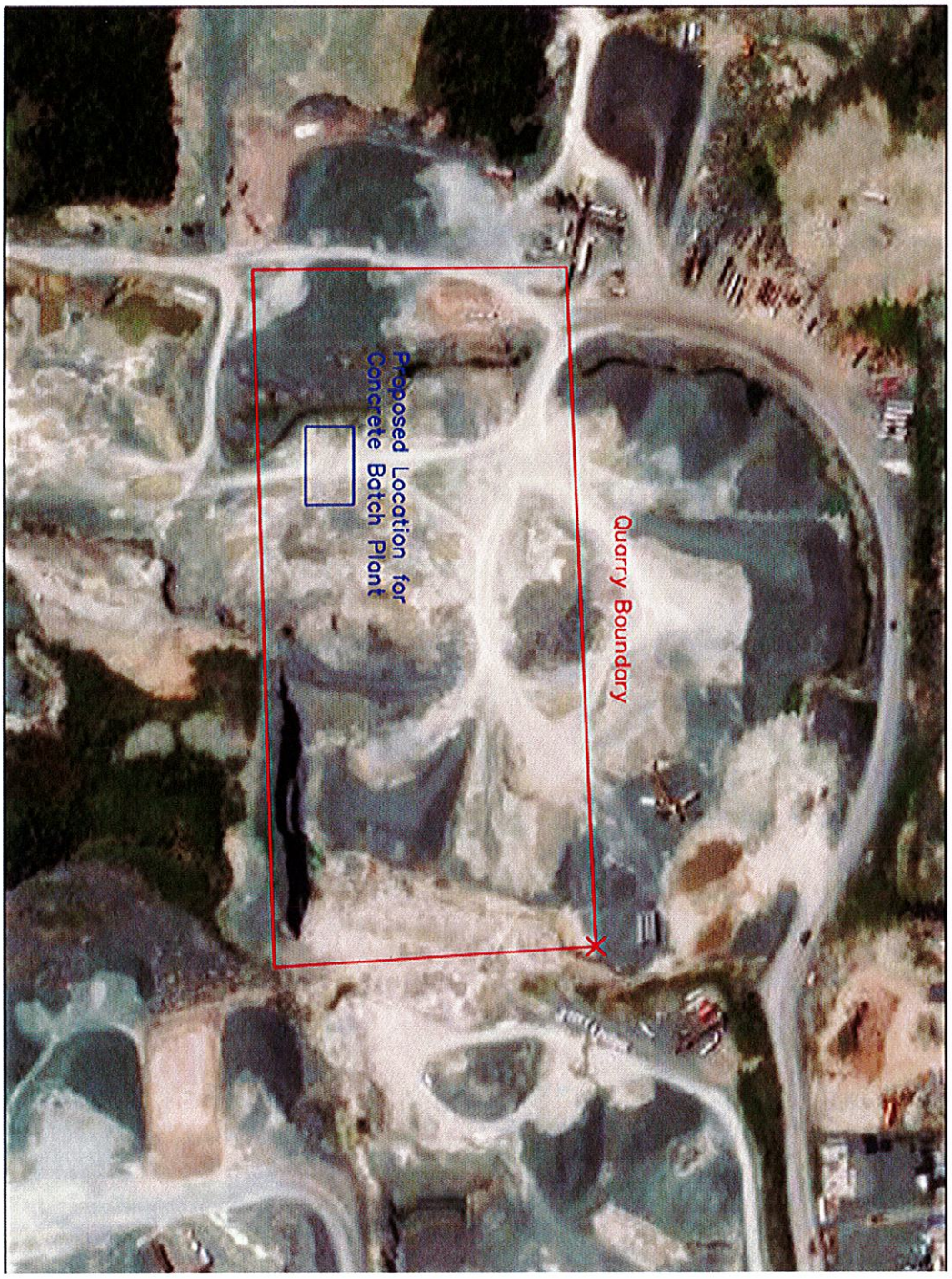
Water Resource Management Plan

EA#2292 – Paddy's Pond Concrete Batch Plant

Farrell's Excavating Limited

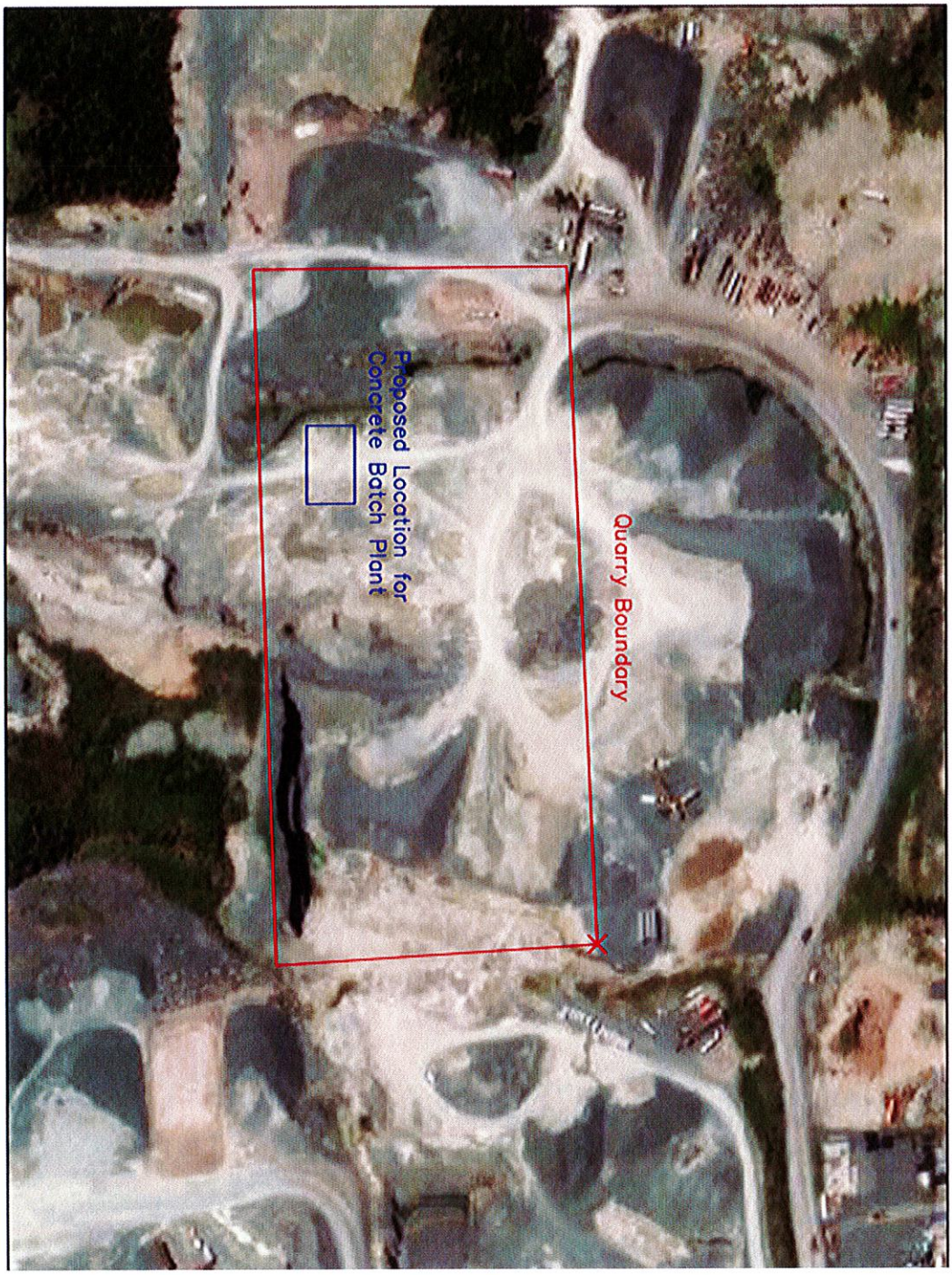
1. Prepare a location map identifying all streams and water bodies within 30 meters of the project footprint area.

There are no Streams or water bodies within 30 meters of the project site



2. Identify all streams or water bodies located inside the project footprint area.

There are no Streams or water bodies within the boundaries of the project site



3. Describe how to manage the stream or water body situated inside the project footprint boundary (eliminate it, divert it, or keep it in place).

There is no stream of water body inside the project area. A settling pond will be created to contain and store runoff which will be used in the Concrete Batch Plant.

4. Determine the amount of stormwater runoff for a 1 in 100-year 24-hour climate change rainfall event.

Below are the IDF curves and volume calculations for the entire catchment area not just the quarry footprint

Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

	Year / Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
UPDATE	1997	4.7	4.9	6.2	8.0	12.2	21.9	46.1	61.4	68.3
UPDATE	1998	3.6	5.8	6.8	11.9	21.3	33.0	56.0	76.0	95.8
UPDATE	1999	4.0	5.8	6.7	9.4	15.3	25.4	37.1	55.4	83.2
UPDATE	2000	3.5	5.5	7.8	14.2	20.3	30.8	48.1	62.0	73.1
UPDATE	2001	5.1	8.6	11.0	18.6	32.6	55.5	95.9	133.1	135.9
UPDATE	2002	3.5	6.7	9.5	13.2	16.1	26.4	44.0	45.0	46.3
UPDATE	2004	4.1	7.4	9.6	13.1	22.5	22.6	43.8	55.2	58.7
UPDATE	2005	3.7	7.2	10.5	14.4	22.2	35.2	43.0	62.9	77.4
UPDATE	2006	2.8	5.1	6.4	8.6	12.2	19.0	36.3	42.5	53.5
UPDATE	2007	7.2	11.1	15.1	27.1	41.7	56.4	76.4	91.0	91.9
UPDATE	2008	5.0	8.0	8.3	11.4	15.6	23.2	45.9	57.8	63.1
UPDATE	2009	4.3	5.9	7.8	10.3	16.0	26.5	49.6	74.6	75.1
UPDATE	2010	5.7	7.2	8.4	11.4	21.4	34.9	56.3	65.3	111.2
UPDATE	2011	4.3	6.4	6.8	10.2	14.6	23.8	37.4	44.9	72.0
UPDATE	2013	3.6	7.0	8.4	10.3	12.8	21.9	37.1	47.7	55.5
UPDATE	2014	4.2	6.5	8.7	12.5	21.0	36.3	45.9	51.2	64.0
	# Yrs. / Années	16	16	16	16	16	16	16	16	16
	Mean / Moyenne	4.3	6.8	8.6	12.8	19.9	30.8	49.9	64.1	76.6
	Std. Dev. / Écart-type	1.1	1.5	2.2	4.6	7.8	11.2	15.8	22.5	23.1
	Skew. / Dissymétrie	1.38	1.46	1.67	2.22	1.72	1.50	2.06	2.13	1.24
	Kurtosis	6.01	6.43	7.02	9.15	6.60	5.08	7.68	8.73	5.08

*-99.9 Indicates Missing Data/Données manquantes
* NM Indicates No Measurements/Aucunes mesures

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	20 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
UPDATE 5 min	4.2	5.1	5.7	6.3	6.5	7.1	7.6	16
UPDATE 10 min	6.6	7.9	8.8	9.7	9.9	10.8	11.6	16
UPDATE 15 min	8.3	10.2	11.6	12.8	13.2	14.4	15.7	16
UPDATE 30 min	12.0	16.1	18.8	21.4	22.2	24.7	27.3	16
UPDATE 1 h	18.6	25.5	30.1	34.5	35.9	40.2	44.4	16
UPDATE 2 h	29.0	38.8	45.4	51.7	53.7	59.8	65.9	16
UPDATE 6 h	47.3	61.3	70.5	79.4	82.2	90.8	99.4	16
UPDATE 12 h	60.4	80.3	93.5	106.1	110.1	122.4	134.6	16
UPDATE 24 h	72.8	93.2	106.7	119.7	123.8	136.5	149.1	16

* 5-min data were used for the update: all durations were updated

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	20 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
UPDATE 5 min	49.9	61.1	68.5	75.6	77.8	84.8	91.6	16
	+/- 5.7	+/- 9.6	+/- 12.9	+/- 16.3	+/- 17.4	+/- 20.9	+/- 24.3	16

Table 1.31 Future Climate IDF Curves for St. John's A (8403506) – 2011-2040 Time Horizon

Minimum Projected Precipitation Amount (mm)							
Duration	Return Interval (years)						
	2	5	10	20	25	50	100
5-min	4.4	5.9	6.9	7.8	8.0	8.9	9.8
10-min	7.0	9.1	10.5	11.7	12.2	13.4	14.6
15-min	9.0	11.9	13.8	15.5	16.0	17.7	19.3
30-min	13.4	17.8	20.7	23.3	24.1	26.5	28.9
1-hr	19.5	26.0	30.2	34.0	35.2	38.8	42.3
2-hr	26.9	36.5	42.8	48.5	50.3	55.6	60.9
6-hr	45.7	60.5	70.1	79.0	81.8	90.1	98.3
12-hr	57.3	76.9	89.7	101.4	105.2	116.4	127.3
24-hr	68.3	88.7	102.1	114.4	118.3	130.0	141.4
Median Projected Precipitation Amount (mm)							
Duration	Return Interval (years)						
	2	5	10	20	25	50	100
5-min	4.8	6.4	7.5	8.4	8.8	9.7	10.7
10-min	7.4	9.7	11.2	12.6	13.0	14.4	15.8
15-min	9.6	12.7	14.7	16.5	17.1	18.9	20.7
30-min	14.4	19.0	21.9	24.7	25.6	28.3	31.0
1-hr	20.9	27.7	31.9	35.9	37.2	41.2	45.1
2-hr	29.0	39.2	45.5	51.6	53.5	59.5	65.4
6-hr	48.8	64.3	74.1	83.4	86.3	95.5	104.5
12-hr	61.4	81.9	95.1	107.3	111.3	123.4	135.5
24-hr	72.5	94.1	107.8	120.7	124.8	137.5	150.2
Maximum Projected Precipitation Amount (mm)							
Duration	Return Interval (years)						
	2	5	10	20	25	50	100
5-min	5.3	7.3	8.7	10.0	10.5	11.7	13.0
10-min	8.1	11.0	12.9	14.7	15.3	17.1	18.8
15-min	10.5	14.3	16.8	19.2	20.0	22.3	24.6
30-min	15.7	21.3	25.0	28.6	29.7	33.2	36.6
1-hr	22.8	30.8	36.1	41.2	42.8	47.8	52.7
2-hr	31.9	44.1	52.2	59.9	62.3	69.9	77.4
6-hr	53.2	71.5	83.6	95.2	98.9	110.2	121.5
12-hr	67.0	91.3	107.4	122.8	127.7	142.8	157.8
24-hr	78.5	104.0	120.9	137.2	142.3	158.2	173.9

https://www.idf-cc-uwo.ca/idfstation

IDF for: ST JOHN'S A ID:8403506

Station Info | IDF historical data | IDF under climate change

GEV | Gumbel

Tables | Plots | Interpolation Equations

Total precipitation amounts are presented in mm and precipitation intensity rates are presented in mm/h for different return periods (T) presented in years

◉ Total PPT (mm) ○ Intensity rates (mm/h)

T (years)	2	5	10	20	25	50	100
5 min	4.71	6.50	7.66	8.74	9.08	10.10	11.10
10 min	7.00	9.48	11.04	12.47	12.92	14.25	15.52
15 min	8.65	11.81	13.93	15.99	16.65	18.69	20.73
30 min	12.32	16.38	19.17	21.93	22.82	25.62	28.49
1 h	17.58	22.66	25.81	28.69	29.57	32.21	34.70
2 h	23.03	30.56	36.31	42.48	44.58	51.52	59.19
6 h	41.28	51.46	57.85	63.73	65.55	71.01	76.21
12 h	53.20	65.11	71.99	77.92	79.68	84.74	89.27
24 h	63.86	77.34	84.54	90.39	92.05	96.67	100.59

FARRELL'S EXCAVATING LIMITED

NEW PIPE CALCULATIONS

HOURLY SUMMARIES

Ruby Line and Depot meter stations used

DAY	29-May-2018		30-May-2018	
TIME	RUBY	DEPOT	RUBY	DEPOT
1:00	0.0	0.0	1.7	3.2
2:00	0.0	0.0	3.9	5.4
3:00	0.0	0.0	6.4	5.1
4:00	0.0	0.0	5.4	7.3
5:00	0.0	0.0	3.5	6.9
6:00	0.0	0.0	6.0	8.3
7:00	0.0	0.0	5.0	7.8
8:00	0.0	0.0	9.5	12.0
9:00	0.0	0.0	10.0	12.7
10:00	0.0	0.0	7.4	9.0
11:00	0.0	0.0	3.2	4.4
12:00	0.0	0.0	4.2	4.3
13:00	0.0	0.0	3.1	3.9
14:00	0.0	0.0	1.9	2.3
15:00	0.0	0.0	1.4	1.4
16:00	0.0	0.0	0.5	0.5
17:00	0.0	0.0	0.3	0.2
18:00	0.0	0.0	0.4	0.5
19:00	1.1	1.6	0.3	0.3
20:00	0.9	1.1	0.3	0.7
21:00	0.6	0.9	0.3	0.3
22:00	1.9	2.1	1.8	0.7
23:00	1.4	1.8	0.9	0.3
0:00	2.9	2.5	0.5	0.8
TOTAL	8.8	10.0	77.9	98.3

24 hour		6 hour	
RUBY	DEPOT	RUBY	DEPOT
82.6	105.2	41.4	56.7

IDF data sources

Government reccomended data: idf-cc-uwo.ca/idfstation 8403506

St. John's future climate report IDF table 1.31.2 median

St. John's ruby line historical rainfall IDF calc's table 2a

EVENT WAS 24hr 5year RAINFALL

Catchment area calculation

Calculations performed from Civil3d using combined St. John's aerial lidar survey, Farrell's survey data, and updated aerial maps from openweb and Google

Coefficient of Runoff

As most of the region is comprised of clean blasted rock, paved parking, buildings, and gravel, runoff should be fairly high. Very little vegetation (<10%)

Pipe flow calculated

Pipe flow was calcuated using software "pipe flow advisor" from pipeflow.co.uk. This was compared to Civil3d pipe pipe network design. The rainfall event that caused flooding for the noted days is a 5 year rainfall event. We will calculate our runoff for a 100 year rainfall event with a 1.5 safety factor.

AVERAGE

24 hour	6 hour
93.9	49.1

100 YEAR STORM CALCULATIONS

Catchment Area (m2)	721,000	*Most of Municipal, Pennecon and Farrell's properties fall within this area*
24hr 5yr storm (mm)	150.1	*Rainfall data provided by St. John's from Ruby and Depot stations*
Coefficient of runoff	0.8	*Most of the catchment area is asphalt, gravel and blast rock*
Volume of water (m3)	129,867	*24hr 5yr event had approx 0.5m of water in quarry base*

Pipe x-sec (m2)	0.071	Pipe dimater (m)	0.3	**EXISTING**
Pipe slope (existing)	0.17%	Mannings Coeff	0.010	Smooth Wall PVC
Flow (calc m3/min)	0.058	*Calculated using pipe flow advisor service and comparing with Civil 3d*		
Calc Days to drain	**25.92**	*The 5yr storm took approx 5 days to drain with existing pipe to operational level*		

Pipe x-sec (m2)	0.442	Pipe dimater (m)	**0.75**	*2 pipes* **PROPOSED**
Pipe slope (proposed)	1.00%	Mannings Coeff	0.022	HDPE corrugated
Flow (calc m3/min)	1.32	*Calculated using pipe flow advisor service and comparing with Civil 3d*		
Calc Days to drain	**1.14**	This would be optimal as we could drain a 100yr 24hr storm in one day		

5. Describe how to manage the runoff or on-site drainage water (1:100-year stormwater runoff amount) – either discharge it directly into the nearby stream/water body or store it in a detention pond and release it gradually.

Runoff will be stored in the settling pond and will either be used in the Concrete Batch Plant for the production of Concrete or will be slowly drained over a vegetated area by an existing culvert.

6. Prepare a schematic diagram of the on-site drainage plan.

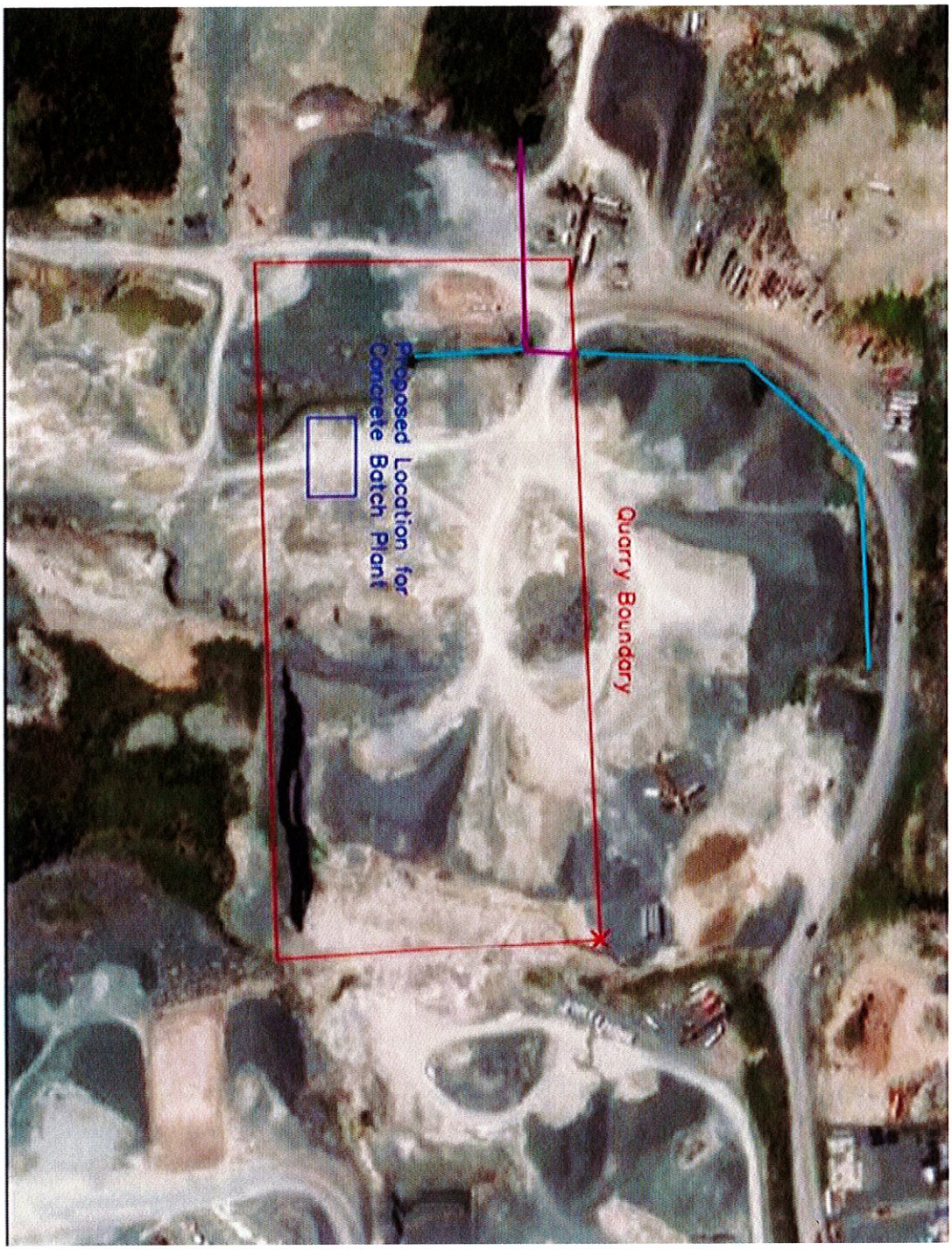


Figure 1: Teal line represents the Drainage ditch that is on the quarry site, and the purple line represents the flow of water through the culvert into the vegetated area

7. Describe how to manage the dewatering of the mine pit/quarry pit, if required.

Dewatering of this area is already controlled using a perimeter ditch and a culvert that outlets into a vegetated area. This water will flow over the vegetated area and will be naturally percolated. Water can also flow over the ground surface into another existing settling pond where sediment can settle out before flowing into 3 Arm Pond.

8. Outline preventive measures to be taken to prevent land erosion from runoff, on-site drainage water, and/or dewatering, as these have the potential to impact the water quality and quantity of natural water bodies.

Along with the use of silt fencing, water will be directed into settling ponds and over vegetated areas to act as a secondary sediment containment area before it gets released into any body of water.