
2013Google, Imagery Mar 29, 2009

May 20, 2014

# Middle and Lower Chase River Dams Progress Update

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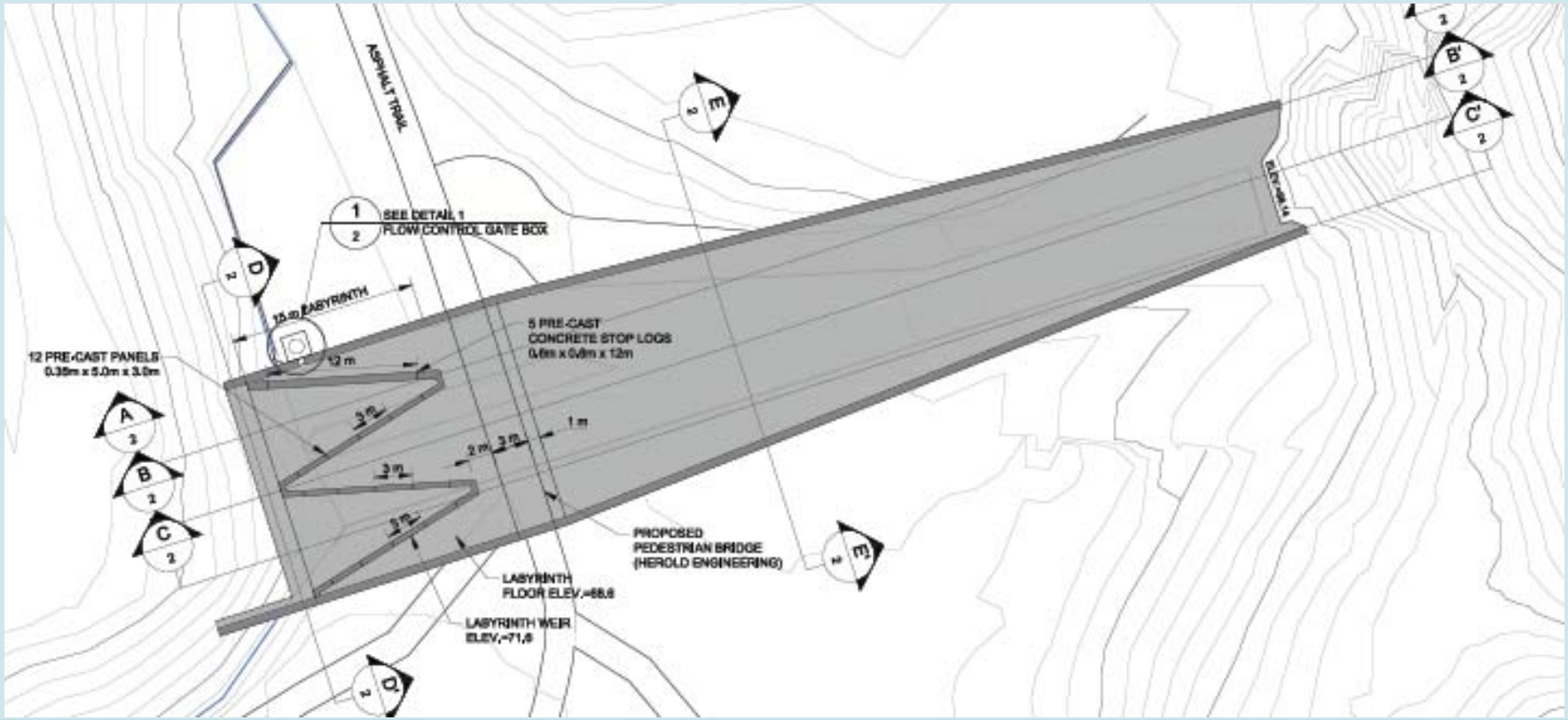
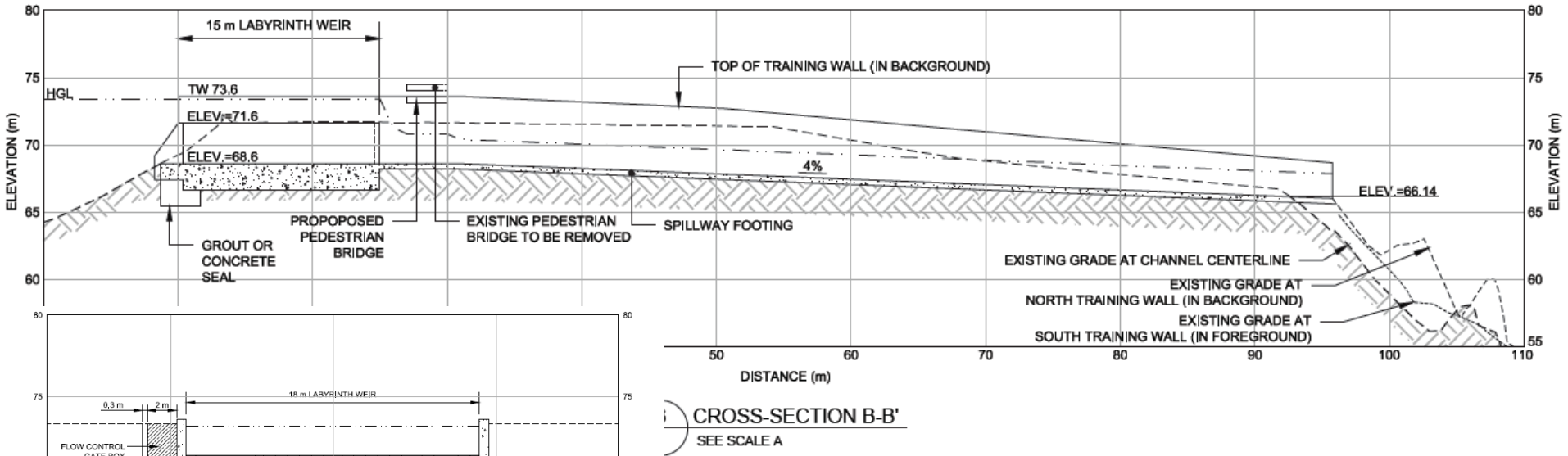
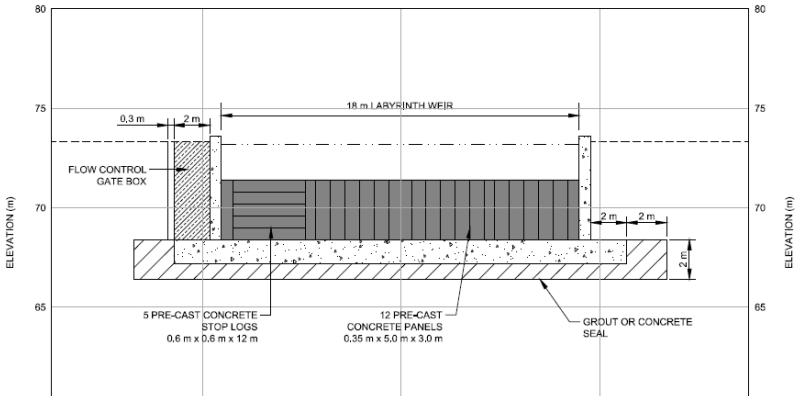
# Lower Dam: Labyrinth Spillway Plan

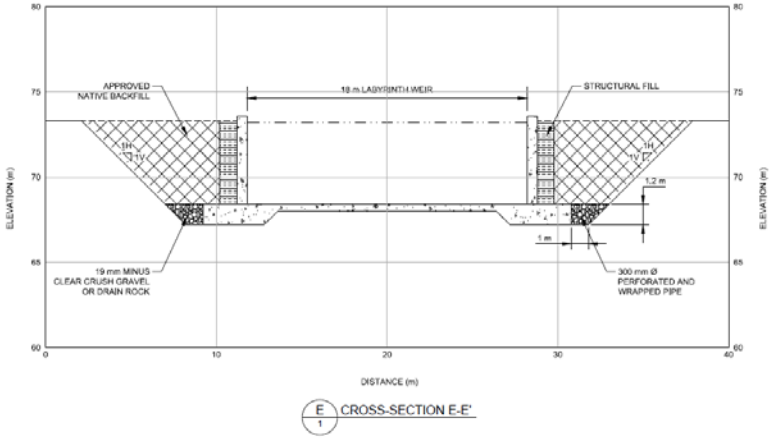



- 18 m wide at spillway entrance tapering to ~10 m wide.
- Total labyrinth height 3 m – 3 of the walls comprised of 12 pre-cast concrete panels and 1 wall comprised of 5 pre-cast concrete stop logs.
- Stop logs enable controlled draw down of reservoir following seismic event. (or for repairs, etc)
- Low level outlet for dry season releases

# Lower Dam: Labyrinth Spillway - Sections

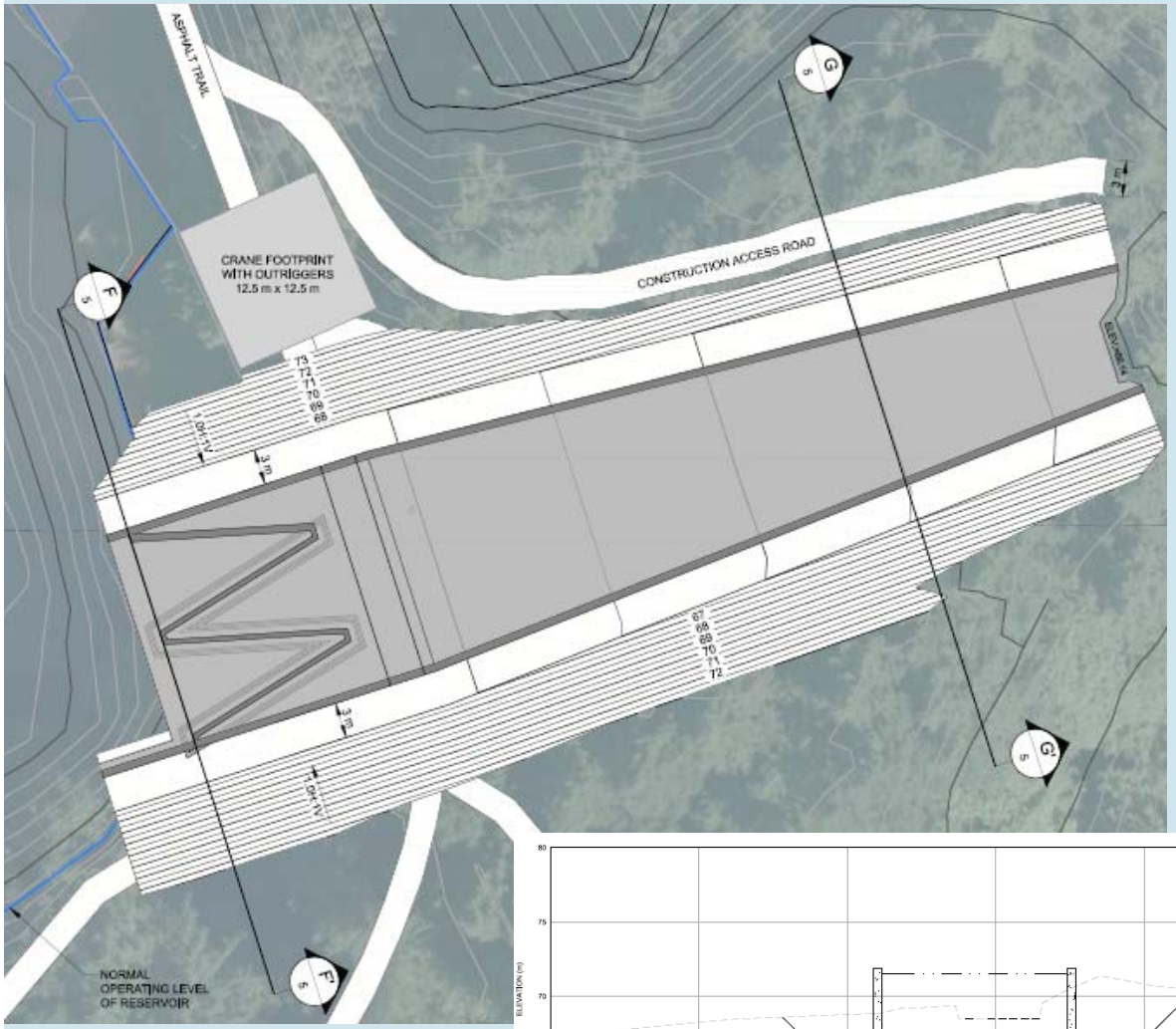


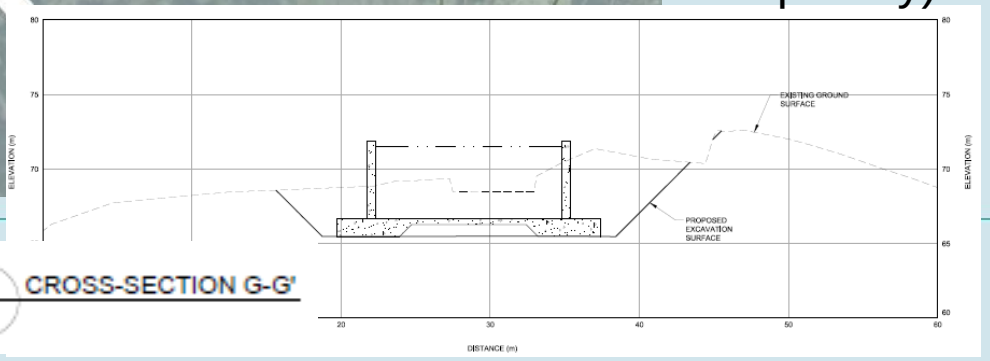




- Total Wall height 5 m at spillway entrance tapering to ~3 m high.
- Uncertainty of foundation materials – particularly beneath the weir
  - Excavation assumed to be half in rock and half in soil
- Grout or concrete seal required at spillway entrance and drainage along channel base.
- Heavy reinforced concrete walls and foundation

# Lower Dam: Labyrinth Spillway Excavation Plan and Section (18 m)




G / 4 CROSS-SECTION G-G'

Construction Sequence

- Construct lab first
- Sectional removal and construction of spillway – starting from downstream

Footprint

- Loss of ~2050m$^2$ of habitat permanently (includes existing spillway footprint)
- Disturbing of habitat during construction – footprint ~2850m$^2$ (including existing spillway).



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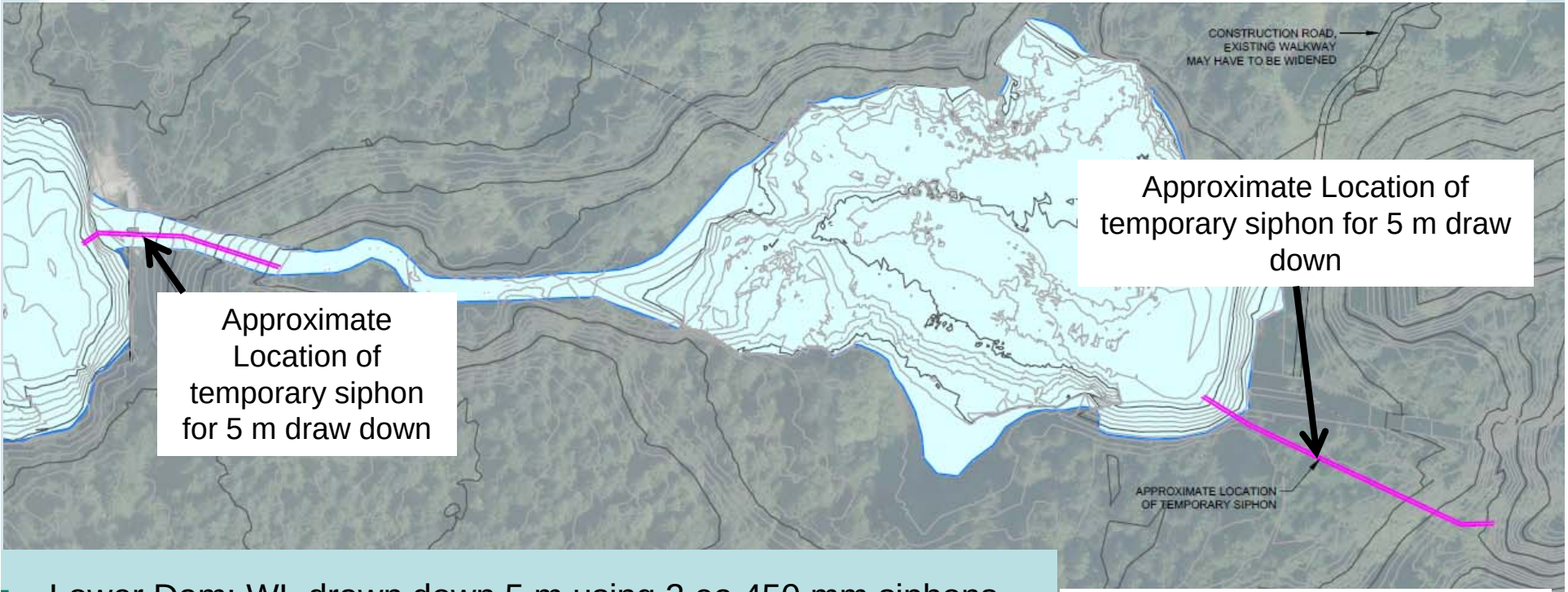
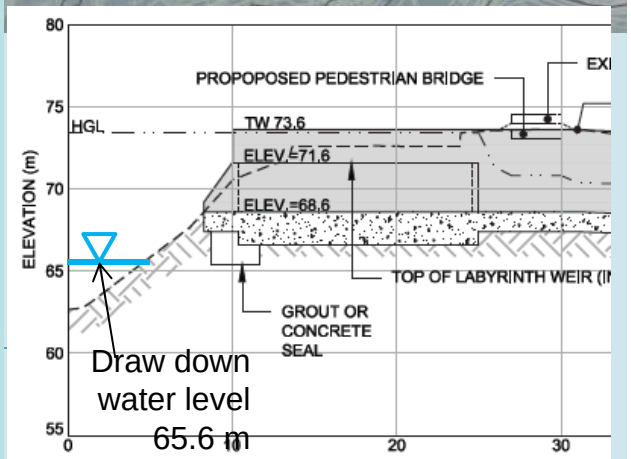
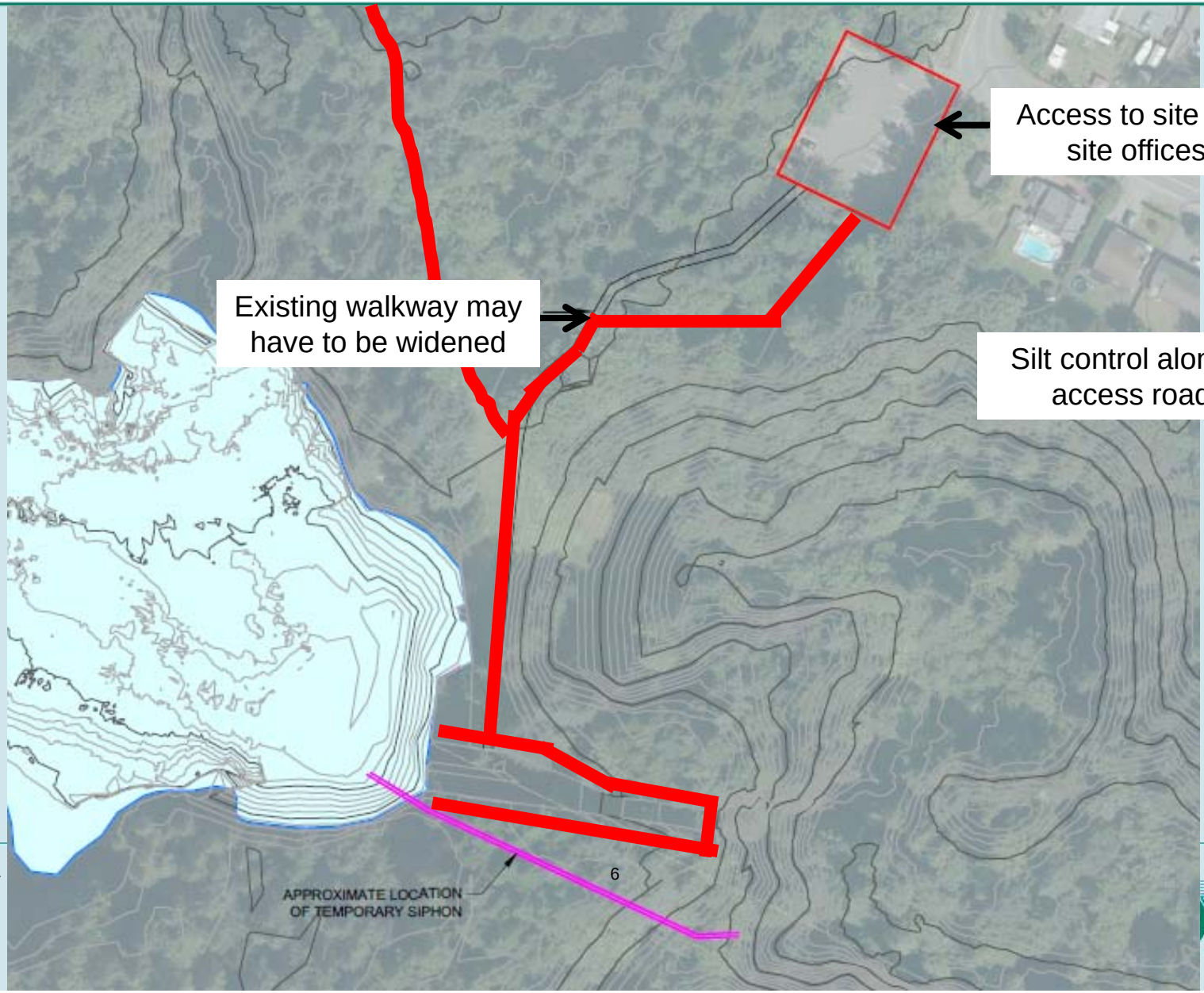
# Lower Dam: Labyrinth Spillway Diversion and Draw Down of Reservoirs




- Lower Dam: WL drawn down 5 m using 2 ea 450 mm siphons.
- Middle Dam: WL drawn down 5 m using 2 ea 450 mm siphons
- Cofferdam required at the Lower Dam only.
- The ideal construction period is Jul-Aug-Sept and 2 siphons supply capacity that's more than 600% of anticipated base flow.
- Flood in excess of diversion capacity to be routed through construction works
  - Cannot pass water over concrete less than 72 hrs - to be addressed in EMP.



# Construction Laydown, Access Roads Layout and Silt Control



# Lower Dam – Overtopping Grading Plan


- Non-level crest to concentrate flow on center of dam.
- Requires a new bridge
- Grading to minimize convergence and provide uniformity to flow.
- Existing spillway modifications required to confine design storm flows (berms not shown in plan).



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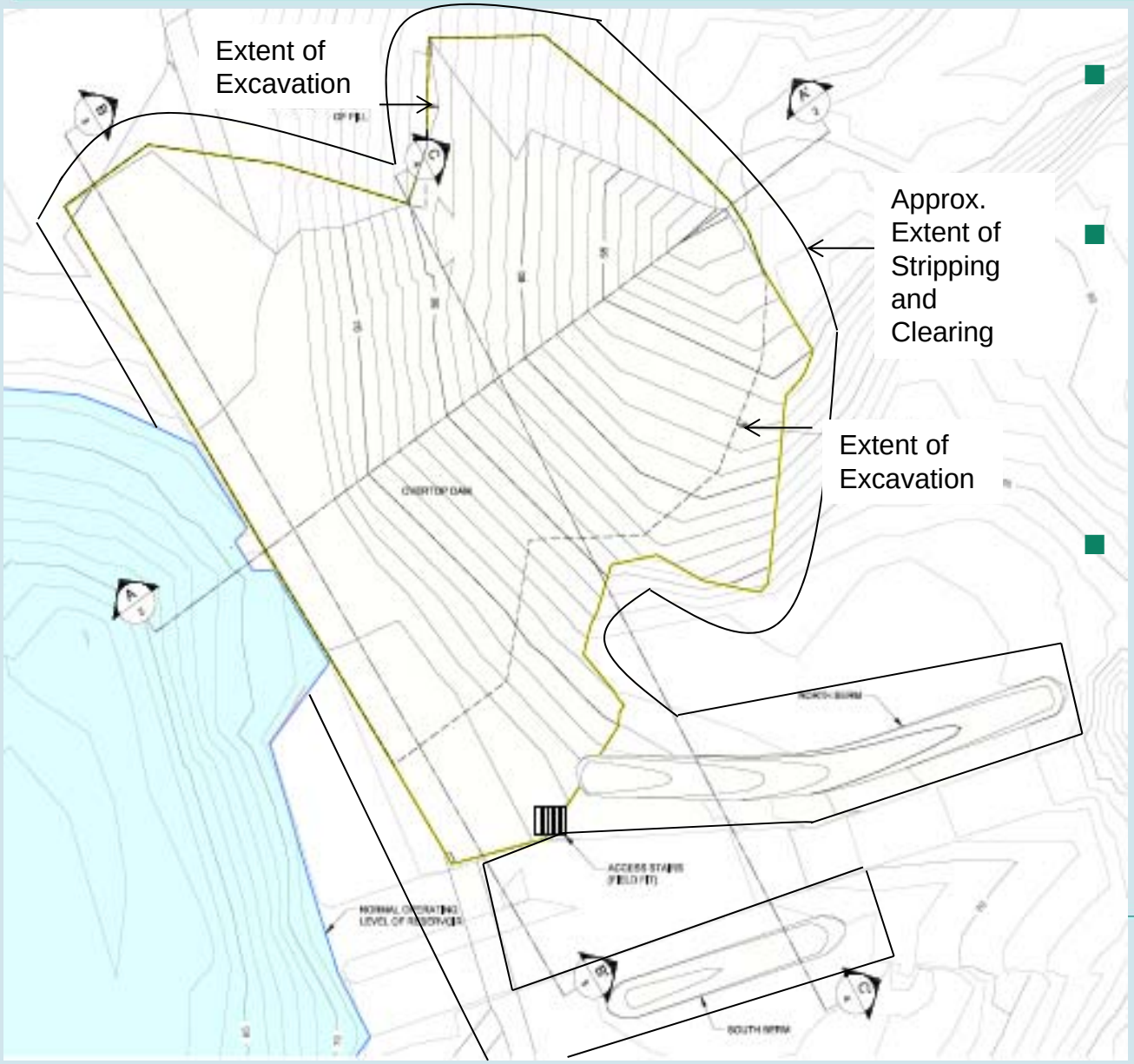
# Lower Dam: Overtop Dam Plan




- The downstream face is re-graded to bowl shape by cut and fill.
- Berms up to 1.5 m high made of soil/ cement mix are constructed along portions of the north and south sides of the existing spillway
- Requires a new bridge .

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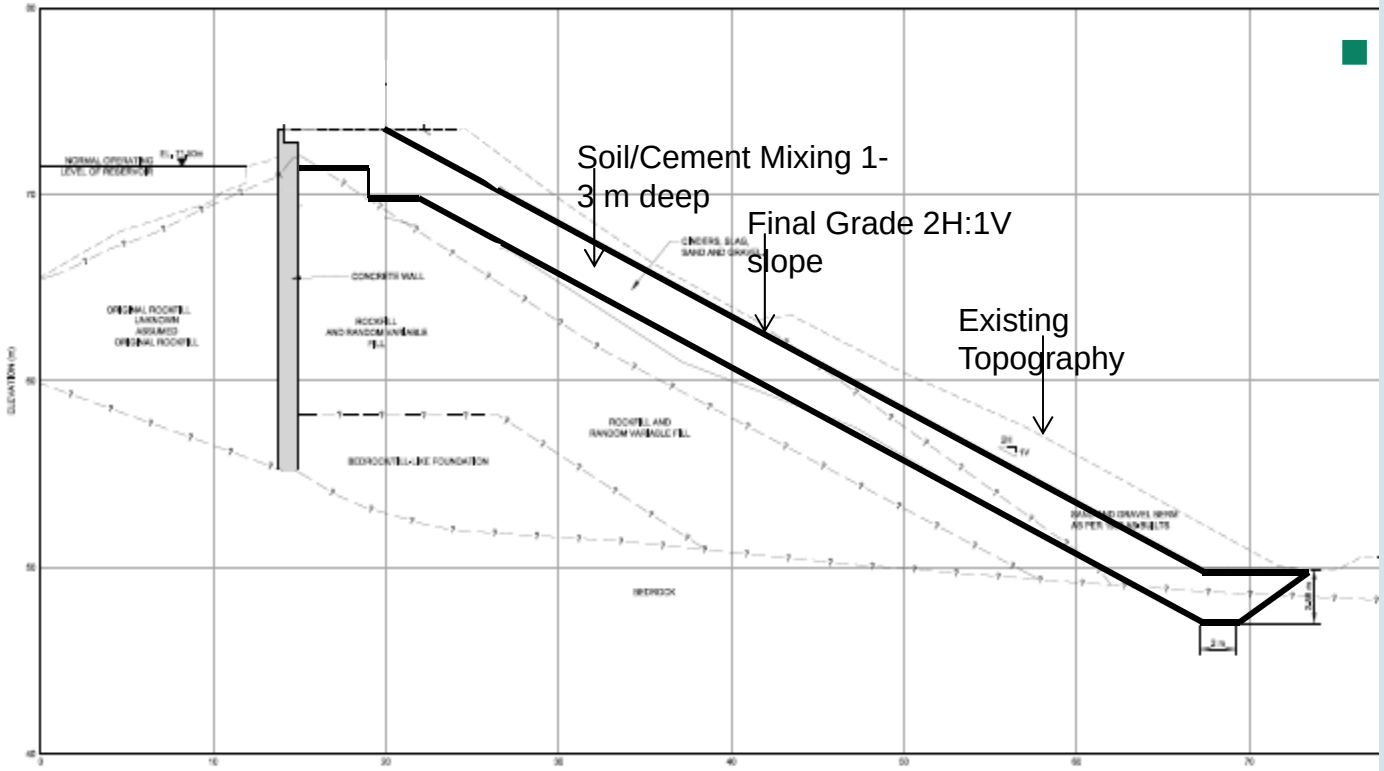
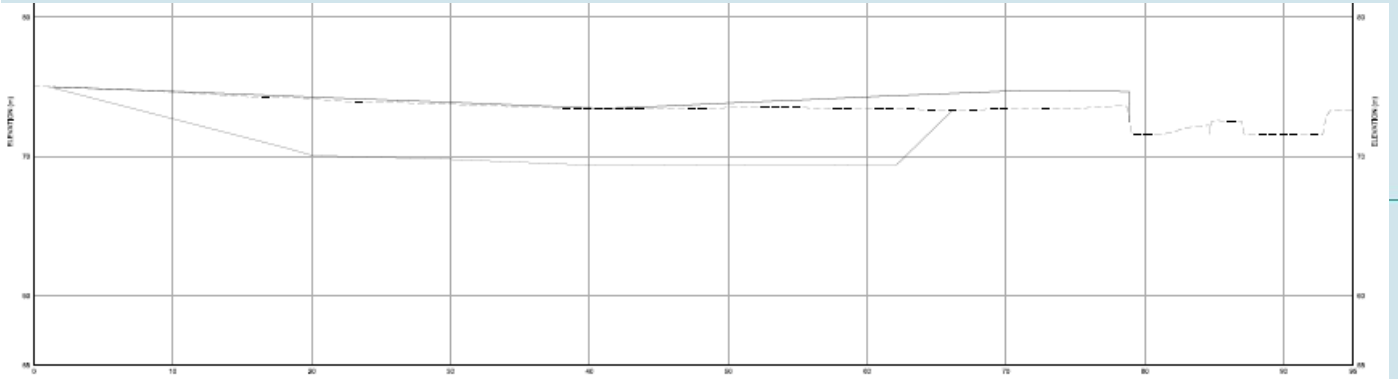
# Lower Dam: Overtop Dam Sections




- 'Hardening" done by excavating and soil/ cement mixing in strips from surface down to about 1-3 m depth.



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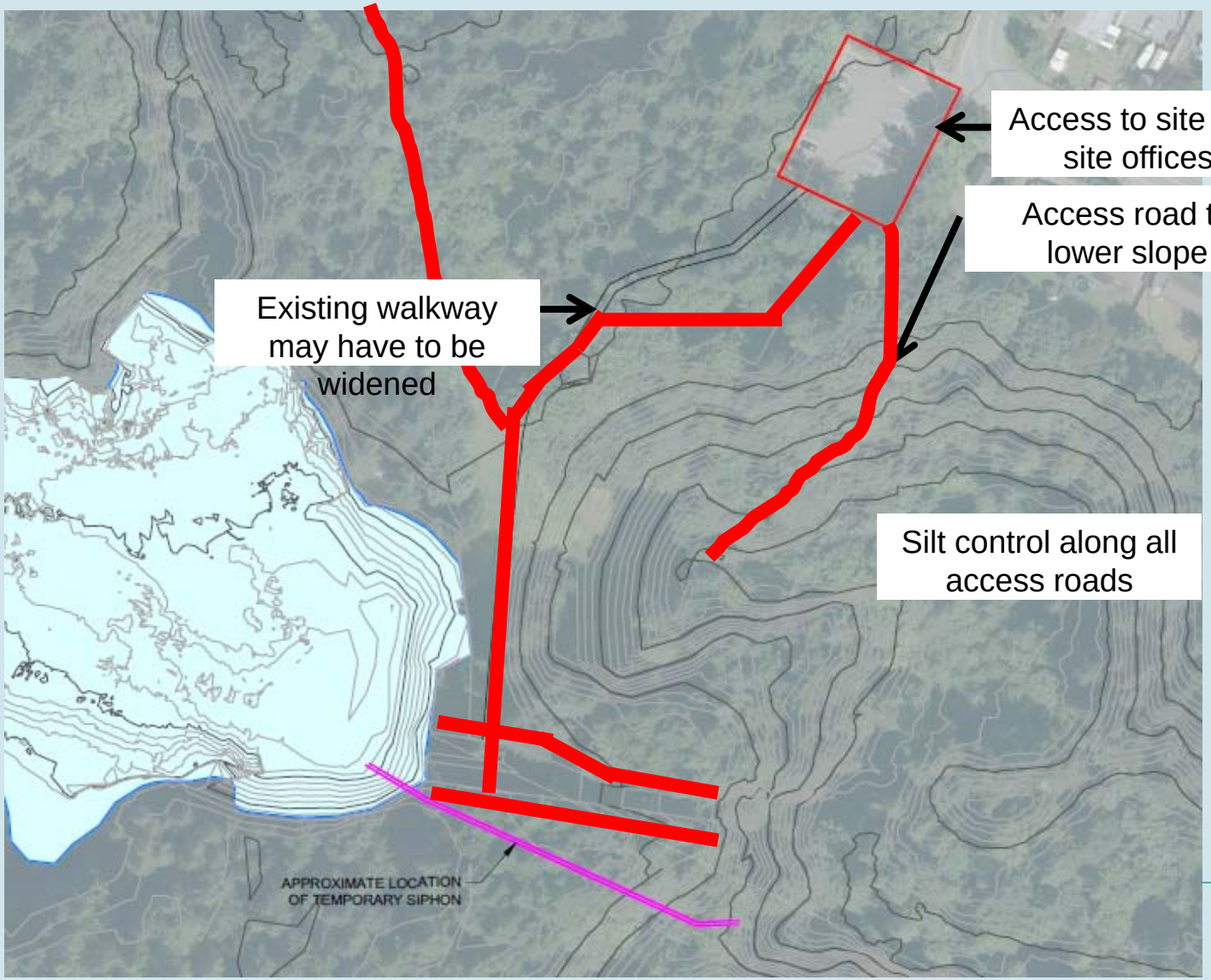
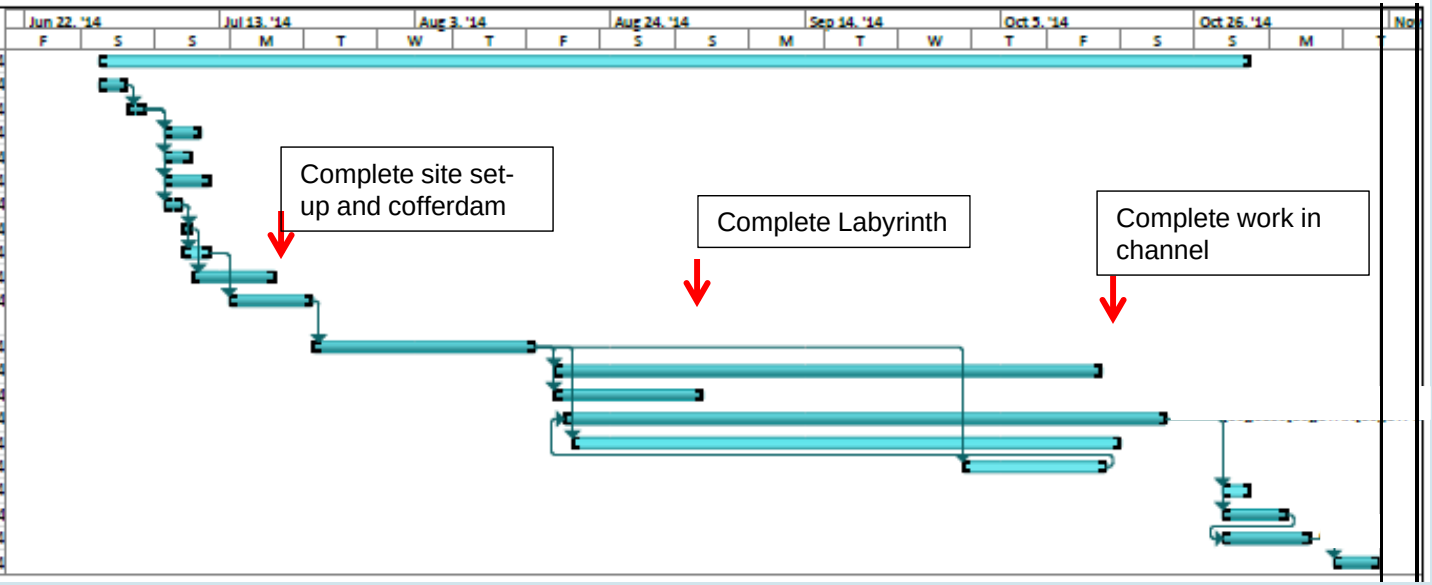


# Lower Dam: Labyrinth Spillway (12 m)

- Similar in design and construction sequence to the 18 m wide spillway.
- 12 m wide at spillway entrance tapering to ~8 m wide.
- Loss of ~1730$m^2$ of habitat permanently (includes existing spillway footprint).
- Disturbing of habitat during construction – footprint ~2380$m^2$ (including existing spillway).
- Cost: $5,214,769.41

# Design Options – Construction Schedule Labyrinth (12 or 18 m)

| Task Name | Duration | Start | Finish |
|---|---|---|---|
| Port Dam Operation | 90 days | Mon 6/30/14 | Fri 10/31/14 |
| Clear and Grub | 3 days | Mon 6/30/14 | Wed 7/2/14 |
| Mobilization | 2 days | Thu 7/3/14 | Fri 7/4/14 |
| Lower Dam Siphon | 4 days | Mon 7/7/14 | Thu 7/10/14 |
| Middle Dam Siphon | 3 days | Mon 7/7/14 | Wed 7/9/14 |
| Lay Down/ Crane Pad | 5 days | Mon 7/7/14 | Fri 7/11/14 |
| Access Roads | 2 days | Mon 7/7/14 | Tue 7/8/14 |
| Porta Dam Supply | 1 day | Wed 7/9/14 | Wed 7/9/14 |
| Stripping | 3 days | Wed 7/9/14 | Fri 7/11/14 |
| Porta Dam 7 Ft Install | 7 days | Thu 7/10/14 | Fri 7/18/14 |
| Sectional Removal of Existing | 7 days | Mon 7/14/14 | Tue 7/22/14 |
| Base | 18 days | Wed 7/23/14 | Fri 8/15/14 |
| Spillway Wall | 43 days | Mon 8/18/14 | Wed 10/15/14 |
| Precast Labyrinth Wall | 12 days | Mon 8/18/14 | Tue 9/2/14 |
| Backfill | 47 days | Tue 8/19/14 | Wed 10/22/14 |
| Slab on Grade | 43 days | Wed 8/20/14 | Fri 10/17/14 |
| Intake Structure | 11.5 days | Wed 10/1/14 | Thu 10/16/14 |
| Porta Dam 7 Ft Removal | 3 days | Wed 10/29/14 | Fri 10/31/14 |
| Rework Walking Trail | 5 days | Wed 10/29/14 | Tue 11/4/14 |
| Bridge Reinstatment | 7.5 days | Wed 10/29/14 | Fri 11/7/14 |
| De-Mobilization | 5 days | Mon 11/10/14 | Fri 11/14/14 |




- 3 - 4 month construction period
  - Start July 1, end Oct 26
  - Work in channel complete mid Oct



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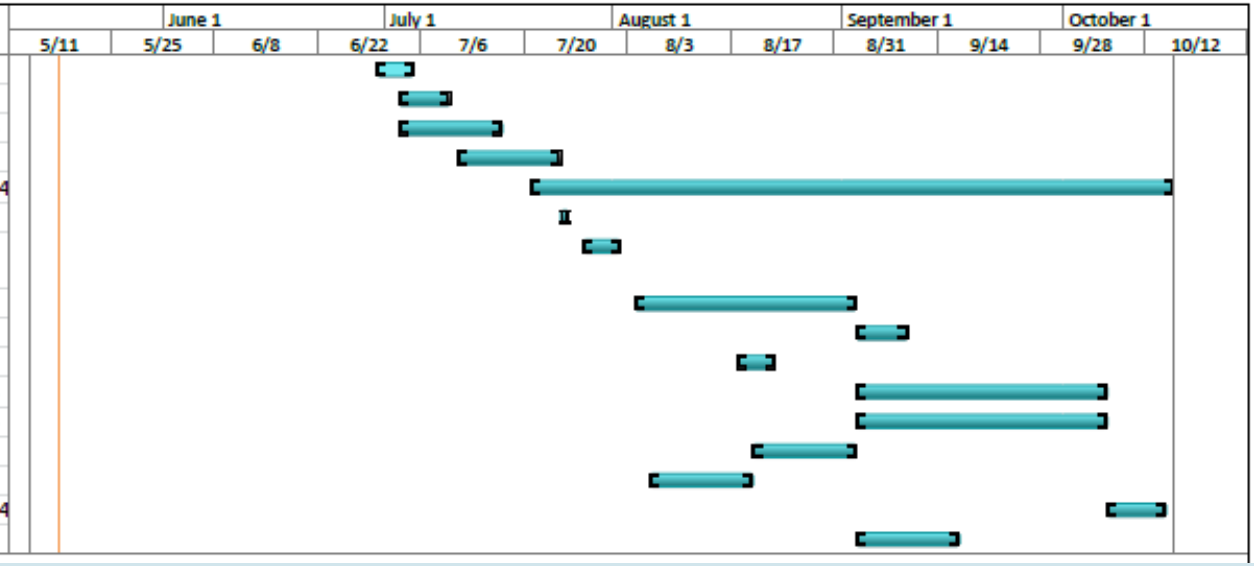
# Design Options – Construction Schedule Overtop Dam

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | Mobilization | 5 days | Mon 6/30/14 | Fri 7/4/14 |
| 2 | Parking Lot Set Up | 5 days | Thu 7/3/14 | Wed 7/9/14 |
| 3 | Clearing & Grubbing | 10 days | Thu 7/3/14 | Wed 7/16/14 |
| 4 | Pioneering Haul Roads | 10 days | Fri 7/11/14 | Thu 7/24/14 |
| 5 | Filtration System | 63 days | Mon 7/21/14 | Wed 10/15/14 |
| 6 | Excavate to Waste | 1 day | Fri 7/25/14 | Fri 7/25/14 |
| 7 | Hoe Pack Face After Stripping | 5 days | Mon 7/28/14 | Fri 8/1/14 |
| 8 | Excavate to Parking Lot | 22 days | Mon 8/4/14 | Tue 9/2/14 |
| 9 | Haul in Import | 5 days | Wed 9/3/14 | Tue 9/9/14 |
| 10 | Contaminated Soil | 5 days | Mon 8/18/14 | Fri 8/22/14 |
| 11 | Process Material | 24 days | Wed 9/3/14 | Mon 10/6/14 |
| 12 | Place Material on Dam | 24 days | Wed 9/3/14 | Mon 10/6/14 |
| 13 | Instrumentation | 10 days | Wed 8/20/14 | Tue 9/2/14 |
| 14 | Berms along Spillway | 10 days | Wed 8/6/14 | Tue 8/19/14 |
| 15 | Erosion Control Mats | 6 days | Tue 10/7/14 | Wed 10/15/14 |
| 16 | Toe Drains | 10 days | Wed 9/3/14 | Tue 9/16/14 |




- 3 month construction period
- Avoid fill placement during wet periods – best done during summer months



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# Risks and Opportunities

Labyrinth Option - Risks

- Design
  - Unexpected fdn materials
- Construction
  - Flooding risk
  - Fish salvage?

Labyrinth Option - Opportunities

- Channel Walls – alternative designs
- Porta Dam – reduce or eliminate?

Overtop Option - Risks

- Design
  - Cannot re-use on site materials (testing program cannot achieve design parameters)
- Construction
  - Encounter unexpected materials
  - Productivity (poor access, more diff to estimate)

Overtop Option - Opportunities



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# Budget Costs

| Labyrinth Option | |
|---|---|
| Base Cost | $5.4 |
| Other items | $0.3 |
| Contingency (10%) | $0.6 |
| Design, RE | $0.6 |
| CM | $0.6 |
| Owners Costs | $0.6 |
| TOTAL | $8.1M |

- Other items – bridge, landscaping
- Reduced contingency reflects opportunities as well as risks

| Overtop Option | |
|---|---|
| Base Cost | $3.2 |
| Other items | $0.7 |
| Contingency (30%) | $1.2 |
| Design, RE | $0.8 |
| CM | $0.8 |
| Owners Costs | $0.6 |
| TOTAL | $7.3M |

- Other items – bridge, perm. siphon, drains, landscaping
- Increased design and CM effort for this option



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# Lower Dam – Overtopping vs Labyrinth

| | Overtopping (soil cement) | Labyrinth |
|---|---|---|
| Environmental | (-) Sl larger construction footprint<br><br>(-) Larger area(s) of disturbance for construction, hauling, stockpiling, and staging | (-) Requires reducing the reservoir levels during construction<br><br>(-) Removal of heritage spillway |
| Design and construction | (-) Sampling and testing of soil cement not yet undertaken<br><br>(-) High level of engineering inspection required<br><br>(-) Not a typical armoring solution<br><br>(-) Existing spillway lifespan in question<br><br>(-) Const risk – materials in dam poorly understood – possible effect on sched and cost; risk of inclement weather | (+) Ability to incorporate some drawdown<br><br>(-) Const risk – flooding risk |
| Design Reliability (life safety risk) | (-) Slightly higher risk of failure (risk assessment) | |
| Maintenance | (-) After flood or seismic event, mtce may be required | |
| Construction Cost | (+) Potentially lower cost | |
| Schedule | (-) 2014 probably not possible | (+) 2014 possible |