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**SUBJECT: Hydrogeological Cumulative Effects Assessment  
Proposed Safarik Pit**

Dear Andreanne,

WSP Canada Inc. (WSP) is pleased to provide this technical memorandum summarizing the cumulative effects assessment for the proposed Safarik Pit (Site), to be operated by CBM St. Marys Cement Inc. (CBM). The Level 1 and 2 Water Report (WSP, October 2025) was submitted as part of the Aggregate Resources Act (ARA) licence application and Planning Act applications in late 2025. Since that time, comments have been provided by the County of Wellington stating the following:

*“Policy 13.18.5 of the County Official Plan requires a “Hydrogeological cumulative effects assessment where aggregate extraction is proposed below the water table. The appropriate boundaries, level of detail, and baseline data to be used will be determined by the County, local municipalities and Conservation Authority as part of pre-consultation.”*

The purpose of this memorandum is to provide the requested assessment, to be reviewed as a companion document to the previously submitted Level 1 and 2 Water Report.

## **1.0 Numerical Groundwater Modeling**

### **1.1 Full Development Model**

The full development model described in **Section G.7.2** of the Numerical Groundwater Model Report found in the Level 1 and 2 Water Report was further modified to simulate cumulative impacts to the Mill Creek watershed from both the proposed Safarik Pit as well as full development at all other approved pit licences within the model domain. ARA site plans for CBM-owned properties were used to simulate conditions at full development. For non-CBM properties, the final pit lakes were simulated to extend to the licenced extraction limits. The well boundary conditions used to model full development at each pit as described in **Section G.4.3.4** of the Numerical Groundwater Model Report are summarized in **Table 1** below.

**Table 1: Full Development Conditions Well Boundary Parameter Values**

Reach	Description	Simulated Pumping Rate (m <sup>3</sup> /day)	Comments
2	CBM Neubauer Pit	996	Assume full pit pond extent, extraction rate at licenced limit
3	CBM Puslinch Quality Aggregates (PQA) North Pit Pond	0	Assume full pit pond extent, no extraction
4	CBM Puslinch Quality Aggregates (PQA) South Pit Pond		
5	Lafarge Warren Pit	1,594	Assume full pit pond extent, extraction rate at licenced limit
6	CBM McNally Pit	507	Assume full pit pond extent, no extraction, wash plant remains
7	Dufferin Mill Creek Pit Phase I Pond	0	Assume full pit pond extent, no extraction in this phase
8	Dufferin Mill Creek Pit Phase IV / V Pond	2,836	Assume full pit pond extent, extraction rate at licenced limit
9	CBM Aberfoyle Pit	1,740	Assume full pit pond extent, extraction rate at licenced limit, wash plant remains
10	Dufferin Aberfoyle Pit 1	709	Assume full pit pond extent, extraction rate at licenced limit, wash plant remains
11	Dufferin Aberfoyle Pit 2	1,328	Assume full pit pond extent, extraction rate at licenced limit
12	CBM Safarik Pit West and East Ponds	996	Assume full pit pond extent, extraction rate at licenced limit split evenly between both ponds
13	CBM Lanci Pit	1,328	Assume full pit pond extent, extraction rate at licenced limit

**Predicted Cumulative Effects**

The predicted cone of depression for the cumulative effects of all existing and proposed pits within the model domain is shown on the attached **Figure 1**.

A drawdown of up to approximately 0.25 m relative to baseline water levels in the contact aquifer is predicted for areas east / northeast of the Site and a smaller area east of the licenced Neubauer Pit. The radius of influence (i.e., 0.25 m drawdown contour) in the contact aquifer covers an area of approximately 6 km<sup>2</sup>. It is noted that private wells at some rural residences in the western portion of the community of Morriston may be subject to drawdown of 0.25 m due to the cumulative effects of the proposed and approved pit operations. As noted in the Level 1 and 2 Water Report, the predicted drawdown falls within the range of seasonal fluctuation observed in the

aquifer and represents a small proportion of the available drawdown at local private overburden wells surveyed as part of the study. Therefore, adverse impacts to off-site well users are not predicted.

### Cumulative Assessment Water Balance

The cumulative full development Site water balance is shown in **Table 2** below. Flow terms are shown both in the model units (m<sup>3</sup>/day), as well as values normalized by the Site area (approximately 0.4 km<sup>2</sup>) in mm/year.

**Table 2: Site Water Balance – Cumulative Full Development Conditions**

Boundary Type	Inflows		Outflows		Outflow – Inflow (m <sup>3</sup> /day)
	(m <sup>3</sup> /day)	(mm/year)	(m <sup>3</sup> /day)	(mm/year)	
Recharge (RCH)	240.2	220.2	0	0	-240.2
Well (WEL)	0	0	996.0	913.1	996.0
Lateral GW Flow	15,506.7	14,216.5	14,711.8	13,487.7	-794.9
<b>TOTAL</b>	<b>15,746.3</b>	<b>14,436.7</b>	<b>15,707.8</b>	<b>14,400.8</b>	<b>-38.5</b>
Discrepancy (%)					<b>-0.2</b>

The recharge and aggregate extraction components of the water budget for this cumulative full development scenario are the same as for the Site (i.e., Safarik Pit) only full development scenario model presented in **Section G.7.2** of the Numerical Groundwater Model Report. However, the net inward flow from the surrounding aquifer increases to 795 m<sup>3</sup>/day, an increase of 16% compared to the Site only full development scenario model.

The water balance for the portion of Mill Creek subwatershed simulated in the cumulative full development model is shown in **Table 3** below. Flow terms are shown both in the model units (m<sup>3</sup>/day), as well as values normalized by the modeled subwatershed area (approximately 29.4 km<sup>2</sup>) in mm/year.

**Table 3: Mill Creek Subwatershed Water Balance – Cumulative Full Development Conditions**

Boundary Type	Inflows		Outflows		Outflow – Inflow (m <sup>3</sup> /day)
	(m <sup>3</sup> /day)	(mm/year)	(m <sup>3</sup> /day)	(mm/year)	
Recharge (RCH)	23,047.5	286.5	0	0	-23,047.5
Constant Head (CHD)	208,611.2	2,593.3	0	0	-208,611.2
River (RIV)	52,578.9	653.6	31,652.8	393.5	-20,926.1
Drain (DRN)	0	0	241,324.5	2,999.9	241,324.5
Well (WEL)	0	0	12,036.0	149.6	12,036.0
Lateral GW Flow	34,794.2	432.5	33,795.1	420.1	-999.1
<b>TOTAL</b>	<b>319,031.7</b>	<b>3,965.9</b>	<b>318,808.4</b>	<b>3,963.1</b>	<b>-223.3</b>
Discrepancy (%)					<b>-0.07</b>

Aggregate extraction at the other licenced pits within the model domain leads to a further decrease in recharge averaged over the simulated portion of the Mill Creek watershed, from 302 mm/year for the Site only model to 287 mm/year for the cumulative model, a decrease of 5.5% compared to baseline conditions. Groundwater inflows from outside of the watershed (simulated using constant head boundaries and lateral groundwater flow) increase by about 6% compared to baseline conditions, while inflows from the local watercourses (simulated using river boundaries) increase by about 45%, which is primarily attributed to future extraction within existing licenced pits. Groundwater discharge to wetlands (simulated using drain boundaries) increases by about 7% compared to baseline conditions.

## 1.2 Rehabilitated Condition Model

To create the cumulative rehabilitation condition model for the Site and other licenced pits within the model domain, the cumulative full development model described in **Section 1.1** above was modified by shutting off the simulated aggregate extraction at all existing and proposed aggregate pits (i.e., all well reaches other than the reach 1 Morrision private supply wells) to simulate only the effects of increased evaporation in the final pit lakes.

### Predicted Cumulative Effects

The predicted cone of depression for the rehabilitation condition cumulative effects of all existing and proposed pits within the model domain is shown on the attached **Figure 2**.

A drawdown of up to approximately 0.25 m relative to baseline water levels in the contact aquifer is predicted for areas east of the Site. The radius of influence (i.e., 0.25 m drawdown contour) in the contact aquifer covers an area of approximately 0.9 km<sup>2</sup>.

### Cumulative Assessment Water Balance

The cumulative final rehabilitation Site water balance is shown in **Table 4** below. Flow terms are shown both in the model units (m<sup>3</sup>/day), as well as values normalized by the Site area (approximately 0.4 km<sup>2</sup>) in mm/year.

**Table 4: Site Water Balance – Cumulative Final Rehabilitation Conditions**

Boundary Type	Inflows		Outflows		Outflow – Inflow (m <sup>3</sup> /day)
	(m <sup>3</sup> /day)	(mm/year)	(m <sup>3</sup> /day)	(mm/year)	
Recharge (RCH)	240.2	220.2	0	0	-240.2
Well (WEL)	0	0	0	0	0
Lateral GW Flow	14,959.4	13,714.7	15,197.9	13,933.4	238.5
<b>TOTAL</b>	<b>15,199.6</b>	<b>13,934.9</b>	<b>15,197.9</b>	<b>13,933.4</b>	<b>-1.7</b>
Discrepancy (%)					<b>-0.01</b>

The recharge for the cumulative final rehabilitation scenario is the same as for the Site only full development and rehabilitation scenario models presented in **Sections G.7.2** and **G.8.2** of the Numerical Groundwater Model Report. Considering cumulative effects from other licenced pits, at final rehabilitation, the Site reverts to a net outward flow to the surrounding aquifer of 239 m<sup>3</sup>/day, a decrease of 35% compared to baseline conditions. It is noted that higher average water levels and lower outward flows from the surrounding aquifer are observed in the

final rehabilitation model relative to the baseline model. This is not unexpected, given that the nearby currently operational pits extractions simulated in the baseline model are “shut off” in the final rehabilitation model.

The water balance for the portion of Mill Creek subwatershed simulated in the cumulative final rehabilitation model is shown in **Table 5** below. Flow terms are shown both in the model units (m<sup>3</sup>/day), as well as values normalized by the modeled subwatershed area (approximately 29.4 km<sup>2</sup>) in mm/year.

**Table 5: Mill Creek Subwatershed Water Balance – Cumulative Final Rehabilitation Conditions**

Boundary Type	Inflows		Outflows		Outflow – Inflow (m <sup>3</sup> /day)
	(m <sup>3</sup> /day)	(mm/year)	(m <sup>3</sup> /day)	(mm/year)	
Recharge (RCH)	23,047.5	286.5	0	0	-23,047.5
Constant Head (CHD)	207,631.0	2,581.1	0	0	-207,631.0
River (RIV)	51,808.3	644.0	32,882.1	408.8	-18,926.2
Drain (DRN)	0	0	250,449.1	3,113.3	250,449.1
Well (WEL)	0	0	0	0	0.0
Lateral GW Flow	34,387.2	427.5	33,523.1	416.7	-861.1
<b>TOTAL</b>	<b>316,874.0</b>	<b>3,939.1</b>	<b>316,854.3</b>	<b>3,938.8</b>	<b>-19.7</b>
<b>Discrepancy (%)</b>					<b>-0.006</b>

The recharge for the cumulative final rehabilitation scenario is the same as for the cumulative full development model since the increased evaporation from the final ponds is permanent. Groundwater inflows from outside of the watershed (simulated using constant head boundaries and lateral groundwater flow) increase by about 6% compared to baseline conditions, while inflows from the local watercourses (simulated using river boundaries) increase by about 31%. Groundwater discharge to wetlands (simulated using drain boundaries) increases by about 11% compared to baseline conditions.

## 2.0 Predicted Groundwater Impacts from Cumulative Effects

### 2.1 Full Development Conditions

When cumulative impacts are considered (i.e. the addition of the existing and proposed aggregate pits in the study area), the predicted cumulative drawdown at full pit development is shown in the attached **Figure 1**. These results of the numerical groundwater model simulations compare the predicted effects from the proposed Site alone to the combined effects of all existing approved licences extracting below water at their maximum approved annual tonnage rates.

The predicted radius of influence in this scenario, (i.e., the 0.25 m drawdown contour) in the aquifer covers an area of approximately 6.4 km<sup>2</sup> when considering these cumulative effects.

### Groundwater Users

In the cumulative scenario, a larger number of local groundwater users may potentially be influenced by the combined effects of all aggregate pits within the model domain compared to the full development of the proposed Safarik Pit in the Level 1 and 2 Water Report alone. Due to the relatively small cumulative effect on the water

table, the proposed well interference mitigation provided the Level 1 and 2 Water Report remains sufficient to address potential impacts.

## 2.2 Rehabilitated Condition

When cumulative impacts are considered, the predicted cumulative drawdown at final rehabilitation is shown in the attached **Figure 2**. The drawdown of up to approximately 0.25 m relative to baseline water levels in the aquifer is predicted for areas north of the Site. The radius of influence in the aquifer covers an area of approximately 0.9 km<sup>2</sup>.

## 2.3 Potential Impact to Wellhead Water Quantity Zone (WHPA-Q)

There are no changes in the prediction of impacts to the WHPA-Q included in the Level 1 and 2 Water Report when cumulative effects are considered. The proposed monitoring plan and spill action plan included in the Level 1 and 2 Water Report is sufficient to mitigate any potential impacts.

## 2.4 Surface Water Impacts

### Impacts to Wetlands

The cumulative effect of all existing and proposed licences within the study area will have an overall effect of increasing groundwater discharge to wetland features (simulated as drain boundaries in the numerical model) due to changes in local water table configuration and increase in lateral groundwater flow into the subcatchment. The changes quantified in the table below equate to a 7% increase above baseline conditions for full development conditions, and an 11% increase above baseline conditions for final rehabilitation conditions. It is noted that the proposed pit represents a minor component (~1%) of the cumulative change under both full development and rehabilitated conditions. The proposed pit also represents a minor change (<0.1%) relative to baseline conditions.

	Baseline Conditions	Full Development Conditions		Final Rehabilitation Conditions	
		Site Only Effect	Cumulative Effect	Site Only Effect	Cumulative Effect
<b>Groundwater Discharge to Wetland Features</b>	225,445	225,648	241,325	225,560	250,449

Note: Discharge quantities provided in m<sup>3</sup>/day.

### Impacts to Surface Watercourses

Similar to the above, the cumulative effect of all existing and proposed licences within the study area will have an overall effect of increasing recharge from surface watercourses (simulated as river boundaries in the numerical model), as quantified in the table below. Again, the proposed pit represents a minor component of the cumulative change (4-6%) under both full development and rehabilitated conditions, and a minor change (2-3%) relative to baseline conditions.

	Baseline Conditions	Full Development Conditions		Final Rehabilitation Conditions	
		Site Only Effect	Cumulative Effect	Site Only Effect	Cumulative Effect
Recharge from Surface Watercourses	14,429	14,846	20,926	14,611	18,926

Note: Recharge quantities provided in m<sup>3</sup>/day.

### 3.0 Closure

We trust that the above hydrogeological cumulative effects assessment is sufficient for your current needs. Please contact us if you have further questions or concerns.

Yours truly,

**WSP Canada Inc.**

Kevin Fitzpatrick, P.Eng.  
Senior Project Engineer

Leigh Davis, M.A.Sc., P.Eng.  
Lead Professional, Environmental Engineering

JLD/KJF/jld

**Attachments: Figure 1 – Predicted Cumulative Drawdown at Full Pit Development**  
**Figure 2 – Predicted Cumulative Drawdown at Final Rehabilitation**

[https://wsonline.sharepoint.com/sites/gld-148930/project files/6 deliverables/ph 2000 - hydrogeology/cumulative assessment/proposed safarik pit - cumulative effects assessment - wsp mar 2026 v2.docx](https://wsonline.sharepoint.com/sites/gld-148930/project%20files/6%20deliverables/ph%202000%20-%20hydrogeology/cumulative%20assessment/proposed%20safarik%20pit%20-%20cumulative%20effects%20assessment%20-%20wsp%20mar%202026%20v2.docx)



