting.

Figure 29: Earthfill Dam construction, Mont Wright, QC.

After the grouting requirements are completed, the remainder of the upstream cofferdam will commence.

The Zone 1 material will be sourced from TD7 in the same manner as the Zone 1 dumped material. The material will also be hauled to the dam in the same manner as the Zone 1 material. Again, processing of the Zone 1 materials is not included in our proposal other than the removal of boulders with an excavator. The material will be placed with a Cat D6 dozer supported with a 35t excavator. A 10t compactor will be utilized for compaction. In the event of rain, the Zone 1 will be sealed with a smooth drum roller and placement stopped until the weather event has ceased.

Zones 2A and 2C will be processed in GD8 in 2015. The material will be loaded with a Cat 980 loader into tandem dump trucks and hauled to site and stockpiled. The material will be reloaded at site with a Cat 980 loader into 40T articulated trucks and hauled to the placement area. The material will be spread with a 35t excavator. A 10t compactor and water truck will be utilized for compaction.

Zone 3A will be loaded with a Cat 980 loader into 40T articulated trucks and hauled to the placement area. The material will be placed with a 35t excavator. A 10t compactor and water truck will be utilized for compaction.

Zones 3C and 3D rock fill will be taken from the existing rock stockpile at the site. The material will be loaded with a 75t excavator into 40T articulated trucks and hauled to the placement area. The material will be spread with a Cat D8 dozer assisted by a 35t excavator. The excavator will remove any oversize from the 3C and it will either be placed in the 3D zone or hauled away from the site.

29. DOWNSTREAM COFFERDAM

Figure 30: Earthfill Cofferdam Construction, Muskrat Falls, NL

The downstream cofferdam will be constructed with the same equipment utilizing the same methodology as the compacted section of the upstream cofferdam.

The downstream cofferdam will be removed in a similar manner as the intake cofferdam.

30. INTAKE COFFERDAM

The overburden material will be excavated with a 75t excavator and loaded into 40T articulated trucks and hauled to a disposal area.

Prior to the placement of fills on in-situ rock, the foundation area under Zones 1 will be cleaned using gas/electric pumps (for wash water), excavators, skid loaders, and labour with hand tools. Small excavators will remove the bulk of the material (using a plate attached to the bucket), then a combination of general washing, high pressure washing, and compressed air. Vacuum truck and hose will be used where conditions are suitable for removal of materials. Small machinery and hand pick up will remove all debris from rock surfaces. All rock surfaces will be thoroughly cleaned leaving no gravel, mud, silt, loose rock, or other debris. The prepared foundation areas will be viewed and signed off on the appropriate foundation inspection form.

Dental concrete will be supplied by a local supplier from Goose Bay or from a plant on site. The concrete will be placed with labourers and vibrated in place. This crew will also place the dry pack and slush grout where directed. Our proposal does not include for any formwork for these items. This would be additional to the proposal.

The remainder of the Intake Cofferdam will be constructed with the same equipment utilizing the same methodology as the compacted section of the upstream cofferdam.

The proposal is based on local water management only, utilizing small submersible pumps. The water will be pumped to the nearest existing sediment pond. The proposal does not include for any treatment, flocculation of the discharged water or construction of additional sediment ponds.

The Intake cofferdam will be removed with the same crew that removed the south access ramp. The material will be hauled to a disposal area.

31. RCC TRIAL SECTION

The purpose of this trial is to demonstrate effectiveness of all equipment, techniques and materials proposed:

- Serve as practice, training and orientation to the staff regarding the different activities needed for the construction of the dam
- Assess the behavior of the concrete under full-scale conditions, paying special attention to the potential for segregation and workability
- Check the strengths reached in the field against those obtained in laboratory tests
- Optimize the spreading and compacting RCC methods, finding the optimum number of vibrating roller passes, and calibrating the nuclear density meters
- Review the methods to be used for the treatment of fresh and cold horizontal joints.
- Determine the acceptable exposure time that should be used
- Assess the performance of cold joints treated with mortar bedding mix
- Determine the appropriate methods for placing GERCC/ Face Concrete against the formwork
- Determine the appropriate methods for placing GERCC against the rock abutments
- Test the methods for inducement of contraction joints
- Optimize the method of raising the formwork specially designed for RCC

The RCC mix designs will be determined by the Engineer.

It will be completed on a prepared foundation in a location to be determined on site.

The formwork system utilized will be the same as the system to be used in the construction of the North Dam. Sample drawings are included in Annex A13-10. The upstream panels will be raised with a 40t crane located on the RCC and the downstream panels will be raised with an 80t crane located on the outside of the trial section.

The RCC will be hauled from the RCC Plant in 40t articulated trucks. It will not be conveyed with conveyors as this will not be practicable for this section. A ramp constructed out of rock fill will provide access for the truck on and off the trial section.

Figure 31: General View of the Test Section at Portugues Dam, PR, USA

The material will be spread with a Cat D5 dozer and compacted with a 12t compactor. Joints will be cut with a plate on a Cat 420 backhoe. Waterstop will be installed with carpenters and labourers will handle the water misting and curing.

Facing concrete will be placed with a pumper truck. Labourers will aid in placement and vibration.

Grout for GERCC will be made in a grout plant. The grout will be placed with a grout crew and vibrated in place after the RCC is placed.

32. ADVANTAGE OF USING THE SPLIT-LEVEL PLACEMENT METHODOLOGY TO PERFORM THE NORTH DAM

In RCC dam construction there are five known methods of placement:

- Horizontal placement
- Slope-layer placement
- Split-level placement
- Block placement
- Non-continuous horizontal layer placement

The horizontal placement method, with layers of RCC being placed horizontally from one abutment to the other, is generally considered the simplest and preferred method, as long as the concrete plant has adequate capacity. This method is specified for the Muskrat Falls North Dam.

However, concurring that the above is true for most cases, there are particular occurrences where certain conditions can make the split-level placement method more advantageous. The O'Connell-Dragados Canada JV strongly believe that the Muskrat Falls North Dam is one of these cases in which the potential disadvantages of the split-level placement method (none of them existing in this case, as we will see), with respect to the horizontal placement method, are enormously overcome by the advantages that it can incorporate. For this reason, we will explain the logic behind our statement below.

The main two reasons to consider the horizontal placement method as the preeminent method are:

- the speed of construction; and
- the minimization of programmed cold joints.

In certain cases, the split-level construction method can improve the speed of construction, with very slight increment (or none) of the programmed cold joints (using a proper split-level approach), or a reduction of these joints. Besides this, more advantages can also be incorporated into the construction methodology such as:

I) better quality of the hot joints, and thus, of the monolithic structure;

II) less risk of occurrence of warm and non-programmed cold joints, which ultimately may lead to supposedly less total cold joints in the final structure;

III) taking advantage of good planning to avoid delays due to the mandatory stops which are impossible to avoid in the Horizontal Placement Method (i.e. placement of horizontal galleries and other obstacles in the dam body), reduction of the construction schedule; and lastly,

IV) a more economic dam; the cost of resources is less and we can build the dam with 2 – 10 hour shifts versus 2 - 12 hour shifts that will be required for the Horizontal Placement Method.

V) a safer work environment

It is extremely important to not mistake or assimilate the split-level placement method with the block placement method, implemented in RCC dams with concrete plants sized far below what is adequate. Also, it is important to mention that the split-level method can have different approaches, with greater or fewer programmed cold joints.

After some precedents around the world of the block placement method, the split-level method was introduced in the largest RCC dam in the world at the time, Beni Haroun in Algeria (2000) constructed by Dragados. Because of the shape of the valley, for a certain period the volume of the horizontal layers was very high and close to the limit of the capacity of the concrete plant. The dam was thus split into two halves with 14.4 m lifts (each of 48 layers of 0.3 m) placed alternatively on one or the other half of the dam. Therefore, for the stretch of the dam height in which this method was implemented, a cold joint in each half of the dam every 14.4 m was produced. But, for sure, many warm and non-programmed cold joints were avoided, with important savings in schedule and cost. This unquestionably improved the quality of the hot joints, deriving this from working within lower exposure times between consecutive layers.

All the plant and equipment at Beni Haroun was sized for a capacity of 500 m^3/h of RCC placement. It was considered impractical to increase this capacity for only the stretch of the dam height in which this would be necessary. Plus, the number of programmed cold joints introduced was negligible compared with the advantages encountered.

Additionally, this method has the great advantage that the formwork (or precast elements) for the horizontal galleries can be erected on one half of the dam while the RCC is placed in the other half, which means a further shortening of the placement schedule.

Figure 32: Split-level Placement Method Implemented at La Brena II Dam in Spain (2007-2008)

For the construction of what is currently the largest RCC dam in Europe, La Breña II in Spain (2007-2008), Dragados followed the same reasoning and the split-level method was implemented in a portion of the dam. In this case we used RCC ramps to move the mobile machinery from one half of the dam to the other at the end of each lift phase, but this may be avoided by using large cranes to move machinery.

In the case of Muskrat Falls, in principle it does not seem the reason to use the split-level method is the capacity of the plant and equipment; the required 400 m^3/h in the specifications

is well above what is normally used for RCC dams of similar volume. But, due to the "U" shape of the "valley" from the first layers of the dam and for a significant portion of the dam height, the volume of the layers is above 2000 m^3. Due to the plan shape of the layers, the formwork raising will also become a critical activity; especially on the downstream face since it has to be raised in full after every four layers.

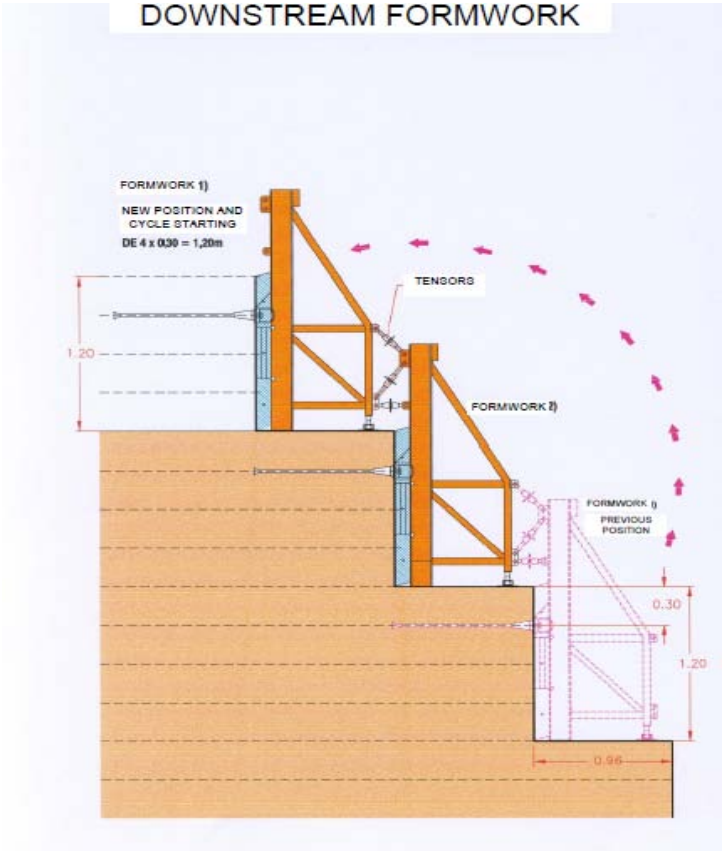


Figure 33: Dragados' Proprietary Formwork System for RCC Construction

Additionally, the length of transport for the trucks on the dam is significant, and due to the congestion of mobile machinery on the dam required for the different activities specific of the RCC, and for safety reasons, the placement output will be subject to slowdowns and hindrances. Thus, despite the high sizing of the concrete plant and conveyors, the operations on the dam will become an important bottle neck for the productions that could be obtained.

It seems a paradox, but the detailed study we have carried out, based on our experience in all sizes of RCC dams, reveals that notwithstanding the, in principle, oversized plant and equipment to be employed, there is a high risk of generating warm joints, which some or many of them could end up as cold joints for a significant part of the height of the dam using the horizontal placement method.

The resuming of RCC placement after a warm or cold joint is hindered by the fact that grout or mortar has to be placed in advance (but not too much in advance) of the RCC, which puts this first layer after the warm or cold joint in danger of not being covered by the second layer within the allowed time for the hot joint. This may lead to a "vicious circle" of working in a warm joint basis for several consecutive layers which is not acceptable.

Furthermore, the dam design includes four levels which are fitted with a horizontal stretch of gallery, the fourth being the access gallery at block 27, and as commented before the presence of horizontal galleries favors the split-level method. In fact, the split-level method approach we are proposing for Muskrat Falls North Dam is not a "balanced" one, with lifts of the same height at each half of the dam. We have arranged the lifts in each half of the dam based on the levels of the horizontal stretches of galleries in them, due to most of these levels are encountered only in one of the halves of the dam.

Because of the above, in this particular case the balance of programmed cold joins is favorable to the option of the split-level method, with a reduction of the number of them, as we show in detail:

- Cold joint at level 8.49: appears in full dam in both methods
- Cold joint at level 10.89: disappears in left half of dam for the split-level method
- Cold joint at level approx. 11.49: appears in left half of dam for the split level method, due to the winter stoppage
- Cold joint at level 13.29: disappears in left half of dam for the split-level method
- Cold joint at level 22.89: disappears in right half of dam for the split-level method
- Cold joint at level 36.39: appears in full dam in both methods

It is important to take into account that this schedule can be accomplished with only the following equipment:

- One concrete plant of 200 m^3/h, instead of two concrete plants for a total of 400 m^3/h

- Four 35T trucks and a double 24" conveyor system of 400 m^3/h
- Machines for spreading, compaction and rest of operations on the dam sized for 200 m^3/h instead of 400 m^3/h

In our proposal, we have allowed for a complete spare system (i.e. RCC plant, 35T truck) to provide the specified redundancy. Additionally, this spare capacity can be brought into production where possible to improve schedule delivery.

We have to take into account that the conveyor system requires much time to set-up once manageable water is achieved. The conveyor system requires a complex installation process with several towers/masts to be erected, this will affect the start of placement for RCC. This conveyor system requires reconfiguring to feed concrete to the upper part of the left abutment.

Figure 34: Creter-crane Type Machine, fed by Agitator Trucks, being used for RCC Dam Construction

There are advantages in the quality of the structure and somewhat in the schedule. Besides these advantages, there is also the potential for improving safety conditions. The erection, dismantling and reconfiguration of the conveyor system are very complex and involve certain

safety risks. Additionally, with the creter-crane type machine, the dump trucks hauling RCC on the dam are avoided. In addition, there is also the advantage of the reduced cost of this alternative.

In conclusion, we propose to use the split-level placement method in this dam from the beginning. We are introducing the five advantages explained previously, including a slight reduction in the construction schedule. The schedule implementing this method involves a reduction of approximately only 11 days with respect to the schedule using the horizontal placement method, but it is important to stress that it is a more consistent schedule, something crucial for the Muskrat Falls Project as a whole, due to the lower risk of occurrence of warm and cold joints.

34. NORTH DAM (2016)

The clearing of the North Abutment will be done by an experienced subcontractor.

The overburden material in the North Abutment will be excavated with a 75t excavator and loaded into 40T articulated trucks and hauled to disposal. A 35t excavator will be utilized for machine cleaning.

A dewatering system utilizing two 8" 100hp submersible pumps with heat traced HDPE pipe will be installed for the management of water. A third pump will be purchased and installed for standby purposes. The water will be pumped to the sediment pond already constructed on the site. No treatment or flocculation of the water is included in our proposal. The proposal is based on the utilization of power supplied by the Company. One 350kw generator will be installed for standby and temporary outages only.

Figure 35: Foundation Clean-up (La Breña II Dam, Spain)

Foundation preparation activities will take place prior to the placement of any material on any of the dams or cofferdams. Foundation preparation includes dental excavation, foundation cleaning with water jets, air jets and hand tools, and treatments such as dental concrete and slush grout.

Dental excavation will be executed using a 35t excavator or smaller to remove any loose rock fragments, or isolated deposits of material that have collected due to the surficial geology. As

the effectiveness of mechanical excavation is reduced, foundation cleaning will take place using pressurized water, hand tools such as brooms and picks, 3 inch electric pumps and a small excavator with an air jet attachment. Fine materials and loose rock fragments will be removed to a reasonable standard during foundation cleaning.

Following the completion of foundation cleaning and once the foundation is dry with no standing water, dental concrete will be placed in the voids of the rock surface to provide a suitable surface on which till or roller compacted concrete materials can be effectively placed.

Figure 36: Dental Concreting of Uneven Foundation (Wuskwatim Generating Station, MB)

Formwork for the RCC will be a combination of fabricated on site and prefabricated (i.e. EFCO, Aluma, or Peri) systems and will be constructed of steel, wood or a combination of both. Forms shall be sufficiently rigid to prevent lateral or vertical distortion from the loading environment to which the forms will be subjected. All forms will be set to the design grades, lines and radii as shown on the Construction Drawings. Forms are to be anchored and firmly set over bearing areas to prevent displacement during concrete placement. Inspections are to be completed by the Project Engineer and/or the QC Engineer. Any correction of grade or alignment prior to, and at any time during concrete placement will be documented on the pour release checklist.

Figure 37: Downstream Formwork (La Breña II Dam, Spain)

Materials/forms intended for use in the work will be submitted for approval with the relevant data submittals.

The surfaces of all formwork to be in contact with concrete will be thoroughly cleaned and treated with Elsro #740 form release oil (or approved equal)before concrete placement. The form oil will be applied using a brush or hand sprayer to ensure forms have an even coating without excess or drip.

Forms will not be stripped until the required structural strength has been reached by the concrete and the governing strip period has been reached for the specific pour. Removal of forms will be done in a manner to avoid damaging or spalling of the concrete.

The upstream panels will be raised with a 40t crane located on the RCC and the downstream panels will be raised with an 80t crane located on the outside of the trial section. As expecting with the construction of the North Dam.

Ties will have a minimum of 100 mm setbacks and use a cone to provide neat, regular hole to be finished with rods being a minimum of 100 mm from the finished surface. All exposed finished edges/corners will be chamfered.

All fabrication drawings (including rib layouts, bracing sections, etc.) will be prepared, stamped and submitted to the Company for review and approval.

All formwork will be detailed on form/lift drawings that will detail the form system, construction details, materials, tie system, spacing, special rigging, finish requirements, etc. In general, it is anticipated to erect steel strong backs (approximate height of 3.0 m) at required spacing. After the strongbacks are erected and braced to the exterior of the RCC structure's previous lift, panelized formwork is than installed in sections ranging in height from 600 to 1200 mm to facilitate the lift heights and to ease handling concerns. The steel strong backs will also be employed to erect temporary safety fencing for workers placing forms and during concrete placement operations.

Figure 38: Upstream Formwork (Portugues Dam, PR, USA)

Foundation Treatment

Prior to the placement of concrete on the prepared in-situ rock (i.e. surface that has been previously been cleaned, in areas with overhanging material will be drilled, broken and excavated to enlarge the shear zones to be removed and to expose in depth the weathered

material to be eliminated an cleaned up. The foundation area will receive a final cleaning using pressure pumps (for wash water) and labourers with hand tools.

Dewatering will be implemented to maintain large trenches in a dry condition while the cleanup until dental concrete fills the trenches. These areas will be treated with slush grout and dental concrete placed where required as soon as an area is prepared and clean, concrete should be placed in the dental area (to avoid or protect against weathering), the foundation area will receive a final cleaning using gas / electric pumps (for wash water) and labourers with hand tools. Prepared foundation areas will be viewed and signed off on the appropriate Foundation Inspection/Release form (refer to Appendix I) and just prior to the placement (any additional/touch up cleaning will be carried out at that time) of the concrete and will be signed off on the pre pour inspection checklist itself.

Concrete will be transported to Site from the conventional concrete plant by mixer trucks and placed by either auto-crane with skip or concrete pump. Compaction of the concrete will be achieved by using vibratory pokers. Simultaneously, the smaller openings of the foundation will be emptied out, cleaned and filled up with surface treatment grout or bedding mortar. Later on, the full surface of the foundation area will be cleaned to inspect the treatment done and to proceed with the consolidation grouting over the specified broken areas. After all treatment is completed a final cleanup will be conducted prior to concrete or RCC placement.

Figure 39: Concrete Plant and Conveyors at Enciso Dam, Spain, currently under construction

RCC placement

The RCC will be transported from the plant in Area J to the dam by two parallel 24" conveyors downstream the dam. Two (2) swingers located within the dam in block 13 will discharge into 35t articulated trucks and spread with a Cat D5 dozer. Compaction will be achieved with a 12t compactor. There will be a placement crew that will work from the abutments towards the center where the feed from the swinger crane will be located. The material will be spread with Bulldozers D5 in layers of no more of 300mm after compaction.

The placement of RCC will continue on a day and night operation until the section as specified is completed.

Transverse Joints

Joints will be cut with a plate on a Cat 420 backhoe. Waterstop will be installed with carpenters and labourers will handle the water misting and curing.

Figure 40: Transverse Joint Cutting with Vibrating Plate (Portugues Dam-Test Section, PR, USA)

Facing concrete will be placed with a pumper truck. Labourers will aid in placement and vibration.

Grout for GERCC will be made in a grout plant. There will be two grout plants. The grout will be placed with a grout crew and vibrated in place after the RCC is placed.

Figure 41: Vibrating GERCC (Portugues Dam-Test Section, PR, USA)

Figure 42: GERCC after Vibration (Portugues Dam-Test Section, PR, USA)

The gallery construction will be divided in two stages. The first stage will include the precast panel installation and the second stage will include the CIP reinforced concrete to form the gallery stairs, after the foundation drains have been drilled and the grout curtain has been completed.

The precast panels will be loaded with a 25T boom truck and transported to the placement area. The 80t crane will place the sections. These sections will be placed as required for construction.

Figure 43: Beni Haroun Gallery

Concrete will be worked thoroughly around tie bars, embedded fixtures, waterstop, along the edges of the formwork and into the angles and corners of the formwork to eliminate air voids and ensure homogeneous consolidation. To limit excessive loading from placing equipment near the edges of formwork, placement and consolidation by hand and small tools (i.e. Bomag walk-behind compactor, plate tamper, etc.) will be employed.

Any areas requiring additional vibration will be achieved using electric vibrators applied at the point of freshly deposited concrete. Vibration will be of sufficient duration and intensity to thoroughly consolidate concrete but not to cause segregation. Two vibrators (or more as required) plus a spare will be available for all pours.

Construction joints between blocks will be constructed, where required, in accordance with the details shown on the Construction Drawings. Construction Joints will be constructed as the RCC is placed, spread and compacted; by inserting the joint material into compacted full lift thickness RCC. The equipment to cut the RCC consists on a 420 backhoe with a plate and a roller compactor.

Durajoint Arctic Grade waterstop will be installed at the V1 joint locations with the bulb centered at the plastic joint. Waterstop will be continuous during installation and protected from damage during on-going work. Ends will be cut square and joined (butt end splicing) using supplier approved Teflon coated thermostatically controlled splicing iron. Intersections that join two or more runs from different directions will be made with shop fabricated sections (i.e. "Y" or "+"). Around the waterstop, grout will be placed on the surface of the uncompacted RCC lift and permitted to soak into the layer. Consolidation using vibrators will ensure the Grout Enriched RCC is embedded thoroughly around the waterstop.

Where the waterstop terminates in rock it will be placed in a (neat) 300mm deep notch and filled with flowable non shrink grout.

Depending on the type of joint (cold/warm), the preparation requirements vary. Green cutting will be completed to expose concrete aggregate in order to provide a clean, rough, bonding surface on horizontal joints. Typically, concrete will be cleaned within 6 to 24 hours depending on temperature and concrete setting time. Initial cleanup after concrete has sufficiently hardened will include broom brushing and jet spray and the area will be flushed using a fire pump and hose. Debris will be gathered and disposed. An inspection of the joint and surface preparation checklist will be signed off on by the appropriate parties prior to the placement of fresh concrete.

Figure 44: Green Cutting with Water Blasting (Portugues Dam-Test Section, PR, USA)

A vacuum truck will be used to dry up ponded water during a joint cleanup. That joint will be performed with a high/low pressure water jetting or air/water jetting depending on the type of joint needed (cold/warm/).

Figure 45: Excess Water Removal with Vacuum Truck (Porce II Dam, Colombia)

Curing of concrete which will be exposed (upper part of the steps, upstream and downstream faces after forms removal…) will immediately follow finishing and after any excess moisture due to bleeding has evaporated. Curing may be carried out by wet curing or by means of a curing compound.

Concrete curing with wet curing will have a minimum (depending mix design requirements) seven (7) day humid cure in finished surface areas. Horizontal areas of the interface with future concrete shall be maintained until covered with concrete. Vertical finished surfaces will utilize a water based (dyed) curing compound. The pigmented curing compound will be applied by a hand sprayer to all exposed surfaces (Note: care will be taken to ensure curing compound is not sprayed on surfaces to receive future concrete). Humid cure will be achieved using soaker hoses, sprinklers, water, burlap, geotextile, and any combination therein to maintain constant moisture on concrete surfaces. Curing method used to be at the Concrete Superintendents discretion.

Figure 46: RCC Conveyors at La Breña II Dam, Spain

Concrete will be adequately protected from adverse weather conditions, including hot / cold temperatures, wind, rain, sleet, and snow. Concrete will be protected from direct sunlight for a period of three days.

The majority of the equipment will have its standby machine at the RCC worksite at all times.

Several environmental measures related to the concrete and batch plant operations will be included in the project procedures including:

- Dust control
- Reuse wash water
- Storage procedures for materials and additives, chemicals
- Wash out areas

Placement in 2016 is expected to stop on or about October 31, 2016. This will be weather dependent. The RCC will be covered with insulated tarpaulins. This will be covered with 0.5m of sand. The sand will be covered with a polyethylene sheet that will be held in place with sand bags.

A dewatering crew of one foreman and labourer will monitor the dewatering over the winter shut down period.

Placement of concrete, finishing of vertical surfaces and the erection and removal of the form systems will be supported on site by a 40 T Rough Terrain (RT) on the dam and a 80T crane on the upstream side in 2016

35. NORTH DAM (2017)

The construction in the spring of 2017 will start with the removal of the winter protection. This is scheduled to be completed in April of 2017 to allow the placement of RCC to recommence on May 1, 2017. This will depend on the weather conditions at that time.

The RCC placement will continue in the same manner as in 2016. The exception is that the 80t crane originally located upstream of the RCC will be removed and replaced with a 120t crane. This crane will be located on the downstream side on the North Dam.

For the North Abutment, from elevation 36.39 to 45.39, we are planning to move one of the swingers to the block 23 (STA 1+560.229) and add the extra conveyors as needed from the other conveyor

Drilling and grouting for the Curtain grouting will start once sufficient RCC has been placed. Most of the grouting will be done from the gallery with adequately dimensioned machinery. The North abutment (B32 to B38) will be done from top of the RCC. We will utilize the services of a grouting specialist for this work.

The construction of the Flip Bucket will start on or about May 29, 2017. Conventional wood forms will be utilized for sections 30 degrees and greater. The sections below this will utilize wooden panels in an open stepped configuration that will allow placement and finishing at the same time.

The construction of the crest concrete will be done in a similar manner as the flip bucket.

A specialist drilling subcontractor will be utilized for drilling the drainage holes from the drainage gallery to the crest.

36. SOUTH DAM

The overburden material will be excavated with a 75t excavator and loaded in to 40T articulated trucks and hauled to a disposal area.

Prior to the placement of fills on in-situ rock, the foundation area under Zones 1 will be cleaned using gas/electric pumps (for wash water), excavators, skid loaders, and labour with hand tools. Small excavators will remove the bulk of the material (using a plate attached to the bucket), then a combination of general washing, high pressure washing, and compressed air. Vacuum truck and hose will be used where conditions are suitable for removal of materials. Small machinery and hand pick up will remove all debris from rock surfaces. All rock surfaces will be thoroughly cleaned leaving no gravel, mud, silt, loose rock, or other debris. The prepared foundation areas will be viewed and signed off on the appropriate foundation inspection form.

Figure 47: Earthfill Dam Construction, Mont Wright, QC

Dental concrete will be supplied by a local supplier from Goose Bay or from a plant on site. The concrete will be placed with labourers and vibrated in place. This crew will also place the dry

pack and slush grout where directed. Our proposal does not include for any formwork for these items. This would be additional to the proposal.

Grouting will be completed with the assistance of a grouting specialist.

The remainder of the South Dam will be constructed with the same equipment utilizing the same methodology as the compacted section of the upstream cofferdam.

37. DEMOBILIZATION

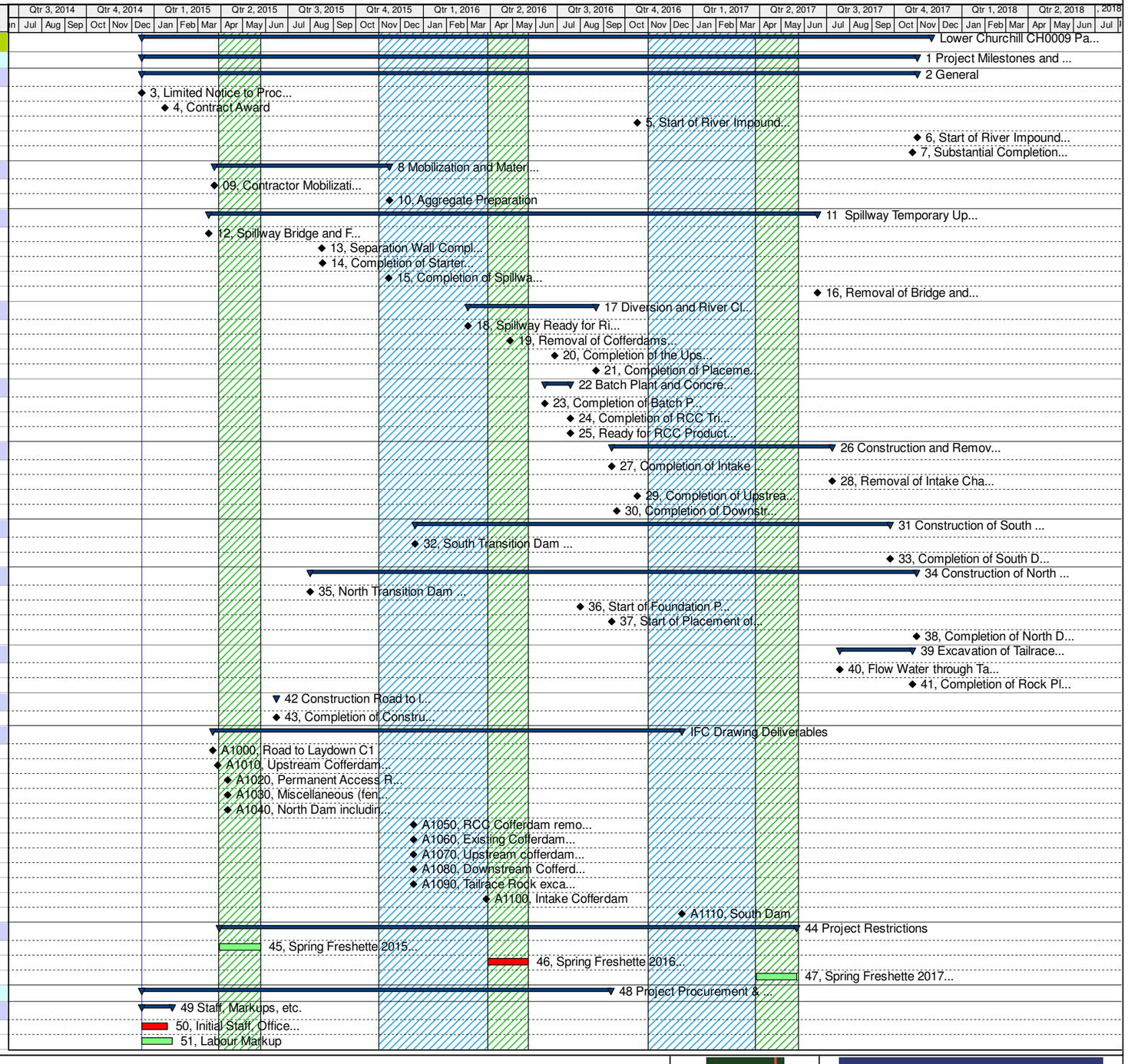
Plant and equipment will be demobilized as it is no longer required for the project. Items will be carefully taken down in reverse order of setup and transported off site.

CIMFP Exhibit P-02759

LOWER CHURCHILL PROJECT - PACKAGE CH-0009
NORTH & SOUTH DAMS

Date: 11/12/14 Time: 12:36
Data Date: 12/15/14

#	Activity ID	Activity Name	Original Duration	Start	Finish
1	**Lower Churchill CH0009 Package - Construction of North & South Dams [11N**		146w 1d	12/15/14	11/20/17
2	**1 Project Milestones and Restrictions**		143w 3d	12/15/14	11/01/17
3	2 General		143w 3d	12/15/14	11/01/17
4	3	Limited Notice to Proceed	0w	12/15/14*	
5	4	Contract Award	0w	01/15/15*	
6	5	Start of River Impoundment to Elev. 25.0m	0w	10/17/16*	
7	6	Start of River Impoundment to Elev. 39.0m	0w	11/01/17*	
8	7	Substantial Completion of the Work	0w		10/25/17
9	8 Mobilization and Materials		34w	03/23/15	11/16/15
10	09	Contractor Mobilization	0w	03/23/15*	
11	10	Aggregate Preparation	0w	11/16/15	
12	11 Spillway Temporary Upstream Bridge and Access Ramps		113w 2d	03/15/15	06/19/17
13	12	Spillway Bridge and Foundation Design	0w	03/15/15*	
14	13	Separation Wall Completed	0w		08/15/15*
15	14	Completion of Starter Groins	0w		08/16/15*
16	15	Completion of Spillway Upstream Temporary Bridge	0w		11/14/15
17	16	Removal of Bridge and Access Ramps	0w	06/19/17	
18	17 Diversion and River Closure		24w 6d	03/01/16	08/22/16
19	18	Spillway Ready for River Diversion	0w	03/01/16*	
20	19	Removal of Cofferdams 1,2 &3 and Area J	0w	04/27/16*	
21	20	Completion of the Upstream and Downstream Groins	0w	06/27/16*	
22	21	Completion of Placement of Till between Groins	0w	08/22/16*	
23	22 Batch Plant and Concrete Production		5w	06/13/16	07/18/16
24	23	Completion of Batch Plant Installation	0w	06/13/16*	
25	24	Completion of RCC Trial Section	0w	07/18/16*	
26	25	Ready for RCC Production	0w	07/18/16*	
27	26 Construction and Removal of Cofferdams		39w 7d	09/12/16	07/09/17
28	27	Completion of Intake Channel Cofferdam	0w	09/12/16*	
29	28	Removal of Intake Channel Cofferdam	0w	07/09/17*	
30	29	Completion of Upstream Cofferdam to Elev. 26m	0w	10/17/16*	
31	30	Completion of Downstream Cofferdam	0w	09/19/16*	
32	31 Construction of South Dam		87w 2d	12/20/15	09/25/17
33	32	South Transition Dam Completed	0w	12/20/15*	
34	33	Completion of South Dam	0w	09/25/17*	
35	34 Construction of North Dam		112w 5d	07/31/15	10/31/17
36	35	North Transition Dam Completed	0w	07/31/15*	
37	36	Start of Foundation Preparation for North Dam	0w	08/01/16*	
38	37	Start of Placement of RCC	0w	09/12/16*	
39	38	Completion of North Dam	0w	10/31/17*	
40	39 Excavation of Tailrace Rock Plug		14w 0d	07/19/17	10/25/17
41	40	Flow Water through Tailrace for Commissioning	0w	07/19/17*	
42	41	Completion of Rock Plug Excavation	0w	10/25/17*	
43	42 Construction Road to laydown C1		0w	06/15/15	06/15/15
44	43	Completion of Construction Road to C1	0w	06/15/15*	
45	IFC Drawing Deliverables		89w	03/20/15	12/16/16
46	A1000	Road to Laydown C1	0w		03/20/15*
47	A1010	Upstream Cofferdam Starter Groins	0w		03/27/15*
48	A1020	Permanent Access Roads	0w		04/10/15*
49	A1030	Miscellaneous (fence, quide rails, etc.)	0w		04/10/15*
50	A1040	North Dam including Precast	0w		04/10/15*
51	A1050	RCC Cofferdam removal	0w		12/18/15*
52	A1060	Existing Cofferdams removal	0w		12/18/15*
53	A1070	Upstream cofferdam for North Dam	0w		12/18/15*
54	A1080	Downstream Cofferdam	0w		12/18/15*
55	A1090	Tailrace Rock excavation	0w		12/18/15*
56	A1100	Intake Cofferdam	0w		03/25/16*
57	A1110	South Dam	0w		12/16/16*
58	44 Project Restrictions		107w 1d	03/30/15	05/21/17
59	45	Spring Freshette 2015 (Estimated)	8w	03/30/15*	05/24/15
60	46	Spring Freshette 2016 (Estimated)	8w	03/28/16*	05/22/16
61	47	Spring Freshette 2017 (Estimated)	8w	03/27/17*	05/21/17
62	**48 Project Procurement & Mobilization**		87w	12/15/14	09/11/16
63	49 Staff, Markups, etc.		4w	12/15/14	01/25/15
64	50	Initial Staff, Office, etc.	3w	12/15/14	01/18/15
65	51	Labour Markup	4w	12/15/14	01/25/15



Remaining Level of Effort
Actual Level of Effort
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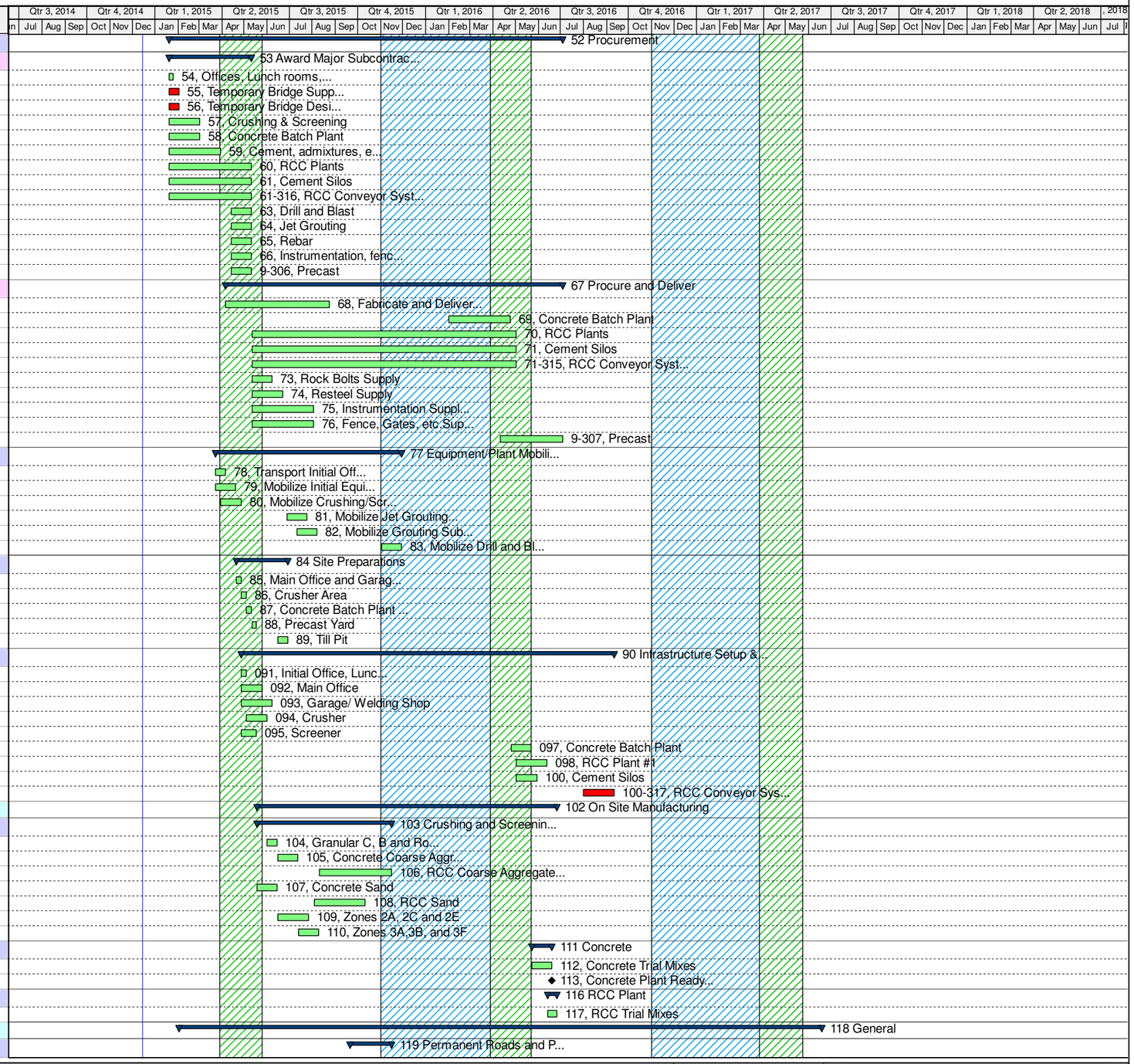
Summary

LOWER CHURCHILL - NORTH & SOUTH DAMS (PACKAGE CH-0009)
Dragados Canada, Inc. and **H.J.O' Connell Contruction Limited**

O'CONNELL

DRAGADOS CANADA

#	Activity ID	Activity Name	Original Duration	Start	Finish
66		52 Procurement	74w	01/19/15	07/03/16
67		53 Award Major Subcontracts	16w	01/19/15	05/10/15
68	54	Offices, Lunch rooms, etc	1w	01/19/15	01/25/15
69	55	Temporary Bridge Supply	2w	01/19/15	02/01/15
70	56	Temporary Bridge Design	2w	01/19/15	02/01/15
71	57	Crushing & Screening	6w	01/19/15	03/01/15
72	58	Concrete Batch Plant	6w	01/19/15	03/01/15
73	59	Cement, admixtures, etc.	10w	01/19/15	03/29/15
74	60	RCC Plants	16w	01/19/15	05/10/15
75	61	Cement Silos	16w	01/19/15	05/10/15
76	61-316	RCC Conveyor System	16w	01/19/15	05/10/15
77	63	Drill and Blast	4w	04/13/15*	05/10/15
78	64	Jet Grouting	4w	04/13/15*	05/10/15
79	65	Rebar	4w	04/13/15*	05/10/15
80	66	Instrumentation, fence, rock bolts, etc.	4w	04/13/15*	05/10/15
81	9-306	Precast	4w	04/13/15*	05/10/15
82		67 Procure and Deliver	63w	04/06/15	07/03/16
83	68	Fabricate and Deliver Bridge	20w	04/06/15	08/23/15
84	69	Concrete Batch Plant	12w	02/01/16*	04/24/16
85	70	RCC Plants	49w	05/11/15	05/01/16
86	71	Cement Silos	49w	05/11/15	05/01/16
87	71-315	RCC Conveyor System	49w	05/11/15	05/01/16
88	73	Rock Bolts Supply	4w	05/11/15	06/07/15
89	74	Resteel Supply	6w	05/11/15	06/21/15
90	75	Instrumentation Supply	12w	05/11/15	08/02/15
91	76	Fence, Gates, etc.Supply	12w	05/11/15	08/02/15
92	9-307	Precast	12w	04/11/16*	07/03/16
93		77 Equipment/Plant Mobilization	36w	03/23/15	11/29/15
94	78	Transport Initial Office, Lunchroom, Washroom, etc	2w	03/23/15*	04/05/15
95	79	Mobilize Initial Equipment	4w	03/23/15*	04/19/15
96	80	Mobilize Crushing/Screening Plants	4w	03/30/15*	04/26/15
97	81	Mobilize Jet Grouting Subcontractor	4w	06/27/15*	07/24/15
98	82	Mobilize Grouting Subcontractor	4w	07/11/15*	08/07/15
99	83	Mobilize Drill and Blast Subcontractor	4w	11/02/15*	11/29/15
100		84 Site Preparations	10w	04/20/15	06/28/15
101	85	Main Office and Garage/ Welding Shop	1w	04/20/15*	04/26/15
102	86	Crusher Area	1w	04/27/15	05/03/15
103	87	Concrete Batch Plant Area	1w	05/04/15	05/10/15
104	88	Precast Yard	1w	05/11/15	05/17/15
105	89	Till Pit	2w	06/15/15*	06/28/15
106		90 Infrastructure Setup & Commission	70w	04/27/15	09/11/16
107	091	Initial Office, Lunchroom and Washroom	1w	04/27/15	05/03/15
108	092	Main Office	4w	04/27/15	05/24/15
109	093	Garage/ Welding Shop	6w	04/27/15	06/07/15
110	094	Crusher	4w	05/04/15	05/31/15
111	095	Screener	3w	04/27/15	05/17/15
112	097	Concrete Batch Plant	4w	04/25/16	05/22/16
113	098	RCC Plant #1	6w	05/02/16	06/12/16
114	100	Cement Silos	4w	05/02/16	05/29/16
115	100-317	RCC Conveyor System	6w	08/01/16	09/11/16
116		**102 On Site Manufacturing**	56w	05/18/15	06/26/16
117		103 Crushing and Screening	26w	05/18/15	11/15/15
118	104	Granular C, B and Road Topping	2w	06/01/15	06/14/15
119	105	Concrete Coarse Aggregates	4w	06/15/15	07/12/15
120	106	RCC Coarse Aggregates	14w	08/10/15*	11/15/15
121	107	Concrete Sand	4w	05/18/15	06/14/15
122	108	RCC Sand	10w	08/03/15*	10/11/15
123	109	Zones 2A, 2C and 2E	6w	06/15/15	07/26/15
124	110	Zones 3A,3B, and 3F	4w	07/13/15	08/09/15
125		111 Concrete	4w	05/23/16	06/19/16
126	112	Concrete Trial Mixes	4w	05/23/16	06/19/16
127	113	Concrete Plant Ready for Production	0w		06/19/16
128		116 RCC Plant	2w	06/13/16	06/26/16
129	117	RCC Trial Mixes	2w	06/13/16	06/26/16
130		**118 General**	119w 1d	02/02/15	06/18/17
131		119 Permanent Roads and Parking Area (S.S.)	8w	09/21/15	11/15/15



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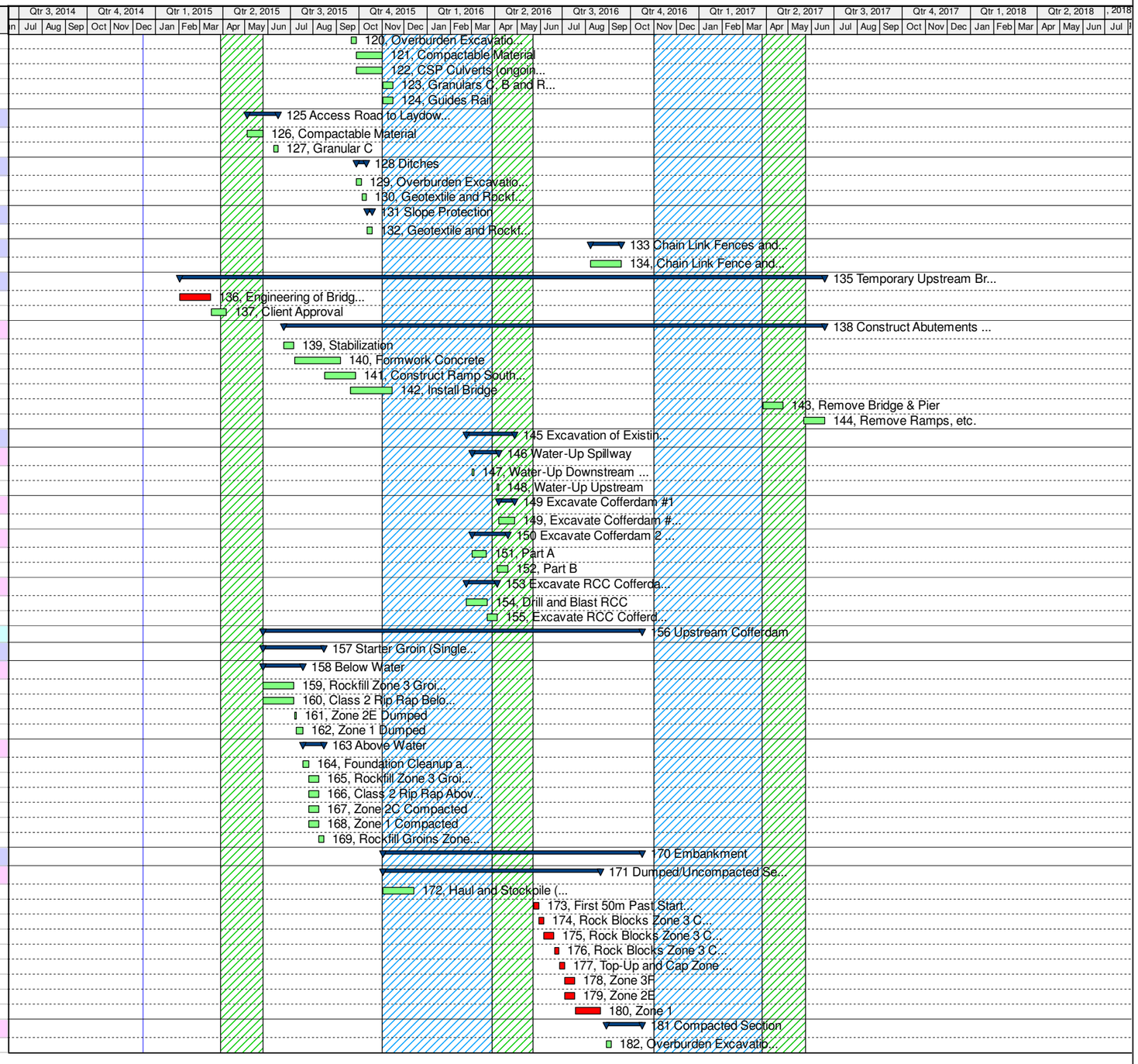
#	Activity ID	Activity Name	Original Duration	Start	Finish
132	120	Overburden Excavation	1w	09/21/15*	09/27/15
133	121	Compactable Material	5w	09/28/15	11/01/15
134	122	CSP Culverts (ongoing)	5w	09/28/15	11/01/15
135	123	Granulars C, B and Road Topping	2w	11/02/15	11/15/15
136	124	Guides Rail	2w	11/02/15	11/15/15
137	125	Access Road to Laydown C1 (S.S.)	6w	05/04/15	06/14/15
138	126	Compactable Material	3w	05/04/15	05/24/15
139	127	Granular C	1w	06/08/15	06/14/15
140	128	Ditches	2w	09/28/15	10/11/15
141	129	Overburden Excavation	1w	09/28/15*	10/04/15
142	130	Geotextile and Rockfill	1w	10/05/15	10/11/15
143	131	Slope Protection	1w	10/12/15	10/18/15
144	132	Geotextile and Rockfill	1w	10/12/15	10/18/15
145	133	Chain Link Fences and Gates	6w	08/08/16	09/18/16
146	134	Chain Link Fence and Gates	6w	08/08/16*	09/18/16
147	135	Temporary Upstream Bridge (S.S.)	119w 1d	02/02/15	06/18/17
148	136	Engineering of Bridge, Piers, etc.	6w	02/02/15	03/15/15
149	137	Client Approval	3w	03/16/15	04/05/15
150	138	Construct Abutements and Pier	99w 1d	06/22/15	06/18/17
151	139	Stabilization	2w	06/22/15*	07/05/15
152	140	Formwork Concrete	9w	07/06/15	09/06/15
153	141	Construct Ramp South Side	6w	08/16/15	09/26/15
154	142	Install Bridge	8w	09/20/15	11/14/15
155	143	Remove Bridge & Pier	4w	03/27/17*	04/23/17
156	144	Remove Ramps, etc.	4w	05/22/17*	06/18/17
157	145	Excavation of Existing Cofferdams	9w 3d	02/22/16	04/27/16
158	146	Water-Up Spillway	5w 2d	03/01/16	04/06/16
159	147	Water-Up Downstream (if required)	0w 3d	03/01/16	03/03/16
160	148	Water-Up Upstream	0w 3d	04/04/16	04/06/16
161	149	Excavate Cofferdam #1	3w	04/06/16	04/27/16
162	149	Excavate Cofferdam #1	3w	04/06/16	04/27/16
163	150	Excavate Cofferdam 2 & 3	6w 6d	03/01/16	04/18/16
164	151	Part A	2w 6d	03/01/16	03/20/16
165	152	Part B	2w	04/04/16	04/18/16
166	153	Excavate RCC Cofferdam	6w	02/22/16	04/04/16
167	154	Drill and Blast RCC	4w	02/22/16	03/21/16
168	155	Excavate RCC Cofferdam	2w	03/21/16	04/04/16
169	**156**	**Upstream Cofferdam**	71w	05/25/15	10/16/16
170	157	Starter Groin (Single Shift)	11w 6d	05/25/15	08/15/15
171	158	Below Water	7w 6d	05/25/15	07/18/15
172	159	Rockfill Zone 3 Groins - Starter to Encase Till	6w	05/25/15	07/05/15
173	160	Class 2 Rip Rap Below WL	6w	05/25/15	07/05/15
174	161	Zone 2E Dumped	0w 3d	07/06/15	07/08/15
175	162	Zone 1 Dumped	1w 3d	07/08/15	07/18/15
176	163	Above Water	4w	07/18/15	08/15/15
177	164	Foundation Cleanup and Preparation	1w	07/18/15	07/25/15
178	165	Rockfill Zone 3 Groin - Above Water	2w	07/25/15	08/08/15
179	166	Class 2 Rip Rap Above WL	2w	07/25/15	08/08/15
180	167	Zone 2C Compacted	2w	07/25/15	08/08/15
181	168	Zone 1 Compacted	2w	07/25/15	08/08/15
182	169	Rockfill Groins Zone 3 - Cap Starter/Ramp	1w	08/08/15	08/15/15
183	170	Embankment	48w	11/02/15	10/16/16
184	171	Dumped/Uncompacted Section	40w	11/02/15	08/21/16
185	172	Haul and Stockpile (1/2 Class 2 and Class3)	6w	11/02/15*	12/13/15
186	173	First 50m Past Starter Groins	1w	05/23/16	05/29/16
187	174	Rock Blocks Zone 3 Class 1	1w	05/30/16	06/05/16
188	175	Rock Blocks Zone 3 Class 2	2w	06/06/16	06/19/16
189	176	Rock Blocks Zone 3 Class 3	1w	06/20/16	06/26/16
190	177	Top-Up and Cap Zone 3	1w	06/27/16	07/03/16
191	178	Zone 3F	2w	07/04/16	07/17/16
192	179	Zone 2E	2w	07/04/16	07/17/16
193	180	Zone 1	5w	07/18/16	08/21/16
194	181	Compacted Section	7w	08/29/16	10/16/16
195	182	Overburden Excavation - North Side	1w	08/29/16*	09/04/16



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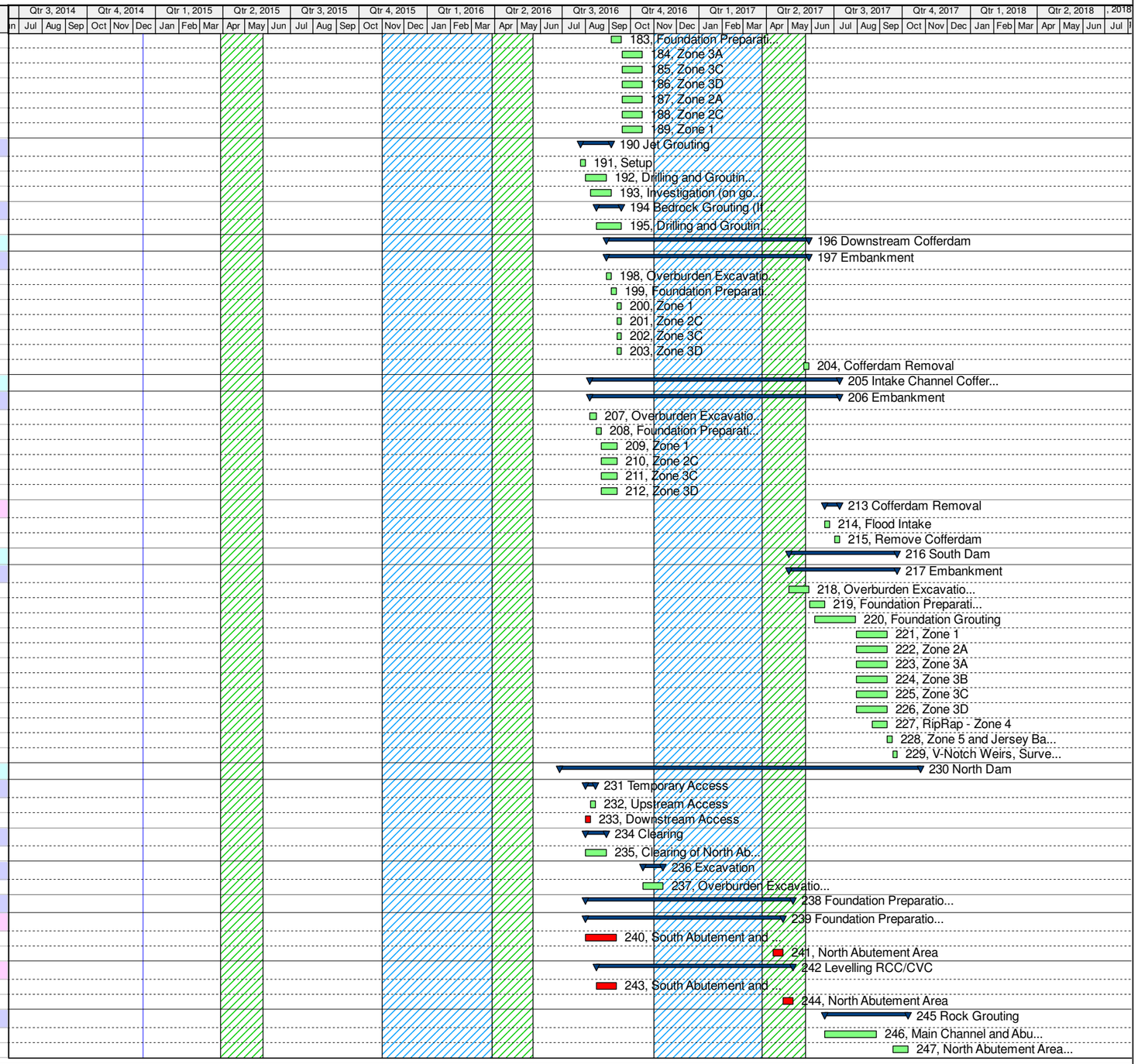
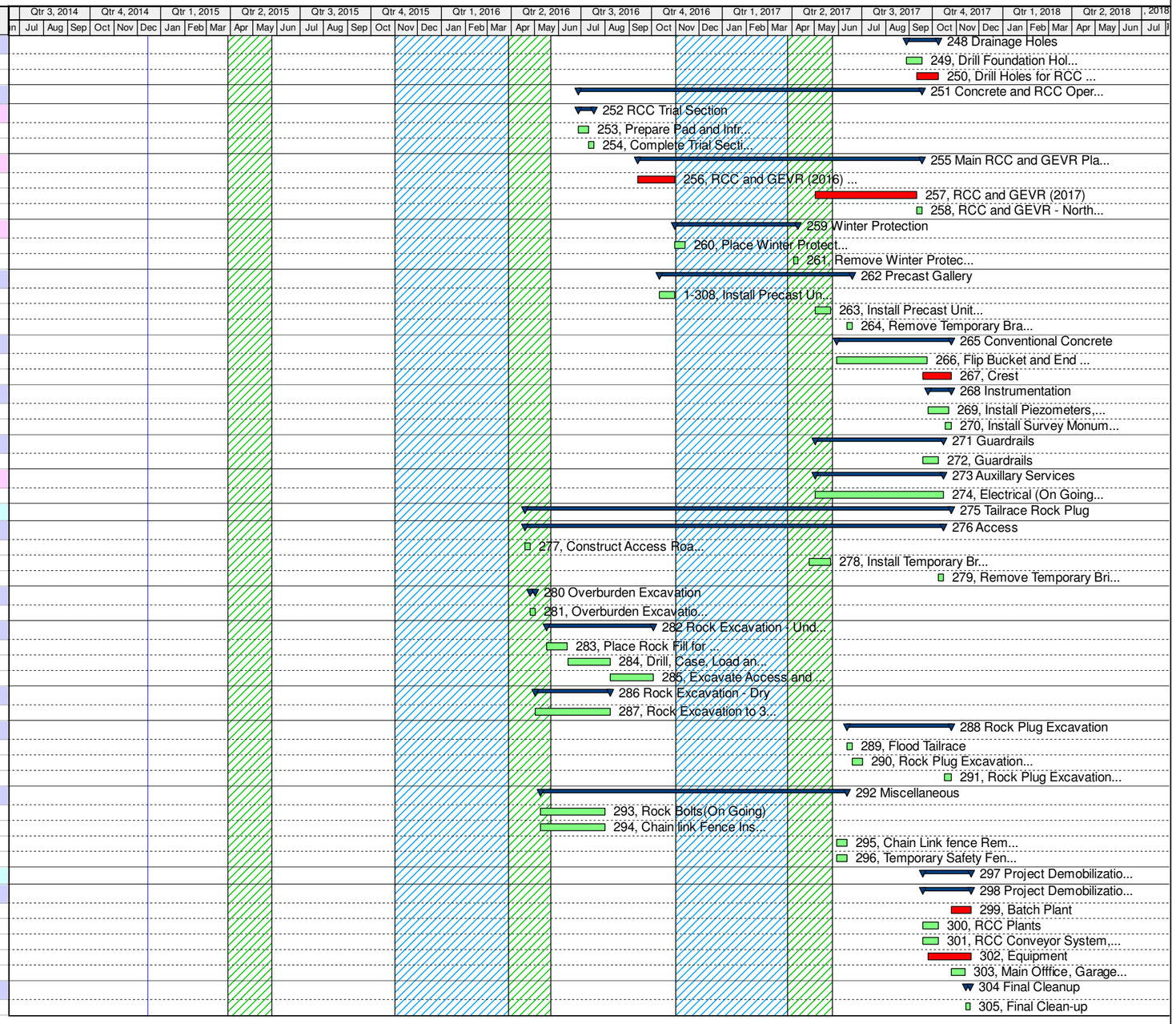
#	Activity ID	Activity Name	Original Duration	Start	Finish
196	183	Foundation Preparation - North Side	2w	09/05/16	09/18/16
197	184	Zone 3A	4w	09/19/16	10/16/16
198	185	Zone 3C	4w	09/19/16	10/16/16
199	186	Zone 3D	4w	09/19/16	10/16/16
200	187	Zone 2A	4w	09/19/16	10/16/16
201	188	Zone 2C	4w	09/19/16	10/16/16
202	189	Zone 1	4w	09/19/16	10/16/16
203	190	Jet Grouting	6w	07/25/16	09/04/16
204	191	Setup	1w	07/25/16	07/31/16
205	192	Drilling and Grouting	4w	08/01/16	08/28/16
206	193	Investigation (on going)	4w	08/08/16	09/04/16
207	194	Bedrock Grouting (If Required)	5w	08/15/16	09/18/16
208	195	Drilling and Grouting	5w	08/15/16	09/18/16
209	**196**	**Downstream Cofferdam**	36w 1d	08/29/16	05/28/17
210	197	Embankment	36w 1d	08/29/16	05/28/17
211	198	Overburden Excavation	1w	08/29/16*	09/04/16
212	199	Foundation Preparation	1w	09/05/16	09/11/16
213	200	Zone 1	1w	09/12/16	09/18/16
214	201	Zone 2C	1w	09/12/16	09/18/16
215	202	Zone 3C	1w	09/12/16	09/18/16
216	203	Zone 3D	1w	09/12/16	09/18/16
217	204	Cofferdam Removal	1w	05/22/17	05/28/17
218	**205**	**Intake Channel Cofferdam**	45w 2d	08/06/16	07/08/17
219	206	Embankment	45w 2d	08/06/16	07/08/17
220	207	Overburden Excavation	1w 2d	08/06/16*	08/15/16
221	208	Foundation Preparation	1w	08/15/16	08/22/16
222	209	Zone 1	3w	08/22/16	09/12/16
223	210	Zone 2C	3w	08/22/16	09/12/16
224	211	Zone 3C	3w	08/22/16	09/12/16
225	212	Zone 3D	3w	08/22/16	09/12/16
226	213	Cofferdam Removal	2w 6d	06/19/17	07/08/17
227	214	Flood Intake	1w	06/19/17*	06/25/17
228	215	Remove Cofferdam	1w	07/02/17	07/08/17
229	**216**	**South Dam**	21w	05/01/17	09/24/17
230	217	Embankment	21w	05/01/17	09/24/17
231	218	Overburden Excavation	4w	05/01/17*	05/28/17
232	219	Foundation Preparation	3w	05/29/17	06/18/17
233	220	Foundation Grouting	8w	06/05/17	07/30/17
234	221	Zone 1	6w	07/31/17	09/10/17
235	222	Zone 2A	6w	07/31/17	09/10/17
236	223	Zone 3A	6w	07/31/17	09/10/17
237	224	Zone 3B	6w	07/31/17	09/10/17
238	225	Zone 3C	6w	07/31/17	09/10/17
239	226	Zone 3D	6w	07/31/17	09/10/17
240	227	RipRap - Zone 4	3w	08/21/17	09/10/17
241	228	Zone 5 and Jersey Barriers	1w	09/11/17	09/17/17
242	229	V-Notch Weirs, Survey Monuments, etc.	1w	09/18/17	09/24/17
243	**230**	**North Dam**	66w 3d	06/27/16	10/25/17
244	231	Temporary Access	2w	08/01/16	08/14/16
245	232	Upstream Access	1w	08/08/16	08/14/16
246	233	Downstream Access	1w	08/01/16	08/07/16
247	234	Clearing	4w	08/01/16	08/28/16
248	235	Clearing of North Abutement	4w	08/01/16*	08/28/16
249	236	Excavation	4w	10/17/16	11/13/16
250	237	Overburden Excavation	4w	10/17/16*	11/13/16
251	238	Foundation Preparation & levelling RCC/Concete	37w 1d	08/01/16	05/07/17
252	239	Foundation Preparation	35w 1d	08/01/16	04/23/17
253	240	South Abutement and Main Channel Area	6w	08/01/16	09/11/16
254	241	North Abutement Area	2w	04/10/17*	04/23/17
255	242	Levelling RCC/CVC	35w 1d	08/15/16	05/07/17
256	243	South Abutement and Main Channel Area	4w	08/15/16	09/11/16
257	244	North Abutement Area	2w	04/24/17*	05/07/17
258	245	Rock Grouting	16w	06/19/17	10/08/17
259	246	Main Channel and Abutements Area	10w	06/19/17*	08/27/17
260	247	North Abutement Area (Part B/Last 50m)	3w	09/18/17	10/08/17



#	Activity ID	Activity Name	Original Duration	Start	Finish
261		248 Drainage Holes	6w	08/28/17	10/08/17
262	249	Drill Foundation Holes	3w	08/28/17	09/17/17
263	250	Drill Holes for RCC Drainage to Gallery from Top	4w	09/11/17	10/08/17
264		251 Concrete and RCC Operations	61w 1d	06/27/16	09/17/17
265		252 RCC Trial Section	3w	06/27/16	07/17/16
266	253	Prepare Pad and Infrastructure	2w	06/27/16*	07/10/16
267	254	Complete Trial Section	1w	07/11/16	07/17/16
268		255 Main RCC and GEVR Placement	50w 1d	09/12/16	09/17/17
269	256	RCC and GEVR (2016) (Incl. Box Culvert - If. Required	7w	09/12/16	10/30/16
270	257	RCC and GEVR (2017)	19w	05/01/17*	09/10/17
271	258	RCC and GEVR - North Abutement (2017)	1w	09/11/17	09/17/17
272		259 Winter Protection	20w 1d	10/31/16	04/09/17
273	260	Place Winter Protection	2w	10/31/16	11/13/16
274	261	Remove Winter Protection	1w	04/03/17*	04/09/17
275		262 Precast Gallery	33w 1d	10/10/16	06/18/17
276	1-308	Install Precast Units 2016 (as required)	3w	10/10/16	10/30/16
277	263	Install Precast Units 2017	3w	05/01/17	05/21/17
278	264	Remove Temporary Bracing	1w	06/12/17	06/18/17
279		265 Conventional Concrete	21w 2d	05/29/17	10/25/17
280	266	Flip Bucket and End Wall	17w	05/29/17	09/24/17
281	267	Crest	5w 2d	09/18/17	10/25/17
282		268 Instrumentation	4w 2d	09/25/17	10/25/17
283	269	Install Piezometers, Weirs, etc.	4w	09/25/17	10/22/17
284	270	Install Survey Monuments	1w	10/18/17	10/25/17
285		271 Guardrails	24w	05/01/17	10/15/17
286	272	Guardrails	3w	09/18/17	10/08/17
287		273 Auxillary Services	24w	05/01/17	10/15/17
288	274	Electrical (On Going)	24w	05/01/17	10/15/17
289		**275 Tailrace Rock Plug**	76w 3d	04/18/16	10/25/17
290		276 Access	75w 1d	04/18/16	10/15/17
291	277	Construct Access Road	1w	04/18/16	04/25/16
292	278	Install Temporary Bridge	4w	04/24/17	05/21/17
293	279	Remove Temporary Bridge	1w	10/09/17	10/15/17
294		280 Overburden Excavation	1w	04/25/16	05/02/16
295	281	Overburden Excavation	1w	04/25/16	05/02/16
296		282 Rock Excavation - Underwater	20w	05/16/16	10/02/16
297	283	Place Rock Fill for Access	4w	05/16/16*	06/12/16
298	284	Drill, Case, Load and Blast	8w	06/13/16	08/07/16
299	285	Excavate Access and Underwater Rock	8w	08/08/16	10/02/16
300		286 Rock Excavation - Dry	14w	05/02/16	08/08/16
301	287	Rock Excavation to 30m Plug at Elevation 9	14w	05/02/16	08/08/16
302		288 Rock Plug Excavation	19w 2d	06/12/17	10/25/17
303	289	Flood Tailrace	1w	06/12/17*	06/18/17
304	290	Rock Plug Excavation Part A	2w	06/19/17	07/02/17
305	291	Rock Plug Excavation Part B	1w 2d	10/16/17	10/25/17
306		292 Miscellaneous	54w 1d	05/09/16	06/11/17
307	293	Rock Bolts(On Going)	12w	05/09/16	08/01/16
308	294	Chain link Fence Installation (On Going)	12w	05/09/16	08/01/16
309	295	Chain Link fence Removal	2w	05/29/17*	06/11/17
310	296	Temporary Safety Fence Removal	2w	05/29/17	06/11/17
311		**297 Project Demobilization and Final Cleanup**	9w 0d	09/18/17	11/20/17
312		298 Project Demobilization	9w 0d	09/18/17	11/20/17
313	299	Batch Plant	3w 5d	10/25/17	11/20/17
314	300	RCC Plants	3w	09/18/17	10/08/17
315	301	RCC Conveyor System, etc.	3w	09/18/17	10/08/17
316	302	Equipment	8w	09/25/17	11/20/17
317	303	Main Offfice, Garage, etc	2w 5d	10/25/17	11/12/17
318		304 Final Cleanup	1w	11/13/17	11/19/17
319	305	Final Clean-up	1w	11/13/17	11/19/17



Remaining Level of Effort
Actual Level of Effort
Remaining Work
Critical Remaining Work
Milestone
Summary