

PROPOSED UPLAND LANDFILL

HYDROGEOLOGICAL REVIEW

BY

GW SOLUTIONS

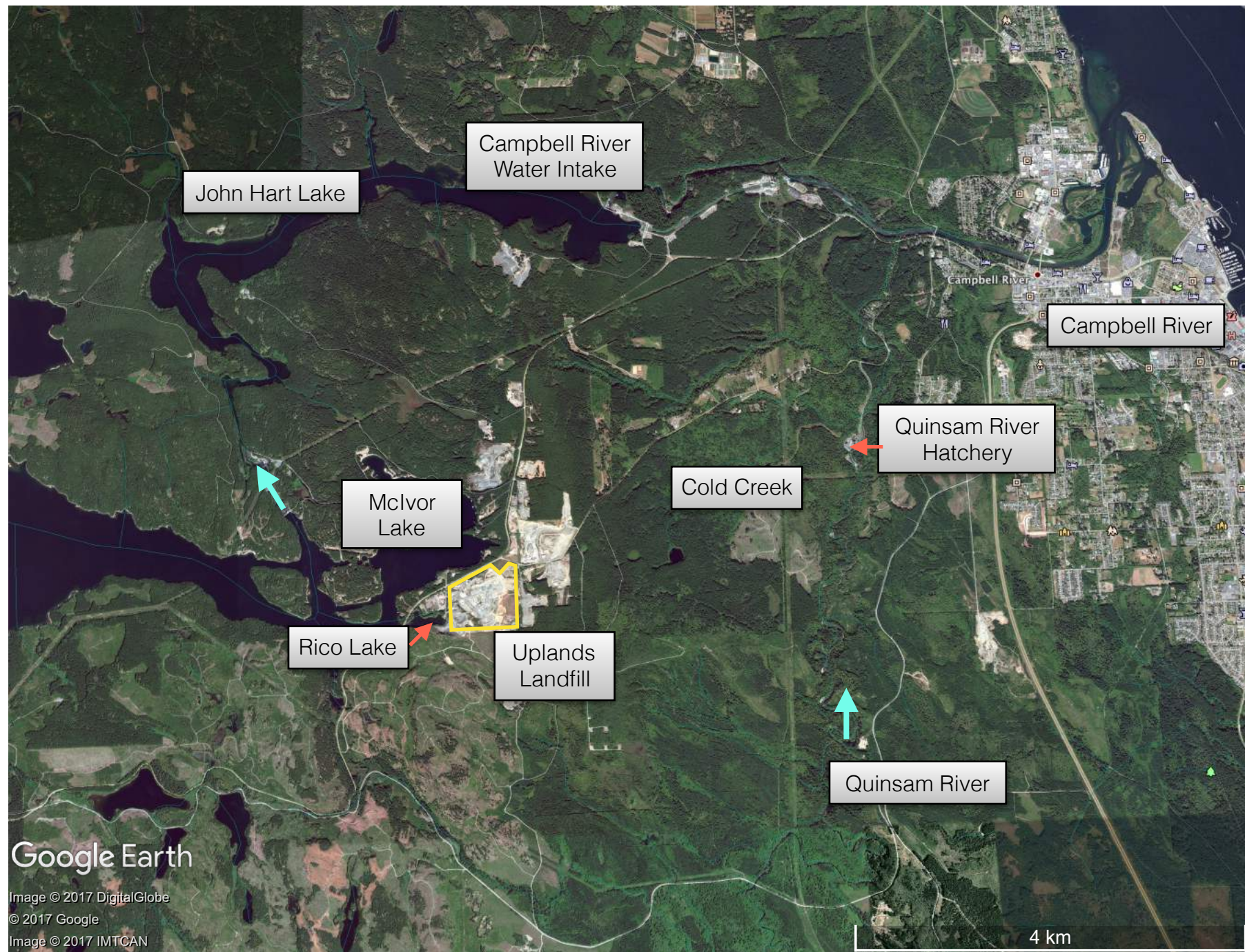
Victoria, October 6, 2017

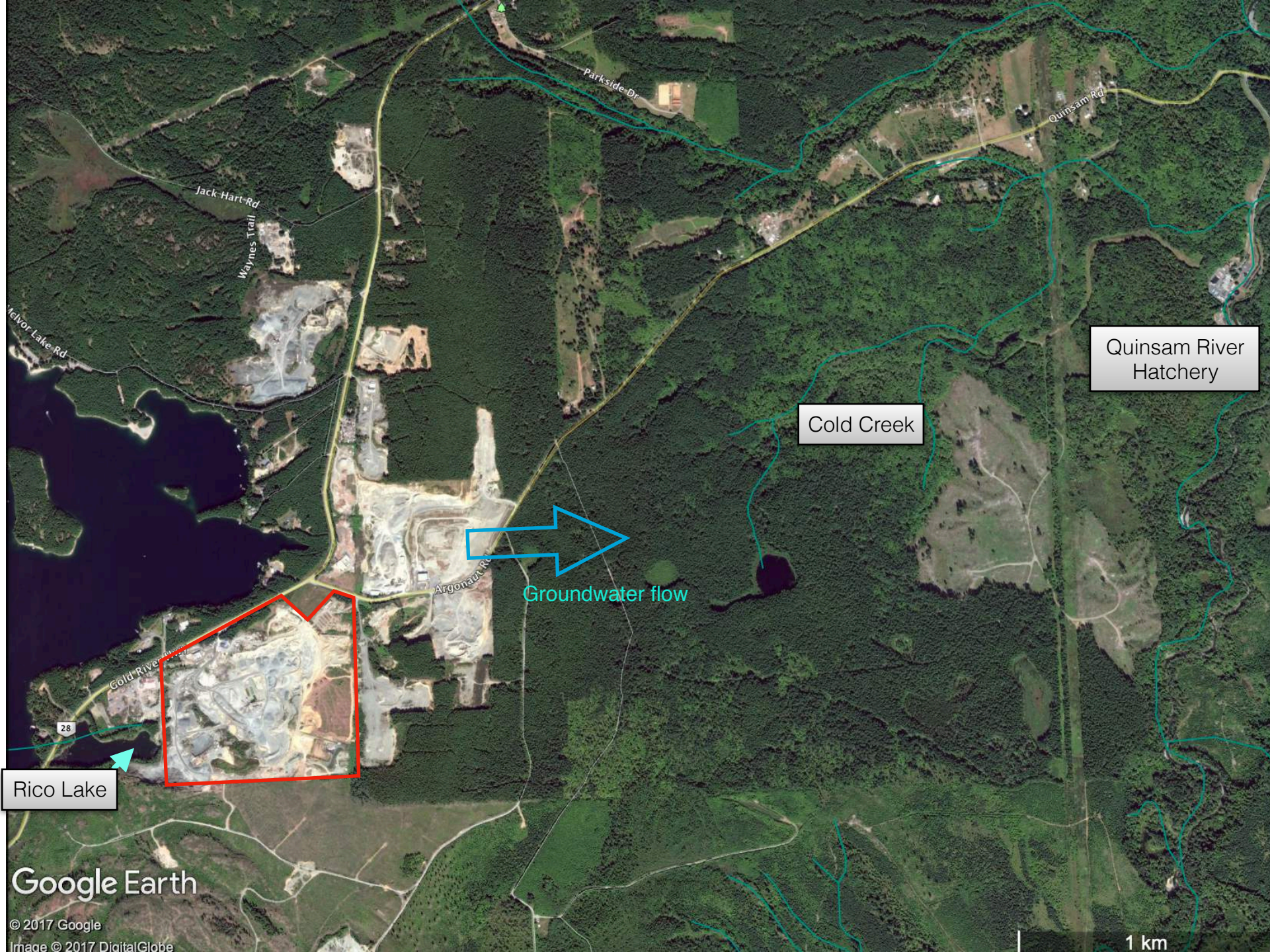
OUTLINE

- Setting
- Sensitive Receptors - Issues
- Completed Work
- Remaining Questions

OUTLINE

- Setting

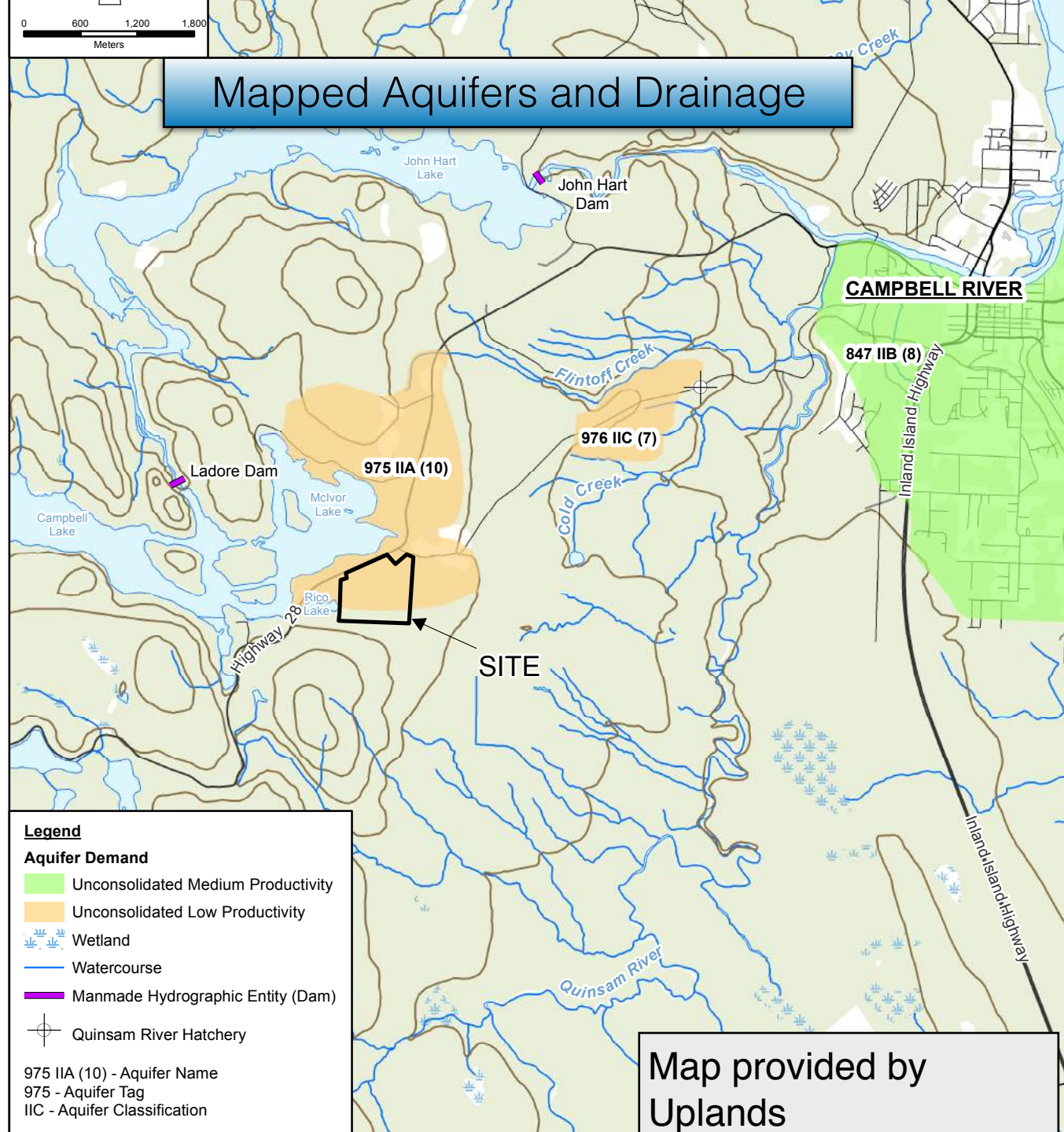


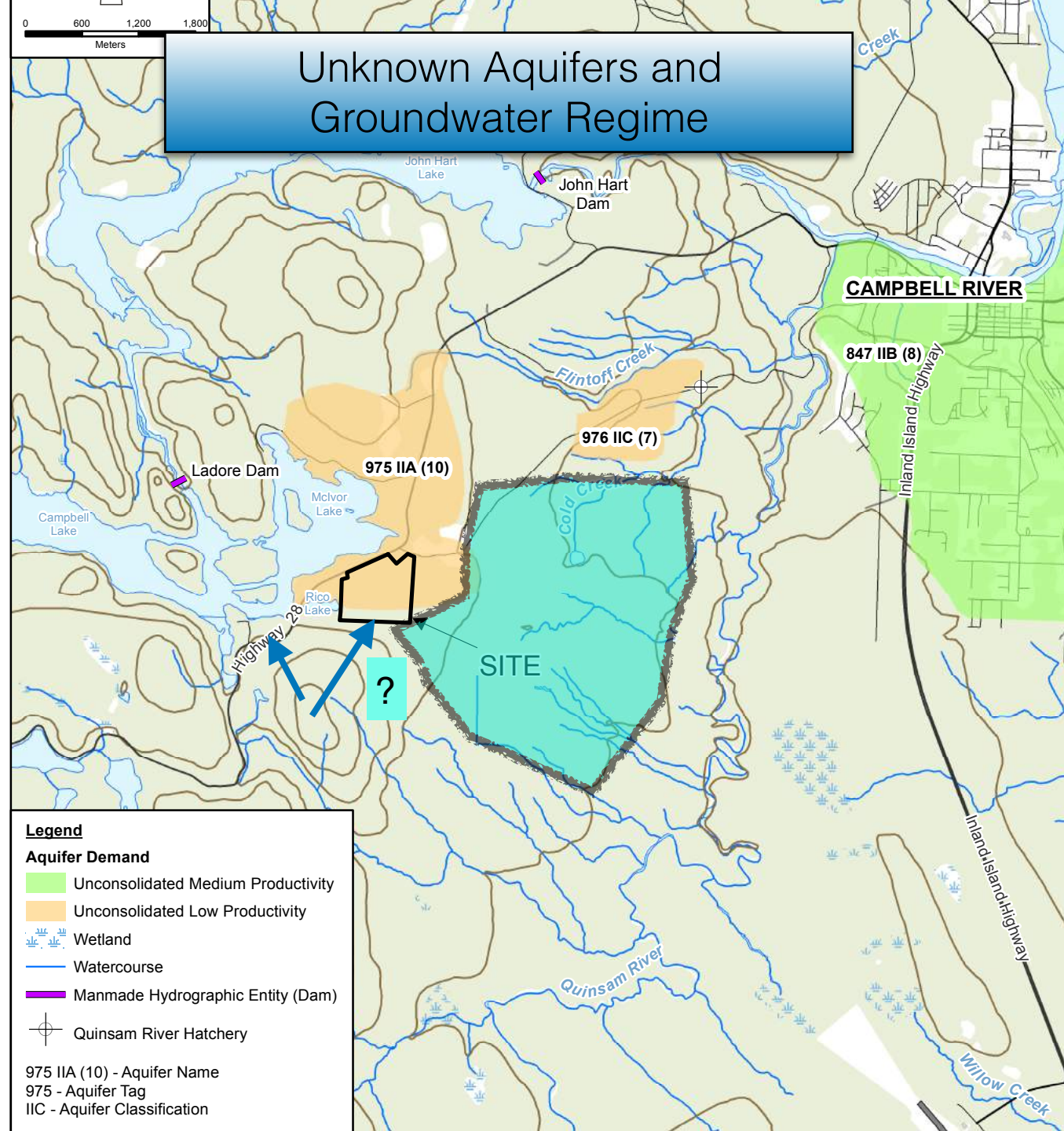


Google Earth

© 2017 Google
Image © 2017 DigitalGlobe

1 km

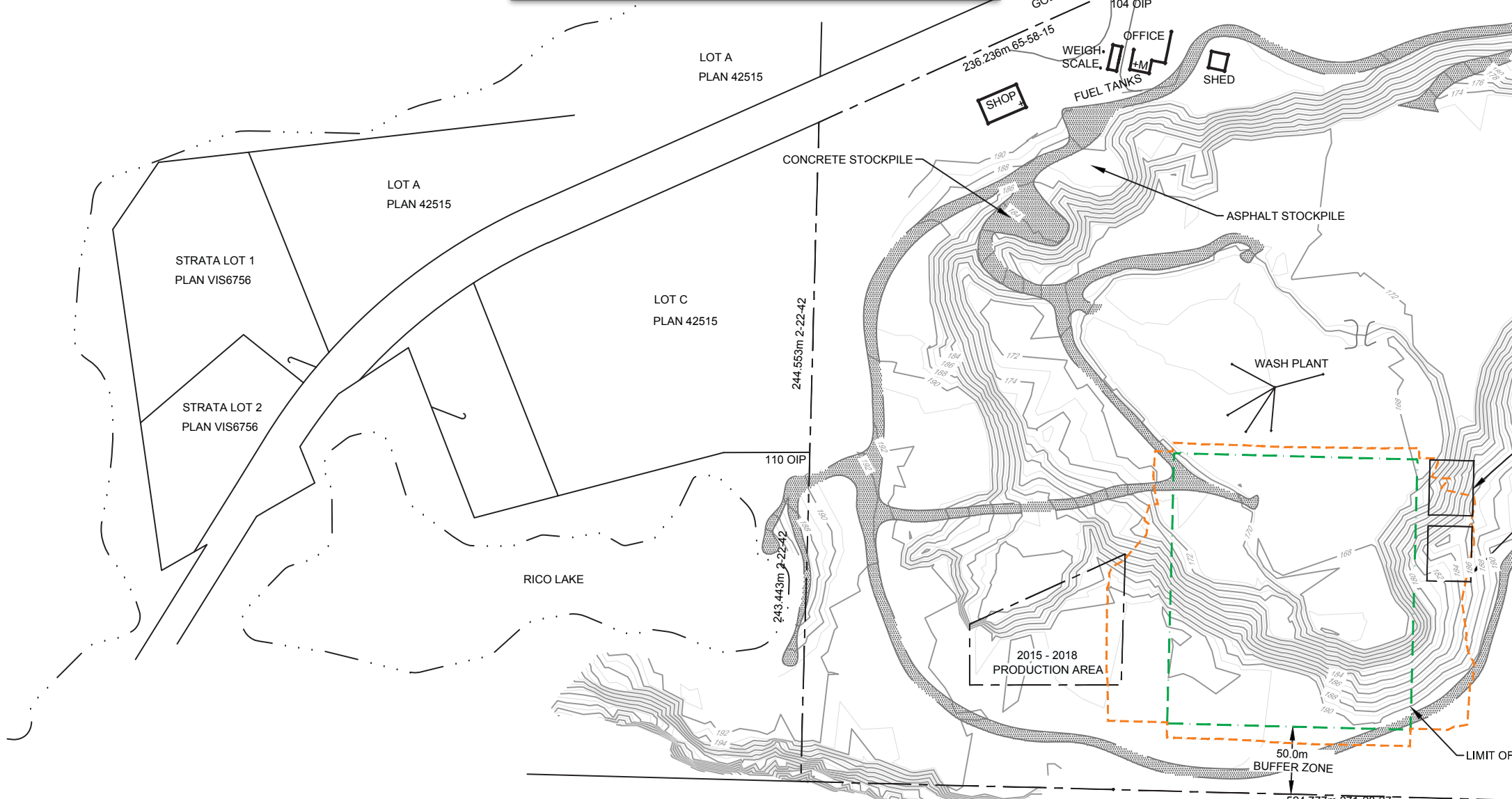




— — — — —

■ ■ ■ ■ ■

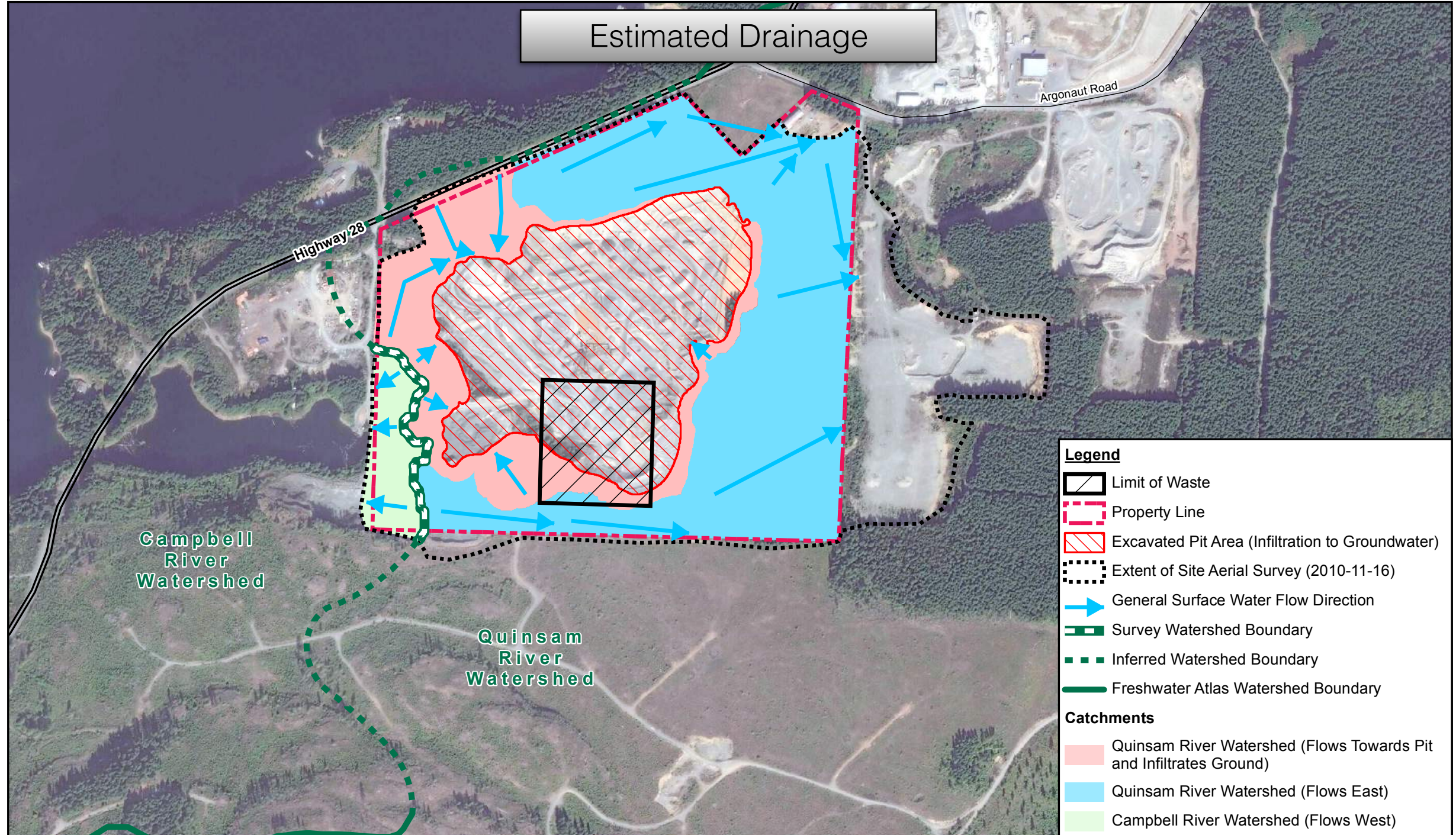
Proposed Landfill



NE 1/4 SEC.32 TP.2

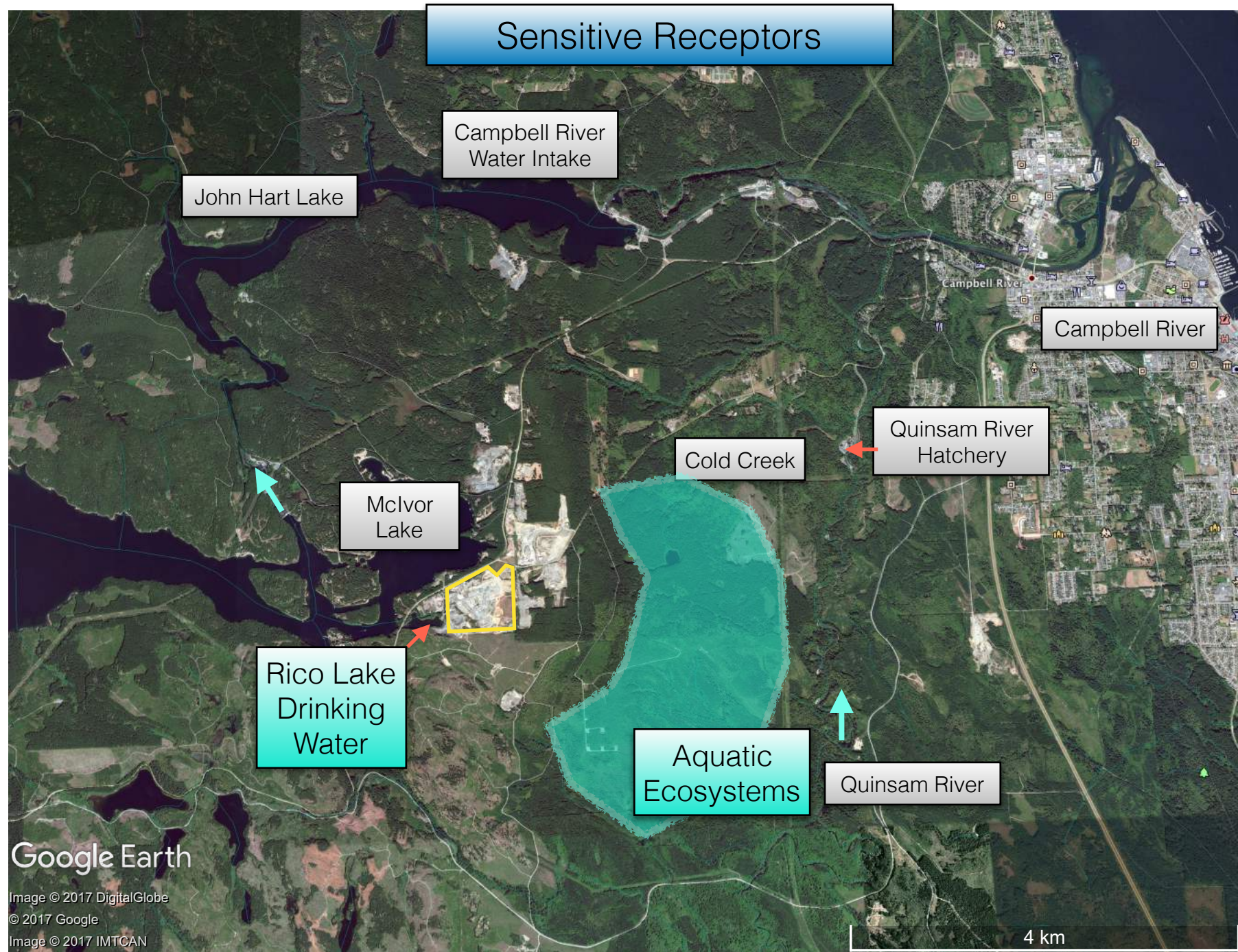
W 1/2 OF NW 1/4 SEC. 33 TP. 2

Estimated Drainage



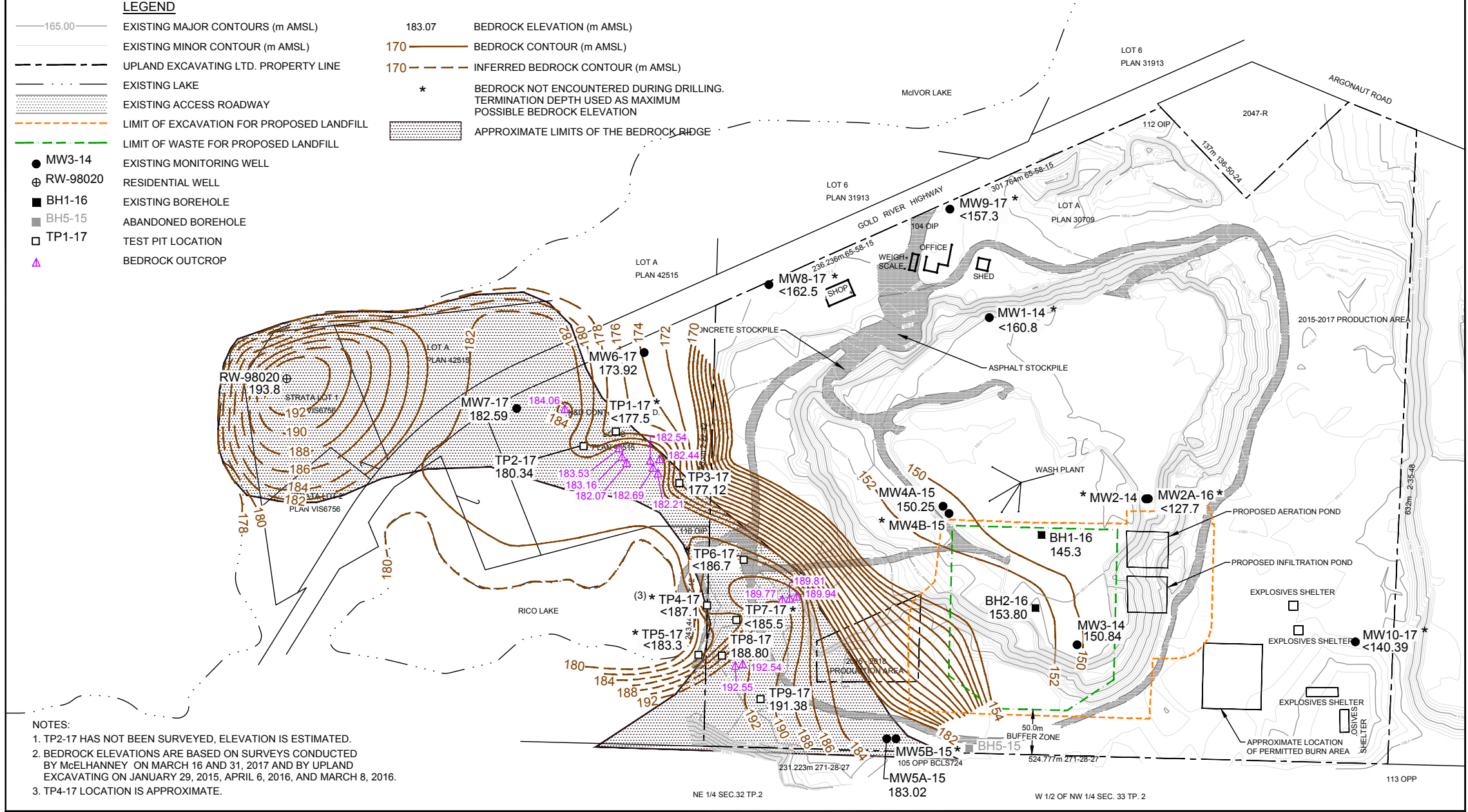
OUTLINE

- Setting
- Sensitive Receptors - Issues



OUTLINE

- Setting
- Sensitive Receptors - Issues
- Completed Work



SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.



UPLAND EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT

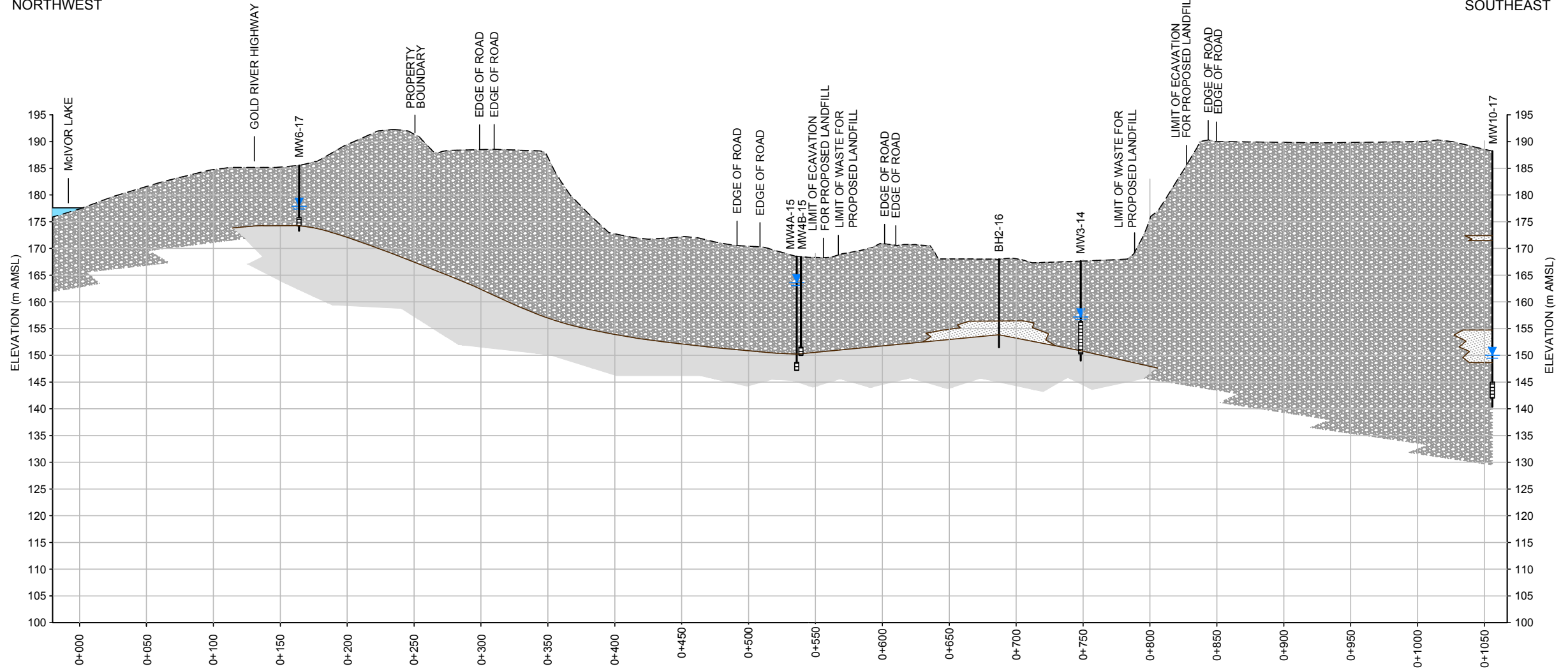
88877-03
May 23, 2017

BEDROCK CONTOURS

14
FIGURE 2.8

D
NORTHWEST

D'
SOUTHEAST



SECTION D-D'
HORZ 1:3000
VERT 1:750
figure 2.2

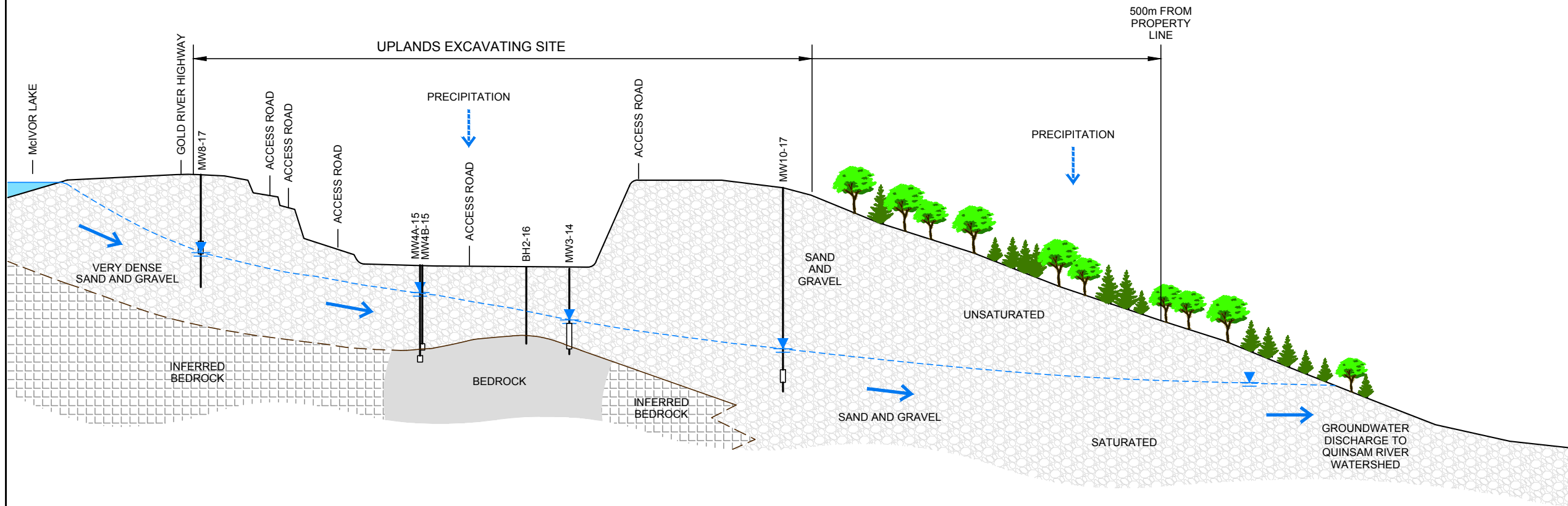


1. ONSITE TOPOGRAPHY IS BASED ON THE TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATE LAND SURVEYING LTD., NOVEMBER 21, 2016.
2. OFFSITE TOPOGRAPHY HAS BEEN ESTIMATED USING ESRI TOPOGRAPHIC BASEMAP, ACCESSED 2017; BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, WATER PROTECTION AND SUSTAINABILITY BRANCH, SEPTEMBER 11, 2014.
3. RICO LAKE IS APPROXIMATELY 12 M DEEP (LAKE BOTTOM IS AT 168 mAMS) - MEASURED BY CAMPBELL RIVER ENVIRONMENTAL COMMITTEE.
4. ALL LOCATIONS ARE APPROXIMATE AND MEANT TO DEMONSTRATE CONCEPTUAL FLOW DIRECTION.



NORTH

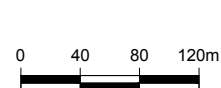
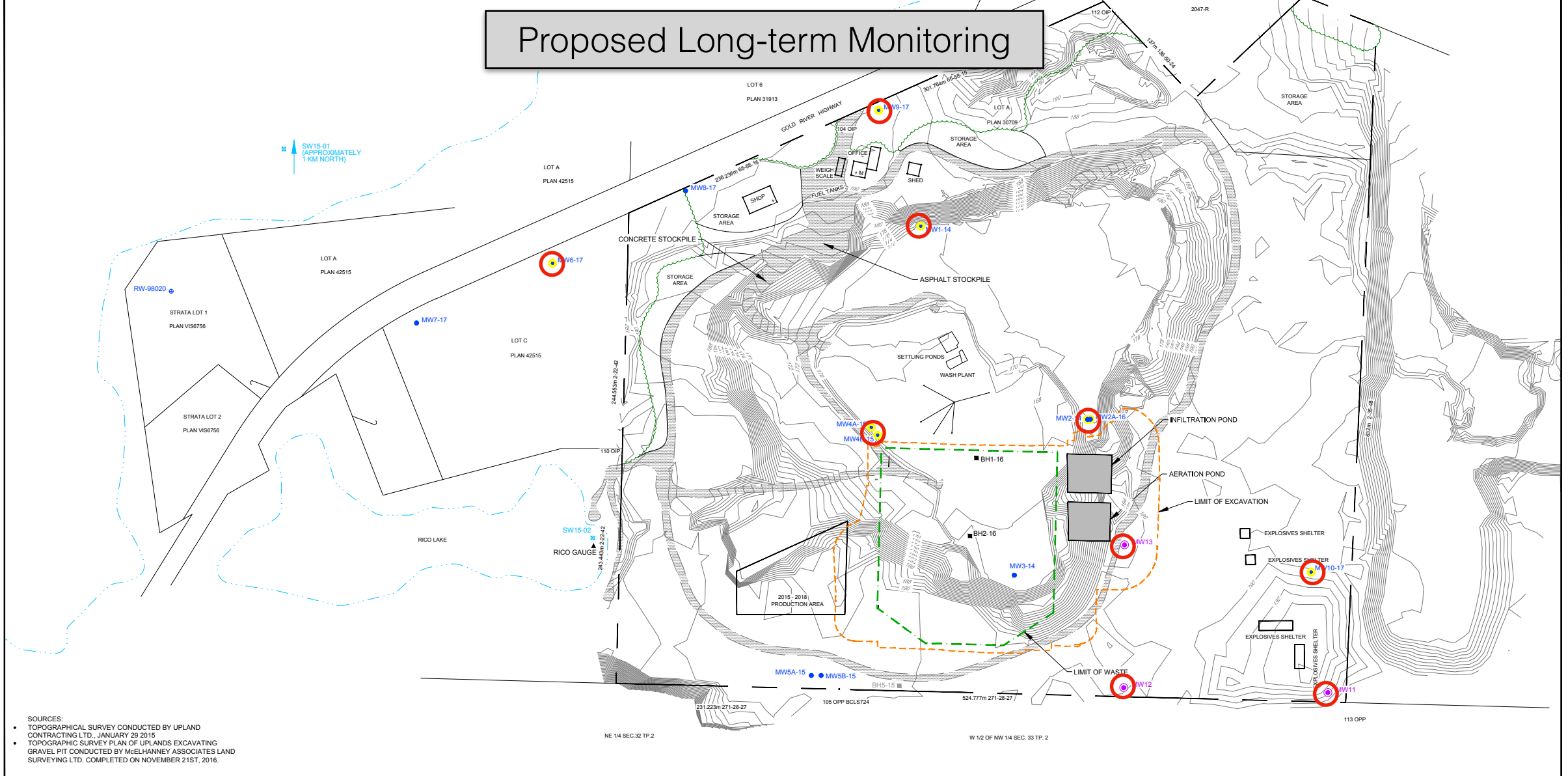
SOUTHEAST



NOT TO SCALE

- NOTES:
1. ONSITE TOPOGRAPHY IS BASED ON THE TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATE LAND SURVEYING LTD., NOVEMBER 21, 2016.
 2. OFFSITE TOPOGRAPHY HAS BEEN ESTIMATED USING ESRI TOPOGRAPHIC BASEMAP, ACCESSED 2017; BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, WATER PROTECTION AND SUSTAINABILITY BRANCH, SEPTEMBER 11, 2014.
 3. ALL LOCATIONS ARE APPROXIMATE AND MEANT TO DEMONSTRATE CONCEPTUAL FLOW DIRECTION.

Proposed Long-term Monitoring



LEGEND	
	EXISTING MAJOR CONTOURS
	EXISTING MINOR CONTOUR
	PROPERTY LINE
	EXISTING LAKE
	EXISTING ACCESS ROADWAY
	LIMIT OF WASTE
	LIMIT OF EXCAVATION

	MW3-14	TREES/VEGETATION
	RW-98020	EXISTING MONITORING WELL
	BH5-15	RESIDENTIAL WELL
	BH5-15	EXISTING BOREHOLE
	BH5-15	ABANDONED BOREHOLE
	SW15-01	SURFACE WATER SAMPLE LOCATION
	▲ RICO GAUGE	SURFACE WATER GAUGE

	MW2-14	MONITORING WELL INCLUDED IN PROPOSED ENVIRONMENTAL MONITORING PROGRAM
	MW12	APPROXIMATE LOCATION OF PROPOSED MONITORING WELL INCLUDED IN PROPOSED ENVIRONMENTAL MONITORING PROGRAM (DURING LANDFILL OPERATIONS)



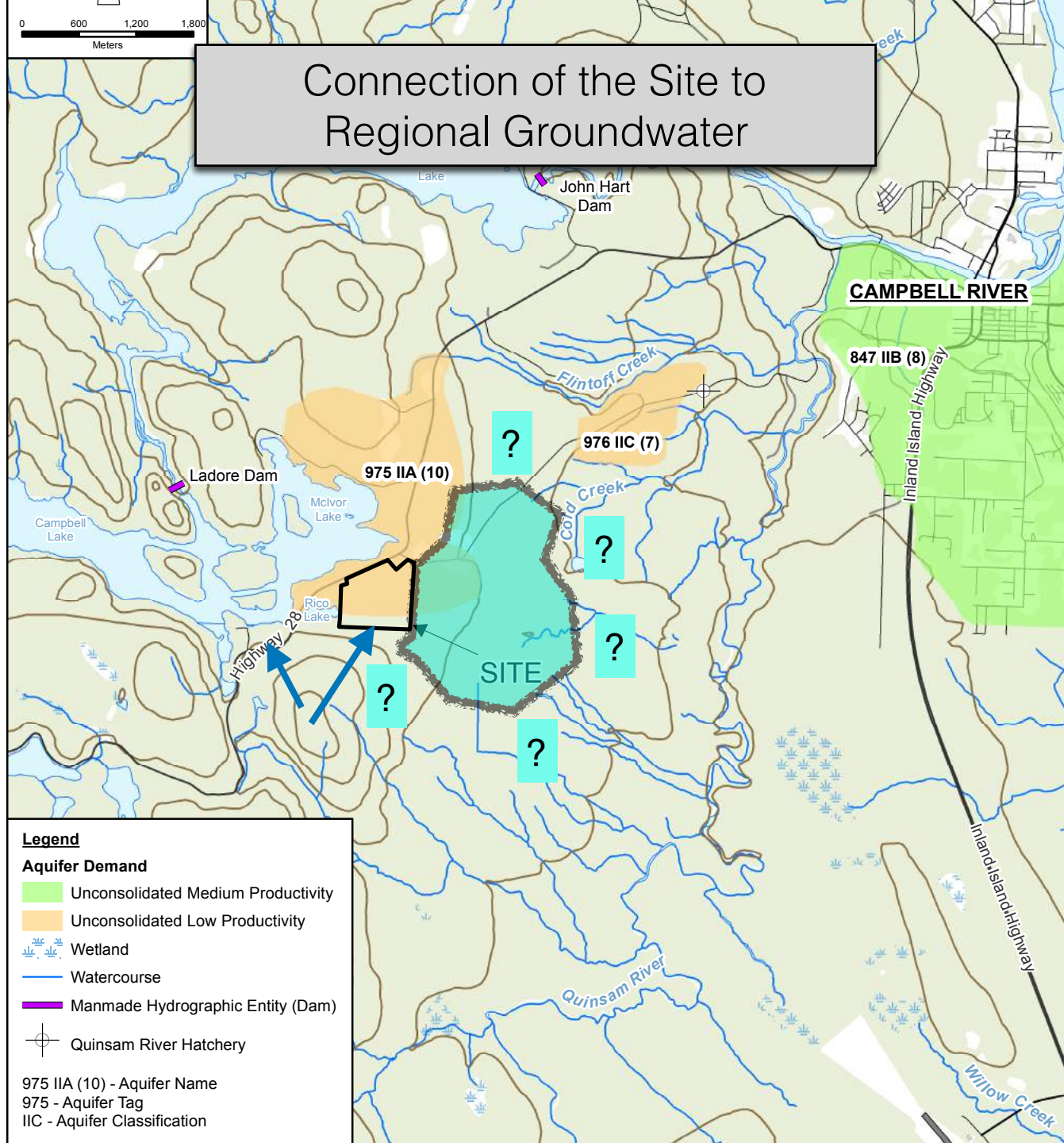
UPLAND EXCAVATING LIMITED
PROPOSED UPLAND LANDFILL
2017 DESIGN, OPERATION, AND CLOSURE PLAN
ENVIRONMENTAL MONITORING PROGRAM
PROPOSED MONITORING LOCATIONS

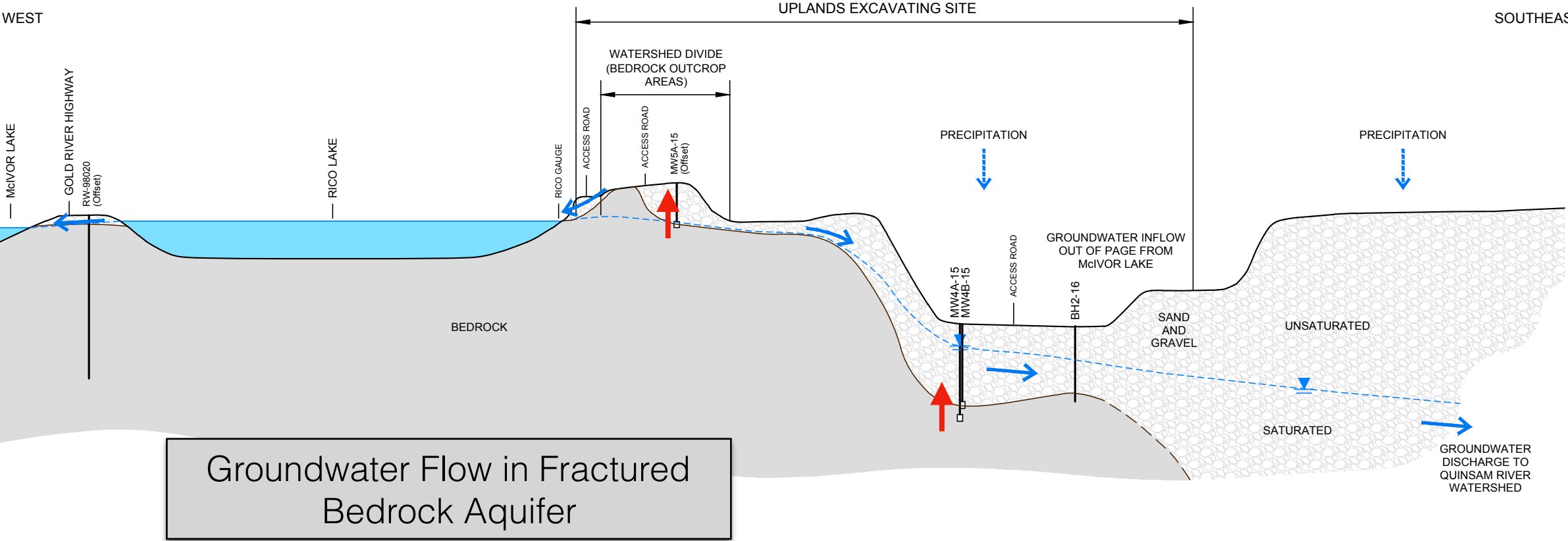
88877-03
May 31, 2017

FIGURE 14.1

OUTLINE

- Setting
- Sensitive Receptors - Issues
- Completed Work
- Remaining Questions





- NOTES:
1. ONSITE TOPOGRAPHY IS BASED ON THE TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNEY ASSOCIATE LAND SURVEYING LTD., NOVEMBER 21, 2016.
 2. OFFSITE TOPOGRAPHY HAS BEEN ESTIMATED USING ESRI TOPOGRAPHIC BASEMAP, ACCESSED 2017; BRITISH COLUMBIA MINISTRY OF ENVIRONMENT, WATER PROTECTION AND SUSTAINABILITY BRANCH, SEPTEMBER 11, 2014.
 3. RICO LAKE IS APPROXIMATELY 12 M DEEP (LAKE BOTTOM IS AT 168 mAMSL) - MEASURED BY CAMPBELL RIVER ENVIRONMENTAL COMMITTEE.
 4. ALL LOCATIONS ARE APPROXIMATE AND MEANT TO DEMONSTRATE CONCEPTUAL FLOW DIRECTION.

LEGEND

SAND AND GRAVEL

BEDROCK

SURFACE WATER

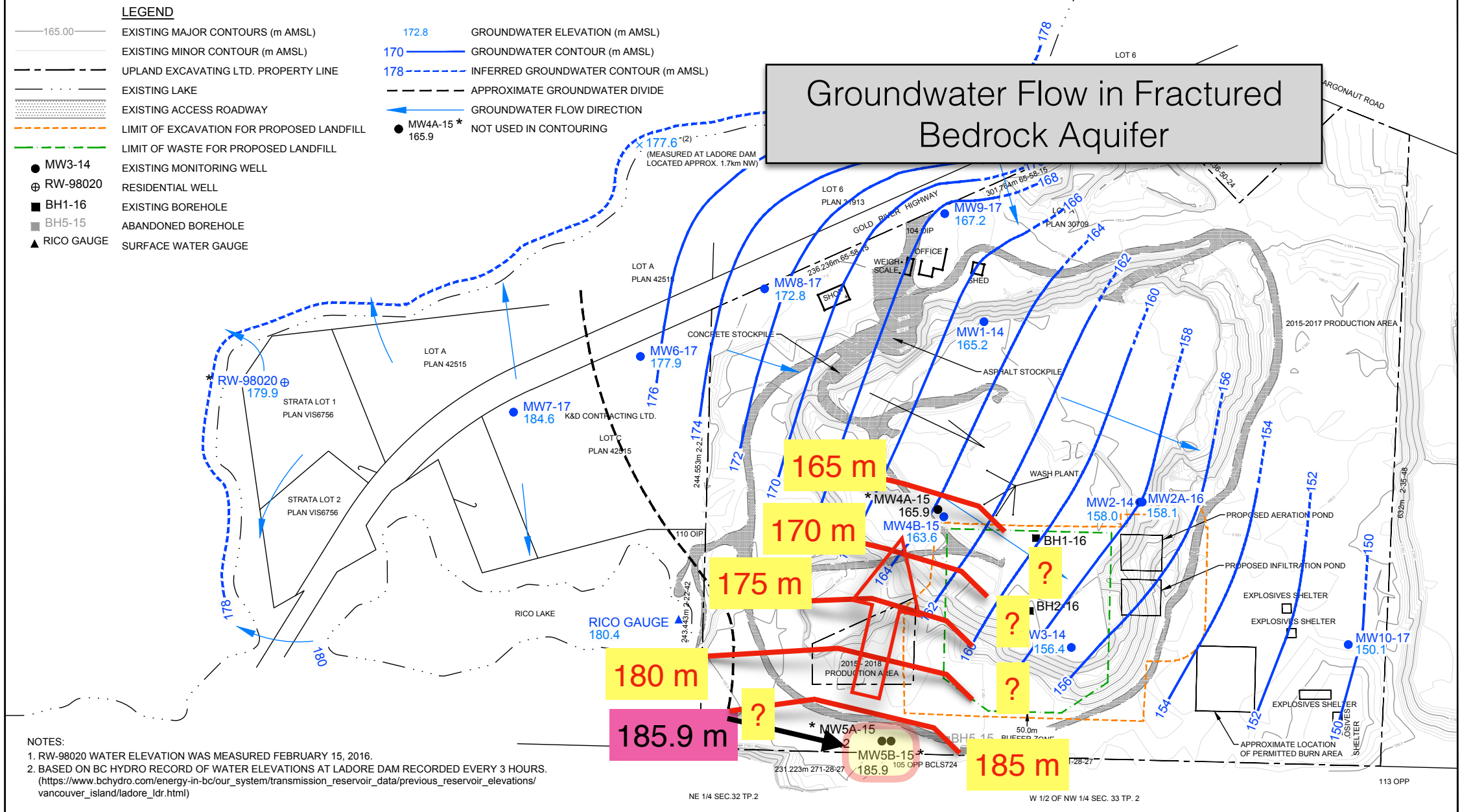
SCREEN INTERVAL

WATER LEVEL

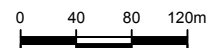
FLOW DIRECTION



UPLAND EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT
CONCEPTUAL FLOW MODEL -
SCHEMATIC CROSS-SECTION - WEST-SOUTHEAST



SOURCE: TOPOGRAPHICAL SURVEY CONDUCTED BY McELHANNAY ASSOCIATES LAND SURVEYING LTD., NOVEMBER 21, 2016.



UPLAND EXCAVATING LTD.
PROPOSED UPLAND LANDFILL
HYDROGEOLOGIC AND HYDROLOGY CHARACTERIZATION REPORT
GROUNDWATER ELEVATION CONTOURS
SAND & GRAVEL AQUIFER - APRIL 6, 2017

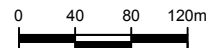
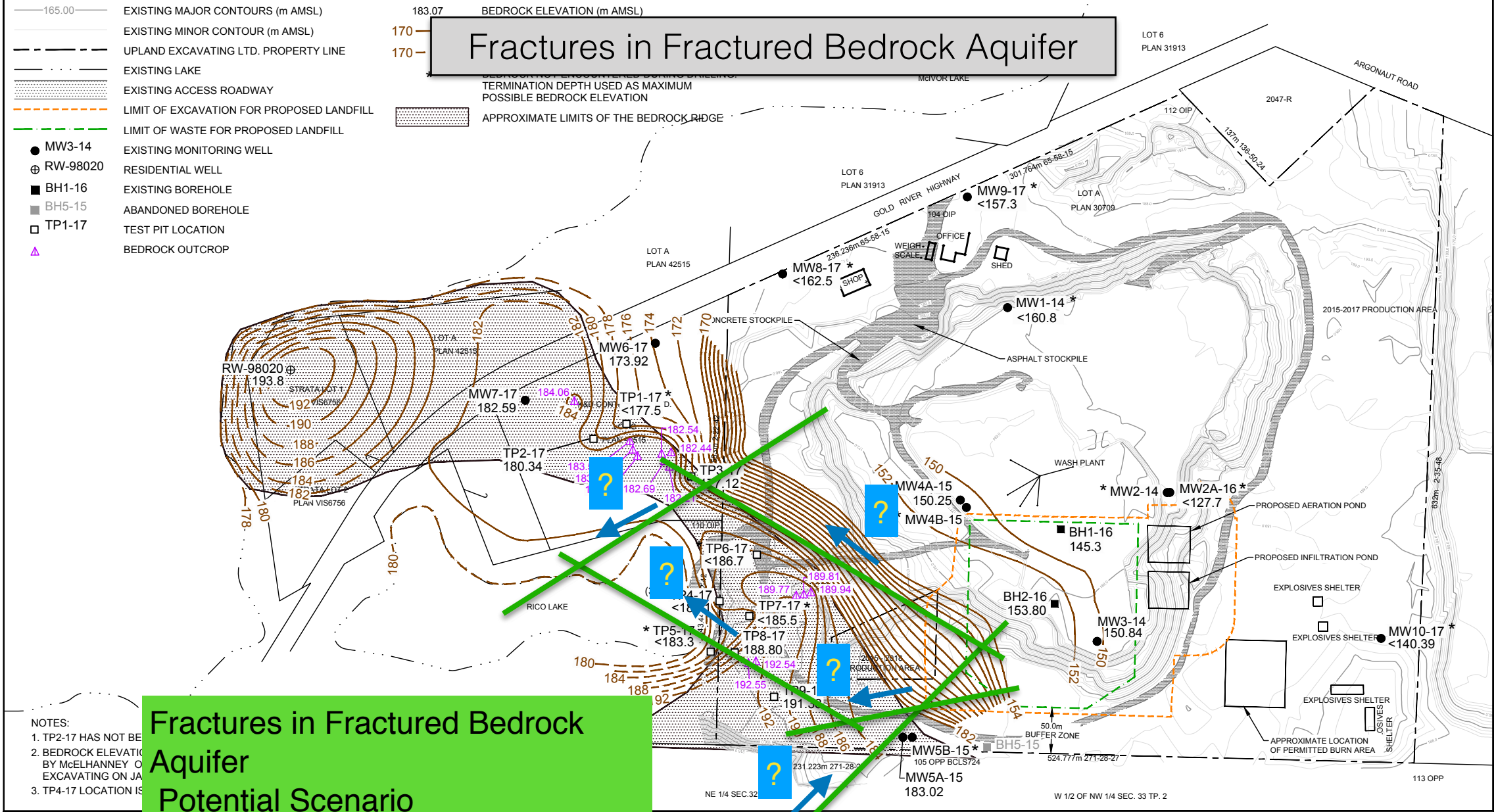
88877-03
May 23, 1997

23
FIGURE 2.9

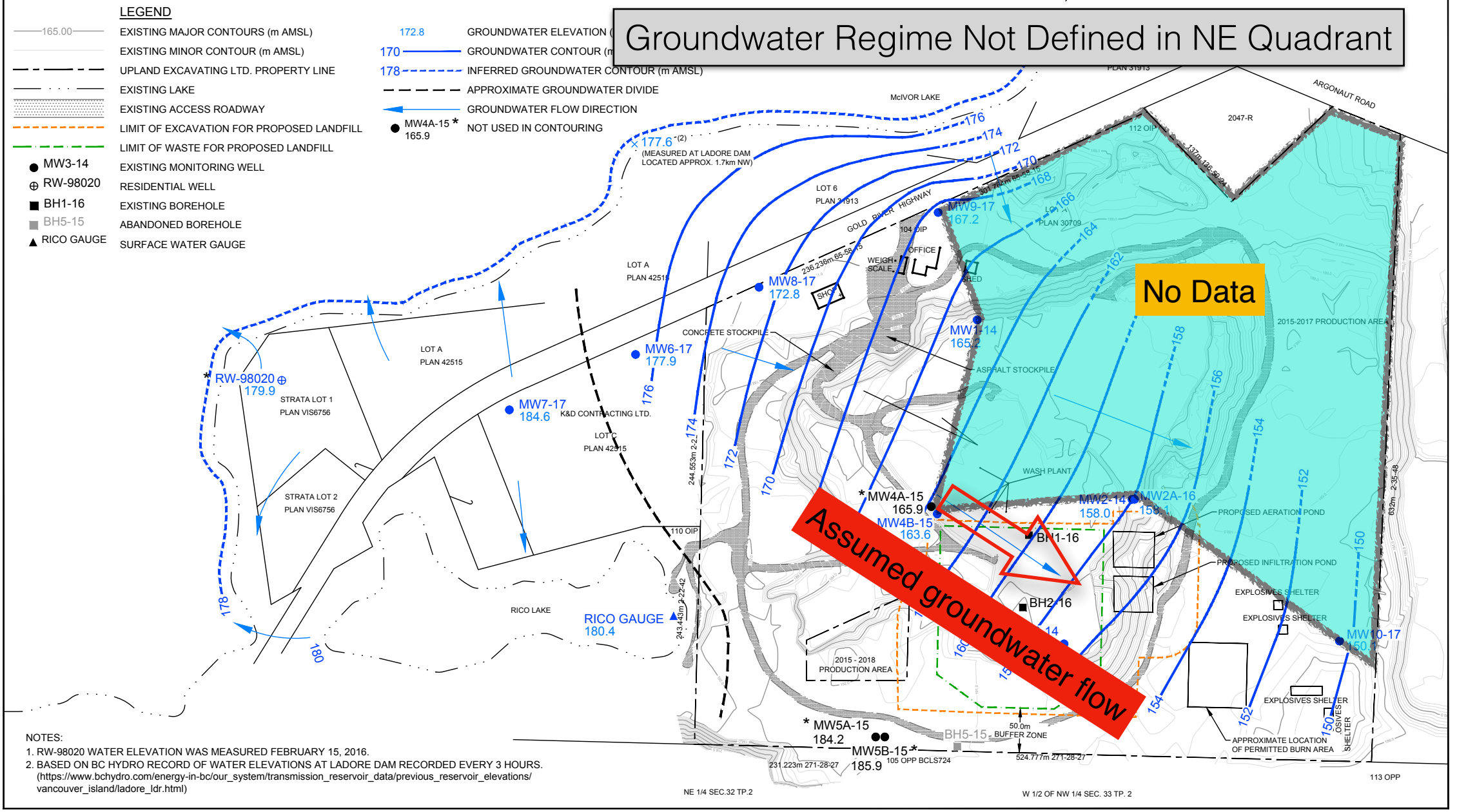
- EXISTING MAJOR CONTOURS (m AMSL)
EXISTING MINOR CONTOUR (m AMSL)
UPLAND EXCAVATING LTD. PROPERTY LINE
EXISTING LAKE
EXISTING ACCESS ROADWAY
LIMIT OF EXCAVATION FOR PROPOSED LANDFILL
LIMIT OF WASTE FOR PROPOSED LANDFILL
EXISTING MONITORING WELL
RESIDENTIAL WELL
EXISTING BOREHOLE
ABANDONED BOREHOLE
TEST PIT LOCATION
BEDROCK OUTCROP

Fractures in Fractured Bedrock Aquifer

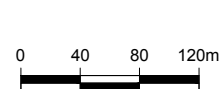
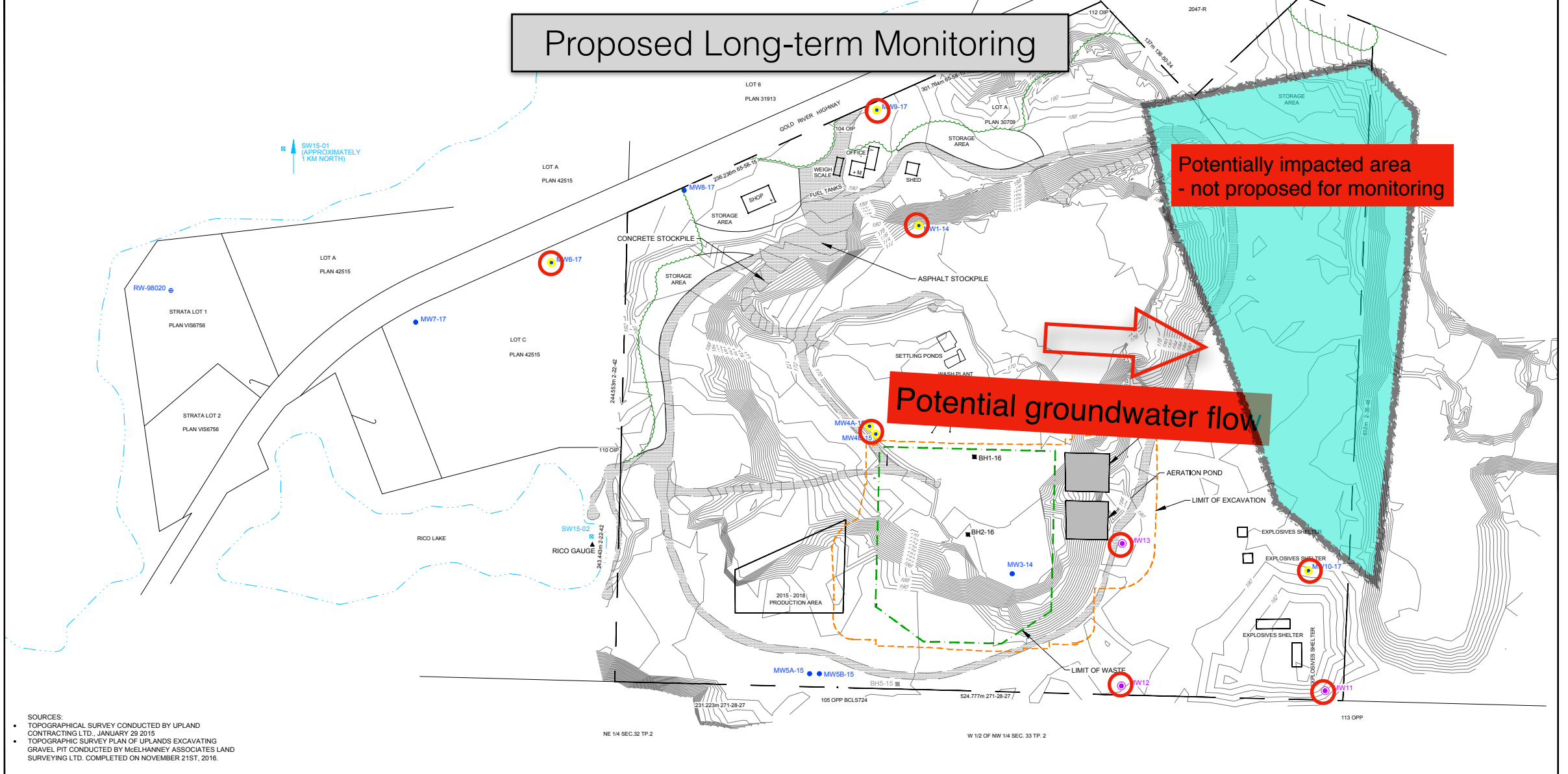
Fractures in Fractured Bedrock Aquifer Potential Scenario



Groundwater Regime Not Defined in NE Quadrant



Proposed Long-term Monitoring



LEGEND	
	EXISTING MAJOR CONTOURS
	EXISTING MINOR CONTOUR
	PROPERTY LINE
	EXISTING LAKE
	EXISTING ACCESS ROADWAY
	LIMIT OF WASTE
	LIMIT OF EXCAVATION

	MW3-14	TREES/VEGETATION
	RW-98020	EXISTING MONITORING WELL
	BH5-15	RESIDENTIAL WELL
	BH5-15	EXISTING BOREHOLE
	BH5-15	ABANDONED BOREHOLE
	SW15-01	SURFACE WATER SAMPLE LOCATION
	SW15-01	SURFACE WATER GAUGE

	MW2-14	MONITORING WELL INCLUDED IN PROPOSED ENVIRONMENTAL MONITORING PROGRAM
	MW12	APPROXIMATE LOCATION OF PROPOSED MONITORING WELL INCLUDED IN PROPOSED ENVIRONMENTAL MONITORING PROGRAM (DURING LANDFILL OPERATIONS)



UPLAND EXCAVATING LIMITED
PROPOSED UPLAND LANDFILL
2017 DESIGN, OPERATION, AND CLOSURE PLAN
ENVIRONMENTAL MONITORING PROGRAM
PROPOSED MONITORING LOCATIONS

88877-03
May 31, 2017

FIGURE 14.1

WRAP-UP

- Completed hydrogeological study: Critical gaps remain.
- Role played by fracture bedrock aquifer: Risks of impact to Rico Lake and Campbell River water supply still exist.
- Groundwater in sand and gravel aquifer(s) discharges into sensitive aquatic ecosystems. Groundwater regime still to be defined.

THANK YOU