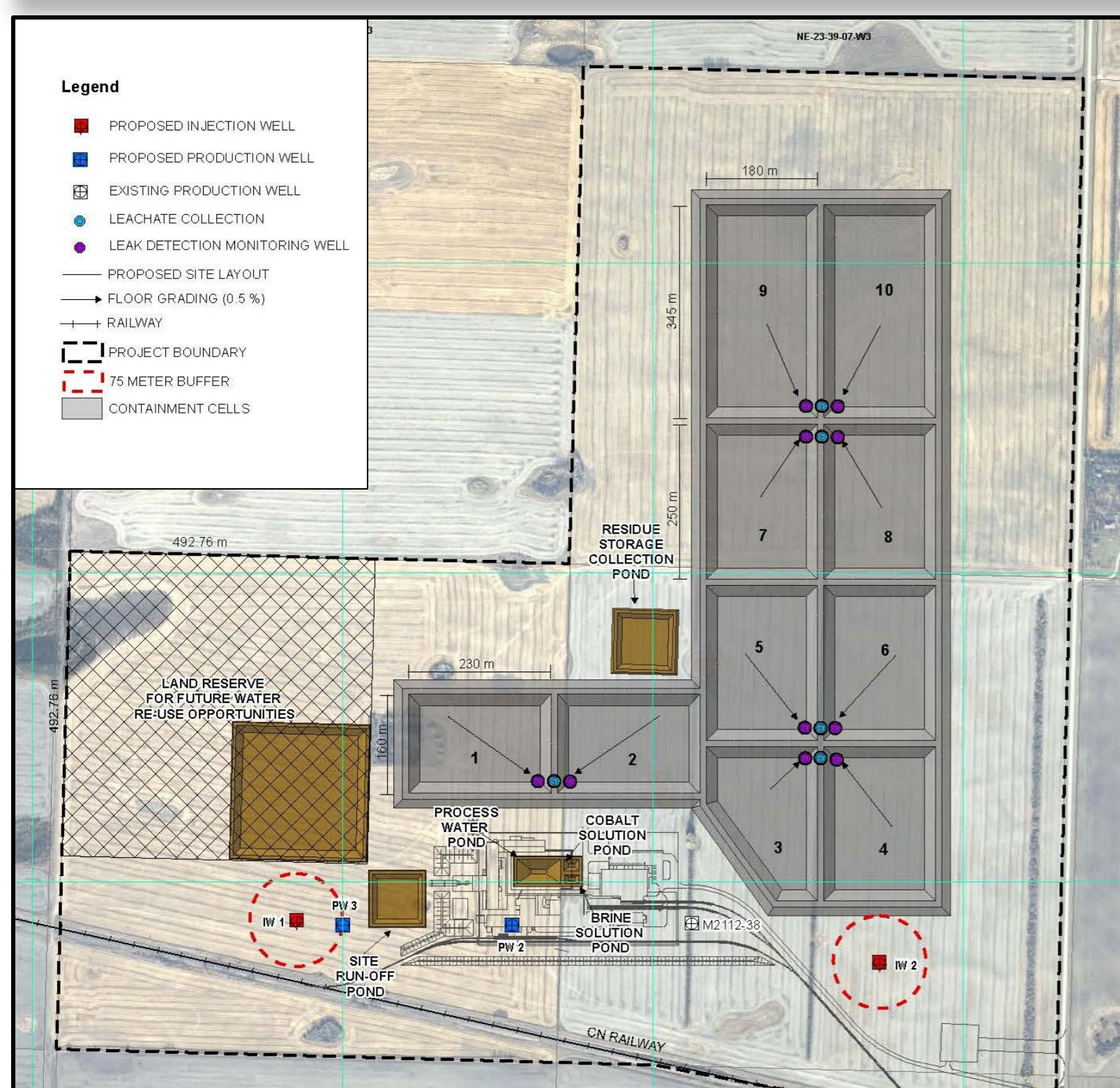


SMPP Storage Facilities



FORTUNE
MINERALS LIMITED



MDH Engineered Solutions Corp. (MDH) was commissioned by Fortune Minerals Limited (FML) in January 2010 to provide geotechnical, hydrogeological, and environmental services in support of the design and construction of the proposed **Saskatchewan Metals Processing Plant (SMPP)** near Langham, Saskatchewan. As part of this project, MDH completed the conceptual Development Plan for the **Process Residue Storage Facility (PRSF)** at the proposed hydrometallurgical facility.

The operation of the SMPP also requires the construction of five storage ponds for site run-off, process water, brine solution, cobalt solution and run-off from the PRSF. An additional effluent water re-use pond was included in the design in the event that FML is able to implement additional water re-use programs in the future.

LEFT: PRSF design showing containment cells, leachate collection system, and leak detection monitoring wells

Process Residue

Approximately 158,000 tonnes of process residue will be generated annually at the SMPP. The specific gravity of the residue is approximately 1.9, resulting in an annual storage volume requirement of approximately 83,200 m³. PRSF Cells 1 through 8 will provide 18 years of residue storage capacity. Each cell will accommodate between 2 and 2.5 years of process residue, approximately 163,200 m³ to 204,000 m³. Cells 9 and 10 will provide an additional 7 years of storage capacity (3.5 years and 287,800 m³ per cell) if FML should elect to expand operations or extend the life of the facility.

All solid waste residue streams will be filtered to maximize water recycling and minimize reagent consumption.

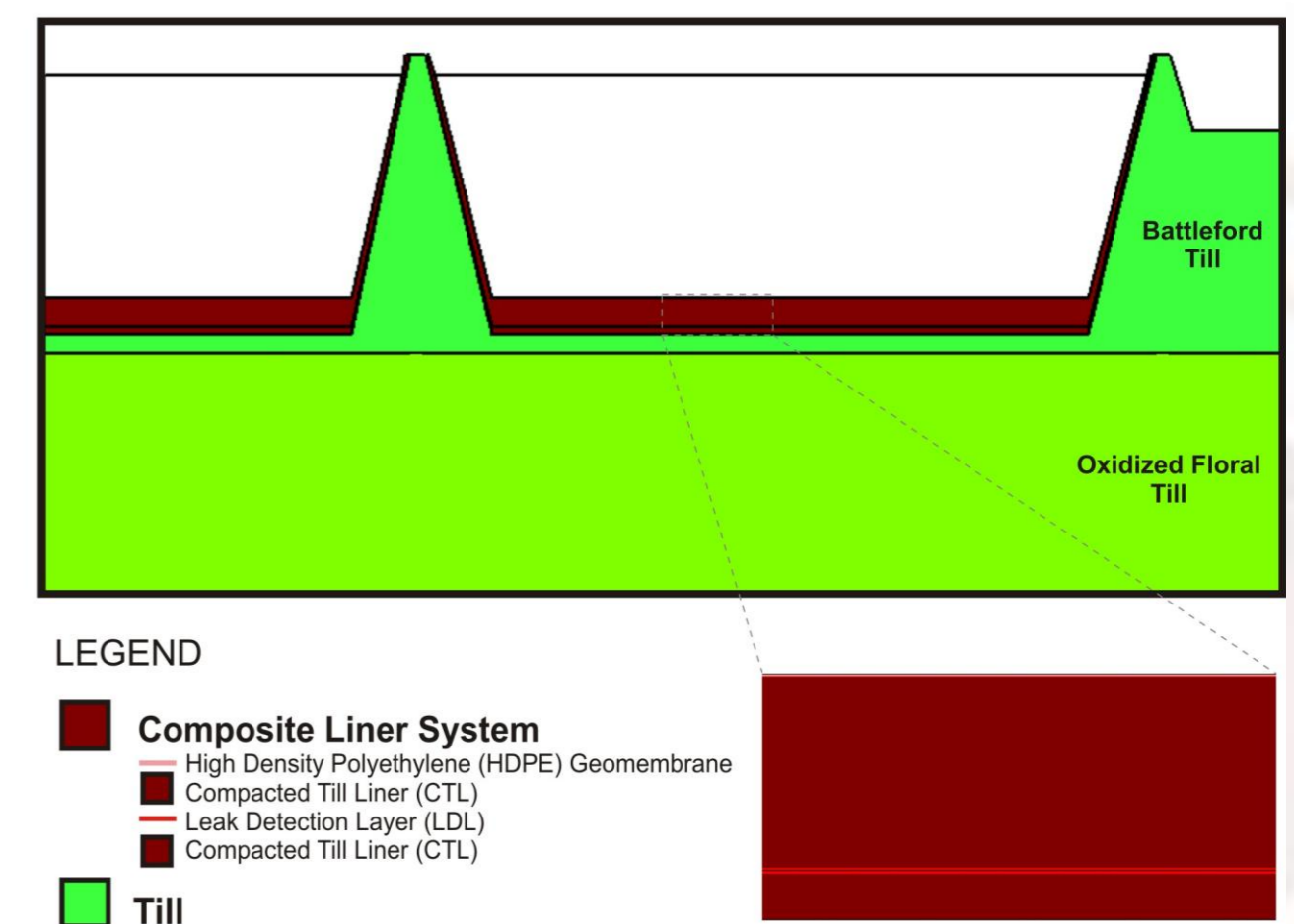
The metal content, acid base accounting, whole rock analysis, and major mineralogical phase results are included in the EIS. The primary mineral constituents of the residue are projected to be Gypsum, Scorodite and Actinolite.

The PRSF cover system will reduce the infiltration of water into the process residue, mitigating leaching of the process residue, while the liner system will inhibit leachate migration to the surrounding environment.

PRSF Design

Containment within the PRSF will be provided by a combination of excavation below ground and the construction of containment dykes. A series of containment cells will be constructed over the process residue storage area to provide the required residue storage capacity. Additionally, the following components were included in the Development Plan for the PRSF containment cells:

- ❑ An engineered containment system which includes a primary composite liner consisting of a geomembrane and a compacted till/clay layer and a secondary liner consisting of a compacted till/clay layer;
- ❑ A leak detection system;
- ❑ A leachate collection system; and
- ❑ An engineered cover system.



RIGHT: Schematic of PRSF liner showing primary composite liner and secondary liner

PRSF CONTAINMENT CELLS	CELLS 1-2	CELL 3	CELLS 4-8	CELLS 9-10
Inside Dyke Length (m)	230	180/66	180	180
Inside Dyke Width (m)	160	250/95	250	345
Footprint Area ^{Note 1} (ha/cell)	5.3	5.0	6.3	8.3
Residue Storage Capacity (yrs/cell)	2.0	2.0	2.5	3.5
Storage Volume (m ³ /cell)	163,121	163,662	203,940	287,703

Note 1. Footprint area includes excavation and dykes for a single cell assuming sequential construction of individual cells.

PRSF Containment Cell Geometry

The level of containment proposed for the PRSF meets or exceeds that in place for any other containment facility in Saskatchewan and will virtually eliminate the potential for leachate migration.

Due to the low dyke height (2 m), the majority of the process residue will be stored below ground, minimizing the visual impact and allowing the land to be reclaimed after closure.

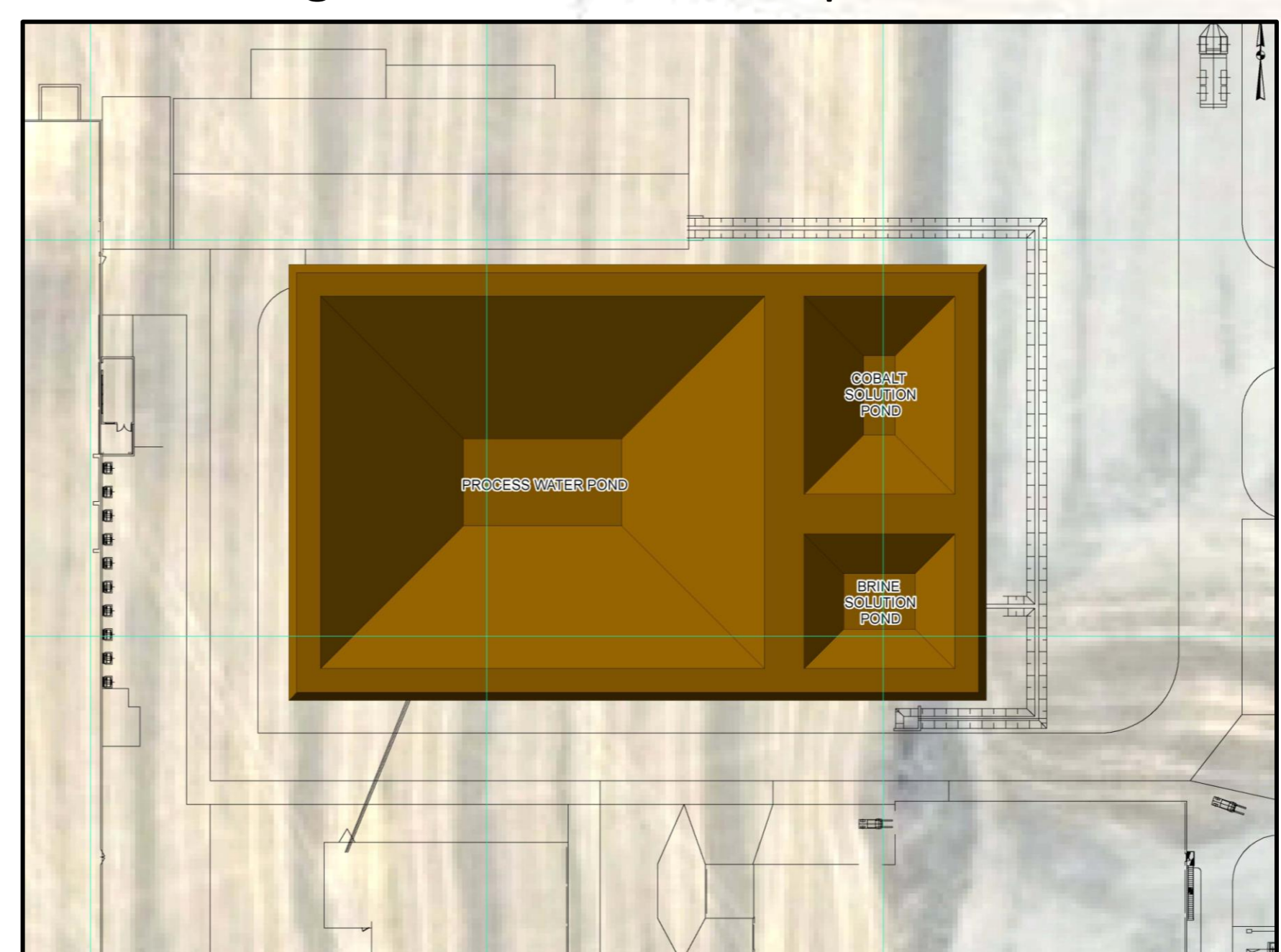
Reclamation of the PRSF will be staged, allowing for ongoing monitoring of the containment system during SMPP operations. Residue will be placed in two cells simultaneously, and once filled, each containment cell will be capped with an engineered cover system.

Storage Ponds

The operation of the SMPP requires the construction of five storage ponds, with potential for a sixth pond for water re-use opportunities in the future. Each of the ponds was sized using a design dyke height of 1.0 m for the perimeter containment dykes. The exterior dyke slopes were set at 3H:1V for construction and 1H:1V post-construction. The interior dyke slopes and excavation slopes vary depending on the storage pond. The storage volumes for the ponds are shown below:

- ❑ Process water pond 5,000 m³
- ❑ Cobalt solution pond 300 m³
- ❑ Brine solution pond 125 m³
- ❑ Site run-off pond 5,200 m³
- ❑ Residue storage collection pond 9,100 m³

The process water, cobalt solution, and brine solution ponds were combined into one pond facility within the plant site. They will be constructed with a composite liner consisting of geomembrane and compacted soil liners similar to the PRSF containment cells. A manufactured geocomposite for leak detection is also included in the design of these ponds. Leak detection monitoring will be on-going through the operation of the facility and maintenance/repair of the liner system will be performed as needed.



Process water, cobalt solution, and brine solution ponds layout

The site run-off pond, on the west side of the plant site, was sized to accommodate the runoff resulting from a 1:50 year precipitation event over the plant site area including the buildings, parking lot, and rail areas. Additional storage was provided in the runoff pond to accommodate the surcharge of runoff resulting from snowmelt. The additional storage will also prevent overflow in the case that a 1:50 year precipitation event occurs and the pond is not completely empty. The site run-off pond will also be constructed with a 0.45 m thick compacted soil liner.

An additional runoff-pond will be required to collect any water which comes from the PRSF. This residue storage collection pond will collect all water from the area during construction, residue placement, and once the cells have been covered. A series of ditches will collect the water from the area and divert the water to the pond which will be located to the south of the PRSF. The pond was also sized to accommodate a 1:50 year precipitation event. The additional storage required for snow melt and in the case that the pond is not empty during a 1:50 year event will be provided by the ditches. The residue storage collection pond will also be constructed with a 0.45 m thick compacted soil liner.