



Wood Buffalo Environmental Association

ANNUAL REPORT – VOLUME 3

SITE DOCUMENTATION

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Operation and Maintenance by:
Wood Buffalo Environmental Association
Fort McMurray, Alberta



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 01 – FORT MCKAY-BERTHA GANTER

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oil Sands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																							
WBEA Program - X														Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS														INTEGRATED SAMPLING																									
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECI	EC/OC	SASS	Dichot	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP				
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X								X						X	X	X		X	X																
Lower Camp	3	Meteorological																X	X	X	X	X	X																
Buffalo Viewpoint	4	Compliance	X	X								X						X	X	X	X	X	X																
Mannix	5	Compliance/Meteorological	X	X								X						X	X	X	X	X	X											X		X	X		
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X			X				X	X	X	X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X			X				X	X	X	X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X						X	X	X	X	X	X	X	X	X	X	X											
Barge Landing	9	Attribution			X							X						X	X	X	X	X	X			X									X				
Lower Camp B	11	Compliance	X	X								X						X	X	X	X	X	X											X		X	X		
Fort McKay South	13	Attribution	X	X	X	X	X	X	X			X	X					X	X	X	X	X	X									X	X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X			X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X					X	X	X	X	X	X	X			X				X			X		X			
Shell Muskeg River	16	Compliance	X				X	X	X			X	X					X	X	X	X	X	X	X			X						X						
Wapasu Creek	17	Compliance	X	X			X	X	X			X	X					X	X	X	X	X	X				X				X						X	X	
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Suncor Firebag	19	Compliance	X	X			X	X	X			X						X	X	X	X	X	X																
Brion Energy	20	Compliance	X	X			X	X	X			X						X	X	X	X	X	X				X												
Cenovus Christina Lake	500	Portable-Compliance	X	X			X	X	X			X						X	X	X	X	X	X																
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X									X	X	X	X	X	X																
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X									X	X	X	X	X	X																
HEMP	104	Portable-Health			X							X	X	X				X	X	X	X	X	X																

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

AMS 01 – Bertha Ganter Station Details

General Site Information

The Berta Ganter station was installed in 1997 as a community station to monitor in the region of the settlement of Fort MacKay. It is situated near the northwest corner of the Fort McKay Water Treatment Plant.

Item	Description			
Station ID	AMS 01			
Station Name	Fort McKay-Bertha Ganter			
General description	Located approximately 200 m northwest of the Fort McKay Water Treatment Plant.			
Community	Fort McKay			
Station Coordinates	57°11'21.94"	North	111°38'26.10"	West
Station elevation	270			Meters
Station Address	NA			
Station Type	Health			
Initial Commission Date	NA			
Area Land Use	Residential			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	10 meters	Height	5 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters	Type	Aluma crank-up tower
	Position	Attached to North end of monitoring shelter		
Station Install Date	December 2007			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description		
Water treatment plant	To the South approximately 250 m	Water treatment plant handles water for the settlement of Fort MacKay		
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Access road	low	50	Gravel access roads

Table 3.0 – Local Source Information

Area Topographic Map

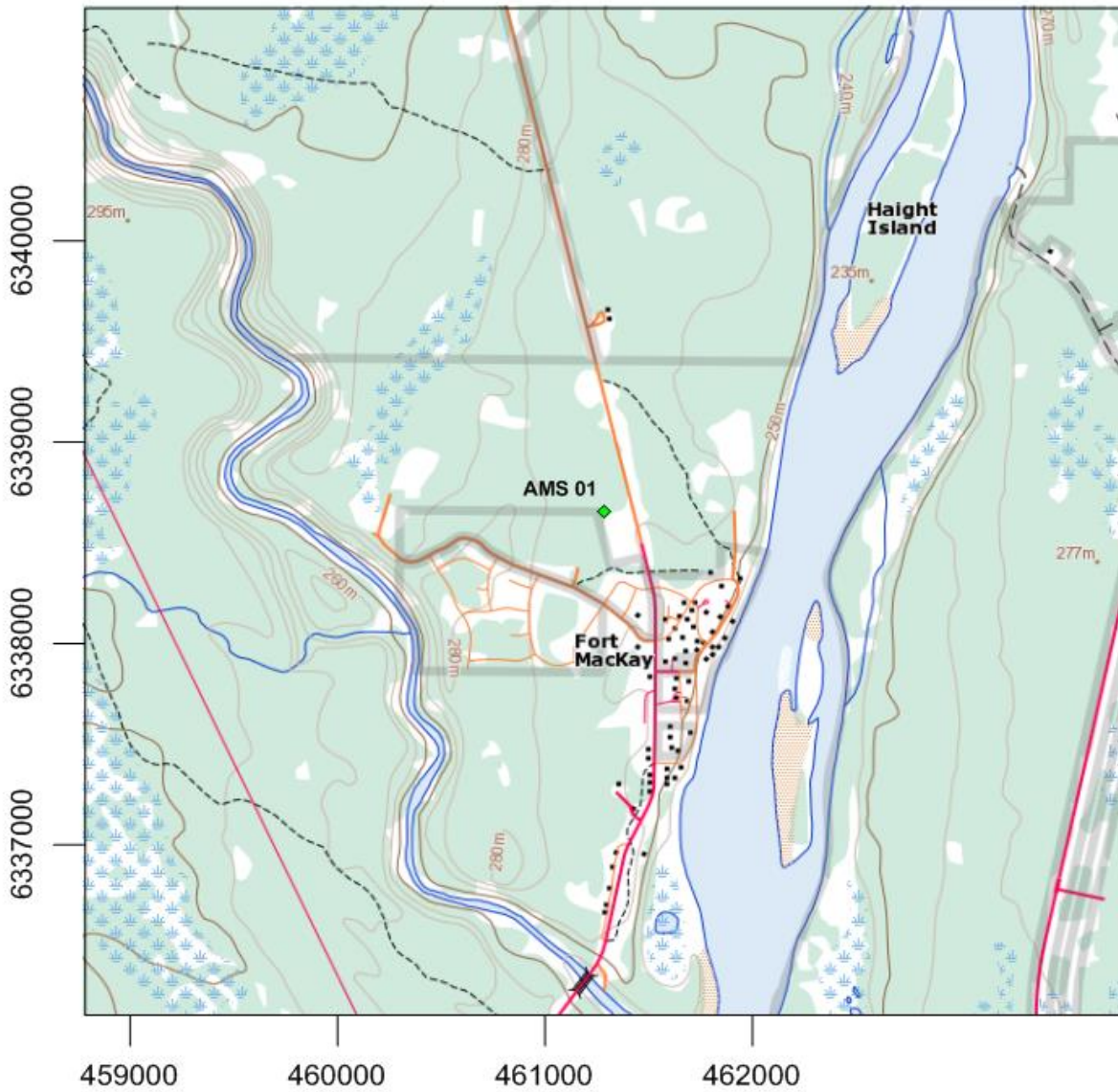


Figure 2.0 – Area Topographic map showing AMS 01 – Fort McKay - Bertha Ganter Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 01 – Fort McKay - Bertha Ganter Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Monitoring compound looking south



Figure 4.2 – Sampling Deck



Figure 4.3 Super SASS enhanced deposition sampling deck



Figure 4.4 – Precipitation Sampling Deck



Figure 4.5 – Continuous Precipitation Monitoring Instrument (Pluvio)



Figure 4.6 – Environ looking north



Figure 4.7 – Environ looking east



Figure 4.8 – Environ looking south



Figure 4.9 – Environ looking west



Figure 4.10 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.11 – East Rack (on the left) & West Rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulphur Dioxide	Thermo Instruments	43i	JC1501301448	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1218153461	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	Thermal Oxidizer	CD Nova	CDN 101	470	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		1
NOx	Nitrogen Dioxide	Thermo Instruments	42i	1218153357	0-1000ppb	Chemiluminescence	4	1
NMHC	Non-Methane Hydrocarbons	Thermo Instruments	55i-LT	1152430012	0-50ppm	Gas Chromatography	4	1
O3	Ozone	Thermo Instruments	T400	1107	0-500 ppb	UV Photometric	4	1
NH3	Ammonia	Teledyne API	T201	152	0-2000 ppb	Chemiluminescence	4	1
NH3 Converter	Thermal converter	Teledyne API	T501NH3	147	NA			
PM2.5	PM <2.5 um in diameter.	Thermo Instruments	5030	E-1486	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
AT/RH	Ambient temperature	Vaisala	HMP155		AT: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.		
WS	Wind Speed<10um	Met One	010C-1		0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1		0-360 degrees	Resistive (potentiometer)	10	
LW	Leaf wetness sensor	Decagon Devices	LWS					
PC	Pluvio	OTT Pluvio		363524			2	
Precip	Integrated sampling.	N-CON	00-120-2	60192			2	
PM 2.5 A	Particulate Matter <2.5ug/m3.	Thermo Instruments	2000i	200012 0456 1405	NA	Inertial Separator and Cartridge Filter	2	

	Integrated sampling.							
PM 2.5 B	Particulate Matter <2.5ug/m3. Integrated sampling.	Thermo Instruments	2000i	200012 04871408	NA	Inertial Separator and Cartridge Filter	2	
PM 10 A	Particulate Matter <10ug/m3. Integrated sampling.	Thermo Instruments	2000i	200012 0457 1405	NA	Inertial Separator and Cartridge Filter	2	
PM 10 B	Particulate Matter <10ug/m3. Integrated sampling.	Thermo Instruments	2000i	200012 04841408	NA	Inertial Separator and Cartridge Filter	2	
EC PAH	Polycyclic aromatic hydrocarbons	Tisch	TE-1000	1001056	NA	Filter/ canister sampler	2	
EC/OC	Partisol Integrated sampling.	Thermo Instruments	2000i	200012 022 1205	NA	Cartridge Filter	2	
PAH	Polycyclic aromatic hydrocarbons	Tisch	TE-1004BL	1616	NA	Filter/ canister sampler	2	
VOC	Volatile Organic Compounds	Tisch	TE-123	1018	NA	Canister sampling	2	
SASS	SASS	Met One	S/SASS	P15905	NA			
Dicot		Thermo Instruments	200DI2	1101102	NA	Inertial Separator and Cartridge Filter	2	
Dicot		Thermo Instruments	200DI2	1161103	NA	Inertial Separator and Cartridge Filter	2	

Table 4.0 - Analytical Equipment in AMS 01

Name	Description	Make	Model	Serial Number
Datalogger	CR3000	Campbell Scientific	CR3000	9036
ZAG	Zero Air Generator	Teledyne API	T701	587
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	ITB	NA	NA
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	1730512
Datalogger	CR1000	Campbell Scientific	CR1000	62004

Table 5.0 - Support Equipment in AMS 01

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Fort McKay - Bertha Ganter (AMS 1)

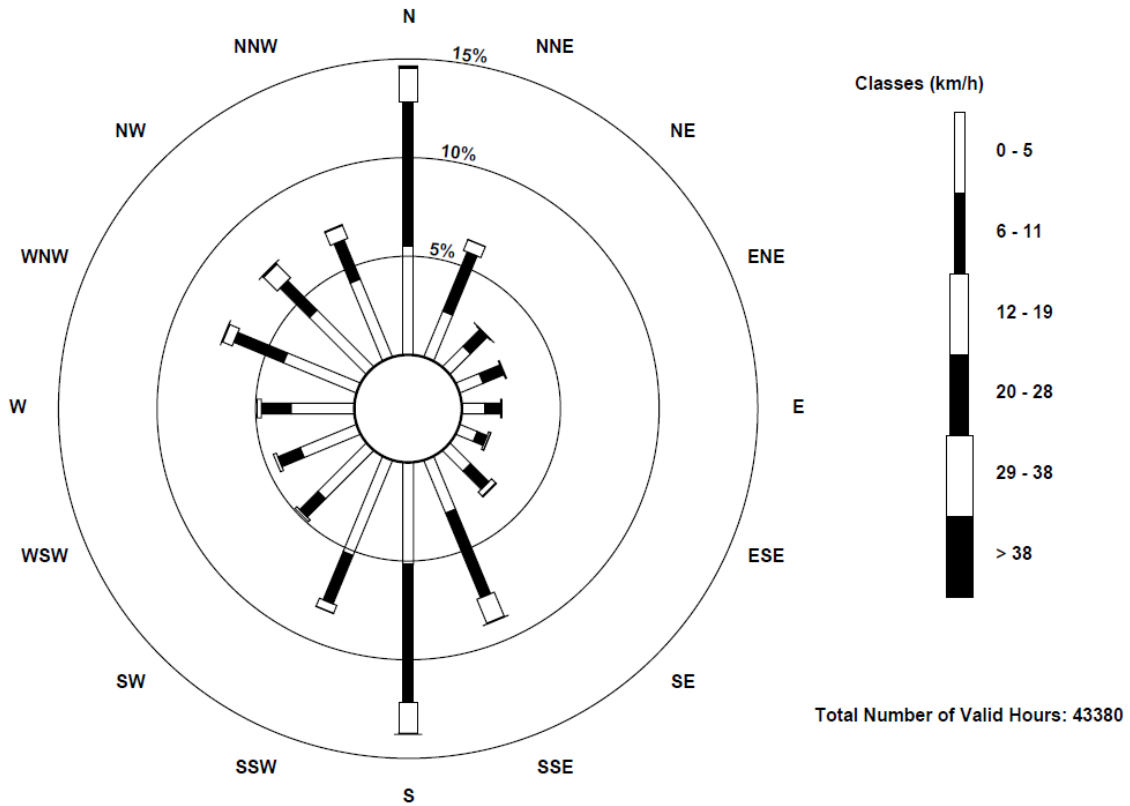


Figure 5.0 – AMS 01 Five Year Wind Rose

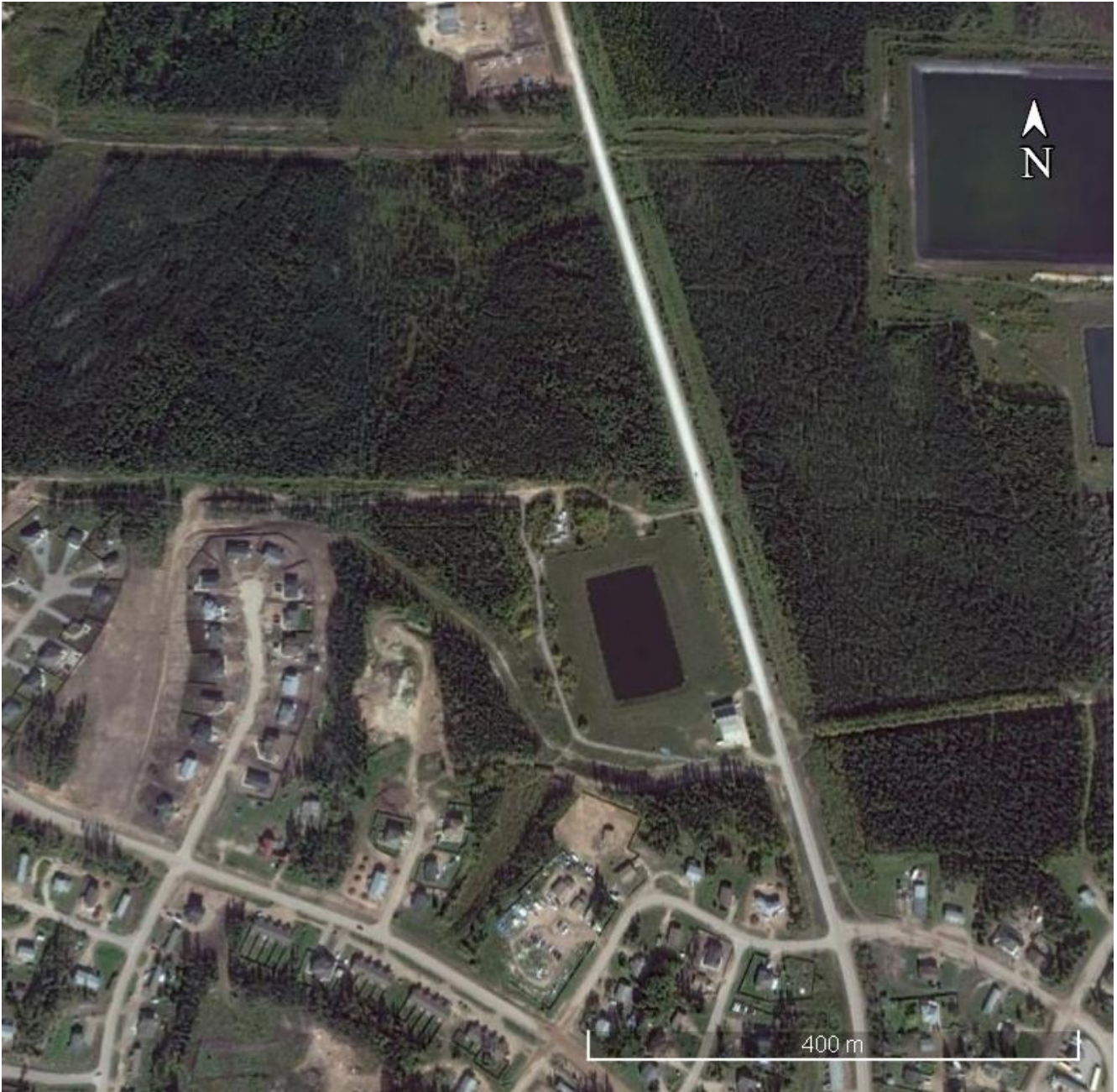


Figure 6.0 – Plan view sketch showing a 500m radius around Bertha Ganter – Fort McKay station.



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 02 – Mildred Lake

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

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WBEA AMBIENT AIR MONITORING NETWORK																																						
WBEA Program - X															Enhanced Deposition Program - X																							
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																							
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP			
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X														
Lower Camp	3	Meteorological																	X	X	X	X	X															
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X															
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X		X	X	X	X				X	X	X	X	X				X					X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X		X	X	X	X	X				X	X	X	X	X				X					X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X											
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X										X		
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X										X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X		
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X	X		X				X	X						
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X											
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X										X	X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X															
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

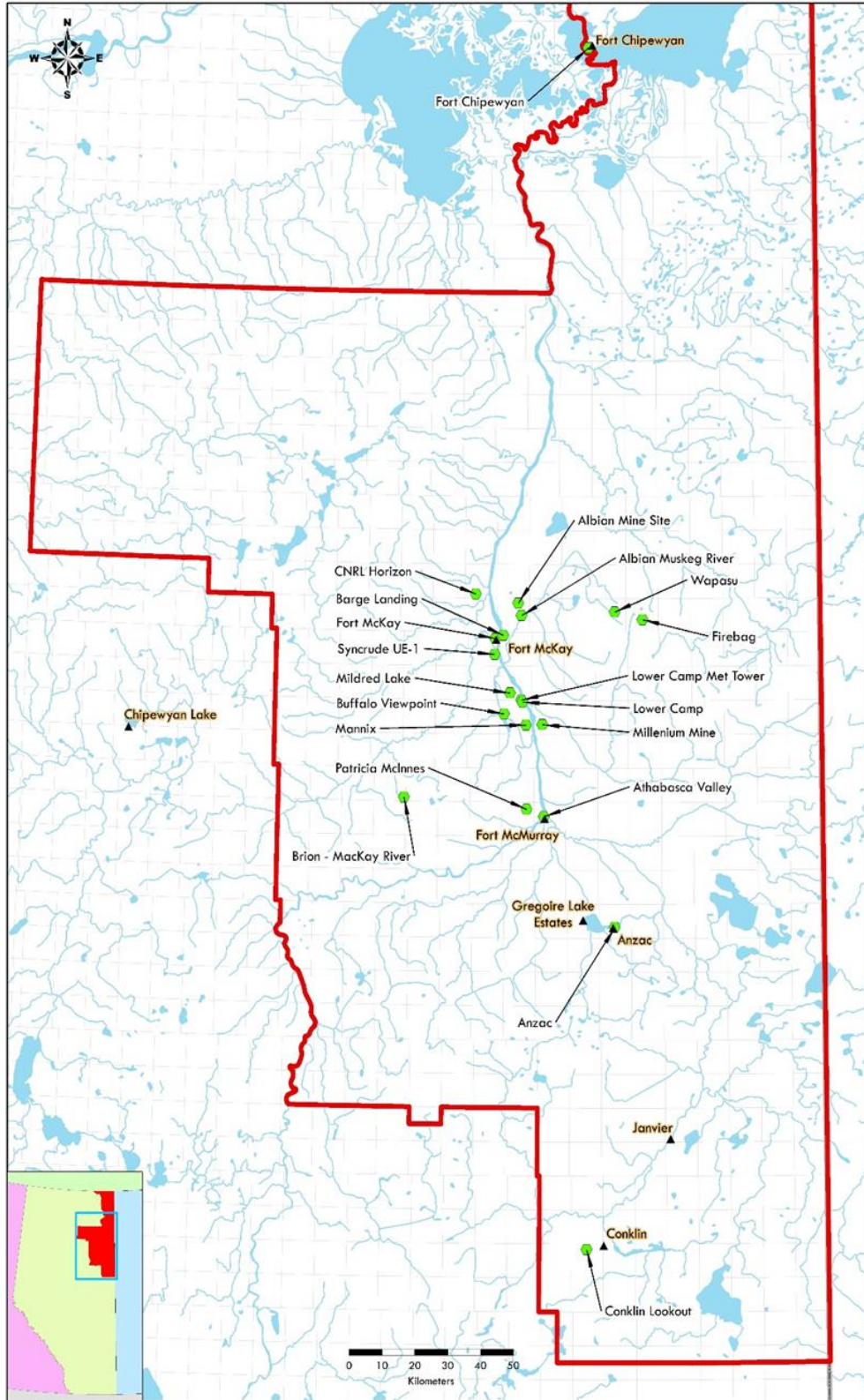


Figure 1.0 – WBEA Monitoring Network Sites

AMS 02 – Mildred Lake Station Details

General Site Information

The Mildred lake station is compliance station which is located at the Syncrude airstrip. This station was originally part of Syncrude's air monitoring network. The Mildred Lake station contains analyzers that continuously measure SO₂, H₂S, THC, Wind speed, Wind direction, External temperature, and Relative humidity.

Item	Description			
Station ID	AMS 02			
Station Name	Mildred Lake			
General description	Located at the south end of the Syncrude airstrip, 400m west of Hwy 63			
Community	NA			
Station Coordinates	57° 3'0.02"	North	111°33'50.93"	West
Station elevation	314			Meters
Station Address	NA			
Station Type	Compliance			
Initial Commission Date	NA			
Area Land Use	Industrial / Aviation			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	3-5 meters			
Airflow Restrictions (yes/no)	North	Yes	East	No
	South	No	West	No
Nearest Tree	Distance	10 meters	Height	10 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	NA			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
Airstrip	80m		Runway for Syncrude aircraft	
Name	Type	Traffic Volume	Distance (m)	Description
Roadway	access	medium	60	Asphalt road
Highway 63	highway	high	300	Provincial highway

Table 3.0 – Local Source Information

Area Topographic Map

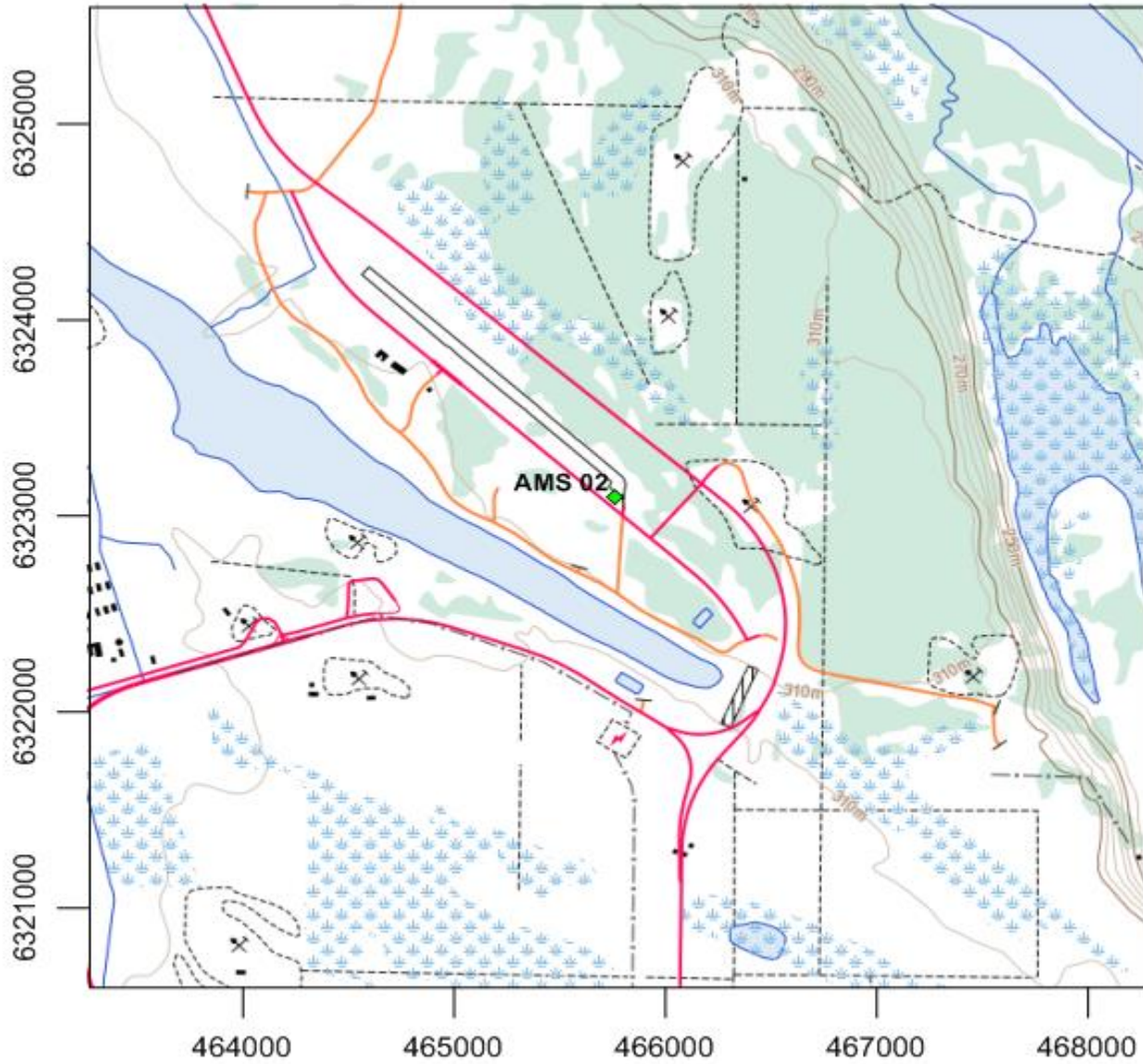


Figure 2.0 – Area Topographic map showing AMS 02 – Mildred Lake Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 02 – Mildred Lake Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Monitoring compound looking south



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east



Figure 4.4 – Environ looking south



Figure 4.5 – Environ looking west



Figure 4.6 – Outdoor Sample Inlet and Indoor manifold setup



Figure 4.7 – Instrument rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Thermo Instruments	43i	JC1404901075	0-1000ppb	Pulsed Fluorescence	4	1
H2S	Hydrogen Sulfide	Thermo Instruments	450i	815129107	0-100ppb	Pulsed Fluorescence	4	1
THC	Total Hydrocarbons	Thermo Instruments	51i-LT	1300156231	0-50ppm	Gas Chromatography and Flame Ionization	4	1
AT/RH	Ambient temp and relative humidity.	Vaisala	HMP155	G4340061	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind speed	Met One	010C-1	B2027	0-80kph	Chopped optical	10	
WD	Wind direction	Met One	020C-1	B1462	0-360 degrees	Resistive (potentiometer)	10	

Table 4.0 - Analytical Equipment in AMS 02

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	2589
ZAG	Zero Air Generator	Teledyne API	T701	825
HVAC	Heating and air conditioning system. Wall mount unit	NA	NA	NA
Shelter / Building	Air monitoring trailer	C & V Shelters	OFFICE	SBB81408
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	1185

Table 5.0 - Support Equipment in AMS 02

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Mildred Lake (AMS 2)

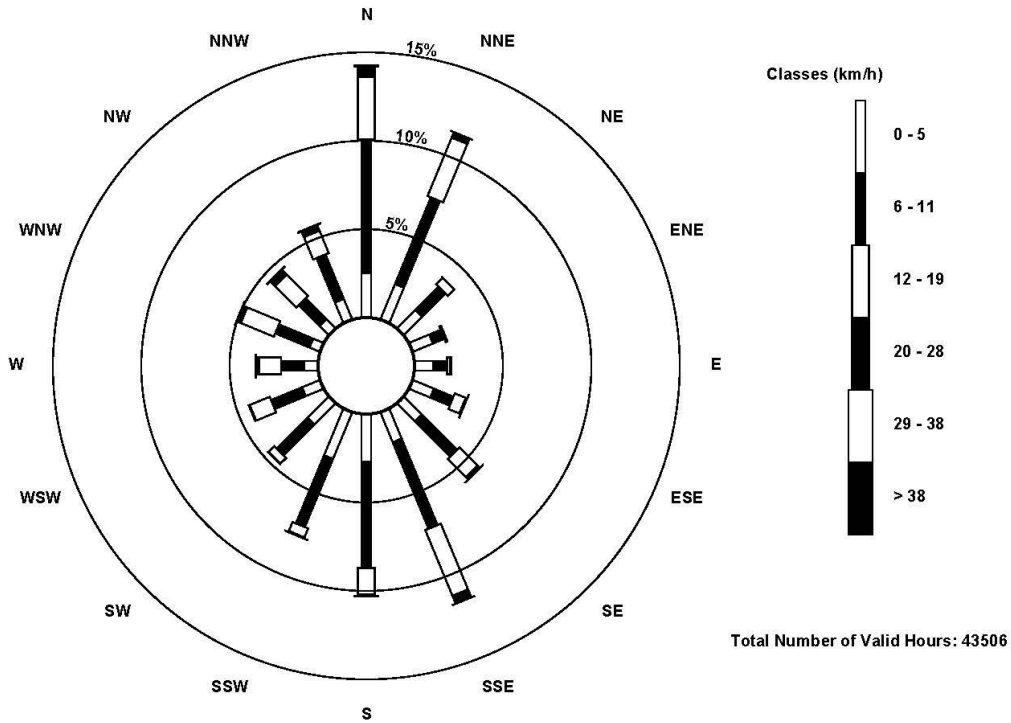


Figure 5.0 – AMS 02 Five Year Wind Rose



Figure 6.0 – Plan view sketch showing 500m radius around Mildred Lake Station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 04 – Buffalo Viewpoint

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																						
WBEA Program - X															Enhanced Deposition Program - X																							
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																							
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP			
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X														
Lower Camp	3	Meteorological																	X	X	X	X	X															
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X															
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X											
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X									X			
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X										X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X		
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X		
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X					X	X					
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X											
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X	X	
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X				X	X	X	
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X															
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

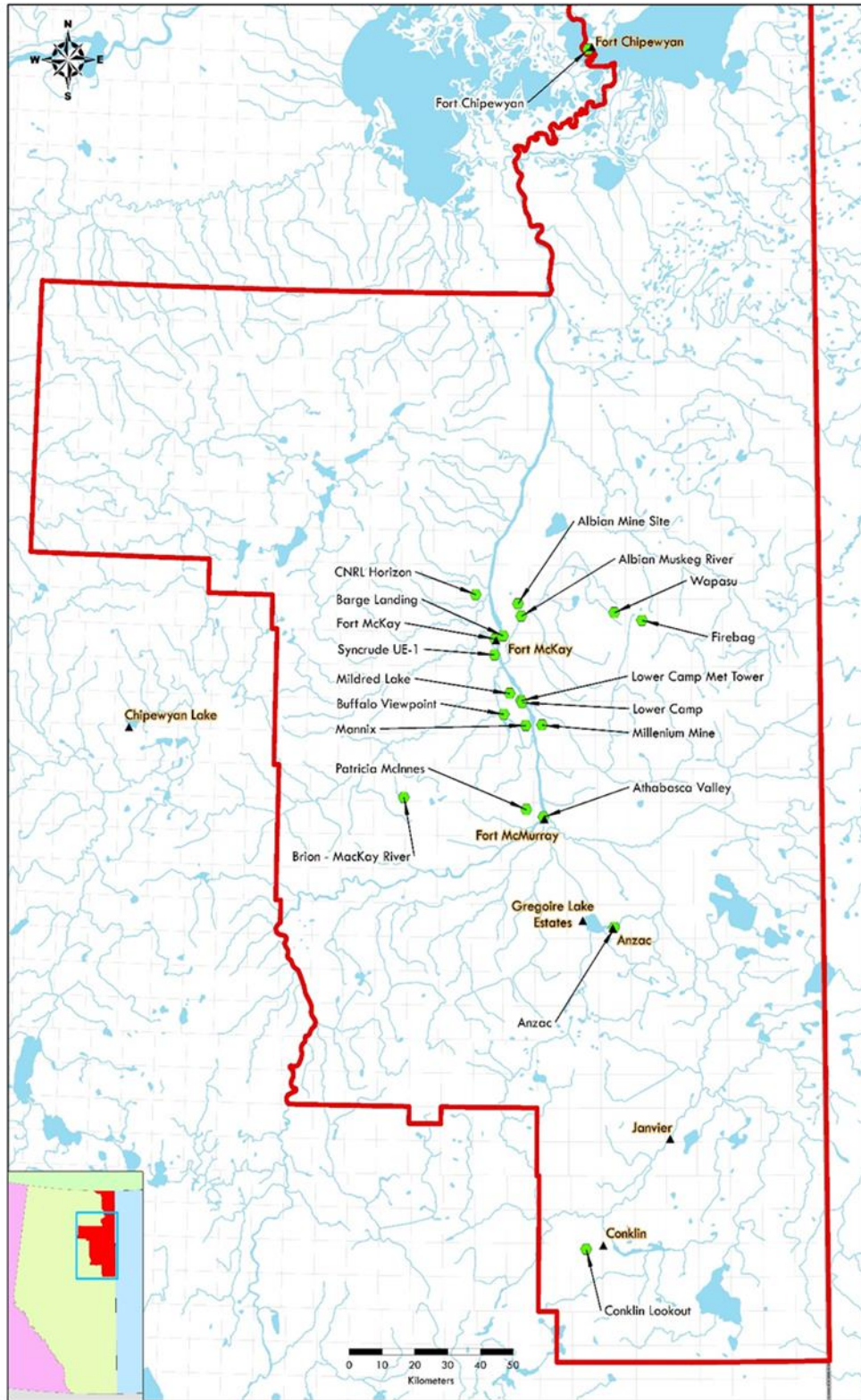


Figure 1.0 – WBEA Monitoring Network Sites

AMS 04 – Buffalo View Point Station Details

General Site Information

The Buffalo View Point station was installed as a Compliance Station. It is situated on a hill in the reclaimed area south of the North American Access Road

Item	Description			
Station ID	AMS 04			
Station Name	Buffalo Viewpoint			
General description	Located at the sound end of Syncrude’s South Mine, along Syncrude North American road.			
Community	NA			
Station Coordinates	56°59'47.24"	North	111°35'34.48"	West
Station elevation	315			Meters
Station Address	NA			
Station Type	Compliance			
Initial Commission Date	NA			
Area Land Use	Industrial			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	10 meters	Height	7 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	Purchased new.			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
None	NA		NA	
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Dirt road	Low	3 west	Access road to AMS 04.
North American Road	Dirt road	Medium	17.5 northwest	Road used to access North American/ Syncrude area.
Highway 63	Asphalt road	High	450 east	Paved highway mostly used by public.

Table 3.0 – Local Source Information

Area Topographic Map

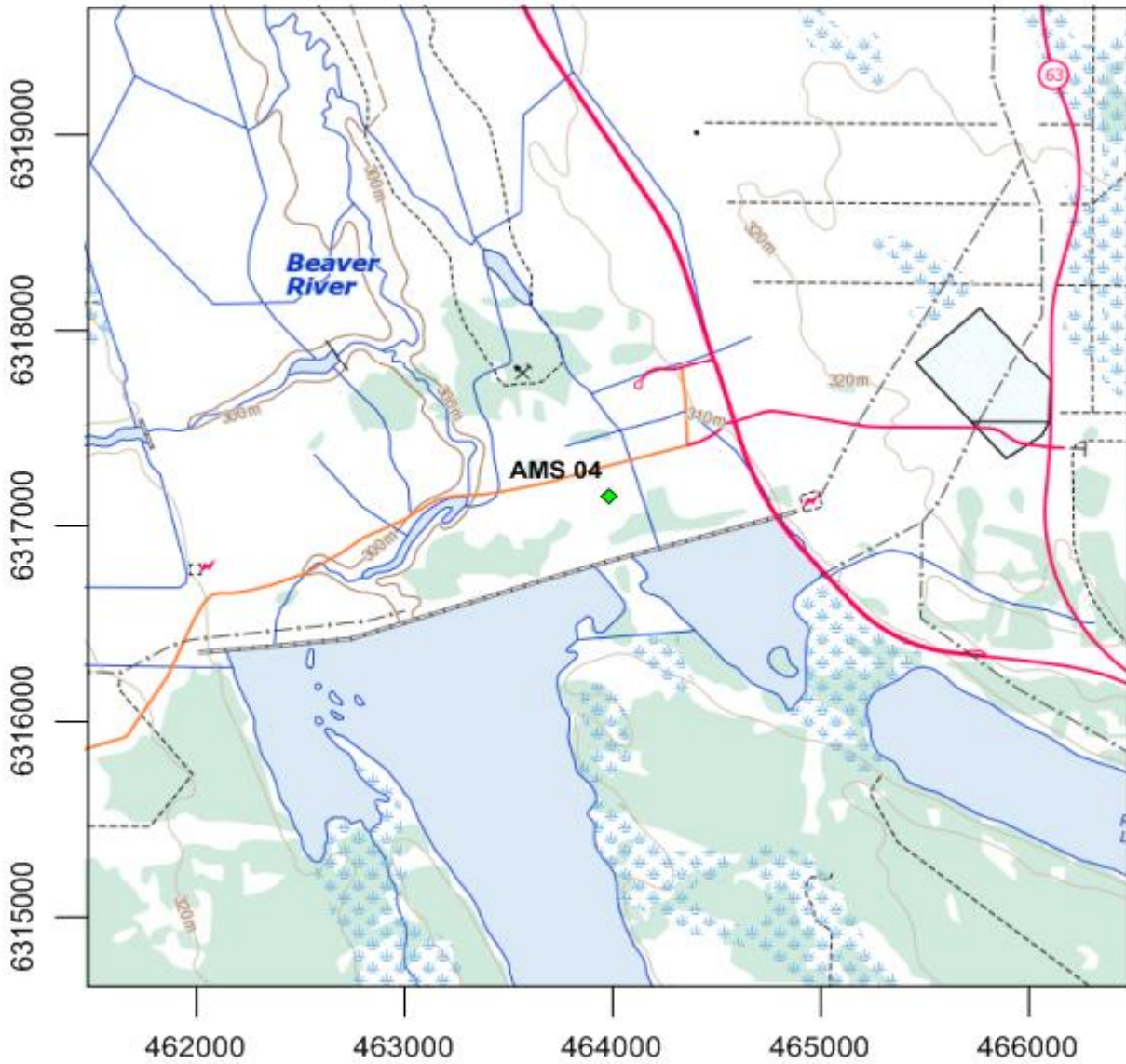


Figure 2.0 – Area Topographic map showing AMS 04 – Buffalo View Point Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 04 – Buffalo View Point Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Environ looking north



Figure 4.2 – Environ looking east



Figure 4.3 – Environ looking south



Figure 4.4 – Environ looking west



Figure 4.5 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.6 –Instrument rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
H2S	Hydrogen Sulfide	Thermo Instruments	450i	1336160094	0-100ppb	Pulsed Fluorescence	4	
SO2	Sulphur Dioxide	Thermo Instruments	43i	JC1327300932	0-1000ppb	Pulsed Fluorescence	4	
THC	Total Hydrocarbon	Thermo Instruments	51-iLT	1201650671	0-50ppm	Gas Chromatography and Flame Ionization	4	
WS	Wind Speed	Met One	010C-1	G3211	0-80 Kph	Chopped optical	10	
WD	Wind Direction	Met One	020C-1	P10612	0-360 Degrees	Resistive (potentiometer)	10	
AT/RH	Ambient Temperature / Relative Humidity	HMP 155	G4330041	G4330041	AT: -80 - +60 RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor		
VS	Visibility Sensor	Vaisala	PWD22	H5030007	0-20 KM	Present weather detector.		

Table 4.0 - Analytical Equipment in AMS 04

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	2635
Datalogger	Logger being used to pull VS data	Campbell Scientific	CR1000	46568
ZAG	Zero Air Generator	Teledyne API	T701	4297
HVAC	Heating and Air Conditioning system. Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	C & V Shelters	OFFICE	SAA81406
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	11551008

Table 5.0 - Support Equipment in AMS 04

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Buffalo Viewpoint (AMS 4)

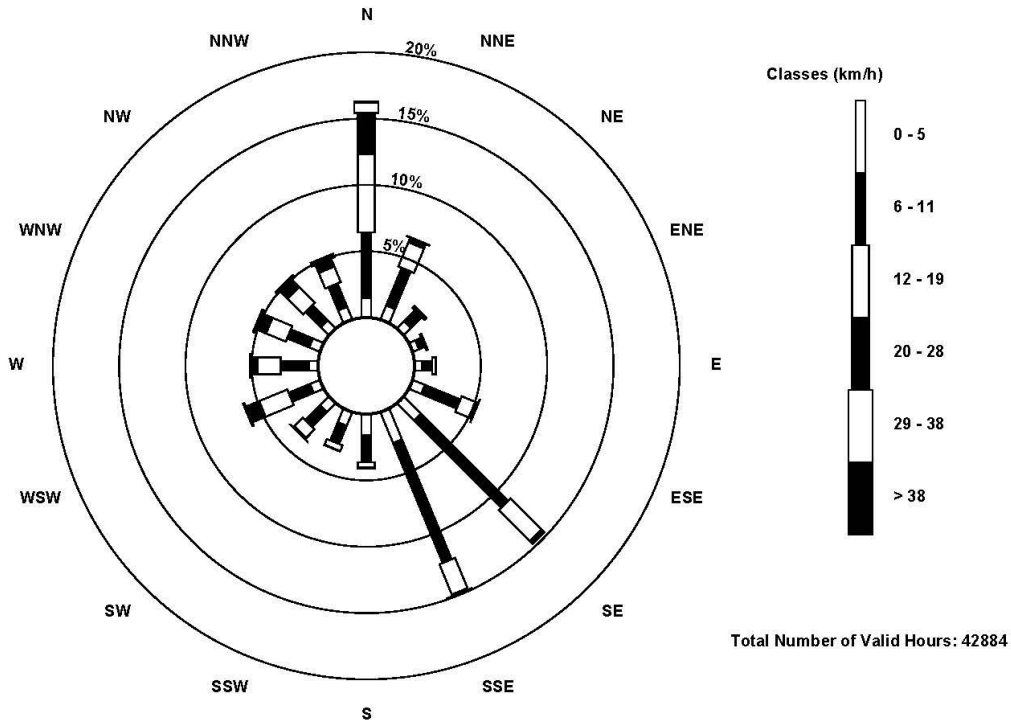


Figure 5.0 – AMS 04 Five Year Wind Rose



Figure 6.0 – Plan view sketch of Buffalo Viewpoint station showing 500m radius



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 05 – Mannix

2017

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Network Background

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WBEA AMBIENT AIR MONITORING NETWORK																																								
WBEA Program - X															Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																									
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP					
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X																
Lower Camp	3	Meteorological																	X	X	X	X	X																	
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X																	
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X						
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X						X	X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X						X	X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X													
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X										X				
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X											X			X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X	X		X	X						X	X	X	X	X										X	X	X	X	X	X		
Anzac	14	Attribution	X		X	X	X	X	X	X		X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X	X			
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X					X	X							
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X													
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X											X	X	
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X					X	X	X		
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X																	
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X													
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X																	
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X																	
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X																	
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X																	

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

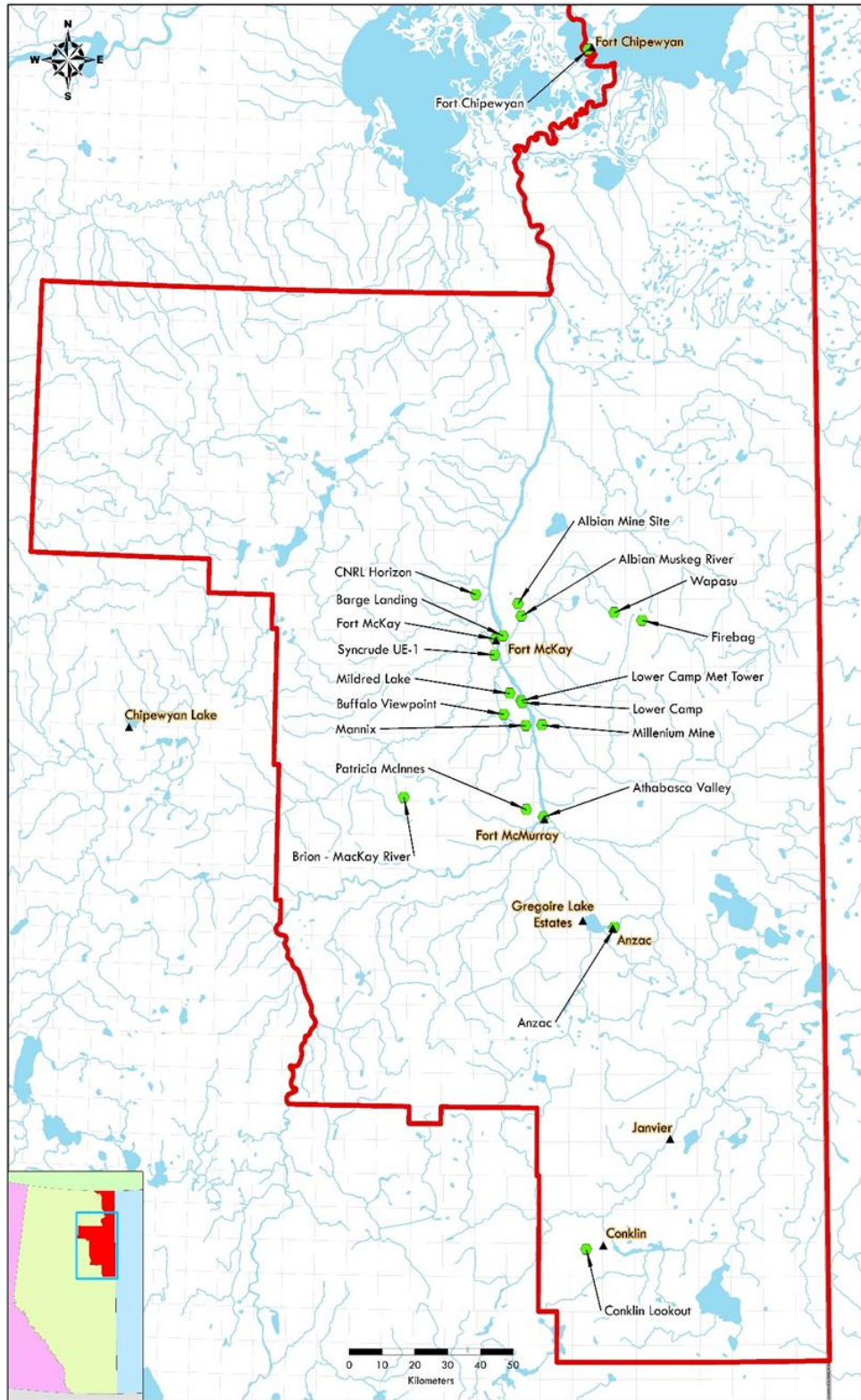


Figure 1.0 – WBEA Monitoring Network Sites

AMS 11 – Lower Camp Station Details

General Site Information

The Mannix station was originally part of the air monitoring network operated by Suncor. It contains analyzers that continuously measure SO₂, H₂S, and THC. The station is located north of a storage tank complex at Suncor.

Item	Description			
Station ID	AMS 05			
Station Name	Mannix			
General description	Located south of Suncor on Range road 101 off of Suncor Base Plant road.			
Community	NA			
Station Coordinates	56°58'4.67"	North	111°28'55.56"	West
Station elevation	332			Meters
Station Address	NA			
Station Type	Compliance/Metrological			
Initial Commission Date	NA			
Area Land Use	Industrial			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	40 meters	Height	10 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	75 meters		
	Type	Stationary tower		
	Position	Place outside of the Mannix compound on left hand side.		
Station Install Date	NA			
Station Origin	Donated by industry.			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
Industrial	200 meters east		Storage tank complex. Possible source of detectable emissions.	
Name	Type	Traffic Volume	Distance (m)	Description
Range road 101	Asphalt road	Medium	100 meters	Paved Road. Frequent by heavy equipment, tractor trailers and pickup trucks.

Table 3.0 – Local Source Information

Area Topographic Map

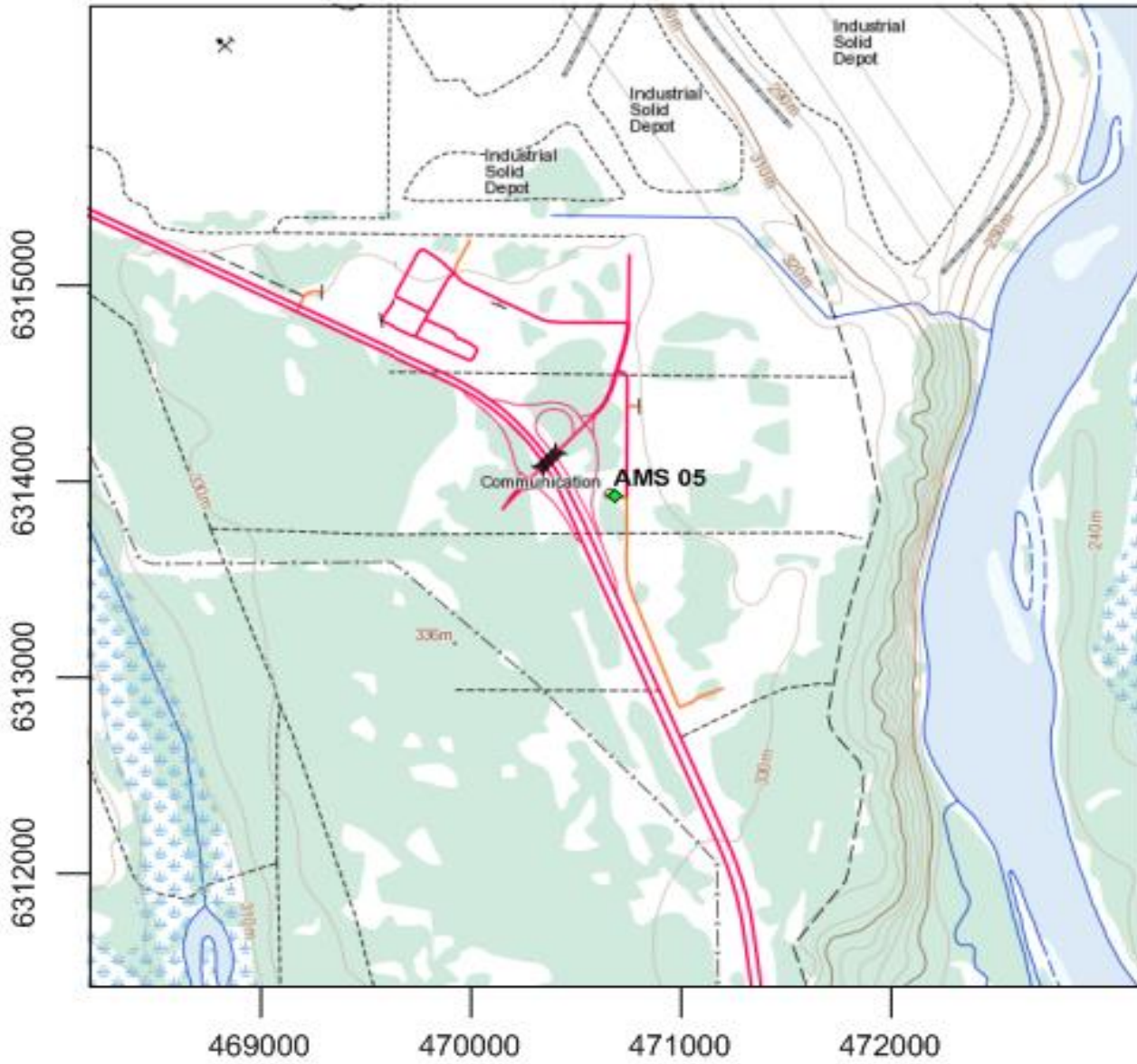


Figure 2.0 – Area Topographic map showing AMS 05 – Mannix

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 05 – Mannix

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Sampling deck which contains EC PM2.5 Partisol sampler & EC High Volume PAH sampler



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east



Figure 4.4 – Environ looking south



Figure 4.5 – Environ looking west



Figure 4.6 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.7 – Instrument rack



Figure 4.8 – Metrological tower

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Thermo Instruments	43i	1008841399	0-1000ppb	Pulsed Fluorescence	4	1
H2S	Hydrogen Sulfide	Thermo Instruments	450i	0815129108	0-100ppb	Pulsed Fluorescence	4	1
THC	Total Hydrocarbons	Thermo Instruments	51i-LT	1317958295	0-50ppm	Gas Chromatography and Flame Ionization	4	1
PAH	Polly Aromatic Hydrocarbon. Integrated Sampling	Akrulogic	N55326	12610	NA	Canister / Filter Sampler	2	
WS	Wind Speed	RM Young	81000	NA	0-80 Kph	Three way sonic sensor	20/45/75	
WD	Wind Direction	RM Young	81000	NA	0-360 Degrees	Three way sonic sensor	20/45/75	
VW	Vertical Wind	RM Young	81000	NA	0-80 Kph	Three way sonic sensor	20/45/75	
AT/RH	Ambient Temperature / Relative Humidity	Vaisala	HMP155	NA	Temp: -80 - +60 degrees Celsius / RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	20/45/75	

Table 4.0 - Analytical Equipment in AMS 05

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	2580
ZAG	Zero Air Generator	Teledyne API	T701	138
HVAC	Heating and Air Conditioning system. Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	C & V Shelters	OFFICE	SAA81407
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	14300410

Table 5.0 - Support Equipment in AMS 05

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed 20 m (WS20m) - km/h
Mannix (AMS 5)

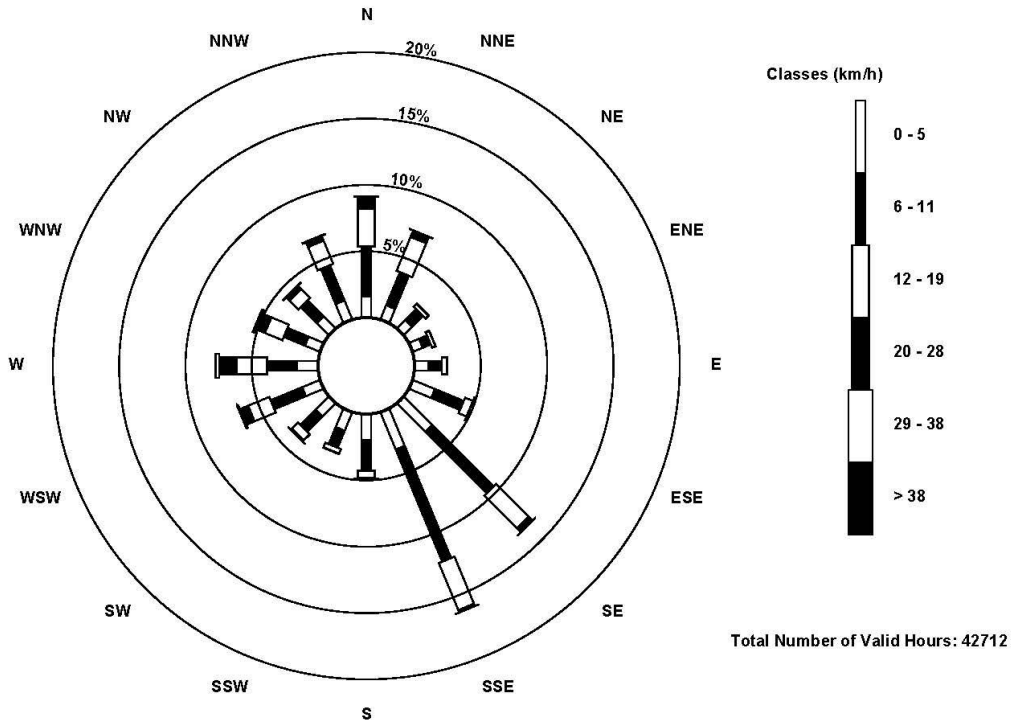


Figure 5.0 – AMS 05 Five Year Wind Rose



Figure 6.0 – Plan View Sketch showing 500m Radius around Mannix station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 06 – Patricia McInnes

2017

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Network Background

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Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oil Sands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																							
WBEA Program - X														Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS														INTEGRATED SAMPLING																									
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/O ₃	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP				
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X					X	X	X		X	X																
Lower Camp	3	Meteorological																	X	X	X	X	X																
Buffalo Viewpoint	4	Compliance	X	X									X					X	X	X		X	X																
Mannix	5	Compliance/Meteorological	X	X									X					X	X	X	X	X	X												X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X		X	X			X						X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X		X	X			X						X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X		X	X	X	X	X												
Barge Landing	9	Attribution			X								X						X	X	X		X	X			X									X			
Lower Camp B	11	Compliance	X	X									X						X	X	X		X	X										X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X	X		X	X						X	X	X		X	X									X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X	X			X	X	X		X	X	X	X	X	X						X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X		X	X	X		X						X		X				
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X		X	X			X												
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X	X			X												
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X									X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X		X	X															
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X		X	X			X												
Cenovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X		X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X		X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X		X	X															
HEMP	104	Portable-Health			X								X	X	X				X	X	X		X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

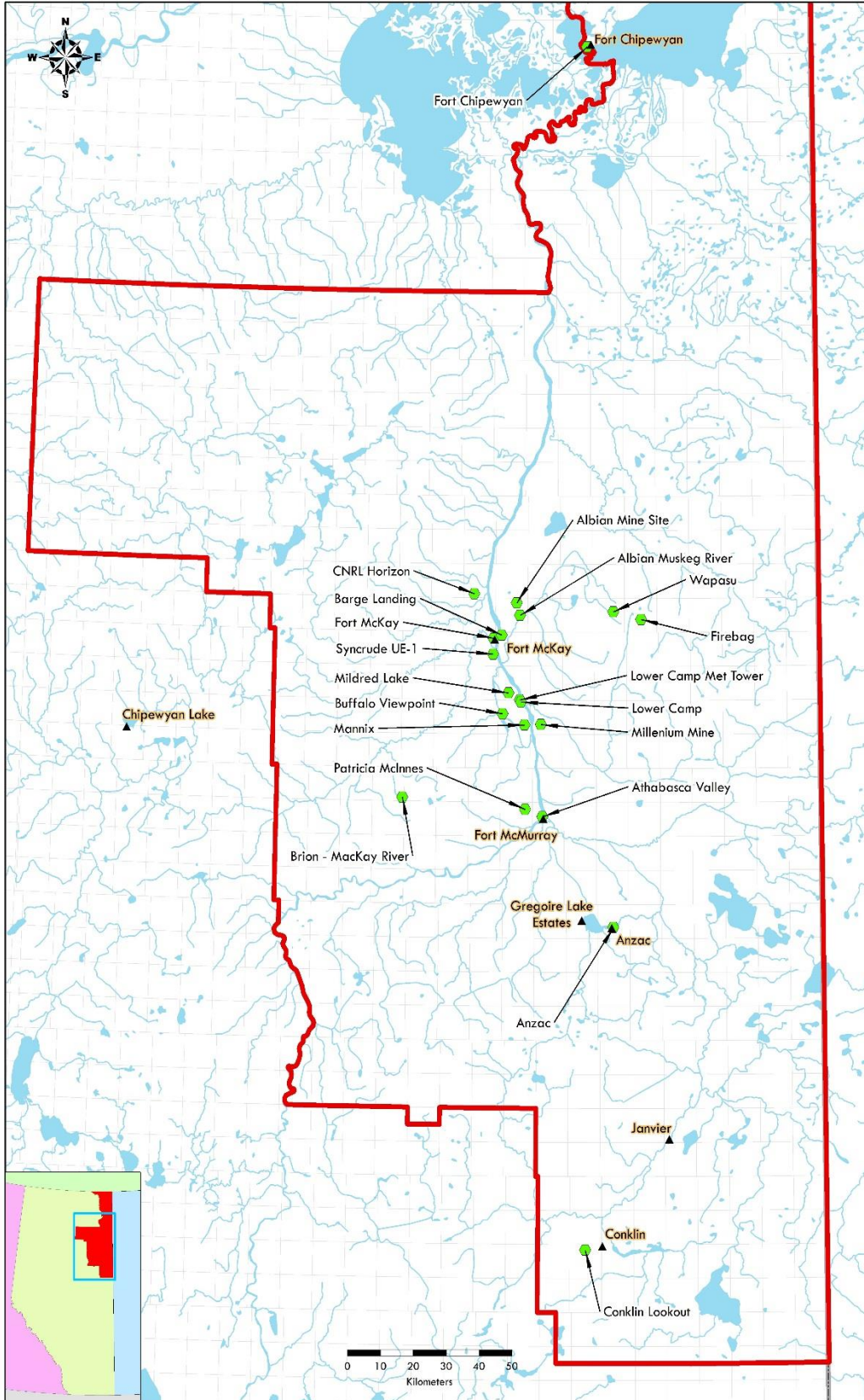


Figure 1.0 – WBEA Monitoring Network Sites

AMS 06- Patricia McInnes Station Details

General Site Information

The Patricia McInnes station was installed in 1997 as a community station to monitor in the West end of Fort McMurray in the Timberlea subdivision. It is situated on a gravel pad near a local recreation area and baseball fields.

Item	Description			
Station ID	AMS 06			
Station Name	Patricia McInnes			
General description	Located in the west end of Fort McMurray in the Timberlea sub-division.			
Community	Regional Municipality of Wood Buffalo			
Station Coordinates	56°45'4.96"	North	111°28'36.10"	West
Station elevation	362			Meters
Station Address	NA			
Station Type	Health			
Initial Commission Date	NA			
Area Land Use	Residential			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	10 meters	Height	3 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to south end of monitoring shelter		
Station Install Date	1997			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description		
Recreation complex	To the north, northeast and northwest of the station at approximately 50 meters.	Maintenance of the fields and recreation complex. Possible PM and NOx sources.		
Baseball field	To the north, north east and north west of the station, approximately 300m.	Maintenance of the fields and recreation complex. Possible source of PM and NOx.		
Residential subdivision	To the south and south east of the station, approximately 100 meters.	Wood burning observed in the area periodically in wood stoves and backyard fire pits. Possible PM source.		
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Residential Roadway	Medium	30	Paved road

Table 3.0 – Local Source Information

Area Topographic Map

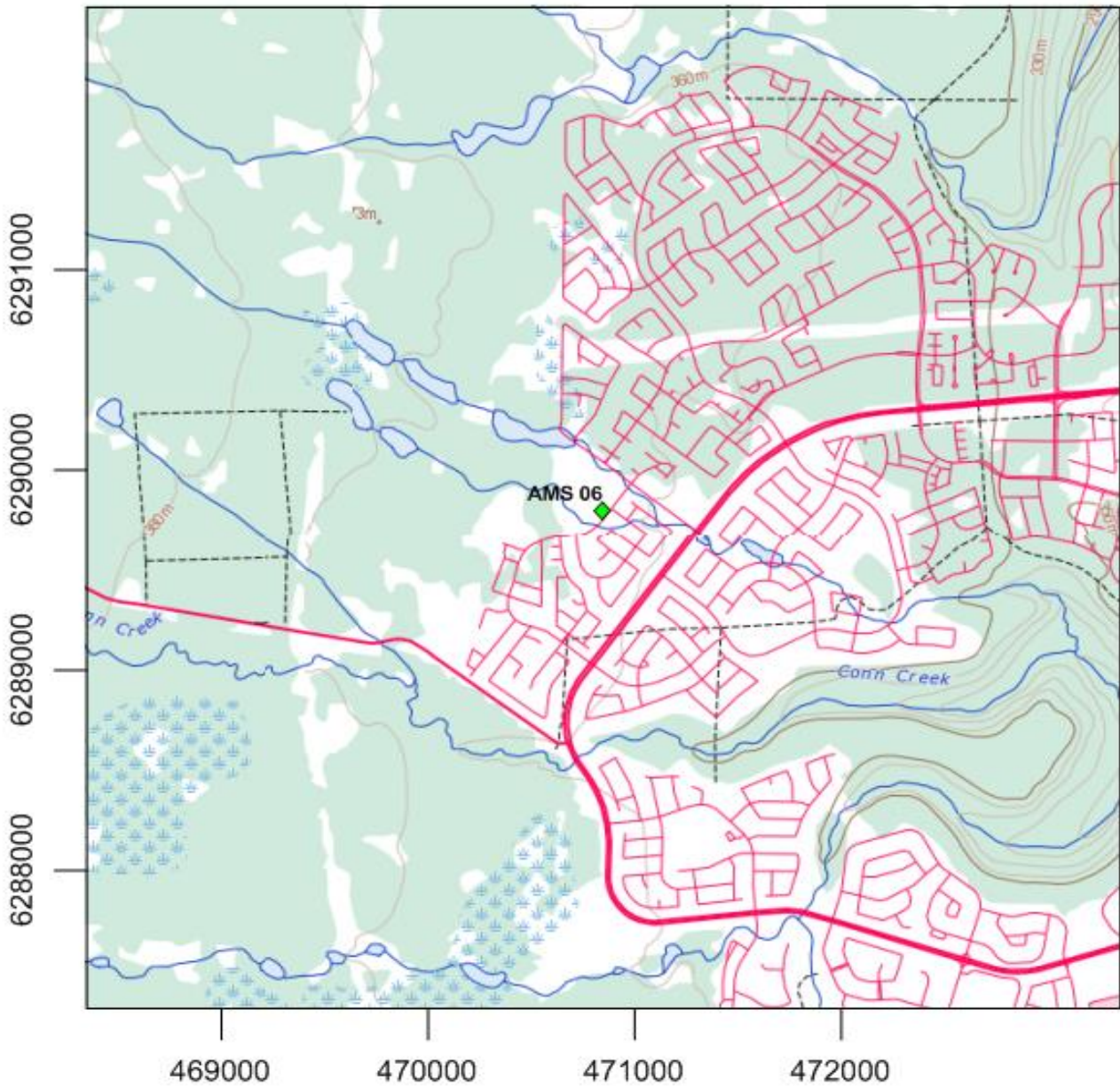


Figure 2.0 – Area Topographic map showing AMS 06 – Patricia McInnes Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 06 – Patricia McInnes Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station

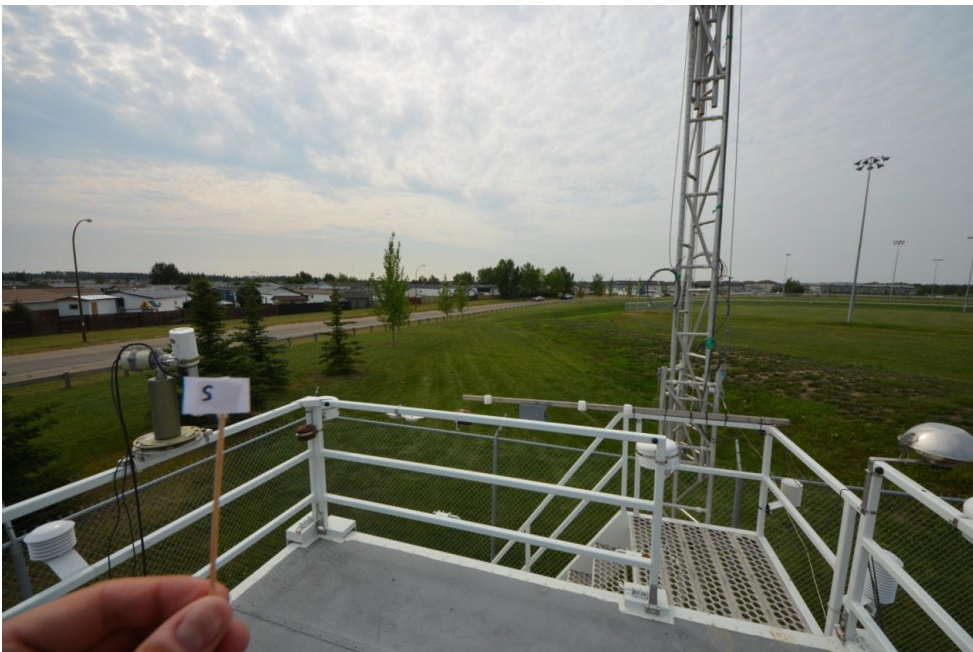


Figure 4.1 – Environ looking south

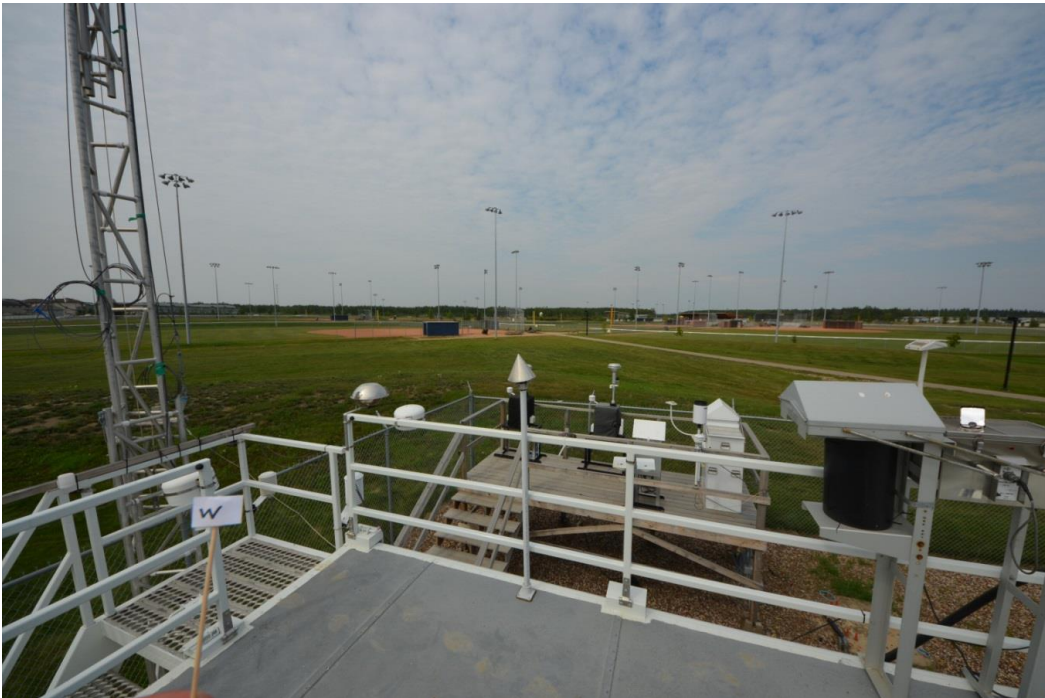


Figure 4.2 – Environ looking west



Figure 4.3 Environ looking east



Figure 4.4 – Environ looking north

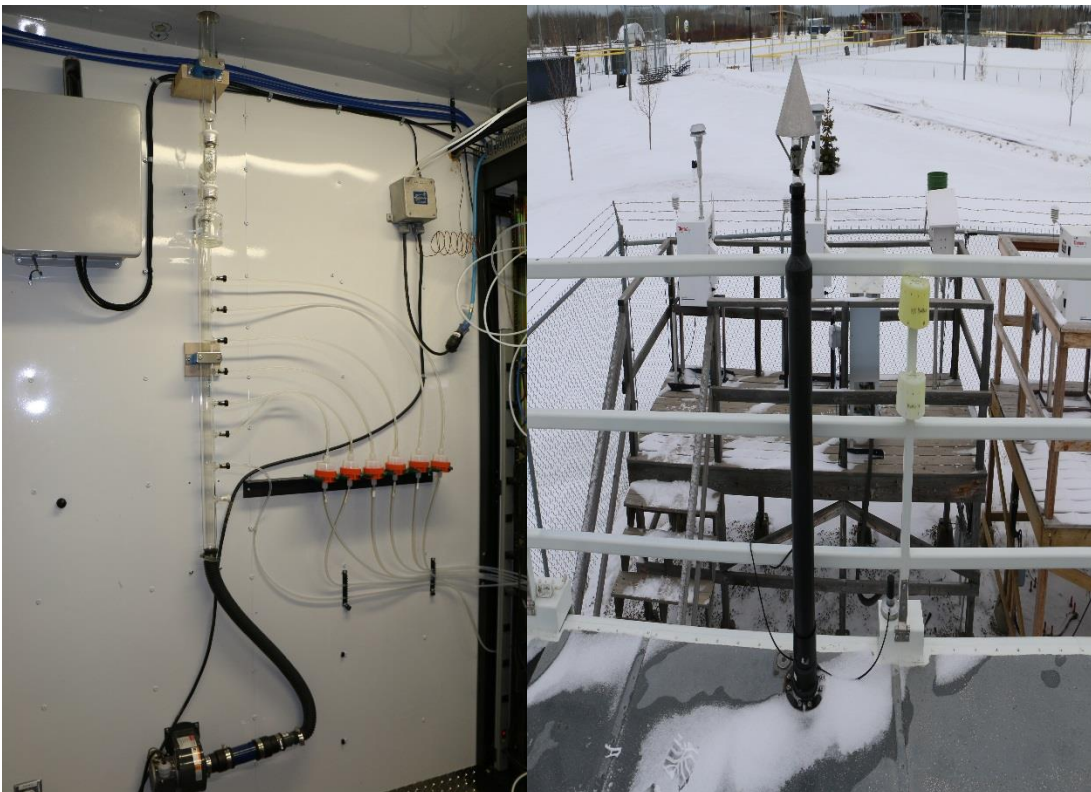


Figure 4.5 – Indoor sample manifold setup and outdoor sample inlet



Figure 4.6 – East (on left side) and west instrument racks



Figure 4.7 – Sampling decks

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulphur Dioxide	Thermo Instruments	43i	1008841397	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1218153358	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	TRS converter	CD Nova	CDN-101	520	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		
NOx	Nitrogen Dioxide	Thermo Instruments	42i	1218153460	0-1000ppb	Chemiluminescence	4	1
NMHC	Non-Methane Hydrocarbons	Thermo Instruments	55i-LT	1331259521	0-50ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	Thermo Instruments	49i	1300156234	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	E1475	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
NH3	Ammonia	Teledyne API	T201	215	0-2500 ppb	Chemiluminescence	4	1
RH/Temp	Relative humidity / external temp	Vaisala	HMP155	J5140017 2013	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind Speed<10um	Met One	010C-1	E5132	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	E4854	0-360 degrees	Resistive (potentiometer)	10	
PM 2.5A	Integrated sampling	Thermo	2025iD	200IW205251411	NA	Inertial Separator and Cartridge Filter	2	
PM 2.5AB	Integrated sampling	Thermo	2025iD	200I2 02151205	NA	Inertial Separator and Cartridge Filter	2	
PM 10A	Integrated sampling	Thermo	2025iD	200I2 04851408	NA	Inertial Separator and Cartridge Filter	2	
PM 10B	Integrated sampling	Thermo	2025iD	200I2 03861308	NA	Inertial Separator and Cartridge Filter	2	
PAH	Polly Aromatic Hydrocarbon. Integrated Sampling	Tisch Environmental	TE100BL	1326	NA	Canister and filter sampler.	2	
VOC	Volatile Organic Compound	Tisch Environmental	TE-123	1021	NA	Canister sampler	4	1

Precip	Precipitation sampler	NA	NA	60198	NA	Precipitation collector	2	
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Table 4.0 - Analytical Equipment in AMS 06

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	10957
ZAG	Zero Air Generator	Teledyne API	T701	201
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	ITB	NA	09 14786
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T701	2449

Table 5.0 - Support Equipment in AMS 06

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Patricia McInnes (AMS 6)

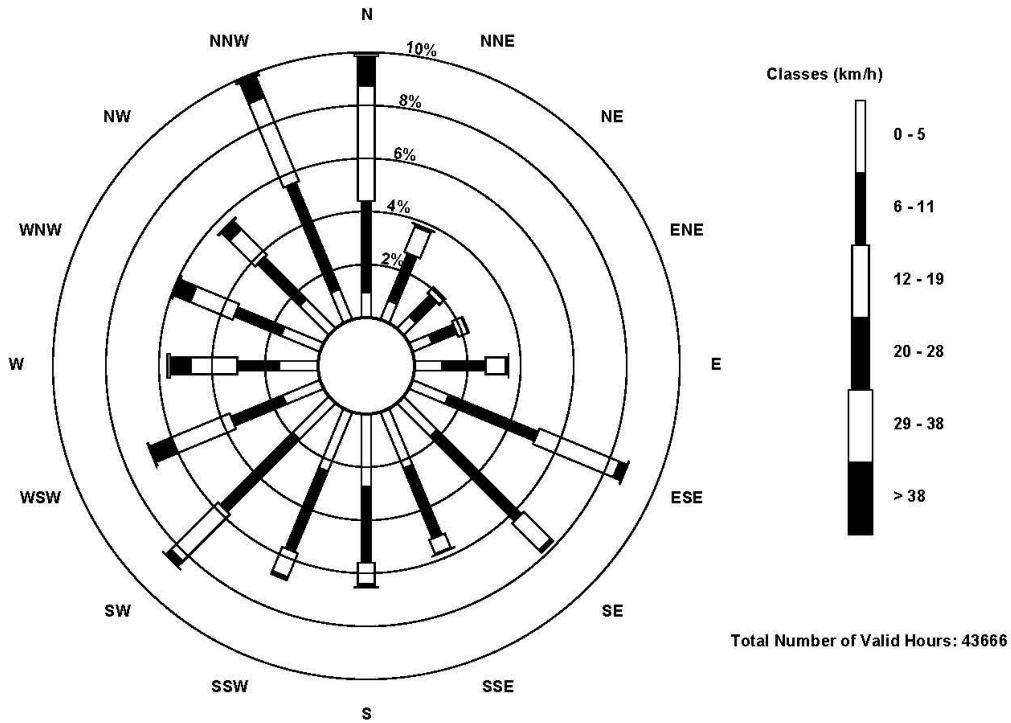


Figure 5.0 – AMS 06 Five Year Wind Rose



Figure 6.0 – Plan View Sketch showing 500m radius around Patrician McInnes station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 07 – Athabasca Valley

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																							
WBEA Program - X														Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS														INTEGRATED SAMPLING																									
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OC	SASS	Dichor	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP				
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X															
Lower Camp	3	Meteorological																	X	X	X	X	X																
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X																
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X												X		X	X	
Patricia Mdnnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X						X	X	X	X	X	X	
Athabasca Valley	7	Health	X	X	X	X	X	X	X		X	X	X	X	X	X			X	X	X	X	X			X							X	X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X												
Barge Landing	9	Attribution			X								X						X	X	X		X				X									X			
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X											X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X										X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X						X	X	X	X	X	X	
CNRL - Horizon	15	Compliance	X	X			X	X	X			X	X						X	X	X		X	X	X		X						X		X				
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X			X									X				
Wapasu Creek	17	Compliance	X	X			X	X	X			X	X						X	X	X	X	X			X											X	X	
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X			X	X	X	X	
Sunco Firebag	19	Compliance	X	X			X	X	X			X							X	X	X		X	X															
Brion Energy	20	Compliance	X	X			X	X	X			X							X	X	X	X	X			X													
Cenovus Christi na Lake	500	Portable-Compliance	X	X			X	X	X			X							X	X	X		X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X		X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X		X	X															
HEMP	104	Portable-Health			X							X	X	X					X	X	X		X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

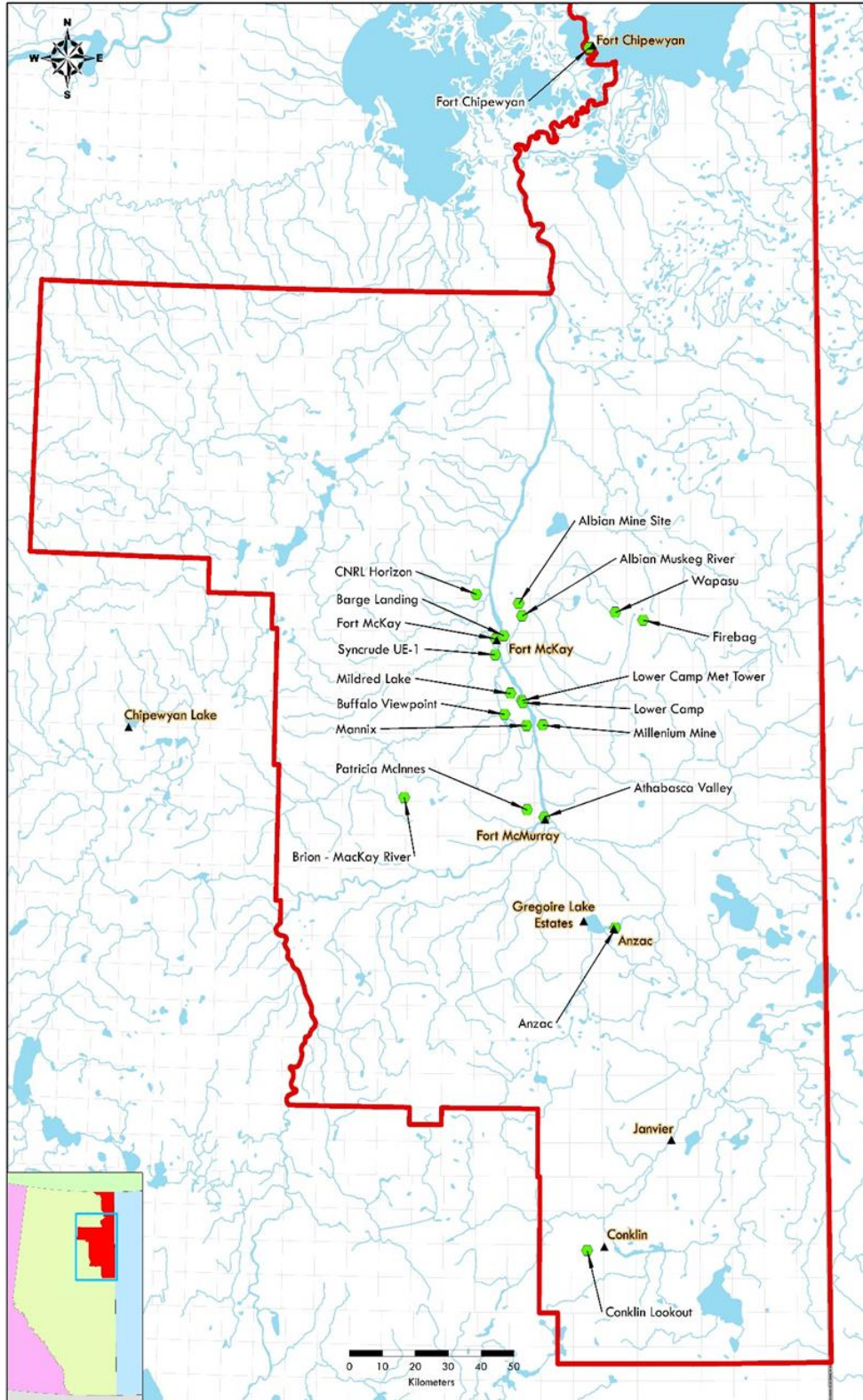


Figure 1.0 – WBEA Monitoring Network Sites

AMS 07 – Athabasca Valley Station Details

General Site Information

The Athabasca Valley Station is a community station that is located at McDonald Drive in Fort McMurray. This station was built and operated by Alberta Environmental Protection until the WBEA took it over in the fall of 1997.

Item	Description
Station ID	AMS 07
Station Name	Athabasca Valley
General description	Located on C.A. Knight Way, near the Athabasca river and the McDonald Island park.
Community	Fort McMurray
Station Coordinates	56°44'1.06" North 111°23'25.55" West
Station elevation	250 Meters
Station Address	NA
Station Type	Health
Initial Commission Date	NA
Area Land Use	Recreation
Angle of elevation to nearby buildings	0 degrees
Average building height in area	NA
Airflow Restrictions (yes/no)	North no East No South no West No
Nearest Tree	Distance 80 meters Height 10 meters
Sample Manifold Type	Glass
Meteorological Tower Information	Height 10 meters Type Aluma crank-up tower Position Attached to North end of monitoring shelter
Station Install Date	NA
Station Origin	Purchased new
Site Preparation	Level gravel pad

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description
Residential area	100 m	Apartment buildings
Recreational park	500 m NE	McDonald Island Park

Name	Type	Traffic Volume	Distance (m)	Description
C.A. Knight Way	Asphalt road	High	15 meters	Access road to McDonald Island Park

Table 3.0 – Local Source Information

Area Topographic Map

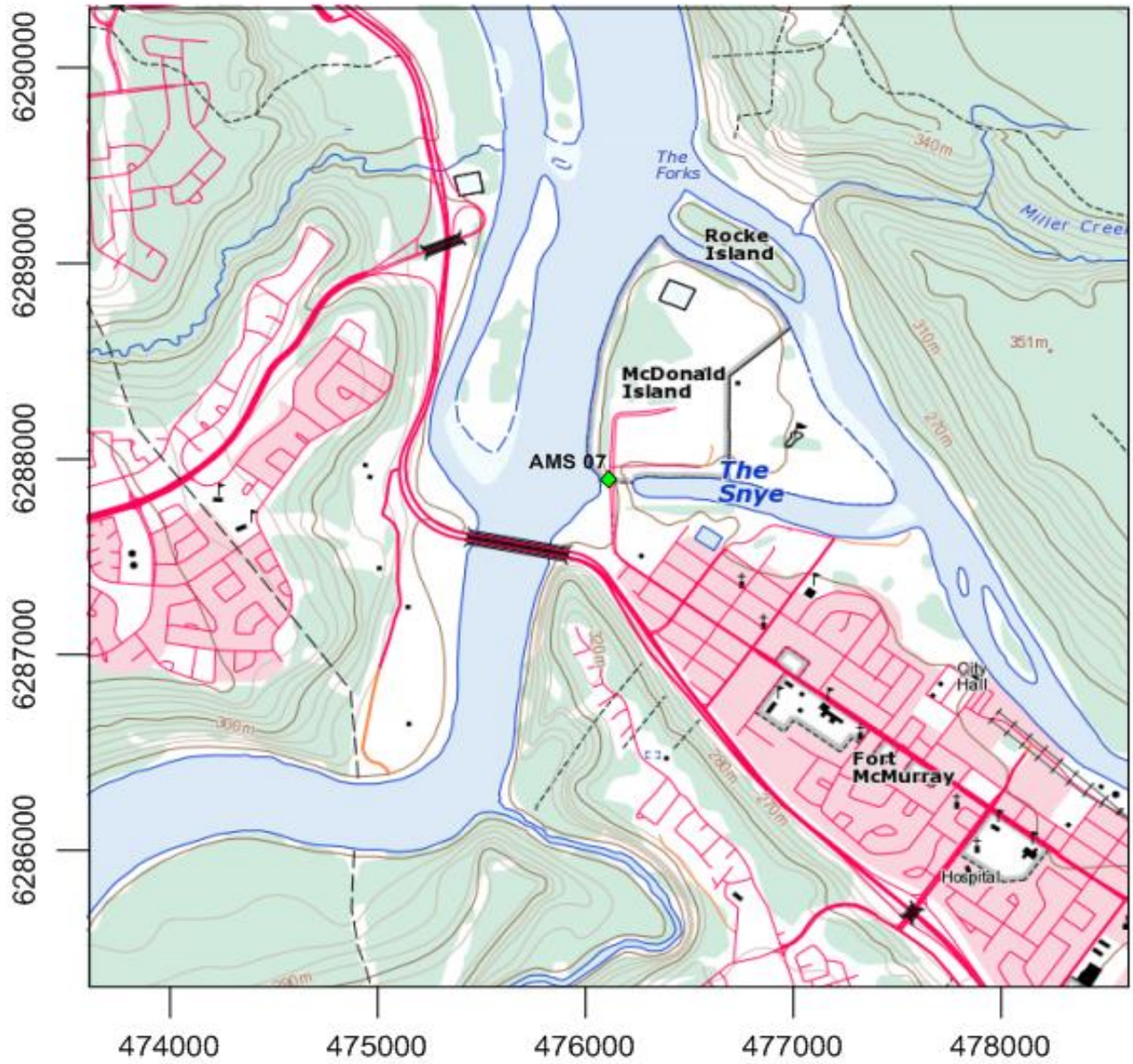


Figure 2.0 – Area Topographic map showing AMS 07 – Athabasca Valley Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 07 – Athabasca Valley Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Sampling Deck



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east



Figure 4.4 – Environ looking south



Figure 4.5 – Environ looking west



Figure 4.6 –Indoor Sample Manifold and Outdoor sample inlet



Figure 4.7 – East Rack (on the left) & West Rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulphur Dioxide	Thermo Instruments	45C	630718530	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1507864683	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	Thermal oxidizer	CD Nova	CDN 101	503	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		1
NOx	Nitrogen Dioxide	Thermo Instruments	42C	601114773	0-1000ppb	Chemiluminescence	4	1
NMHC	Methane Non Methane	Thermo Instruments	55i-LT	1426262594	0-50ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	Thermo Instruments	49i	1507964700	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	E-515/3256	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
CO	Carbon monoxide	Thermo Instruments	48i	1408761381	0-50 ppm	Absorption of infrared radiation	4	1
RH/Temp	Relative humidity / external temp	Vaisala	HMP155	G4340069	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind Speed<10um	Met One	010C-1	E5131	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	NA	0-360 degrees	Resistive (potentiometer)	10	
VOC	Volatile Organic Compounds	Tisch	TE-123	1029	NA	Canister sampler	4	
PAH	Polycyclic aromatic hydrocarbons	Tisch	TE PUF+BL	1001057	NA	Filter/ Canister sampler	2	
PM 2.5 A	Partisol sampler. Integrated	Thermo Instruments	2000i	20001204331312	NA	Cartridge filter	2	

	sampling.							
PM2.5 B	Partisol sampler. Integrated sampling.	Thermo Instruments	2000i	20001203611305	NA	Cartridge filter	2	
PM 10 A	Partisol sampler. Integrated sampling.	Thermo Instruments	2000i	20001203551305	NA	Cartridge filter	2	
PM 10 B	Partisol sampler. Integrated sampling.	Thermo Instruments	2000i	20001203821308	NA	Cartridge filter	2	

Table 4.0 - Analytical Equipment in AMS 07

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	556A
ZAG	Zero Air Generator	Teledyne API	T701	1864
ZAG	Zero Air Generator	Teledyne API	701H	586
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	ITB	NA	NA
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	11021107

Table 5.0 - Support Equipment in AMS 07

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Athabasca Valley (AMS 7)

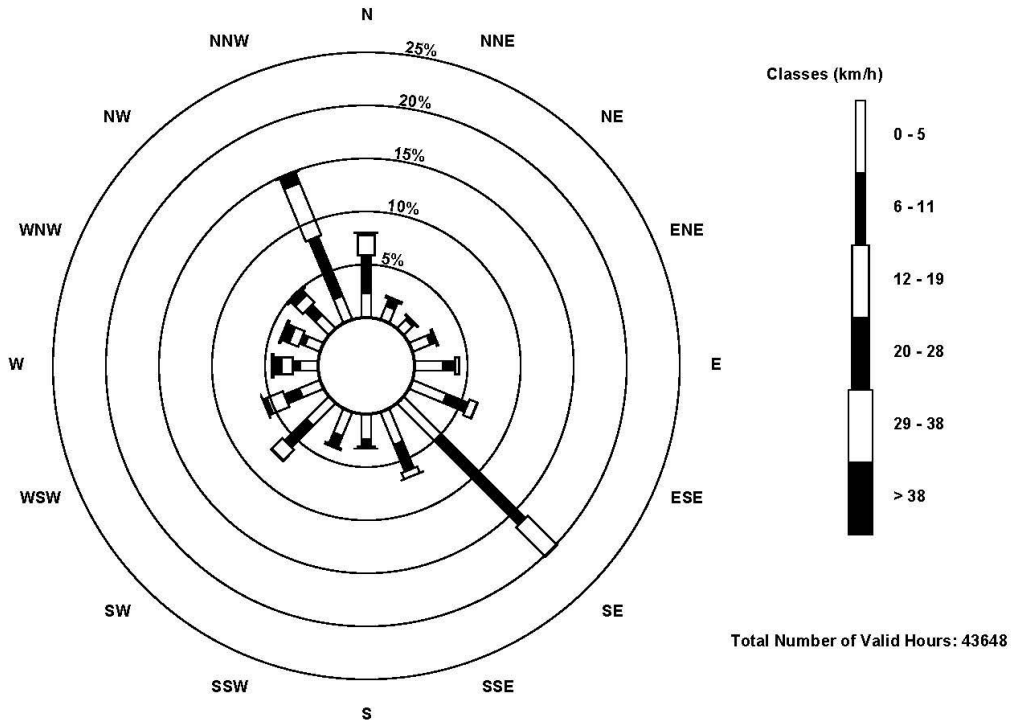


Figure 5.0 – AMS 07 Five Year Wind Rose



Figure 6.0 – Plan View Sketch showing 500m radius around Athabasca Valley station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 08 – Fort Chipewyan

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

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The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																							
WBEA Program - X														Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS														INTEGRATED SAMPLING																									
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OC	SASS	Dichor	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP				
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X															
Lower Camp	3	Meteorological																	X	X	X	X	X																
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X																
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X												X		X	X	
Patricia Mdnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X						X	X	X	X	X	X	X
Athabasca Valley	7	Health	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X			X								X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X												
Barge Landing	9	Attribution			X								X						X	X	X		X				X									X			
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X												X		X	X	
Fort McKay South	13	Attribution	X	X	X	X	X	X	X			X	X						X	X	X	X	X										X	X	X	X	X	X	X
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X						X	X	X	X	X	X	X
CNRL - Horizon	15	Compliance	X	X			X	X	X			X	X						X	X	X		X	X	X		X						X		X				
Shell Muskeg River	16	Compliance	X			X	X	X	X			X	X						X	X	X	X	X	X		X									X				
Wapasu Creek	17	Compliance	X	X			X	X	X			X	X						X	X	X	X	X			X									X			X	X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X				X	X	X	X
Sunco Firebag	19	Compliance	X	X			X	X	X			X							X	X	X		X	X															
Brion Energy	20	Compliance	X	X			X	X	X			X							X	X	X	X	X			X													
Cenovus Christi na Lake	500	Portable-Compliance	X	X			X	X	X			X							X	X	X		X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X		X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X		X	X															
HEMP	104	Portable-Health			X							X	X	X					X	X	X		X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

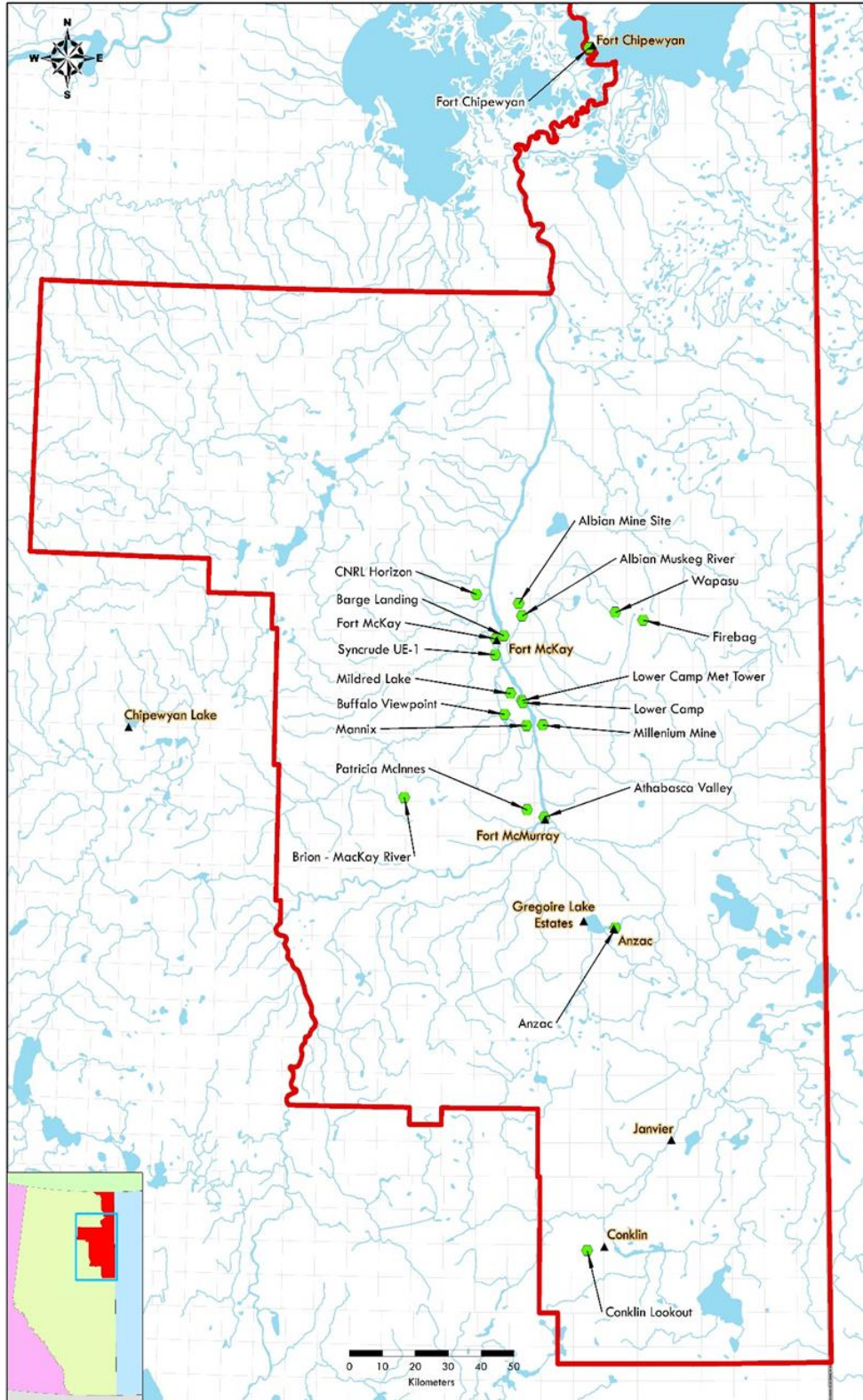


Figure 1.0 – WBEA Monitoring Network Sites

AMS 08 – Fort Chipewyan Station Details

General Site Information

The Fort Chipewyan Station overlooks Lake Athabasca on the outskirts of Fort Chipewyan. This station was constructed during the summer of 1998.

The Fort Chipewyan Station contains analyzers that continuously measure SO₂, O₃, NO, NO₂, NO_x, PM_{2.5}, wind speed and direction, temperature, global radiation, leaf wetness, and humidity.

Item	Description			
Station ID	AMS 08			
Station Name	Fort Chipewyan			
General description	Station is located at the west end of Fort Chipewyan, on a hill overlooking Lake Athabasca.			
Community	Fort McMurray			
Station Coordinates	58°42'33.25"	North	111°10'29.98"	West
Station elevation	221			Meters
Station Address	NA			
Station Type	Background/Health			
Initial Commission Date	NA			
Area Land Use	Residential			
Angle of elevation to nearby buildings	5 degrees			
Average building height in area	20 ft.			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	25 meters	Height	5 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description		
House	60 m	Truck idling. Emissions from wood stove.		
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Gravel road	Low	200	Residential access road.

Table 3.0 – Local Source Information

Area Topographic Map

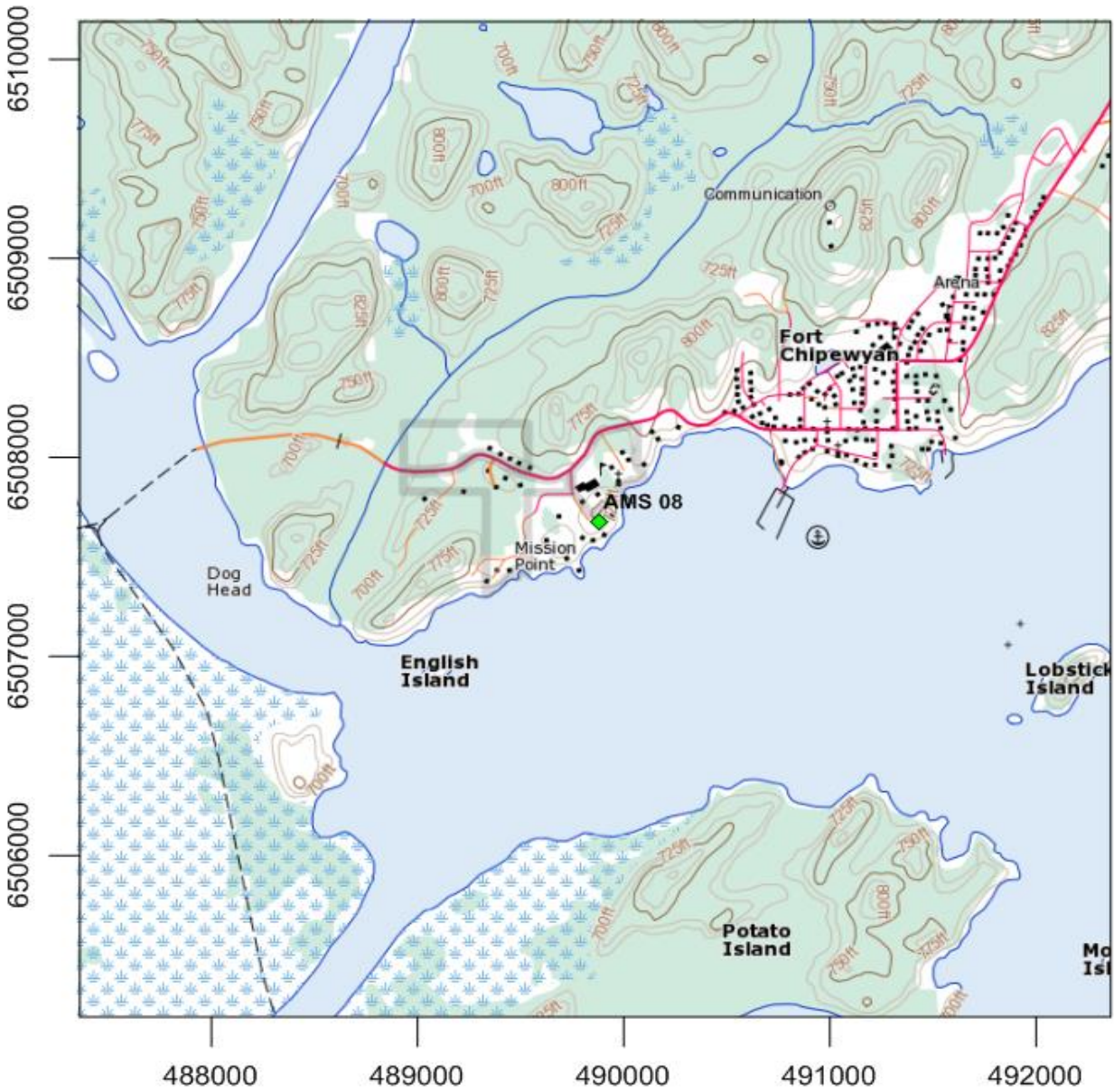


Figure 2.0 – Area Topographic map showing AMS 08 – Fort Chipewyan Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 08 – Fort Chipewyan Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Environ looking north



Figure 4.2 – Environ looking east



Figure 4.3 – Environ looking south



Figure 4.4 – Environ looking west

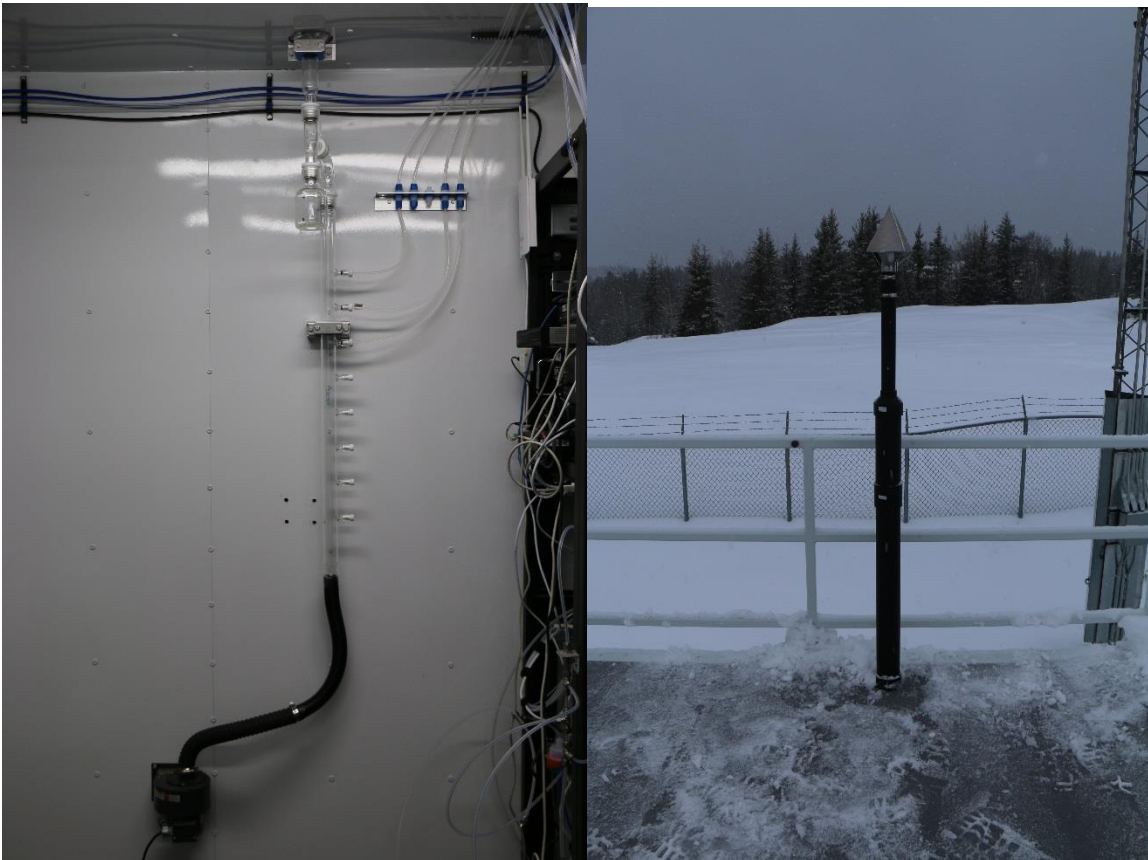


Figure 4.5 –Indoor Sample Manifold and Outdoor sample Inlet



Figure 4.6 – East Rack (on the left) & West Rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulphur Dioxide	Thermo Instruments	43-TLE	1136451241	0-100ppb	Pulsed Fluorescence	4	1
NOx	Nitrogen Dioxide	Teledyne API	T200U	172	0-100ppb	Chemiluminescence	4	1
O3	Ozone	Teledyne API	T400	1020	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	E2025	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
AT/RH	Ambient Temp/Relative Humidity	Vaisala	HMP155	J2310017	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind Speed<10um	Met One	010C-1	E5131	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	NA	0-360 degrees	Resistive (potentiometer)	10	
PC	Precip tipping bucket	Met One	8" rain gauge 0.01"		NA			
GR	Global radiation	Met one						
LW	Leaf wetness	Decagon Devices LWS						

Table 4.0 - Analytical Equipment in AMS 08

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	11039
ZAG	Zero Air Generator	Teledyne API	M701	4698
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	ITB	NA	13 15920
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	747

Table 5.0 - Support Equipment in AMS 08

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Fort Chipewyan (AMS 8)

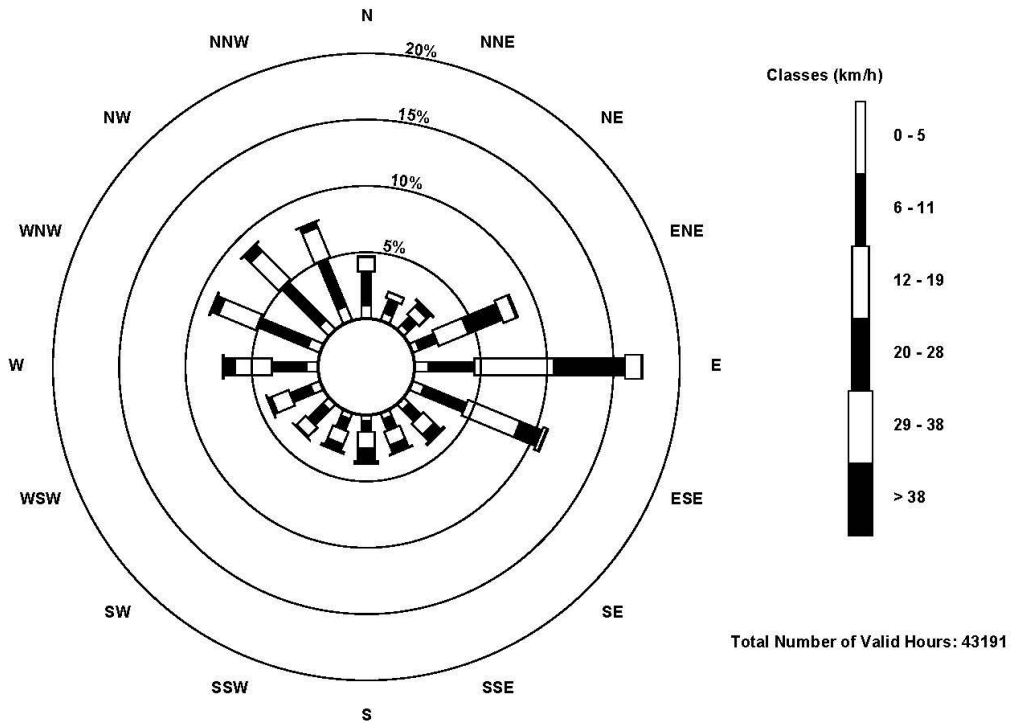


Figure 5.0 – AMS 08 Five Year Wind Rose

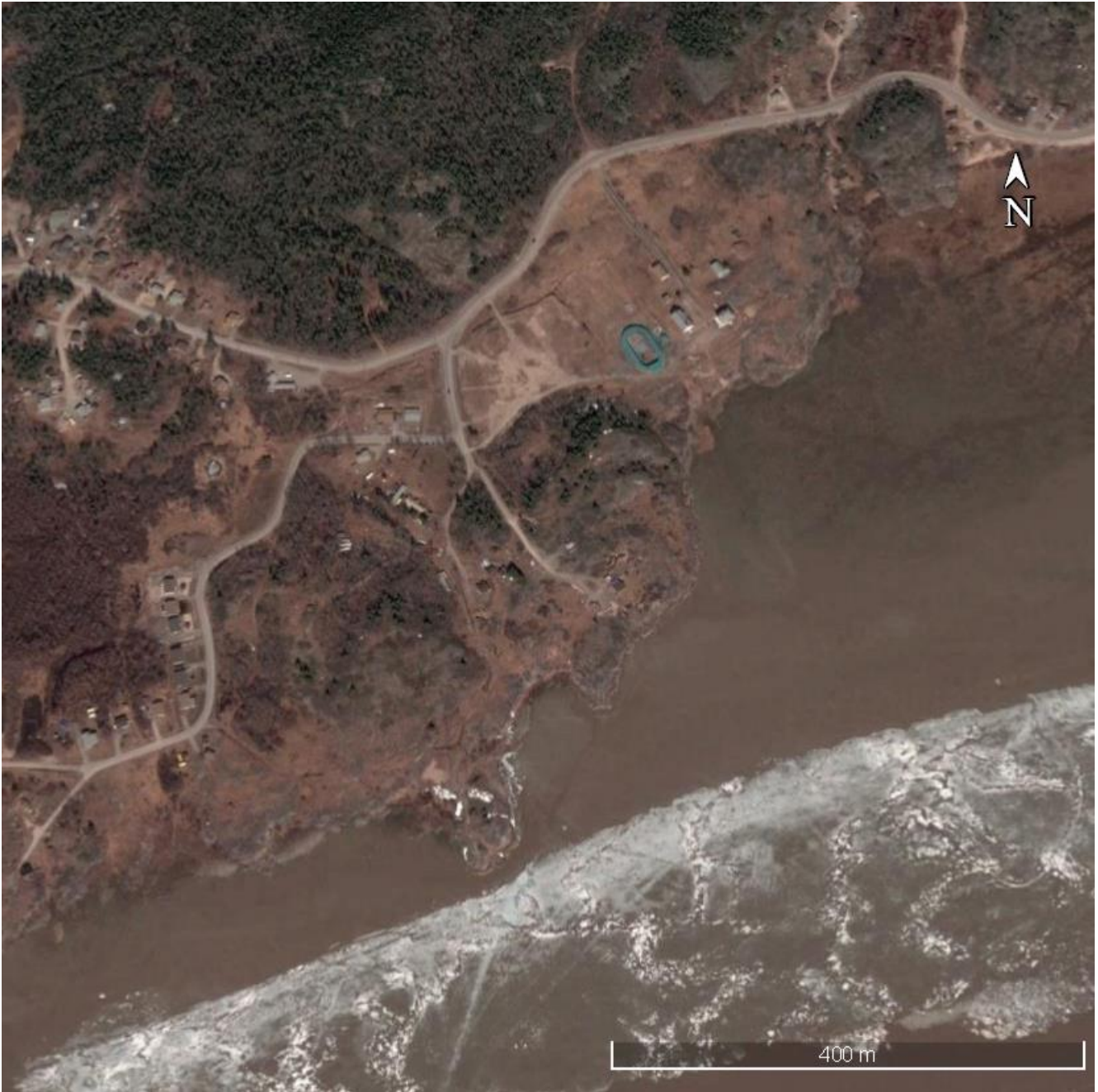


Figure 6.0 – Plan View Sketch showing 500m radius around Fort Chipewyan station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 09 – Barge Landing

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

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WBEA AMBIENT AIR MONITORING NETWORK																																						
WBEA Program - X															Enhanced Deposition Program - X																							
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																							
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP			
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X														
Lower Camp	3	Meteorological																	X	X	X	X	X															
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X															
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X											
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X									X			
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X										X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X		
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X				X	X	X	X	X			
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X				X	X						
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X											
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X	X	
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X				X	X	X	
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X															
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

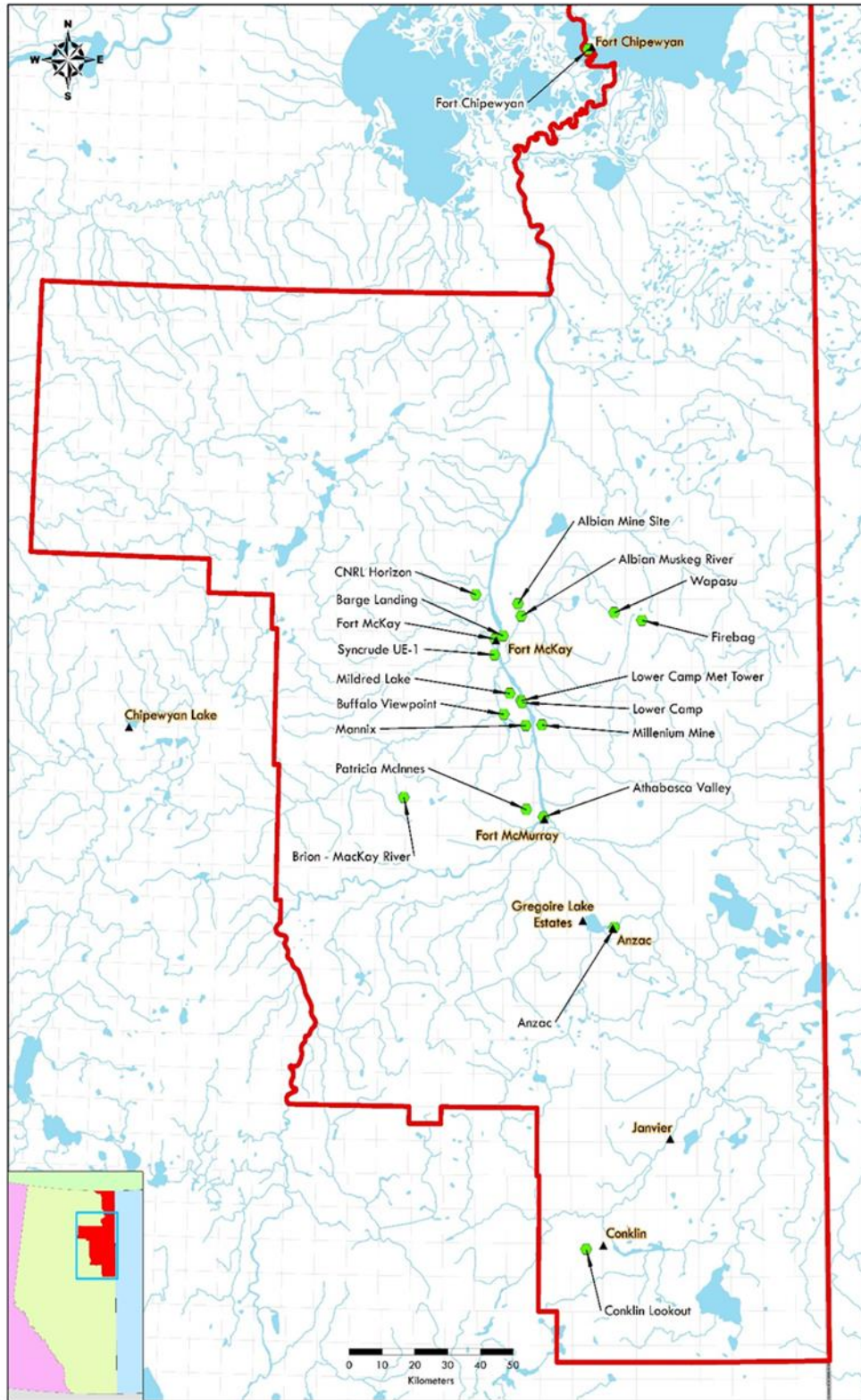


Figure 1.0 – WBEA Monitoring Network Sites

AMS 09 – Barge Landing Station Details

General Site Information

The Barge Landing Station is located on the Barge Road off of Highway 63 North of Fort McKay. This station was built as an Albian Sands Energy Ltd. station and donated to the WBEA in 2001.

Item	Description			
Station ID	AMS 09			
Station Name	Barge Landing			
General description	Located off of the Barge Landing road, approximately 300 m east of the Barge Landing lodge.			
Community	NA			
Station Coordinates	57°11'53.47"	North	111°35'58.35"	West
Station elevation	282			Meters
Station Address	NA			
Station Type	Attribution			
Initial Commission Date	NA			
Area Land Use	Industrial.			
Angle of elevation to nearby buildings	NA			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	36 meters	Height	10 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	2001			
Station Origin	Donated by Shell Albian Sands			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
Camp site	300 to West		Workers camp site.	
Name	Type	Traffic Volume	Distance (m)	Description
Roadway	Station access	Very low	70 meters	Dirt road
Highway 63	Asphalt	Medium	400 meters	Highway

Table 3.0 – Local Source Information

Area Topographic Map

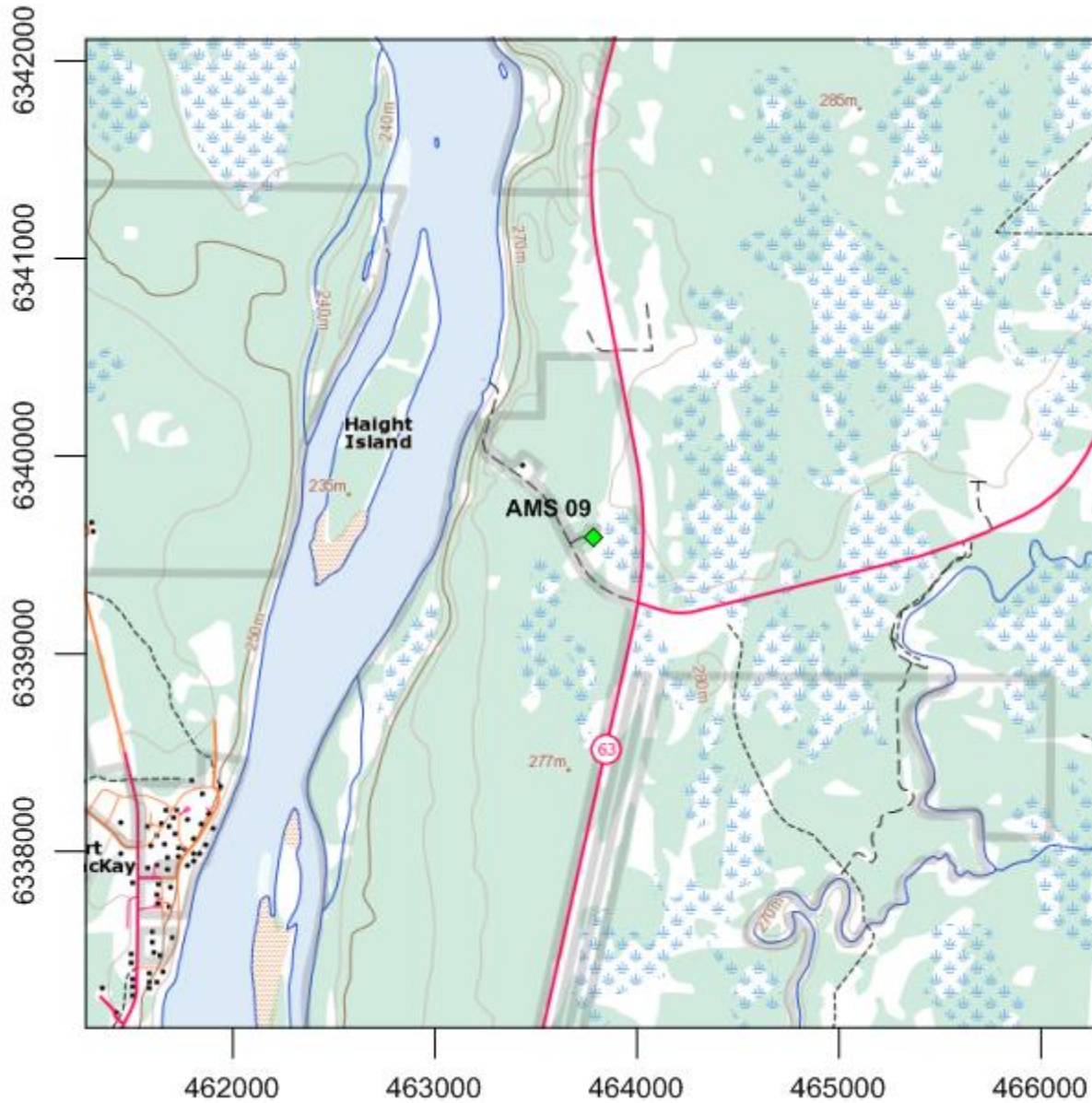


Figure 2.0 – Area Topographic map showing AMS 09 – Barge Landing Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 09 – Barge Landing Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Environ looking north



Figure 4.2 – Environ looking east



Figure 4.3 – Environ looking south



Figure 4.4 – Environ looking west

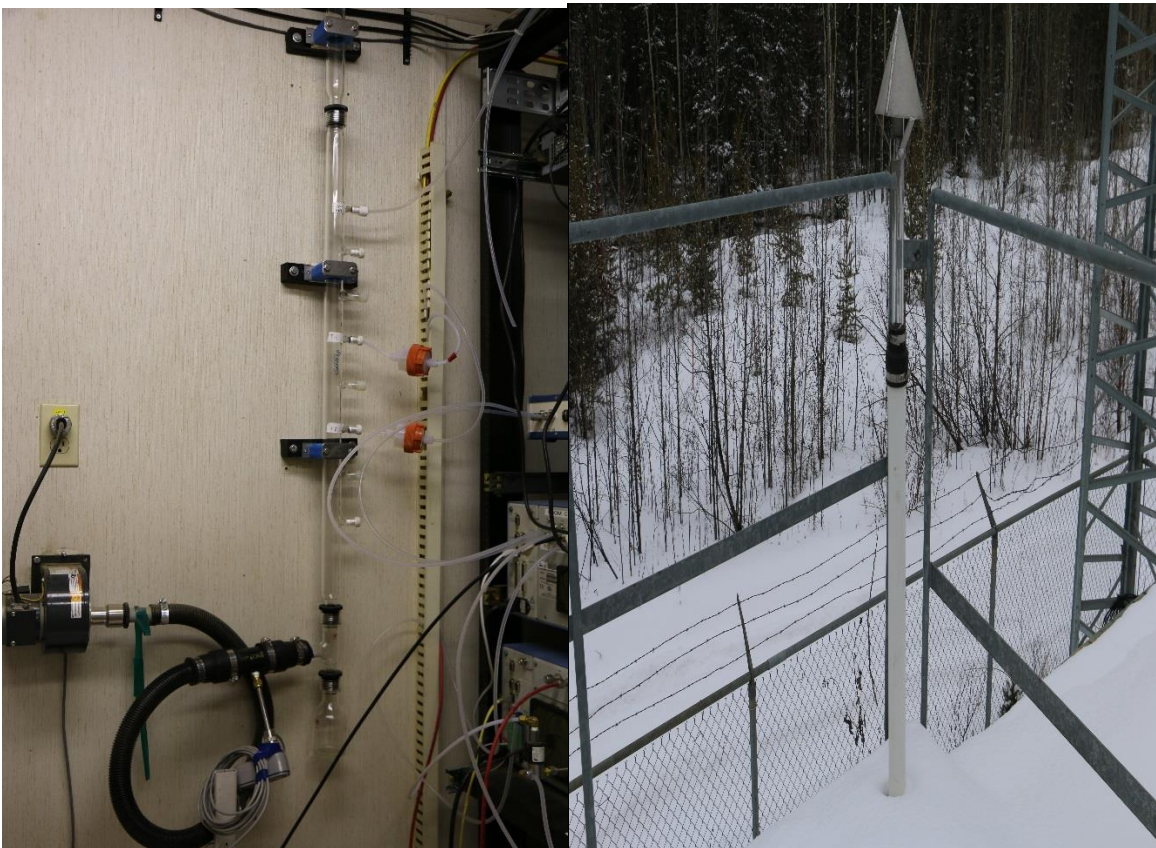


Figure 4.5 –Indoor Sample manifold and outdoor sample inlet



Figure 4.6 – Instrumentation rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
TRS	Total Reduced Sulfurs	Thermo Instruments	43i-TLE	1331259320	0-100ppb	Pulsed Fluorescence	4	1
THC	Total Hydrocarbons	Thermo Instruments	51i-LT	1327059296	0-50ppm	Gas Chromatography and Flame Ionization	4	1
Temp/RH	External temp and relative humidity.	Vaisala	HMP155	NA	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind speed	Met One	010C-1	B4128	0-80kph	Chopped optical	10	
WD	Wind direction	Met One	20C-1	E4852	0-360 degrees	Resistive (potentiometer)	10	
VOC	Volatile organic compounds. Integrated sampling.	Tisch Environmental	TE-123	1027	NA	Canister sampler	4	1

Table 4.0 - Analytical Equipment in AMS 09

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	5564
ZAG	Zero Air Generator	Teledyne API	T701	4888
HVAC	Heating and Air Conditioning system. Wall mount unit	NA	NA	NA
Shelter / Building	Air monitoring trailer	National trailer	NA	2N9MMFY3615
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	11071107

Table 5.0 - Support Equipment in AMS 09

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Barge Landing (AMS 9)

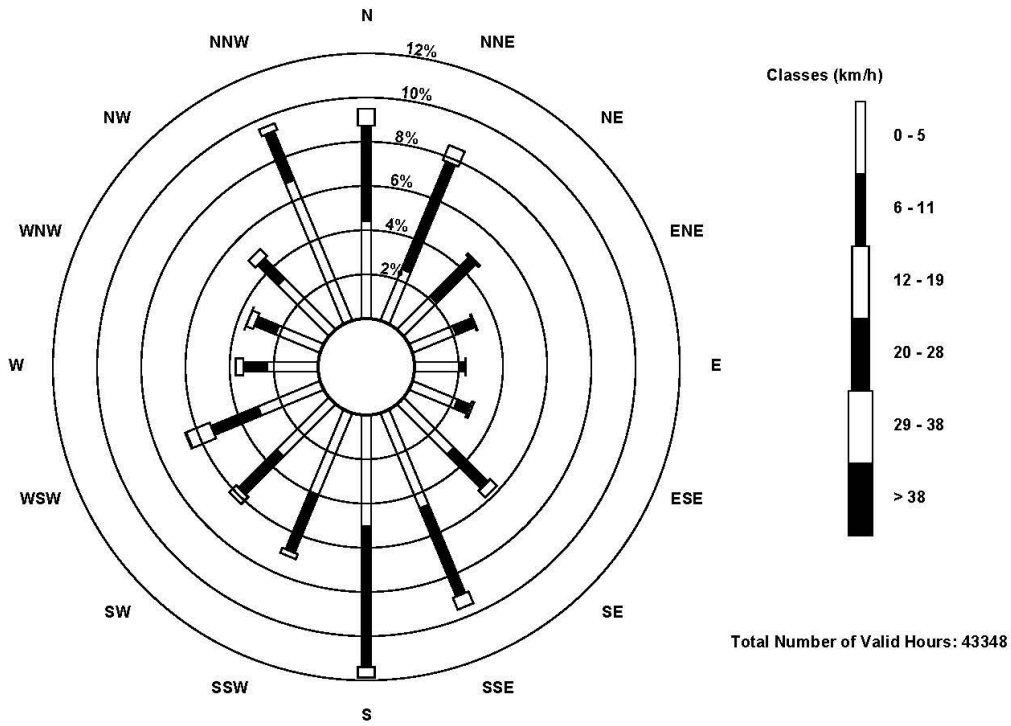


Figure 5.0 – AMS 09 Five Year Wind Rose



Figure 6.0 – Plan View Sketch showing 500m radius around Barge Landing station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 11 – Lower Camp

2017

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Network Background

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Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oil Sands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																					
WBEA Program - X															Enhanced Deposition Program - X																						
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																						
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP		
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X													
Lower Camp	3	Meteorological																	X	X	X	X	X														
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X														
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X
Patricia McInnes	6	Health	X		X	X	X	X	X	X		X	X	X	X				X	X	X	X	X				X					X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X		X	X	X	X	X				X	X	X	X	X				X					X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X										
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X									X		
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X										X		X	X	
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X	X
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X					X	X				
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X										
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X	X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X				X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X														
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X										
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X														
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X														

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

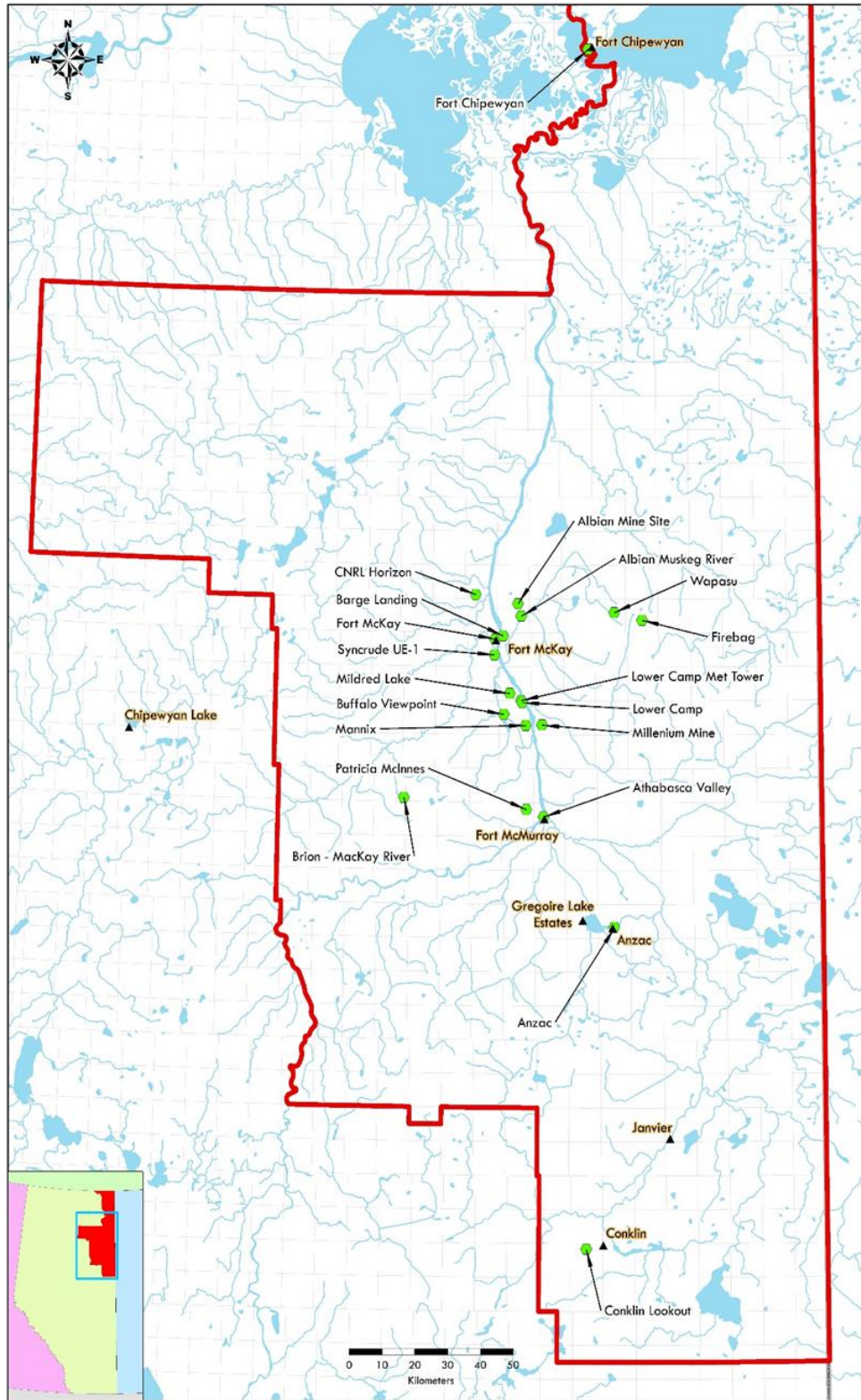


Figure 1.0 – WBEA Monitoring Network Sites

AMS 11 – Lower Camp Station Details

General Site Information

The Lower Camp station was installed as a Compliance Station. It situated by the Athabasca River Valley, North of Suncor and East of Syncrude. The station was established September 14, 2000.

Item	Description			
Station ID	AMS 11			
Station Name	Lower Camp			
General description	Located by the Athabasca River Valley at about 115 meters south of the Syncrude pump house.			
Community	NA			
Station Coordinates	57° 1'36.45"	North	111°30'2.95"	West
Station elevation	235			Meters
Station Address	NA			
Station Type	Compliance			
Initial Commission Date	NA			
Area Land Use	Oil sands lease			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	3 meters	Height	4 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
Laydown	79.21m W		Equipment Laydown	
Water Pond	136.86m NW		Reservoir	
Athabasca River	33.8m E		River	
Pumping Station	114m N		Syncrude Water Pump Station	
Deck	4m E		Has Precipitation, PM2.5, and PUF Samplers on it	
Name	Type	Traffic Volume	Distance (m)	Description
Gravel Road	Gravel	Low	20m	Road Access to Lay down and pumping station

Table 3.0 – Local Source Information

Area Topographic Map

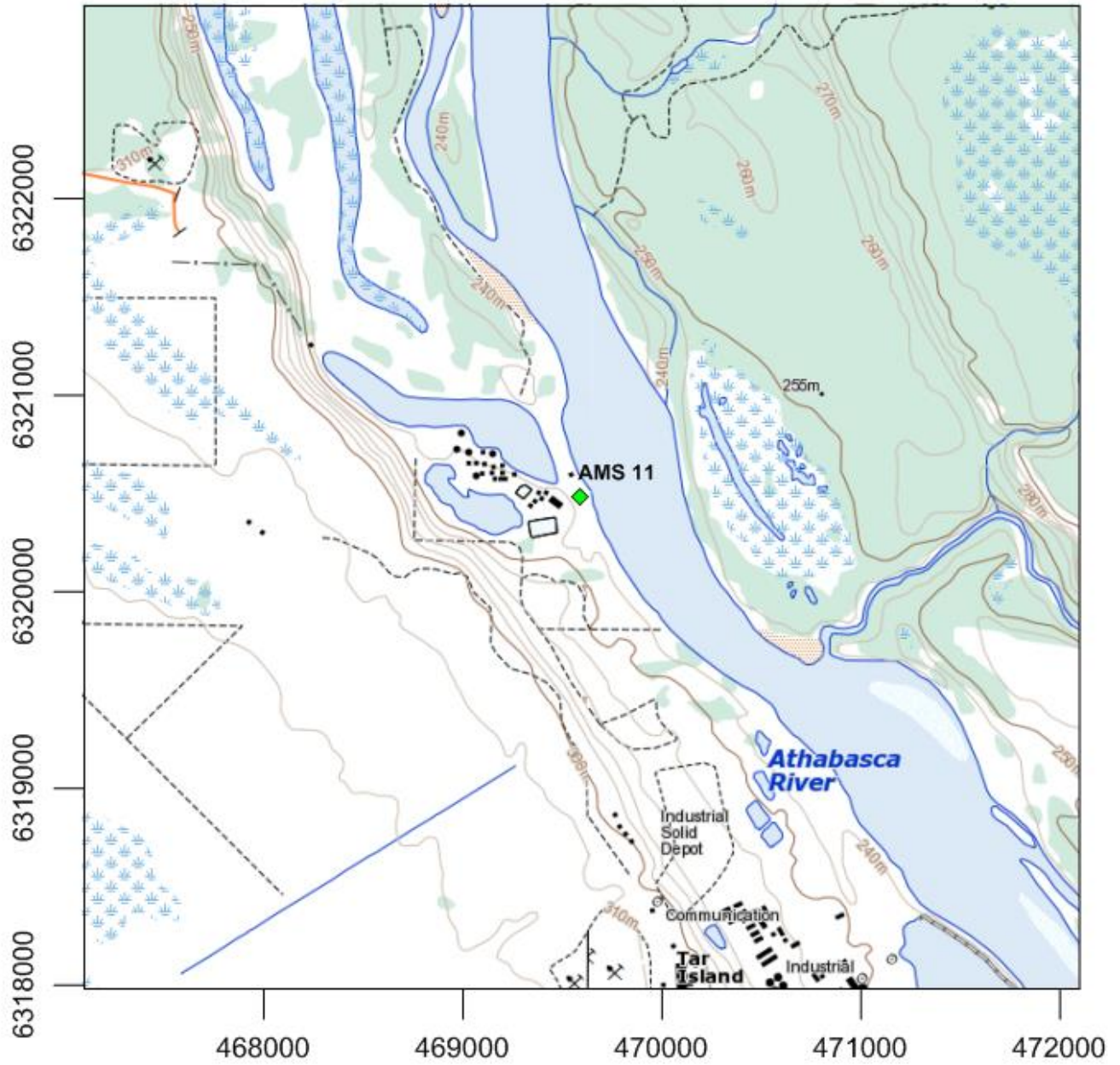


Figure 2.0 – Area Topographic map showing AMS 11 – Lower Camp Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 11 – Lower Camp Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Sampling Deck which contains EC PM2.5 & High Volume PAH Sampler



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east



Figure 4.4 – Environ looking south



Figure 4.5 – Environ looking west



Figure 4.6 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.7 – Instrument racks

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Thermo Instruments	43i	100841398	0-1000ppb	Pulsed Fluorescence	4	1
H2S	Hydrogen Sulfide	Thermo Instruments	450i	1410661328	0-100ppb	Pulsed Fluorescence	4	1
THC	Total Hydrocarbons	Thermo Instruments	51i-LT	1218153353	0-50ppm	Gas Chromatography and Flame Ionization	4	1
AT/RH	Ambient temp and relative humidity.	Vaisala	HMP155	K2510020	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
VS	Visibility sensor	Vaisala	PWD22	H5030008	0-20 km			
WS	Wind speed	Met One	010C-1	P19838	0-80kph	Chopped optical	10	
WD	Wind direction	Met One	20C-1	P19941	0-360 degrees	Resistive (potentiometer)	10	
EC PM 2.5	Integrated sampling	Thermo Instruments	2000i	20001W206011510	NA	Filter sampler	2	
EC PAH	Polycyclic aromatic hydrocarbons	Tisch Environmental	TE-303	1549	NA	Filter/ canister sampler		

Table 4.0 - Analytical Equipment in AMS 11

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	2403
ZAG	Zero Air Generator	Teledyne API	T701	3411
HVAC	Heating and Air Conditioning system. Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	C & V Shelters	OFFICE	SBB81409
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	11051107

Table 5.0 - Support Equipment in AMS 11

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Lower Camp (AMS 11)

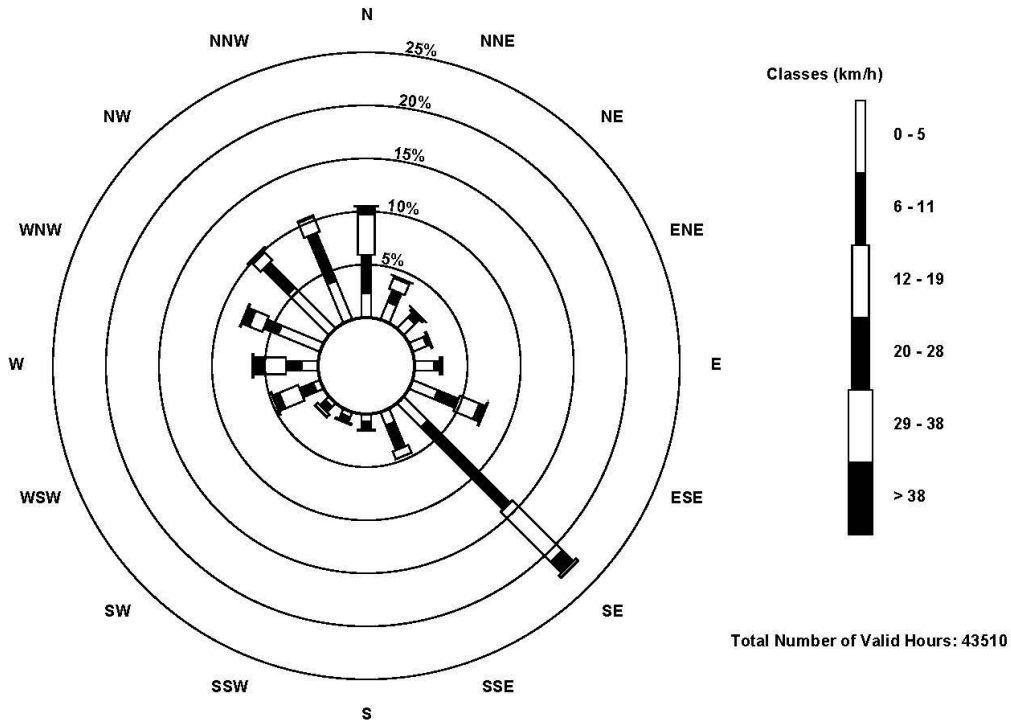


Figure 5.0 – AMS 11 Five Year Wind Rose



Figure 6.0 – Plan View Sketch showing 500m radius around Lower Camp station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 13 – Fort McKay South

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oil Sands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																					
WBEA Program - X															Enhanced Deposition Program - X																						
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																						
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP		
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X													
Lower Camp	3	Meteorological																	X	X	X	X	X														
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X														
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X
Patricia McInnes	6	Health	X		X	X	X	X	X	X		X	X	X	X				X	X	X	X	X				X					X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X		X	X	X	X	X				X	X	X	X	X				X					X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X										
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X										X	
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X										X		X	X	
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X	X
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X				X	X					
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X										
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X	X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X				X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X														
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X										
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X														
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X														

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

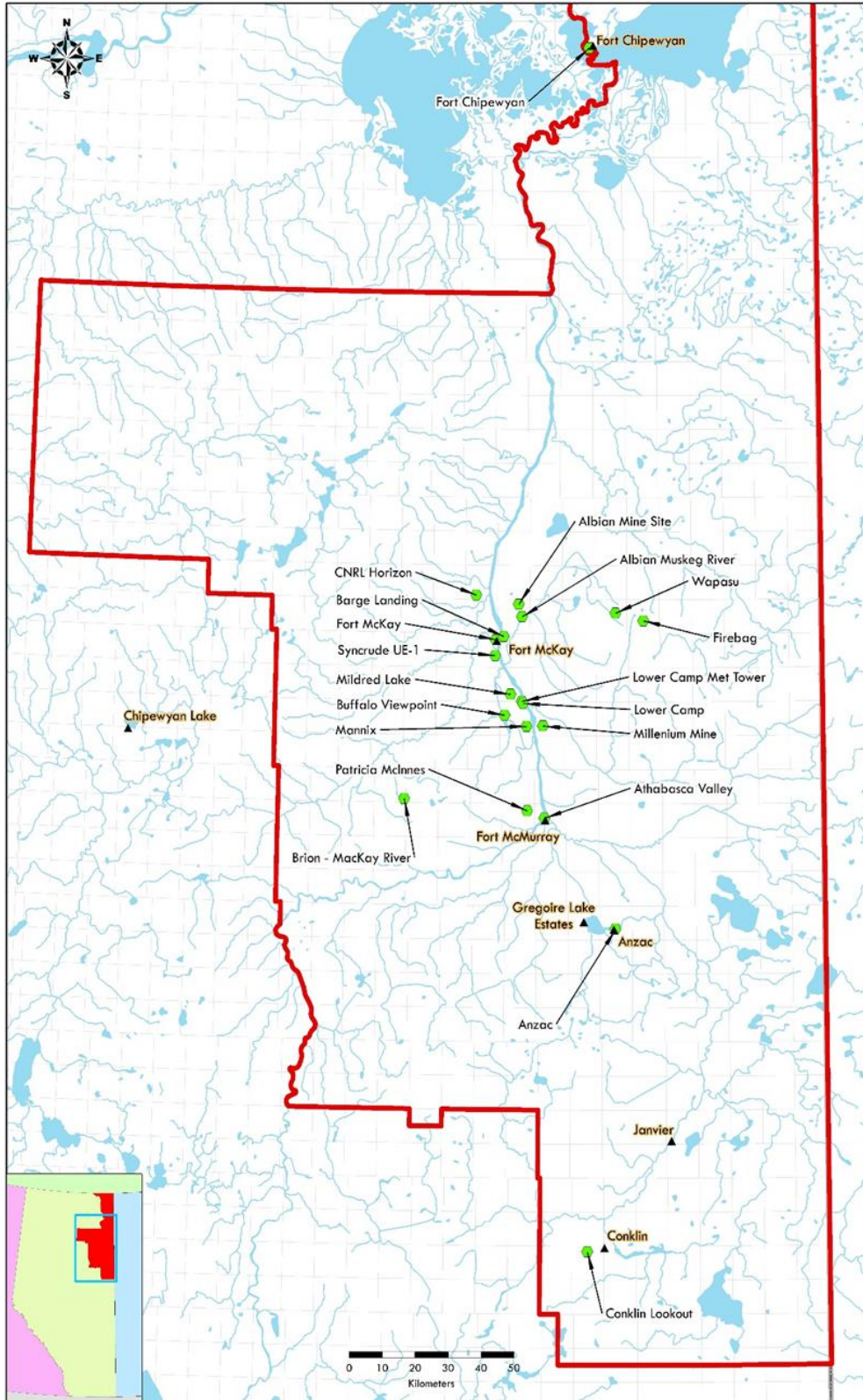


Figure 1.0 – WBEA Monitoring Network Sites

AMS 13 – Fort McKay South Station Details

General Site Information

The Fort McKay South Station is located between the community of Fort McKay and the Syncrude Canada mine site.

The Fort McKay South Station contains analyzers that continuously measure SO₂, O₃, TRS, THC, NO, NO₂, NO_x, PM 2.5, wind speed and direction, and temperature. Non-continuous measurement devices include VOCs and PM₁₀.

Item	Description			
Station ID	AMS 13			
Station Name	Fort McKay South			
General description	Approximately 4km south of Fort McKay and approximately 6km north of Syncrude Base Mine			
Community	Fort McKay			
Station Coordinates	57° 8'57.03"	North	111°38'32.44"	West
Station elevation	268			Meters
Station Address	NA			
Station Type	Attribution			
Initial Commission Date	NA			
Area Land Use	Crown land			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	5 meters	Height	6 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	NA			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
Air Monitoring station	3 meters N		Environment Canada Air Monitoring compound.	
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Access	Extremely low	5	Gravel/dirt road

Table 3.0 – Local Source Information

Area Topographic Map

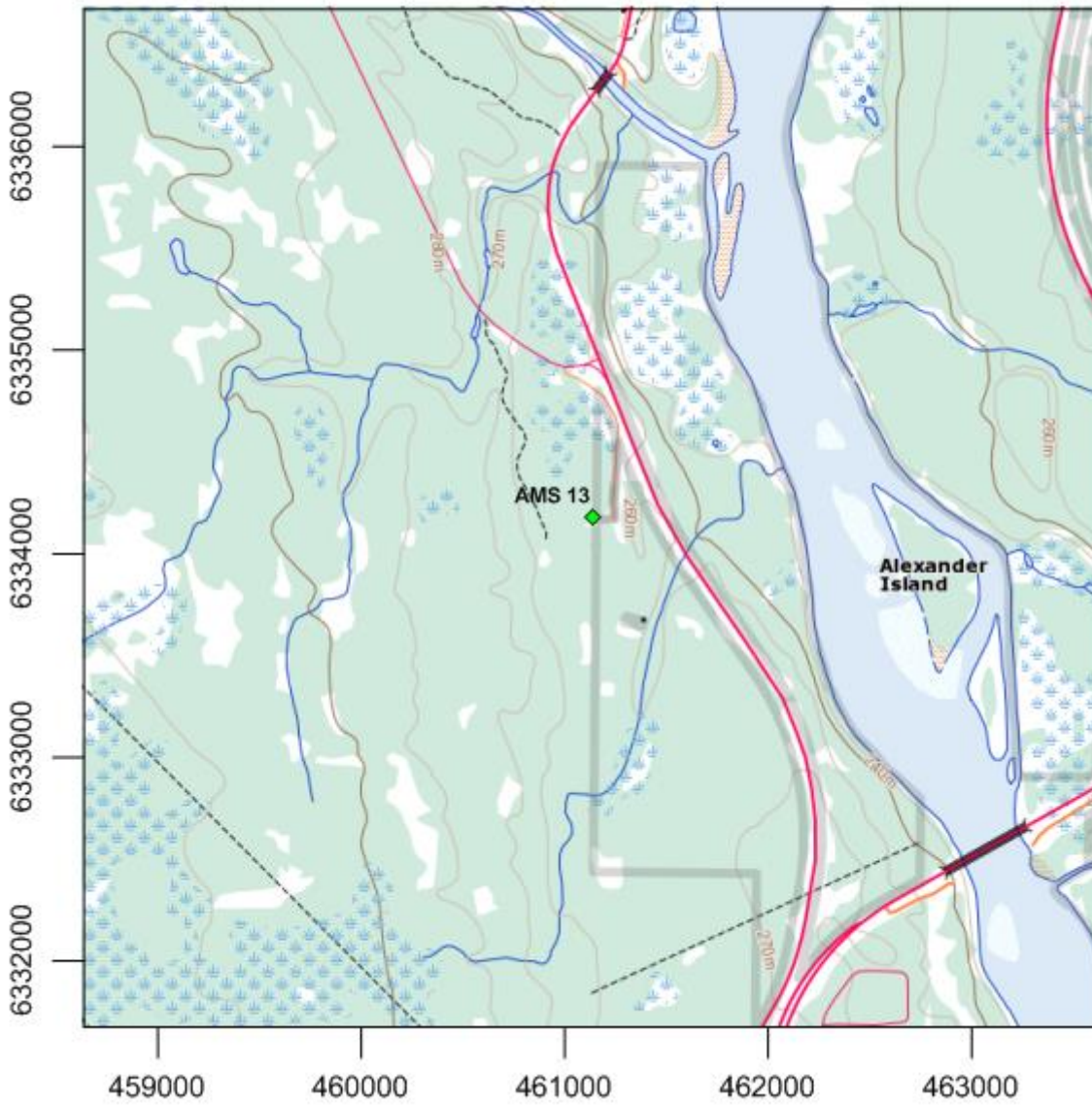


Figure 2.0 – Area Topographic map showing AMS 13 – Fort McKay South Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 13 – Fort McKay South Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Environ looking north



Figure 4.2 – Environ looking east



Figure 4.3 – Environ looking south



Figure 4.4 – Environ looking west

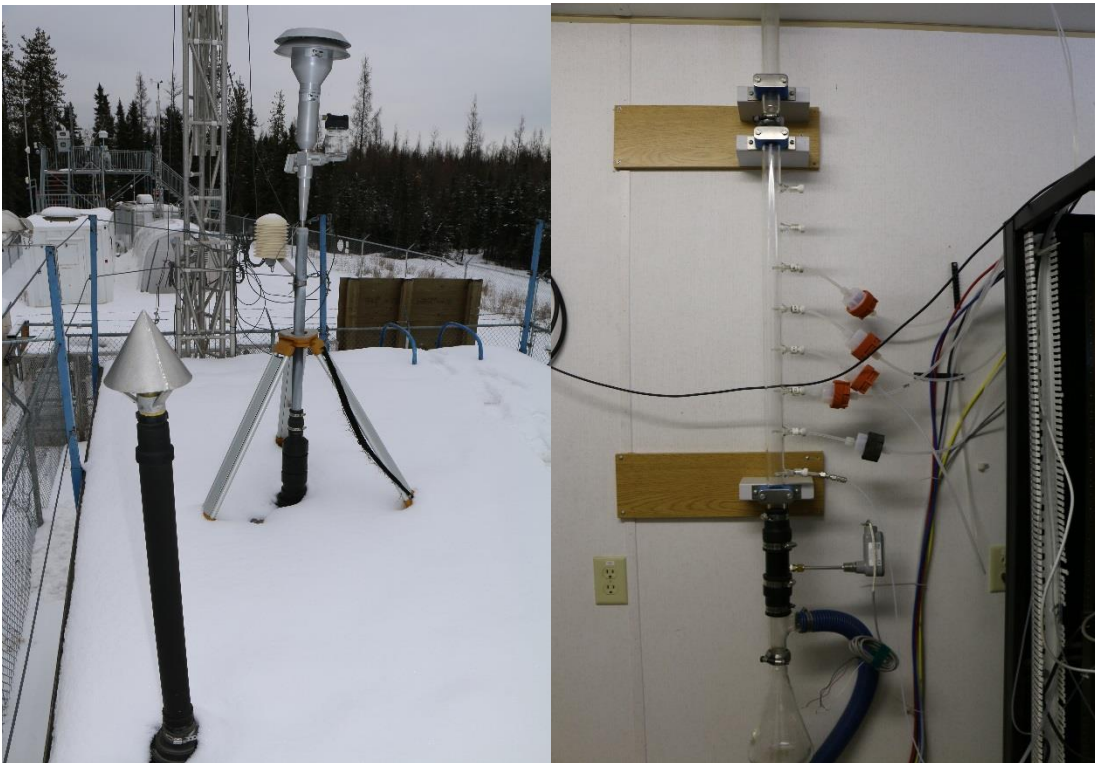


Figure 4.5 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.6 – Instrument racks



Figure 4.7 – PM 10, Integrated Partisol samplers

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulphur Dioxide	Teledyne API	T100	599	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1218153359	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	Thermal oxidizer	CD Nova	CDN101	456	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		
NOx	Nitrogen Dioxide	Thermo Instruments	42i	1410661329	0-1000ppb	Chemiluminescence	4	1
THC	Total Hydrocarbons	Thermo Instruments	51i-LT	1505164380	0-50ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	Teledyne API	T400	825	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	E-773	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
RH/Temp	Relative humidity / external temp	Vaisala	HMP155	G4340047	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind Speed<10um	Met One	010C-1	N11127	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	N13744	0-360 degrees	Resistive (potentiometer)	10	
VOC	Volatile Organic Compounds	Tisch	TE-123	1023	NA		4	
PM10	Particulate matter. Integrated sampling.	Thermo Instruments	2000i	20001204911408	NA		2	
PM10	Particulate matter. Integrated sampling.	Thermo Instruments	2000i	20001204921408	NA		2	

Table 4.0 - Analytical Equipment in AMS 13

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	11038
ZAG	Zero Air Generator	Teledyne API	T701	5613
HVAC	Air Conditioner/Heater .Wall mount unit	NA	NA	NA
Shelter / Building	Air monitoring trailer	C & V Portable	Office	5201657
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	11041107

Table 5.0 - Support Equipment in AMS 13

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Fort McKay South (AMS 13)

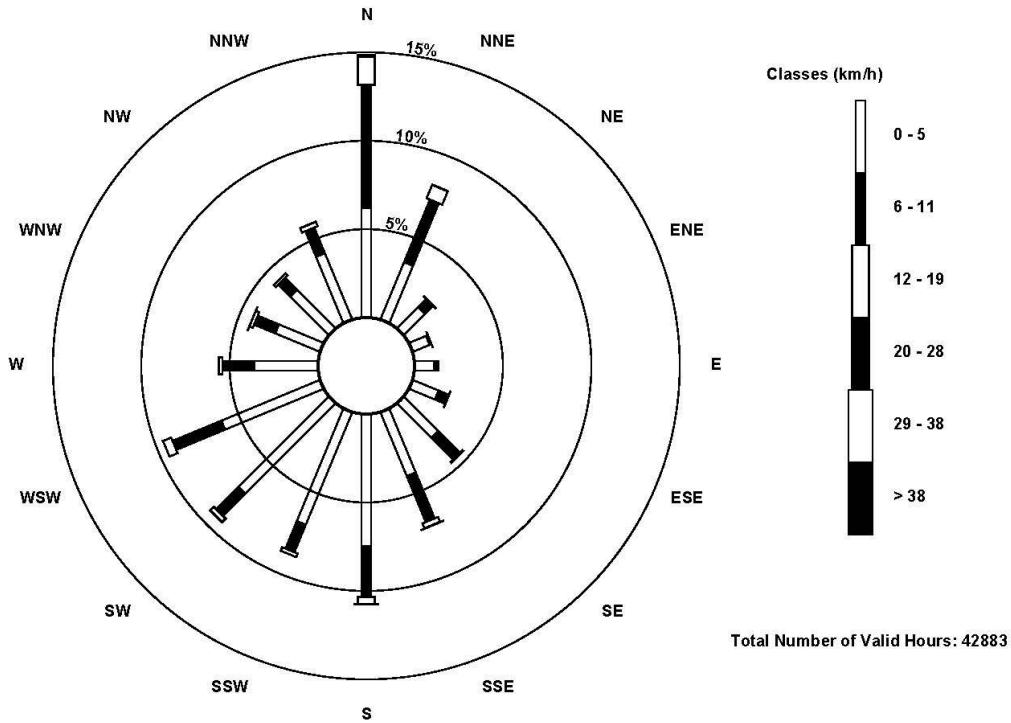


Figure 5.0 – AMS 13 Five Year Wind Rose



Figure 6.0 – Plan View Sketch showing 500m radius around Fort McKay South station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 14 – Anzac

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

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WBEA AMBIENT AIR MONITORING NETWORK																																						
WBEA Program - X															Enhanced Deposition Program - X																							
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																							
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP			
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X														
Lower Camp	3	Meteorological																	X	X	X	X	X															
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X															
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X											
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X									X			
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X										X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X		
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X		
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X					X	X					
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X											
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X	X	
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X															
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

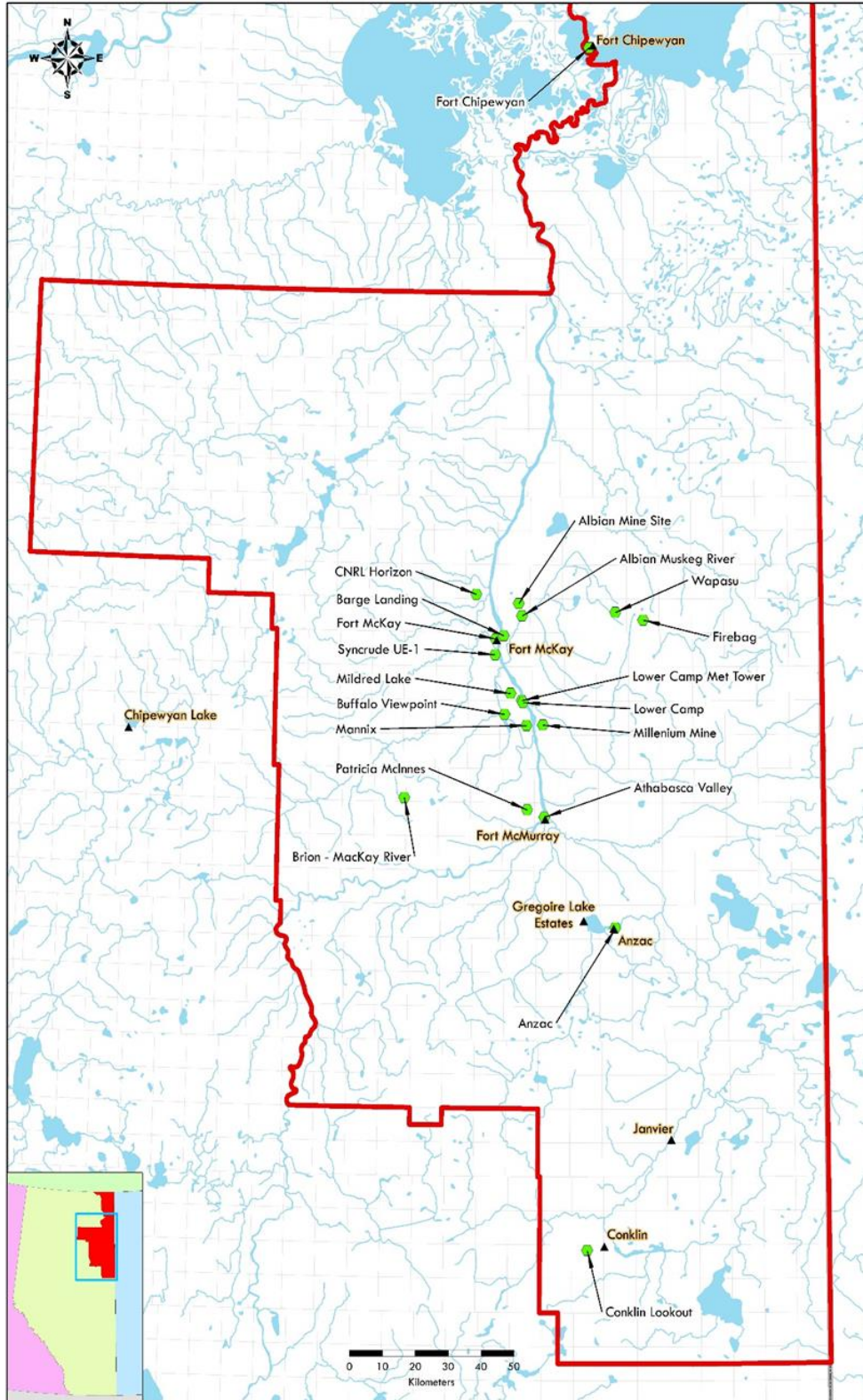


Figure 1.0 – WBEA Monitoring Network Sites

AMS 14 – Anzac Station Details

General Site Information

The Anzac AMS is a community station located approximately 35 km southeast of Fort McMurray on the northern edge of the hamlet of Anzac. It was installed January 1, 2016.

Item	Description			
Station ID	AMS 14			
Station Name	Anzac			
General description	Located North of the TELUS Building, East of the railroad tracks, inside Anzac			
Community	Anzac			
Station Coordinates	56°26'56.07"	North	111° 2'16.71"	West
Station elevation	497			Meters
Station Address	NA			
Station Type	Community			
Initial Commission Date	NA			
Area Land Use	Crown land			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	23 meters	Height	40 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	20 meters		
	Type	Stationary tower		
	Position	North side of the trailer		
Station Install Date	NA			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description		
Idling Trucks	23m on West Side	Water, Sewage and Semi Trucks idling next to house and garage		
Garage	23m NW	Where the trucks are housed and fixed, Emissions coming from garage Vents		
House	28m SW	Trucks are idling near, Emissions coming from house vents		
Trains/ Railroad Tracks	77m East side	Trains going through every week, Crews bring Trucks and equipment to fix tracks		
TELUS Trailer	19mS	TELUS trucks idling near TELUS Trailer		
Name	Type	Traffic Volume	Distance (m)	Description
Stony Mountain Road	Pavement	High	62mS	Main Road for Anzac
Access Road	Gravel	Low	16mE	Access road to Station

Table 3.0 – Local Source Information

Area Topographic Map

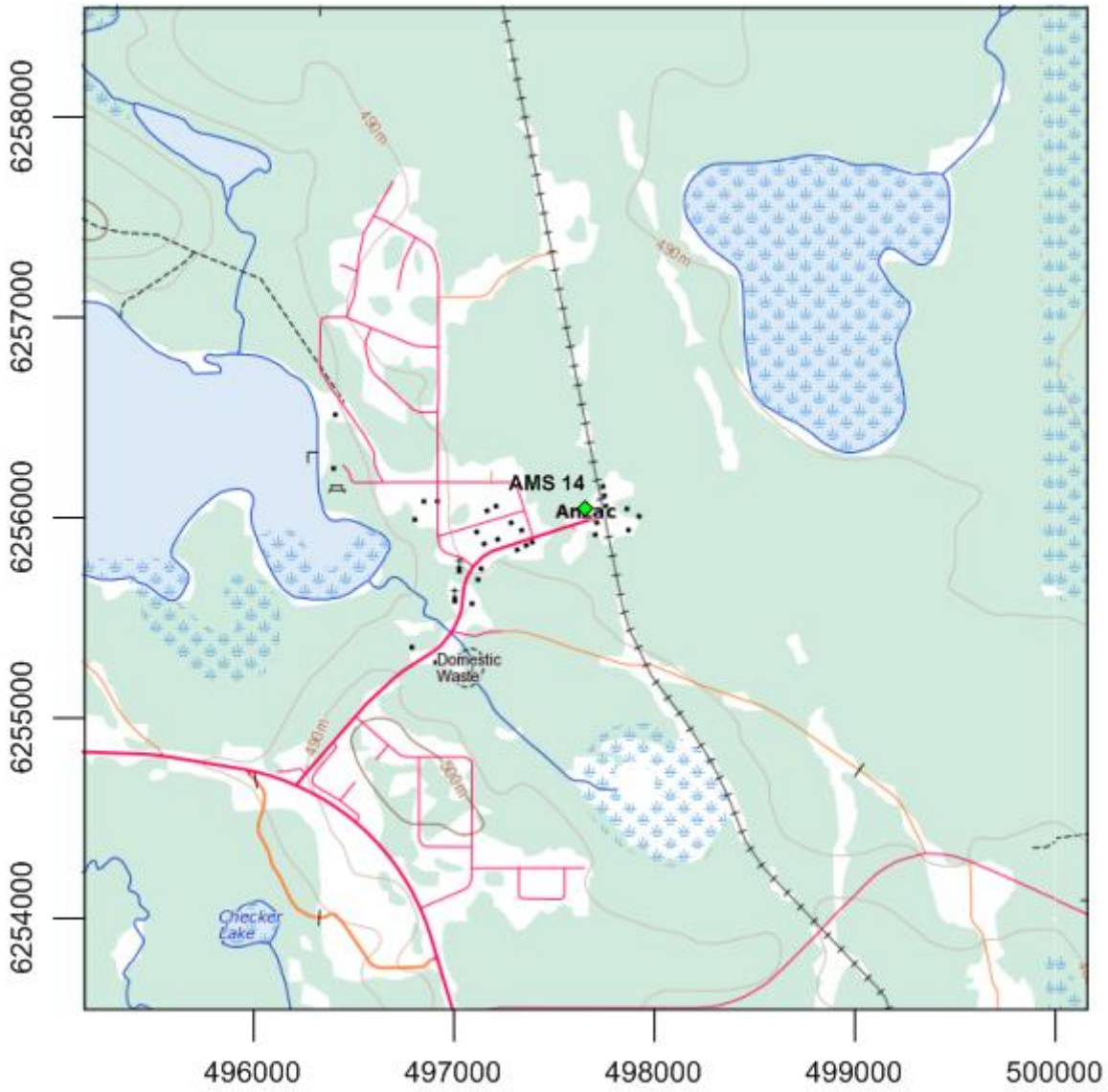


Figure 2.0 – Area Topographic map showing AMS 14 – Anzac Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 14 – Anzac Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Monitoring compound looking south



Figure 4.2 – Sampling Deck



Figure 4.3 – Environ looking north



Figure 4.4 – Environ looking east



Figure 4.5 – Environ looking south



Figure 4.6 – Environ looking west



Figure 4.7 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.8 –Instrument Rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulphur Dioxide	Thermo Instruments	43i	1152430005	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1300156232	0-100ppb	Pulsed Fluorescence	4	1
TRS Converter	Thermal oxidizer	CD Nova	CDN101	510	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		
NOx	Nitrogen Dioxide	Thermo Instruments	42i	1426262592	0-1000ppb	Chemiluminescence	4	1
NMHC	Methane Non Methane	Thermo Instruments	55i-LT	1218153355	0-50ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	Thermo Instruments	49i	1426262595	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter.	Thermo Instruments	5030	E-1093	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
RH/Temp	Relative humidity / external temp	Vaisala	HMP155	G4330054	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind Speed<10um	Met One	010C-1	D6359	0-80kph	Chopped optical	20	
WD	Wind Direction	Met One	20C-1	Z1048	0-360 degrees	Resistive (potentiometer)	20	
LW	Leaf wetness sensor	Decagon Devices	LWS	NA	NA			
PC	Precip tipping bucket	Met One	8" Heated Rain Gauge 0.01"	N1505A	NA			

PM 2.5	Partisol sampler	Thermo Instruments	2000i	20001204821408	NA	Cartridge Filter	2
PM 2.5	Partisol sampler	Thermo Instruments	2000i	20001204581405	NA	Cartridge Filter	2
PM 10	Partisol sampler	Thermo Instruments	2000i	20001203871308	NA	Cartridge Filter	2
PM 10	Partisol sampler	Thermo Instruments	2000i	2000IW205911510	NA	Cartridge Filter	2
PUF	Polycyclic aromatic hydrocarbons	Tisch	TE-PUF+BL	1001055	NA	Filter/ canister sampler	2
VOC	Volatile organic compounds	Tisch	TE-123	1024	NA	Canister sampler	4

Table 4.0 - Analytical Equipment in AMS 14

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	2582
ZAG	Zero Air Generator	Teledyne API	T701	4764
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	National	NA	2N9MF53785
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	2659

Table 5.0 - Support Equipment in AMS 14

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Anzac (AMS 14)

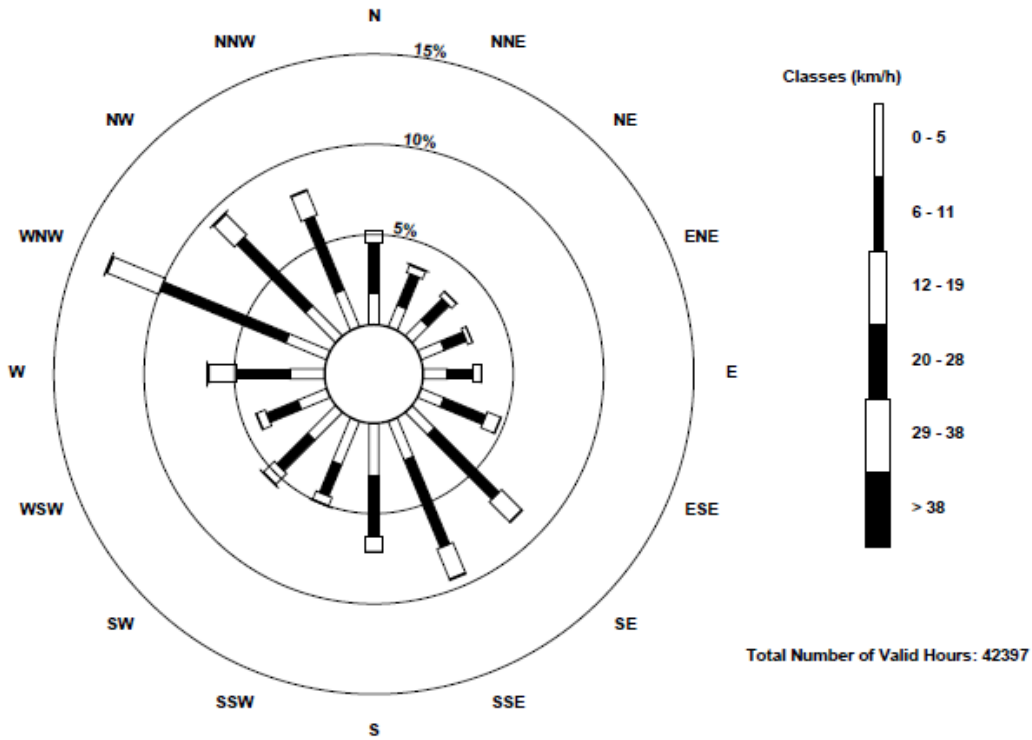


Figure 5.0 – AMS 14 Five Year Wind Rose



Figure 6.0 – Plan view sketch showing a 500m radius around Anzac Station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 15 – CNRL Horizon

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																						
WBEA Program - X															Enhanced Deposition Program - X																							
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																							
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP			
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X														
Lower Camp	3	Meteorological																	X	X	X	X	X															
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X															
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X											
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X										X		
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X											X		X	X	
Fort McKay South	13	Attribution	X		X	X	X	X	X	X		X	X						X	X	X	X	X									X	X	X	X	X	X	X
Anzac	14	Attribution	X		X	X	X	X	X	X		X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X					X	X					
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X											
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X		X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X															
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

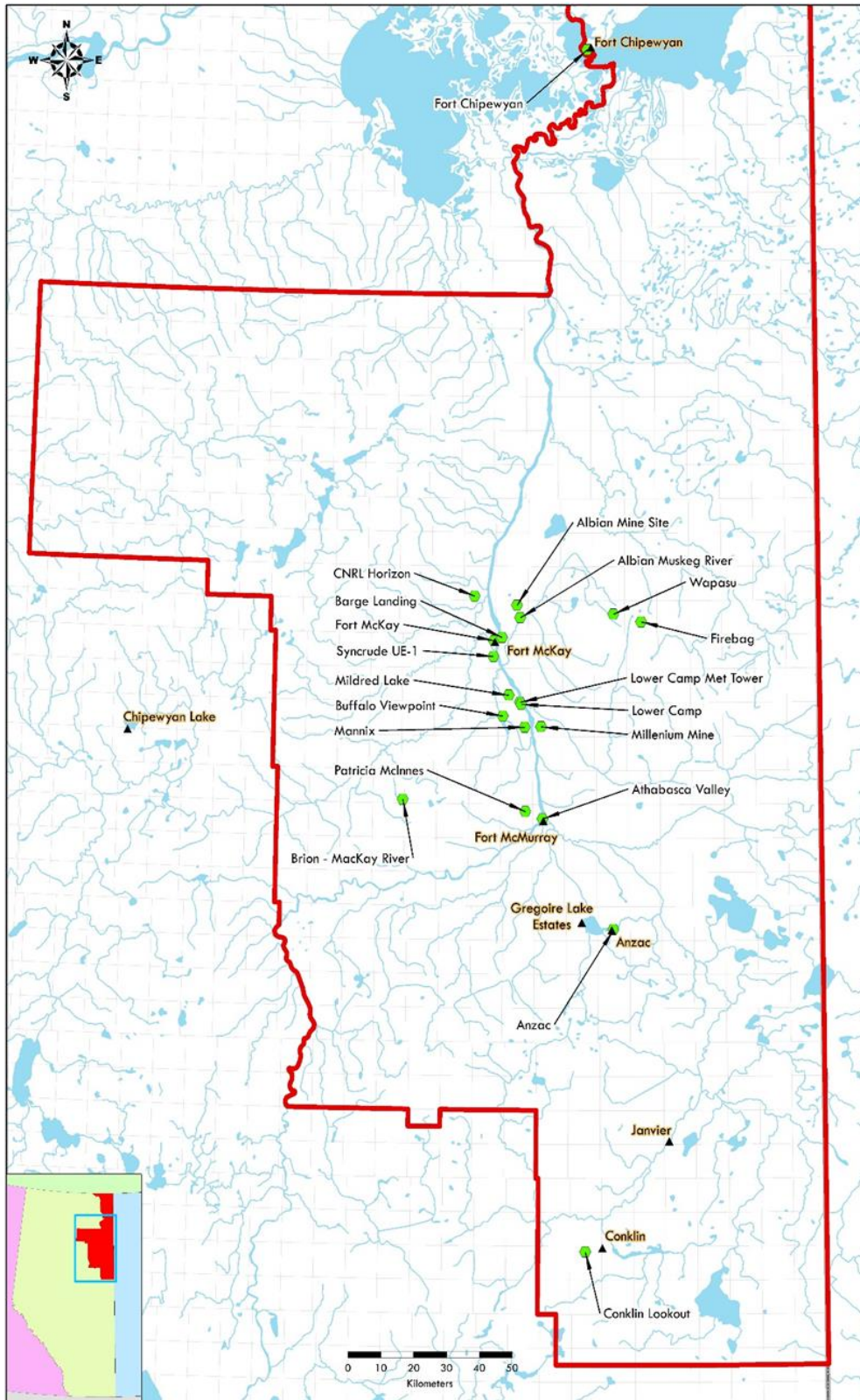


Figure 1.0 – WBEA Monitoring Network Sites

AMS 15 – CNRL Horizon Station Details

General Site Information

The CNRL Horizon is compliance air monitoring station which is located in the regional Municipality of Wood Buffalo, 75 km Northwest of Fort McMurray, Alberta near Fort McKay. The air quality station is a requirement of Alberta Environment approval number 149968-00-01.

Item	Description			
Station ID	AMS 15			
Station Name	CNRL Horizon			
General description	Located at about 300 m northwest of the Total Joslyn camp.			
Community	NA			
Station Coordinates	57°18'13.28"	North	111°44'22.16"	West
Station elevation	302			Meters
Station Address	NA			
Station Type	Compliance			
Initial Commission Date	NA			
Area Land Use	Industrial			
Angle of elevation to nearby buildings	NA			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	10 meters	Height	10 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance			Description
Camp	300 m SE			Total Joslyn workers camp
Name	Type	Traffic Volume	Distance (m)	Description
Roadway	Access road	Very Low	3 m	Dirt Road

Table 3.0 – Local Source Information

Area Topographic Map

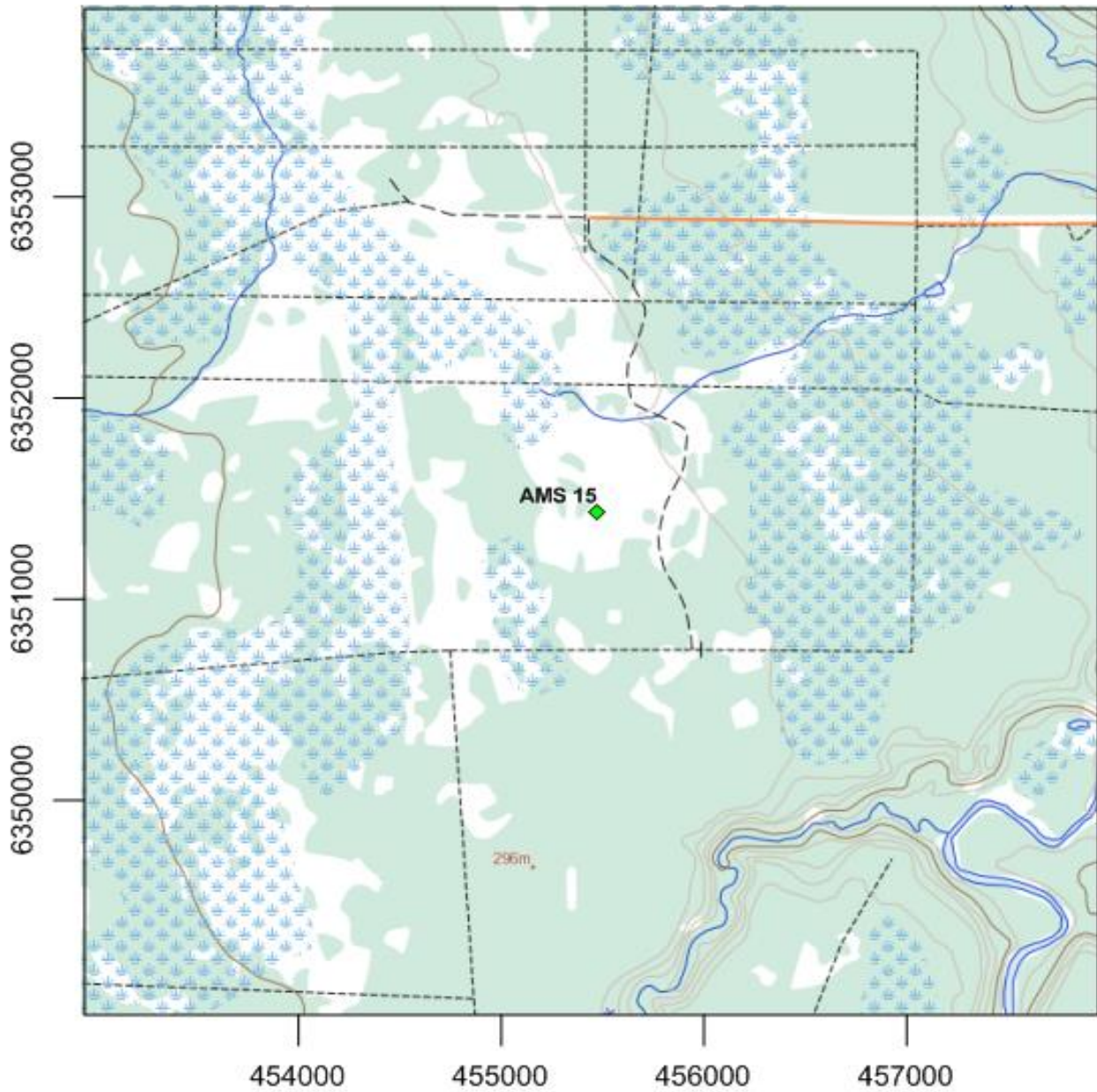


Figure 2.0 – Area Topographic map showing AMS 15 – CNRL Horizon Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 15 – CNRL Horizon Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Environ looking north



Figure 4.2 – Environ looking east



Figure 4.3 – Environ looking south



Figure 4.4 – Environ looking west



Figure 4.5 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.6 – Instrument rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Thermo Instruments	43i	710321322	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1151680032	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	Thermal oxidizer	CD Nova	CDN 101	531	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		1
NOx	Nitrogen oxide	Thermo Instruments	42i	710321429	0-1000ppb	Chemiluminescence	4	1
THC	Total Hydrocarbon	Thermo Instruments	51i-LT	1327059295	0-50ppm	Gas Chromatography and Flame Ionization	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	E-2020	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
Temp/RH	External temp/ Relative Humidity	Vaisala	HMP155	J2310016	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	1
WS	Wind Speed	Met One	010C-1	J4337	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	J2732	0-360 degrees	Resistive (potentiometer)	10	
GR	Global radiation	Met One	NA	38244				
PM 10	Integrated sampling	Thermo Instruments	2025iD	2000I2 04961409	NA	Inertial Separator and Cartridge Filter	2	
PM 10	Integrated sampling	Thermo Instruments	2025iD	2000I2 04891408	NA	Inertial Separator and Cartridge Filter	2	
PC	Precip tipping bucket	Met One	8" rain gauge 0.01"	N15053	NA		2	
VOC	Canister	TISCH		1030			4	1

Table 4.0 - Analytical Equipment in AMS 15

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	11040
ZAG	Zero Air Generator	Teledyne API	T701	1004
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	National trailer	NA	NA
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	1223

Table 5.0 - Support Equipment in AMS 15

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
CNRL Horizon (AMS 15)

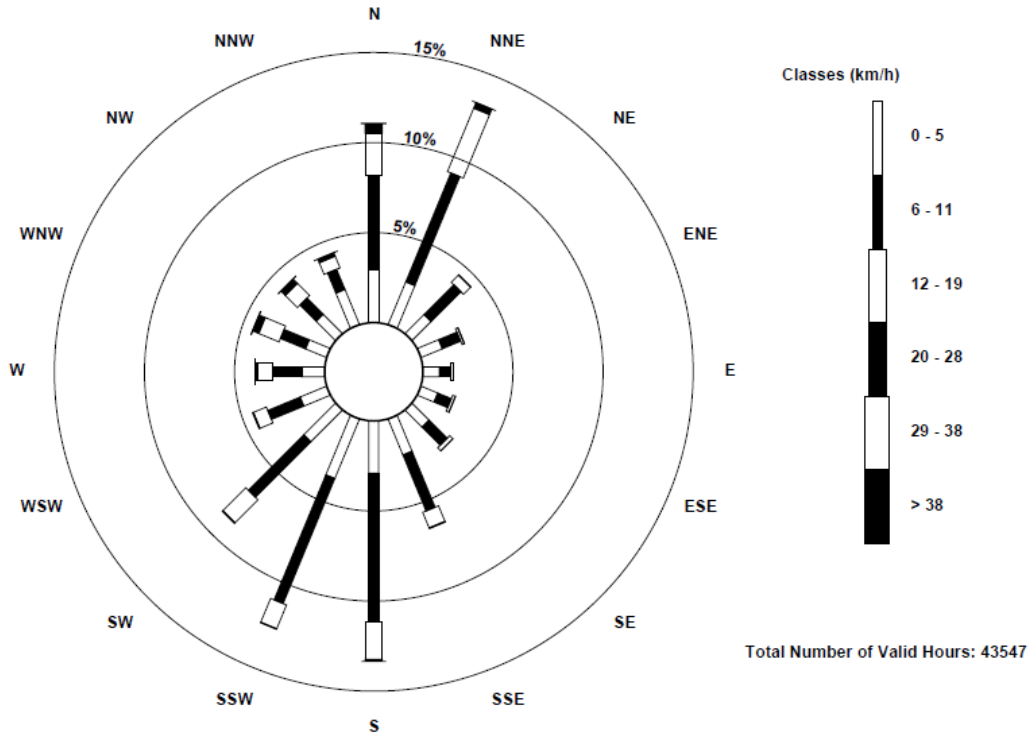


Figure 5.0 – AMS 15 Five Year Wind Rose



Figure 6.0 – Plan view sketch showing a 500m radius around CNRL Horizon Station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 16 – Shell Muskeg River

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

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WBEA AMBIENT AIR MONITORING NETWORK																																						
WBEA Program - X														Enhanced Deposition Program - X																								
CONTINUOUS MONITORED PARAMETERS																				INTEGRATED SAMPLING																		
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECI	EC/OC	SASS	Dichot	PM ₁₀	PM _{2.5}	VOC	PAH	PRECI			
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X														
Lower Camp	3	Meteorological																	X	X	X	X	X															
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X															
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X		X	X			X					X	X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X		X	X		X						X	X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X		X	X	X	X	X											
Barge Landing	9	Attribution			X								X						X	X	X		X	X		X									X			
Lower Camp B	11	Compliance	X	X									X						X	X	X		X	X										X		X	X	
Fort McKay South	13	Attribution	X		X	X	X	X	X	X		X	X						X	X	X		X	X								X	X	X	X	X	X	X
Anzac	14	Attribution	X		X	X	X	X	X	X		X	X	X	X				X	X	X		X	X	X	X	X					X	X	X	X	X	X	X
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X		X	X	X		X					X		X				
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X		X	X		X						X						
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X	X		X						X					X	X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X		X	X	X	X	X				X	X			X	X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X			X							X	X	X		X	X														
Brion Energy	20	Compliance	X	X			X	X	X			X							X	X	X		X	X		X												
Cenovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X		X	X														
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X		X	X														
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X		X	X														
HEMP	104	Portable-Health			X								X	X	X				X	X	X		X	X														

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

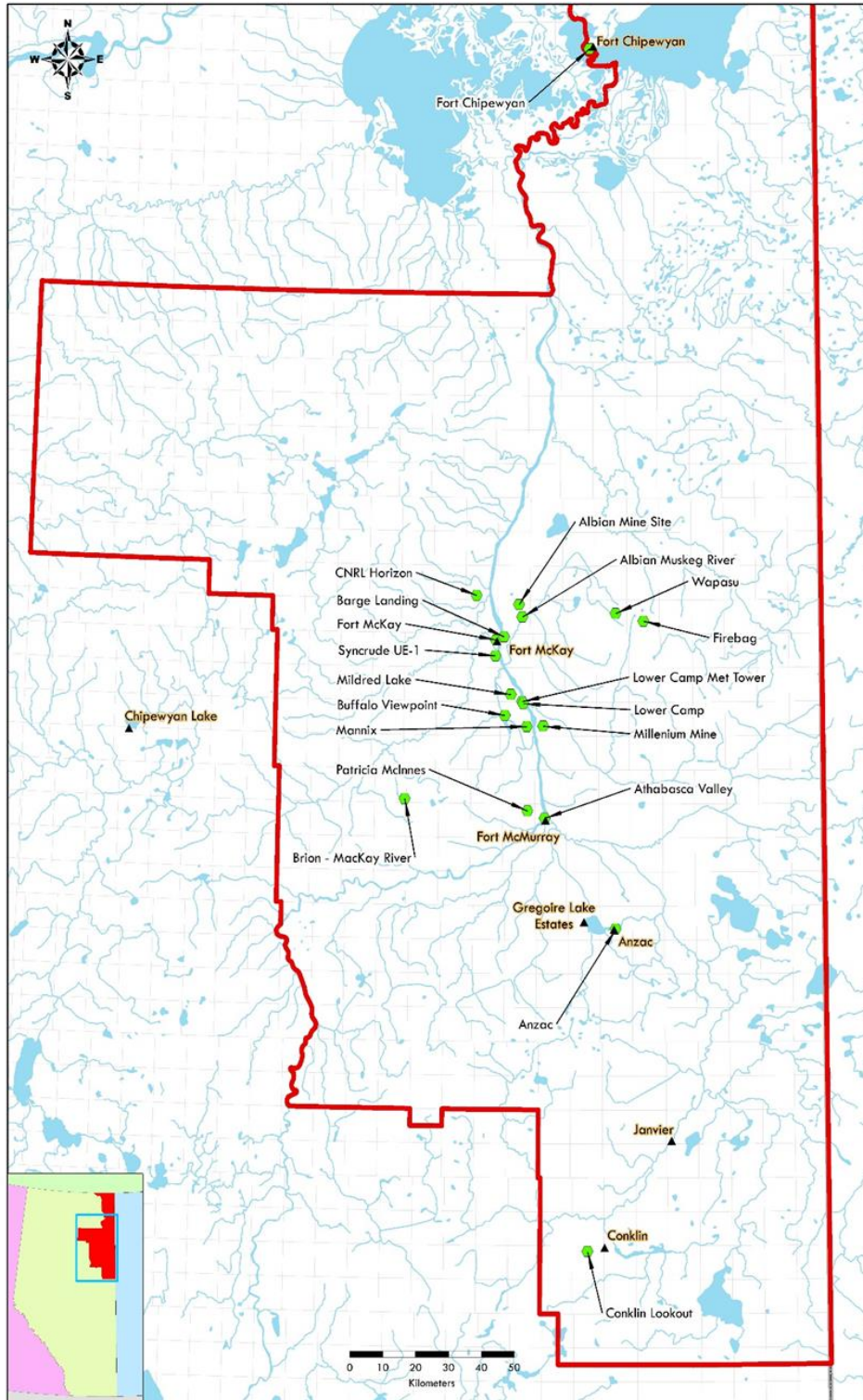


Figure 1.0 – WBEA Monitoring Network Sites

AMS 16 – Shell Muskeg River Station Details

General Site Information

The Shell Muskeg River is a compliance station, located about 4 km southeast of the decommissioned Albanian Mine Site (AMS 10), and commenced operation on February 10, 2009.

The Shell Muskeg River station contains analyzers that continuously measure NO, NO₂, NO_x SO₂, THC, PM2.5, wind speed and direction, and temperature. PM10 is measured intermittently.

Item	Description			
Station ID	AMS 16			
Station Name	Shell Muskeg River			
General description	Located approximately 250m south of Shell MRM plant site			
Community	NA			
Station Coordinates	57°14'56.73"	North	111°30'31.15"	West
Station elevation	285			Meters
Station Address	NA			
Station Type	Compliance			
Initial Commission Date	February 10, 2009			
Area Land Use	Industrial			
Angle of elevation to nearby buildings	NA			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	10 meters	Height	10 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	20 meters		
	Type	Stationary tower		
	Position	NE side of the station		
Station Install Date	NA			
Station Origin	Previously AMS 10			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description		
Communications tower and building	70m	Radio/cell tower and building		
Shell - Muskeg River Mine	300 m north	MRM's extraction and tailings operations.		
Name	Type	Traffic Volume	Distance (m)	Description
roadway	Plant site access	high	300	Asphalt road
roadway	Station access	low	30	Gravel road

Table 3.0 – Local Source Information

Area Topographic Map

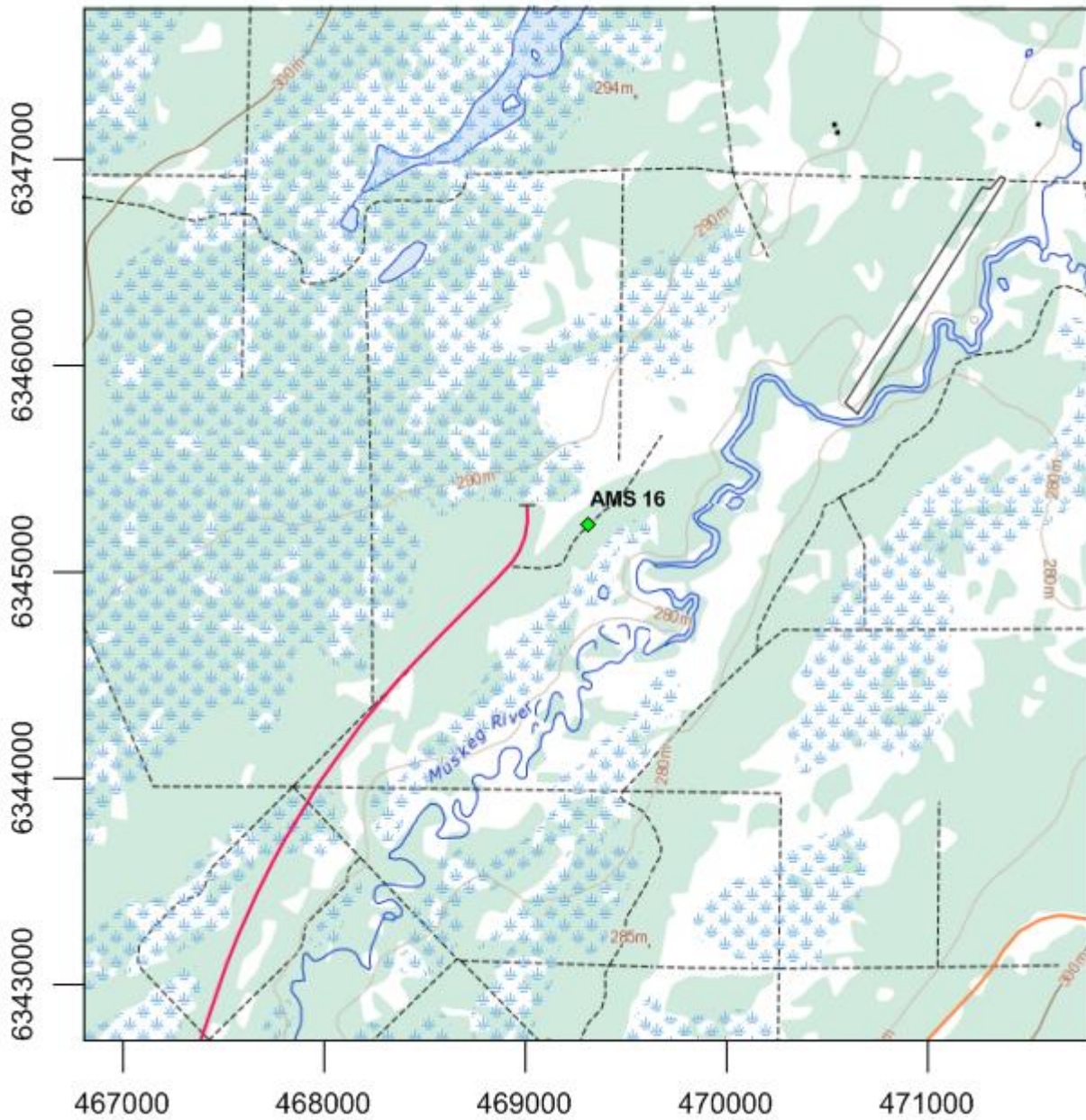


Figure 2.0 – Area Topographic map showing AMS 16 – Shell Muskeg River Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 16 – Shell Muskeg River Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station looking north



Figure 4.1 – Environ looking north



Figure 4.2 – Environ looking east



Figure 4.3 – Environ looking south



Figure 4.4 –Environ looking west



Figure 4.5 – Instrument racks



Figure 4.6 – Indoor manifold setup and Outdoor sample inlet



Figure 4.7 – PM 10, Integrated Partisol Samplers

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	3492
ZAG	Zero Air Generator	Teledyne API	T701	2155
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	National Trailer	NA	2N9MFY3614
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	493

Table 5.0 - Support Equipment in AMS 16

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2012-2016

Wind Speed (WS) - km/h
Shell Muskeg River (AMS 16)

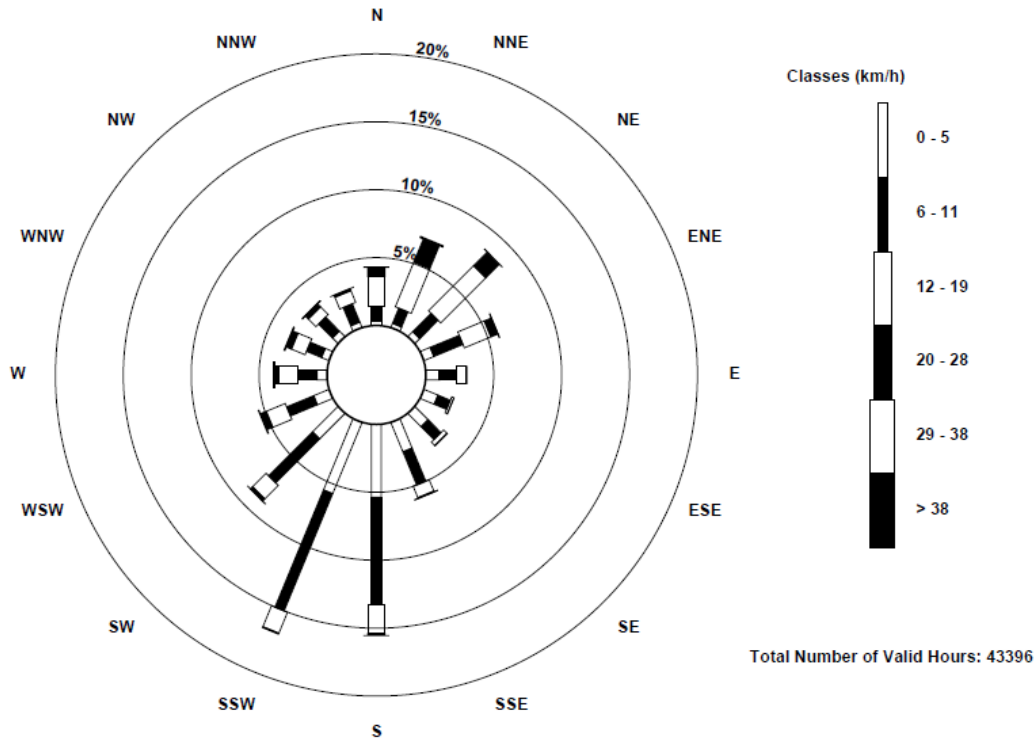


Figure 5.0 – AMS 16 Five Year Wind Rose



Figure 6.0 – Plan view sketch showing a 500m radius around Shell Muskeg River station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 17 – Wapasu Creek

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 3 to 10 air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness and vertical temperature gradient. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																								
WBEA Program - X														Enhanced Deposition Program - X																										
CONTINUOUS MONITORED PARAMETERS														INTEGRATED SAMPLING																										
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OC	SASS	Dichol	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP					
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Mildred Lake	2	Compliance	X	X									X						X	X	X	X	X	X																
Lower Camp	3	Meteorological																	X	X	X	X	X																	
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X																	
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X																	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X				X	X	X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X					X	X	X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X	X		X								X	X	X	X	X	X	X	X	X												
Barge Landing	9	Attribution			X								X						X	X	X	X	X	X			X										X			
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X													X	X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X	X		X	X						X	X	X	X	X	X								X	X	X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X	X	X	X	X	X		X	X						X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	
Shell Muskeg River	16	Compliance	X			X	X	X	X	X		X	X						X	X	X	X	X	X			X					X								
Wapasu Creek	17	Compliance	X	X		X	X	X	X	X		X	X						X	X	X	X	X	X			X											X	X	
Conklin	18	Background	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X				X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X	X		X	X						X	X	X	X	X	X																
Brion Energy	20	Compliance	X	X			X	X	X	X		X							X	X	X	X	X				X													
Cenovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X	X		X							X	X	X	X	X																	
Stat Oil Leismer	501	Portable-Compliance	X	X		X	X	X	X	X									X	X	X	X	X																	
ConocoPhillips Surmont	502	Portable-Compliance	X	X		X	X	X	X	X									X	X	X	X	X																	
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X																	

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

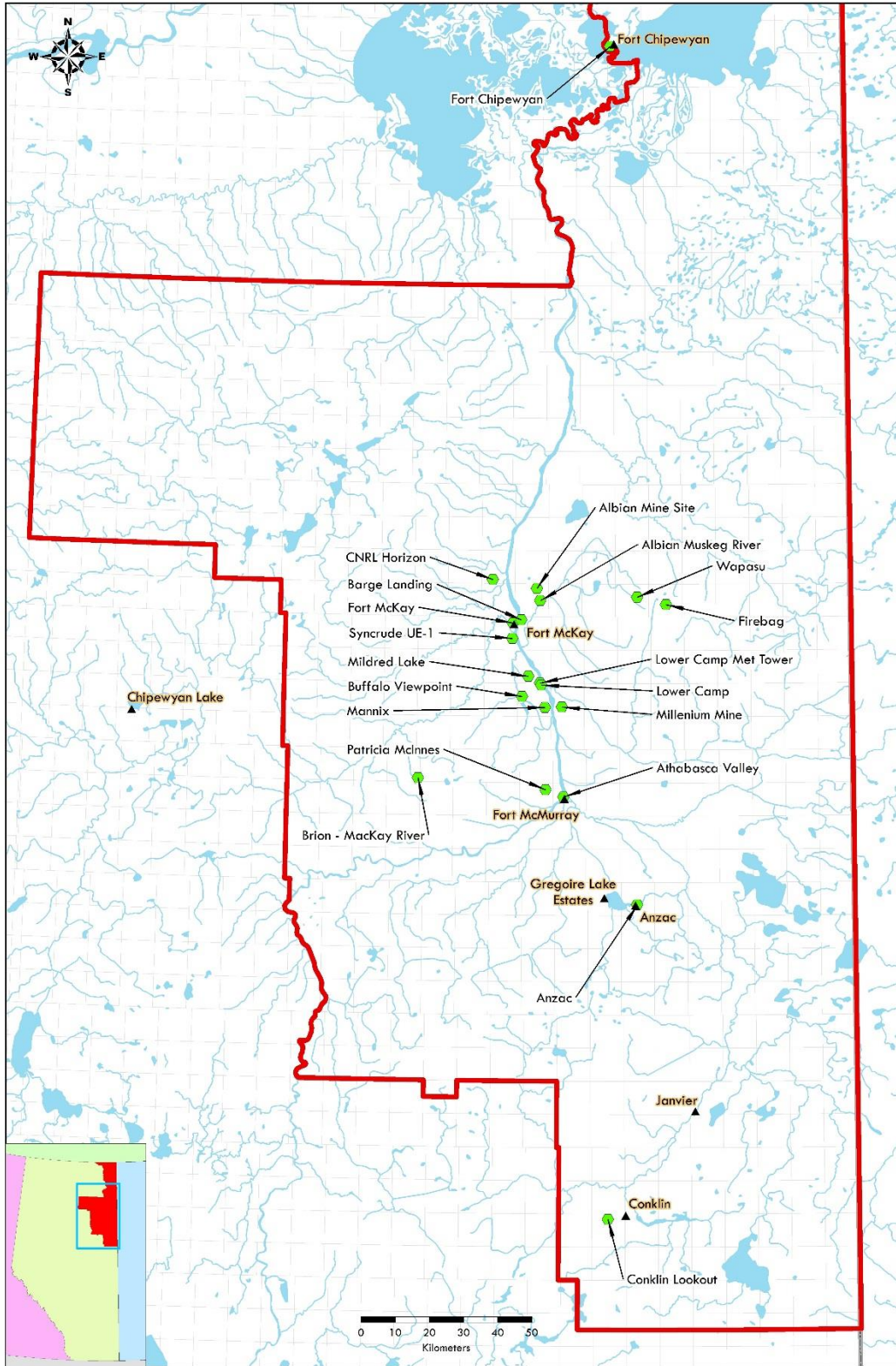


Figure 1.0 – WBEA Monitoring Network Sites

AMS 17 – Wapasu Creek Station Details

General Site Information

The Wapasu station was installed in 2013 as a compliance station to monitor for Husky. It is situated north of the Wapasu camp, near the 16-22 water pump house.

Item	Description			
Station ID	AMS 17			
Station Name	Wapasu Creek			
General description	The site is located on the north of the Wapasu Camp.			
Community	NA			
Station Coordinates	57°15'33.11"	North	111° 2'18.90"	West
Station elevation	491			Meters
Station Address	NA			
Station Type	Compliance			
Initial Commission Date	NA			
Area Land Use	Oil sands lease / Industrial			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	40 meters	Height	15 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters	Type	Aluma crank-up tower
	Position	Attached to North end of monitoring shelter		
Station Install Date	November 2013			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description		
Abandoned Well	To the East approximately 6 metres	Well Abandoned, Capped		
Building	To the North approximately 310 metres	Pump House		
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Access road	low	5	Gravel access roads
Canterra	Main Road	High	1560	Gravel Road

Table 3.0 – Local Source Information

Area Topographic Map

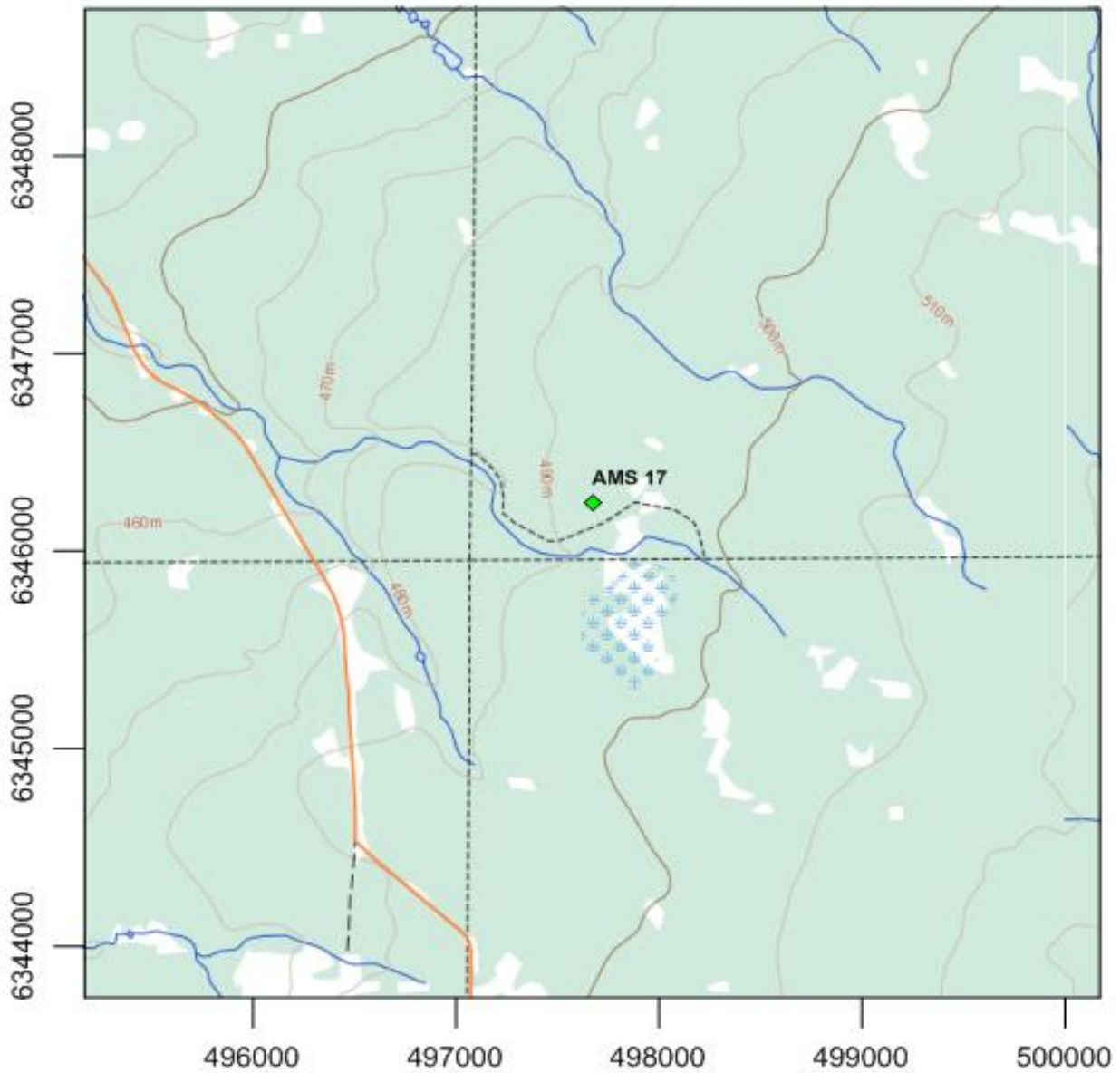


Figure 2.0 – Area Topographic map showing AMS 17 – Wapasu Creek Station

Aerial Photo

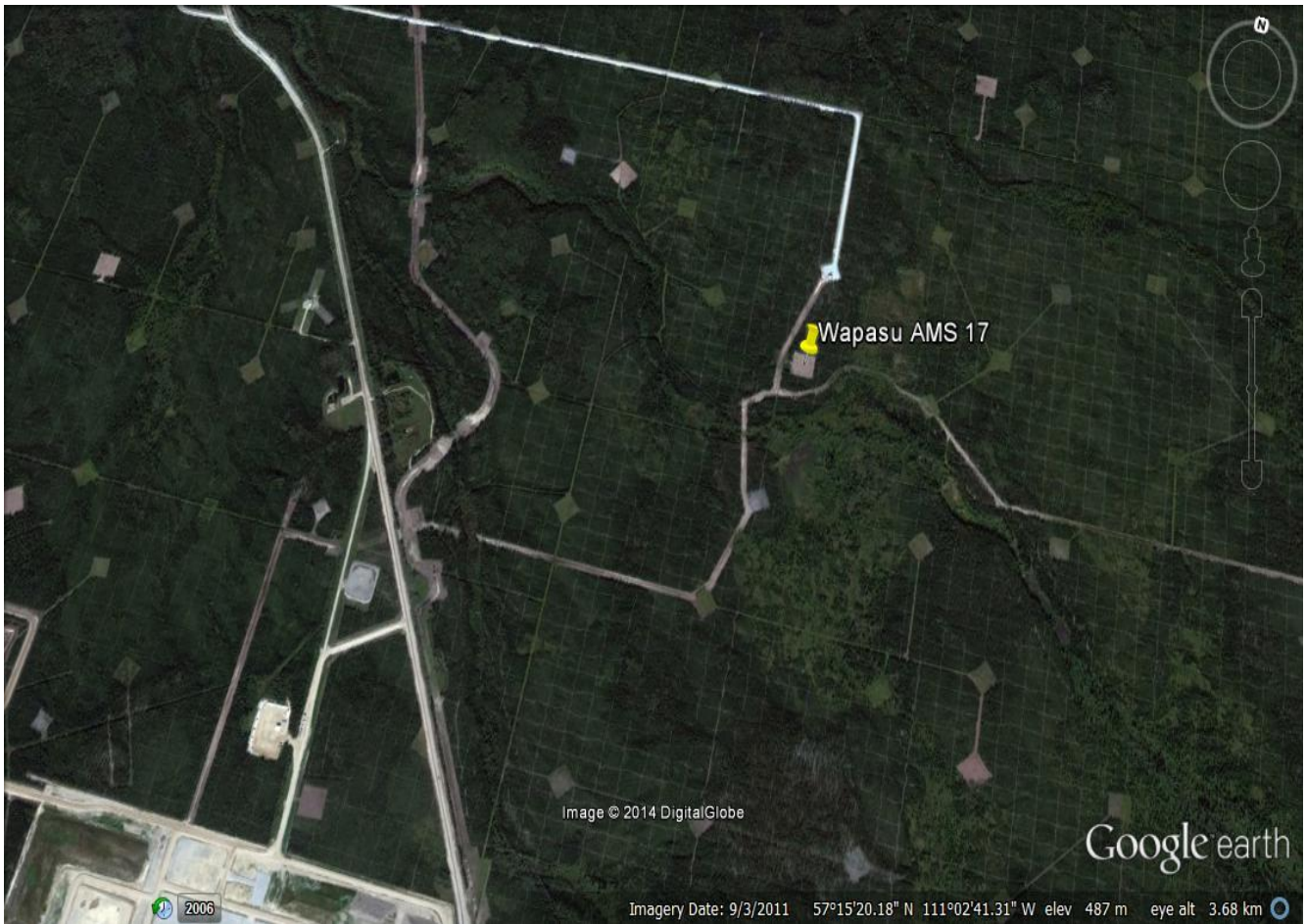


Figure 3.0 – Aerial photo showing AMS 17 - Wapasu Creek Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Sampling Deck



Figure 4.2 – High Volume PAH Sampler



Figure 4.3 – Wind Profiler Remtech



Figure 4.4– Continuous precipitation monitoring instrument (Pluvio)

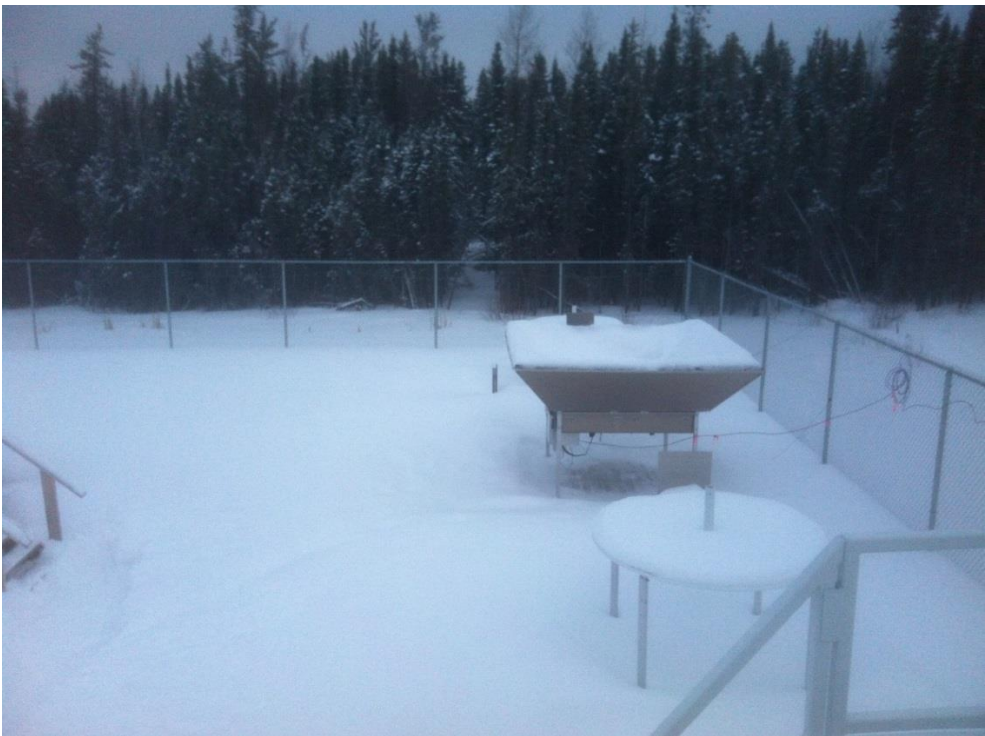


Figure 4.5 – Environ looking north



Figure 4.6 – Environ looking east



Figure 4.7 – Environ looking south



Figure 4.8 – Environ looking west



Figure 4.9 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.10 – Instrument Racks



Figure 4.11 – Aethalometer 22 rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
H2S	Hydrogen Sulfide	Thermo Electron Instruments	450i	1218153583	0 – 100 ppb	Pulsed Fluorescence	4	1
SO2	Sulfur Dioxide	Thermo Electron Instruments	43i	1218153459	0 – 1000 ppb	Pulsed Fluorescence	4	1
NOx	Nitrogen Dioxide	Teledyne API	T200	833	0 – 1000 ppb	Chemiluminescence	4	1
THC	Total Hydrocarbons	Thermo Electron Instruments	51i	1218153352	0 – 50 ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	API	T400	824	0-500ppm	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Electron Instruments	SHARP	CM-2390	0-100ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
AE22	Aethalometer	Magee Scientific	AE22-ER	979:0906			4	1
Dicot	PM2.5 Fine and Coarse	Thermo Electron Instruments Partisal	2000i-D	2000ID2 01251103	NA	Inertial Separator and Cartridge Filter	2	
PAH	PAH			N55326	NA	Canister / Filter Sampler	2	
Pluvio	Rain Gauge			356338			2	
	Wind Profiler	Remtech						
WS	Wind Speed	RM Young 8500	010C-1	P10039		Chopped optical	10	
WD	Wind Direction	RM Young 8500	020C-1	P19942		Resistive (potentiometer)	10	
Temp/RH	Temperature/relative Humidity	HMP 155C		G4330048		Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.		

Table 4.0 - Analytical Equipment in AMS 17

Name	Description	Make	Model	Serial Number
Datalogger	Data Acquisition System	Campbell Scientific	CR3000	2633
CR6 Datalogger	Data Acquisition System, used for AE22	Campbell Scientific	CR6	884
Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	997
ZAG	Zero air generator	Teledyne API	T701	4427
HVAC	Air Conditioner/Heater. Wall mount unit.	BARD	N/A	N/A
Shelter	Air monitoring trailer	ITB	N/A	ITB1215686

Table 5.0 - Support Equipment in AMS 17

Wind Rose



Wood Buffalo Environmental Association
Wind Rose December 2013 - December 2016

Wind Speed (WS) - km/h
Wapasu (AMS 17)

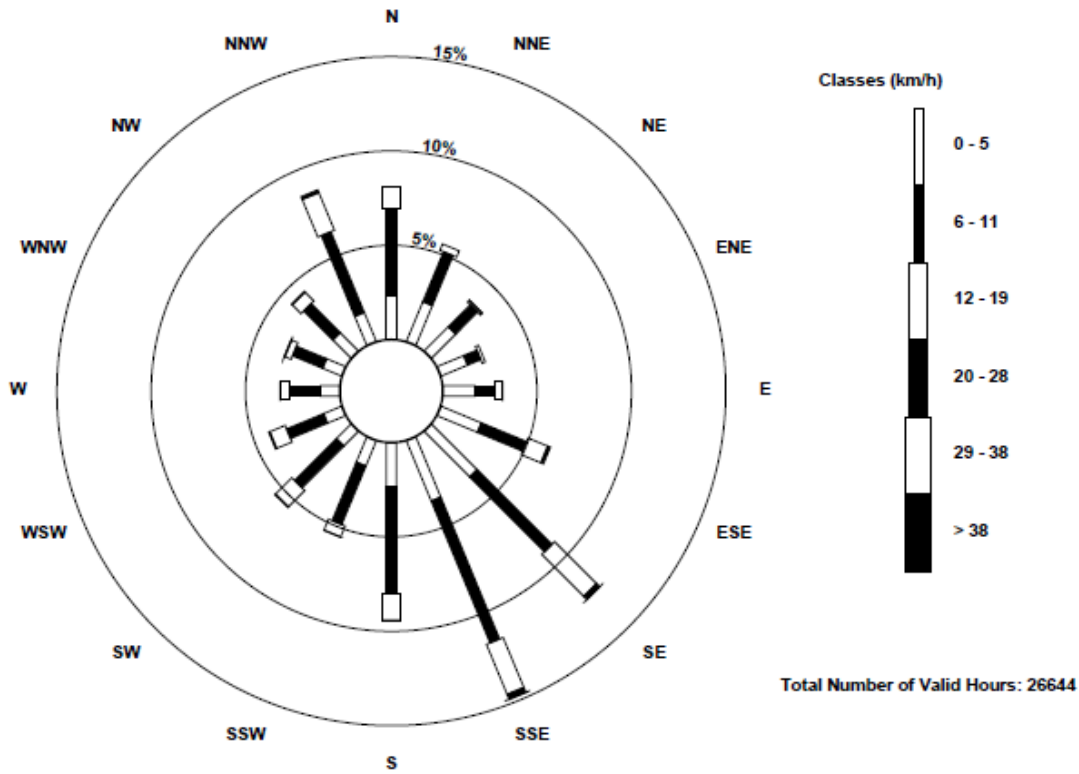


Figure 5.0 – AMS 17 Three Year Wind Rose

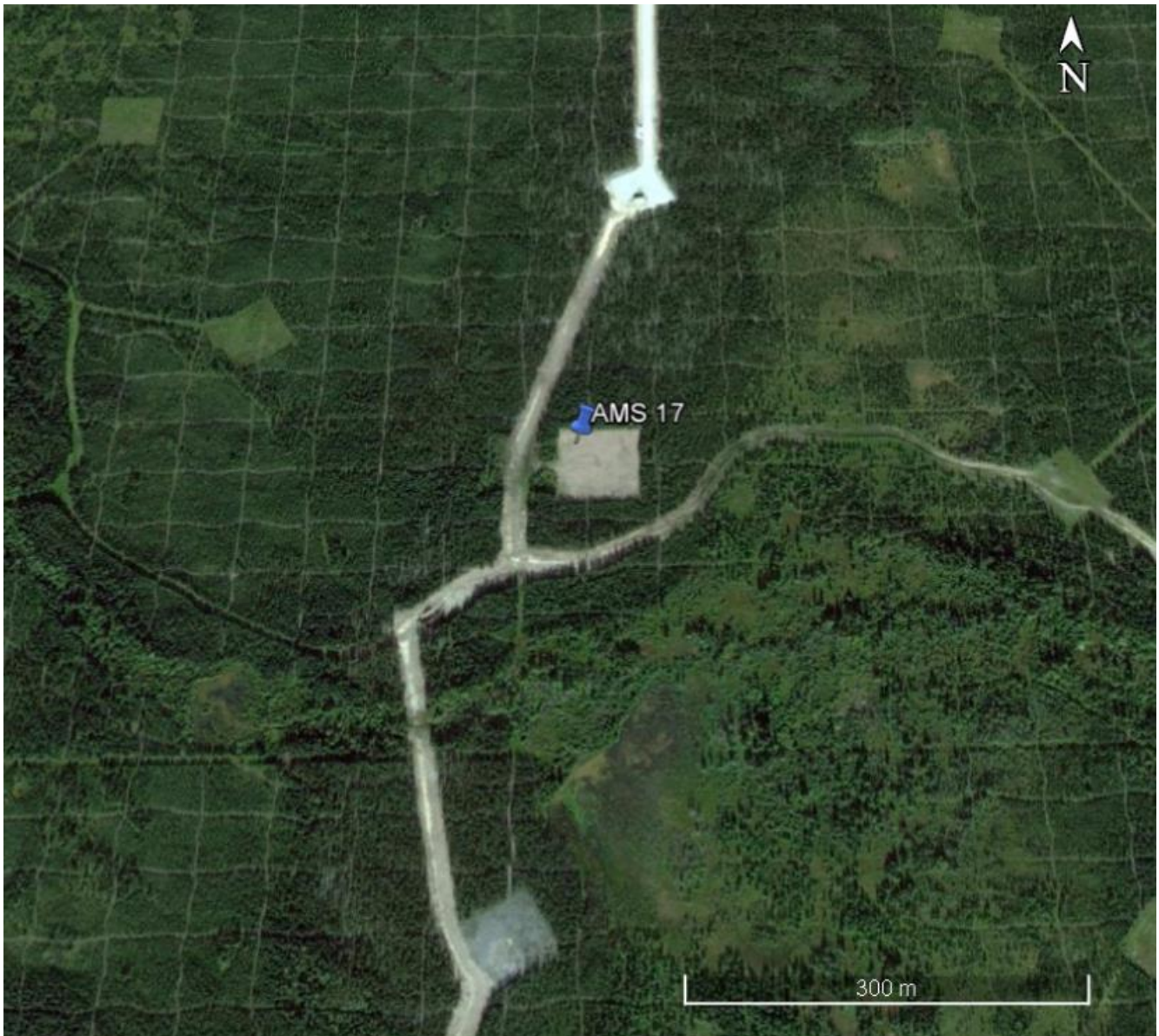


Figure 6.0 – Plan view sketch showing a 500m radius around Wapasu Creek station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 18 – Stony Mountain

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

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WBEA AMBIENT AIR MONITORING NETWORK																																							
WBEA Program - X														Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS														INTEGRATED SAMPLING																									
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/O ₃	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP				
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X					X	X	X		X	X																
Lower Camp	3	Meteorological																	X	X	X	X	X																
Buffalo Viewpoint	4	Compliance	X	X									X					X	X	X		X	X																
Mannix	5	Compliance/Meteorological	X	X									X					X	X	X	X	X	X											X		X	X		
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X				X						X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X				X						X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X						X	X	X		X	X		X	X	X	X											
Barge Landing	9	Attribution			X								X					X	X	X		X	X			X									X				
Lower Camp B	11	Compliance	X	X									X					X	X	X		X	X											X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X	X		X	X					X	X	X		X	X										X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X	X		X	X	X		X	X		X	X	X	X	X					X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X					X	X	X		X	X		X		X						X		X				
Shell Muskeg River	16	Compliance	X			X	X	X	X			X	X					X	X	X		X	X			X								X					
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X					X	X	X	X	X	X			X								X					
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X							X	X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X					X	X	X		X	X																
Brion Energy	20	Compliance	X	X			X	X	X				X					X	X	X		X	X			X													
Cenovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X						X	X	X		X	X																
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X									X	X	X		X	X																
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X									X	X	X		X	X																
HEMP	104	Portable-Health			X								X	X	X			X	X	X		X	X																

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

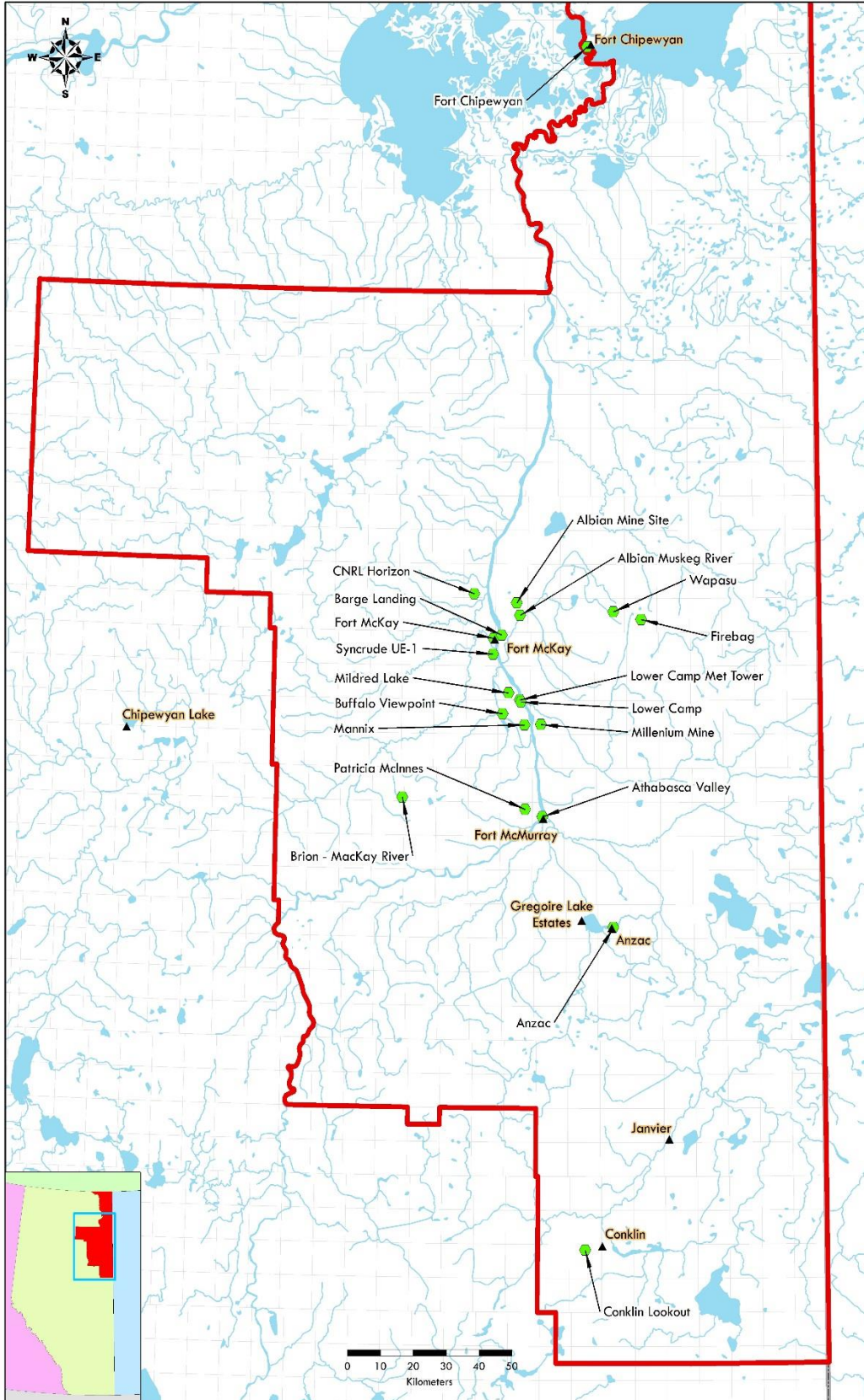


Figure 1.0 – WBEA Monitoring Network Sites

AMS 18- Stony Mountain Station Details

General Site Information

Stony Mountain is a WBEA air monitoring station located 5.5 km west of the community of Conklin, AB, at an elevation of 673 m, near a provincial fire tower.

Item	Description			
Station ID	AMS 18			
Station Name	Stony Mountain			
General description	Situated at approximately 100 m SE of the ESRD fire watch tower.			
Community	Conklin			
Station Coordinates	55°37'17.07"	North	111°10'21.67"	West
Station elevation	673			Meters
Station Address	1-33-076-08 W4			
Station Type	Background			
Initial Commission Date	NA			
Area Land Use	Crown land			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	10 meters	Height	10 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	June 2015			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance	Description		
Fire watch tower	100m NW of the station	Fire lookout tower, operated by ESRD.		
Communication tower	30m east of the station	Telus communication tower		
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Access road	low	10 m	Dirt/ sandy road

Table 3.0 – Local Source Information

Area Topographic Map

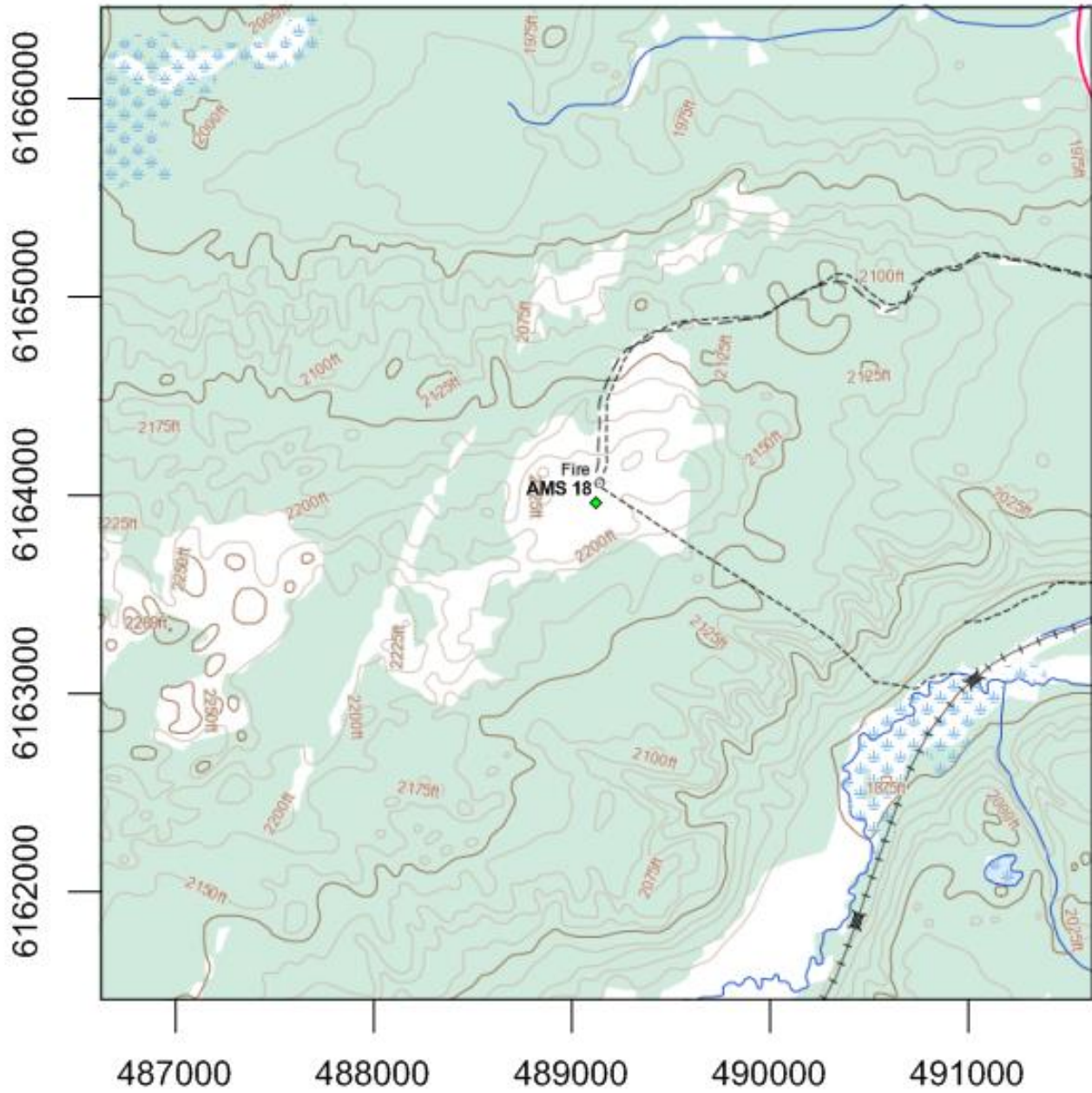


Figure 2.0 – Area Topographic map showing AMS 18 - Stony Mountain Station

Aerial Photo

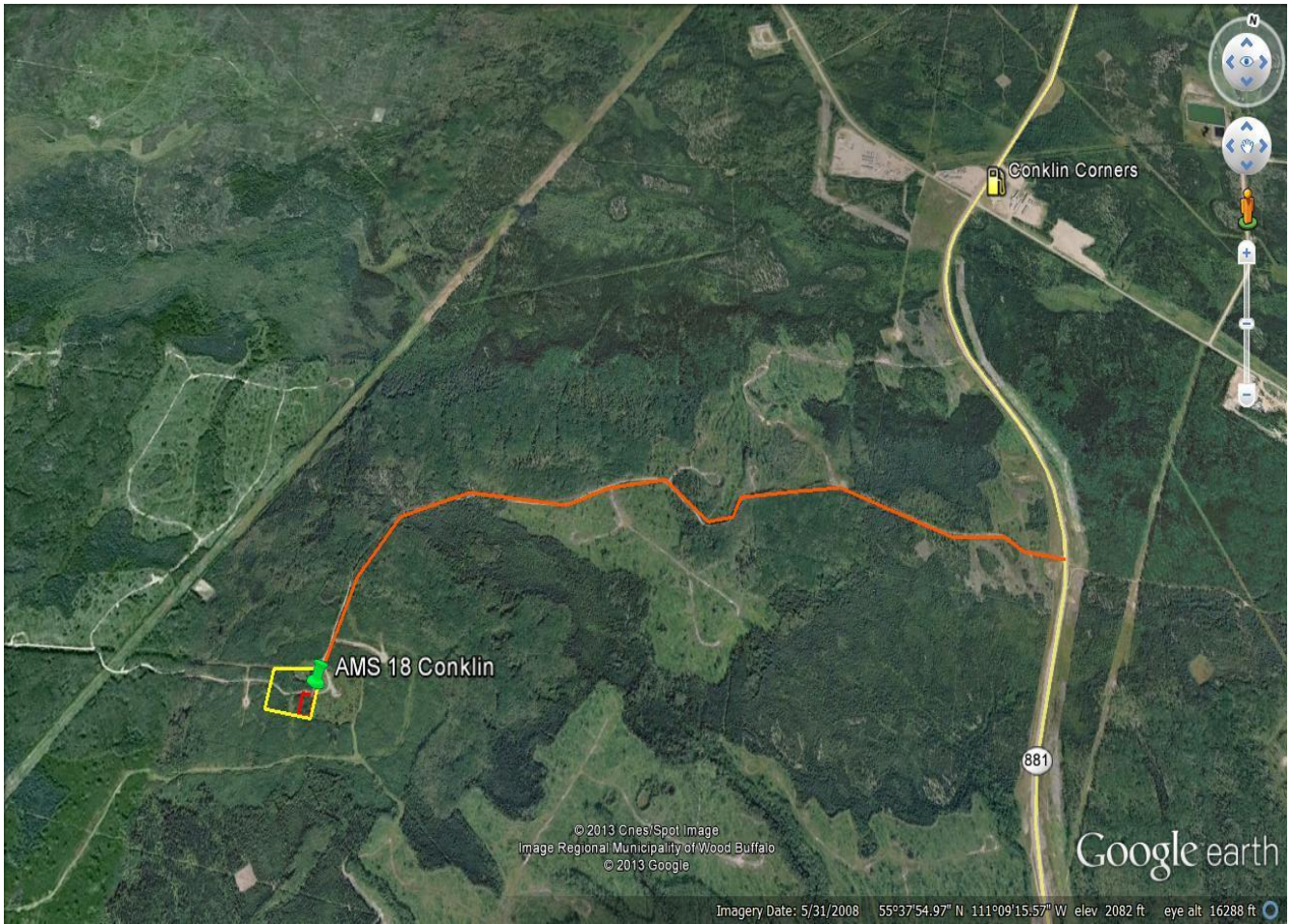


Figure 3.0 – Aerial photo showing AMS 18 – Stony Mountain Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Environ looking south



Figure 4.2 – Environ looking north



Figure 4.3 Environ looking east



Figure 4.4 – Environ looking west



Figure 4.5 – Indoor sample manifold setup and outdoor sample inlet



Figure 4.6 – Compound with east-west orientation



Figure 4.7 – Compound with north-south orientation



Figure 4.8 – Instrument racks



Figure 4.9 – Integrated sampling equipment deck



Figure 4.10 – Continuous precipitation monitoring instrument (Pluvio)

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulphur Dioxide	Thermo Instruments	43i	JC1501301453	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1336160090	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	Converter	CD Nova	CDN 101	522	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		1
NOx	Nitrogen Dioxide	Thermo Instruments	42i	1336160088	0-1000ppb	Chemiluminescence	4	1
NMHC	Non-Methane Hydrocarbons	Thermo Instruments	55i-LT	1505164381	0-50ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	Thermo Instruments	49i	1501663733	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	4048/E-781	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
AT/RH	Ambient temp/Relative humidity	Vaisala	HMP155	K1720033	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.		
WS	Wind Speed	Met One	010C-1	RM8126	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	R14654	0-360 degrees	Resistive (potentiometer)	10	
GR	Global radiation	Met One	NA	38008			4	
PM 2.5	Integrated sampling	Thermo	2025iD	202D1W201651503	NA	Inertial Separator and Cartridge Filter	2	
LW	Leaf wetness sensor	Decagon Devices	LWS					
EC VOC	Integrated sampling	Xonteck		6229	NA	Canister Sampler	4	

EC Pluvio				363526	NA		2
EC SASS pump box	Integrated sampling	Met One		R20400	NA		2
EC SASS Shield	Integrated sampling	Met One		62688	NA		2
EC SASS Control Box	Integrated sampling	Met One		R20401	NA		2
EC PUF	Integrated sampling	TISCH	TE-303	1614	NA	Canister / Filter Sampler	2
EC DICOT	Integrated sampling	Thermo Instruments		2001D201341103	NA	Inertial Separator and Cartridge Filter	2
EC DICOT	Integrated sampling	Thermo Instruments		2001D201181103	NA	Inertial Separator and Cartridge Filter	2

Table 4.0 - Analytical Equipment in AMS 18

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	9035
ZAG	Zero Air Generator	Teledyne API	T701	5610
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	ITB	NA	ITB-1416019
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	1222

Table 5.0 - Support Equipment in AMS 18

Wind Rose



Wood Buffalo Environmental Association
Wind Rose August 2015 - December 2016

Wind Speed (WS) - km/h
Stony Mountain (AMS 18)

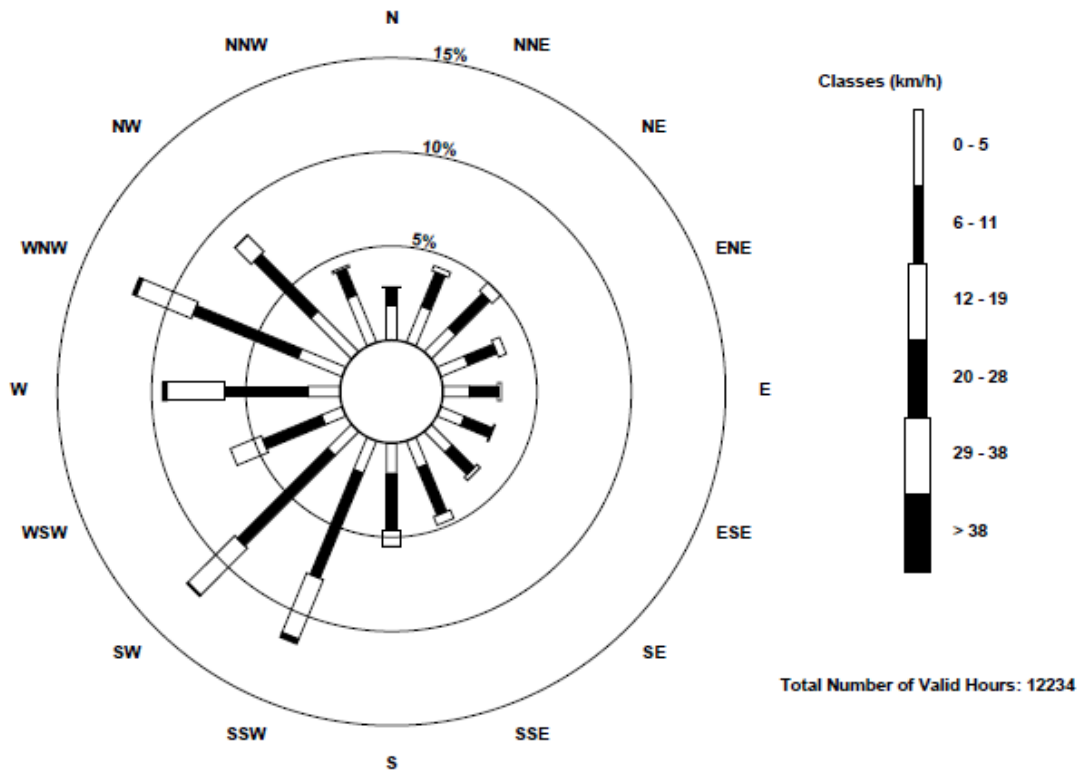


Figure 5.0 – AMS 18 16 Months Wind Rose

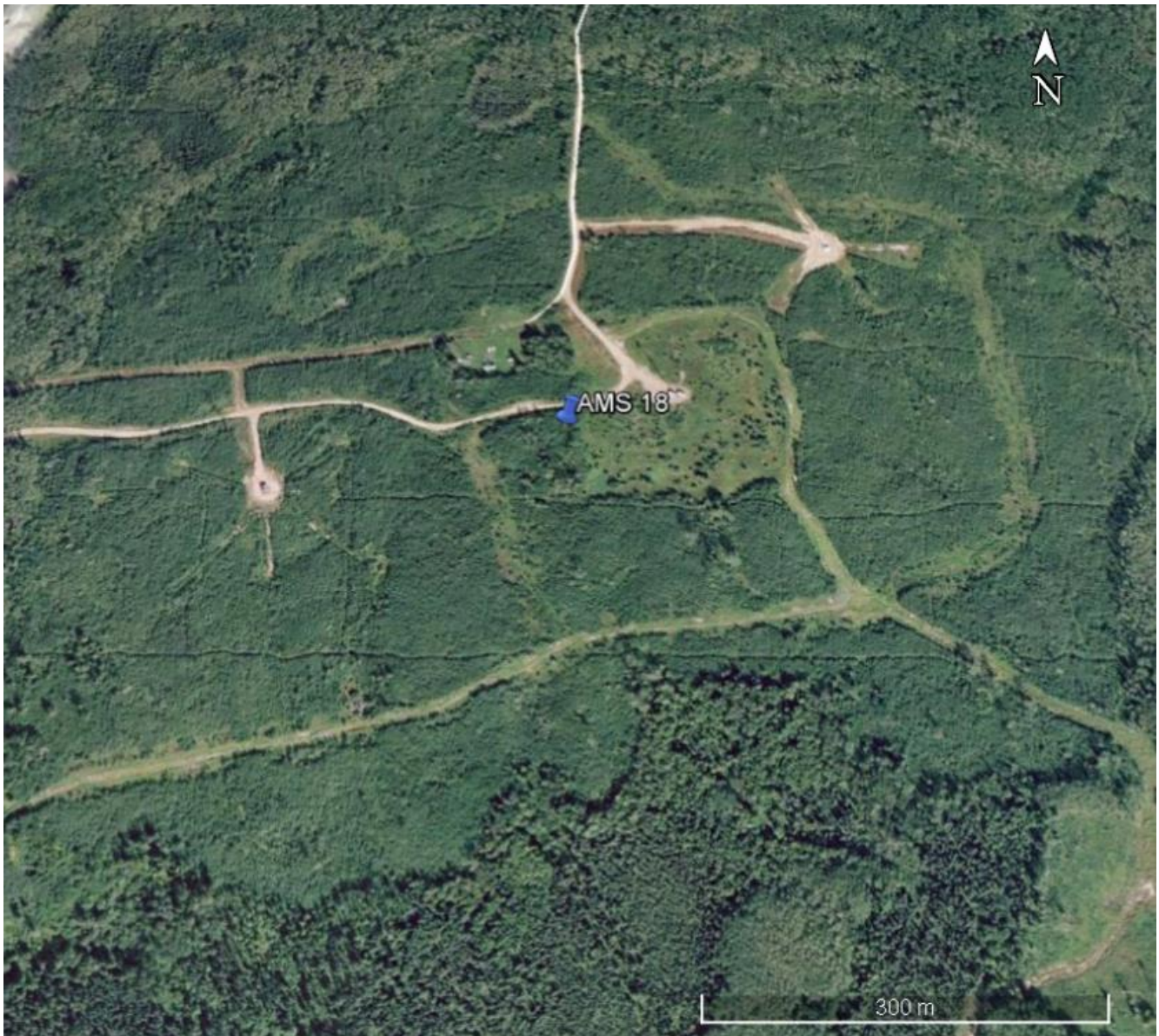


Figure 6.0 – Plan view sketch showing a 500m radius around Stony Mountain station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 19 – Firebag

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.



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WBEA AMBIENT AIR MONITORING NETWORK																																							
WBEA Program - X														Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS																																							
INTEGRATED SAMPLING																																							
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP				
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X															
Lower Camp	3	Meteorological																	X	X	X	X	X																
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X																
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X																
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X						X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X						X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X												
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X													
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X																
Fort McKay South	13	Attribution	X		X	X	X	X	X	X		X	X						X	X	X	X	X										X	X	X	X	X		
Anzac	14	Attribution	X		X	X	X	X	X	X		X	X	X	X				X	X	X	X	X	X	X	X	X						X	X	X	X	X		
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X	X	X	X						X	X					
Shell Muskeg River	16	Compliance	X			X	X	X	X			X	X						X	X	X	X	X	X			X												
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X												
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X												
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X																
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X												
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X																
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X																
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X																
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X																

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.



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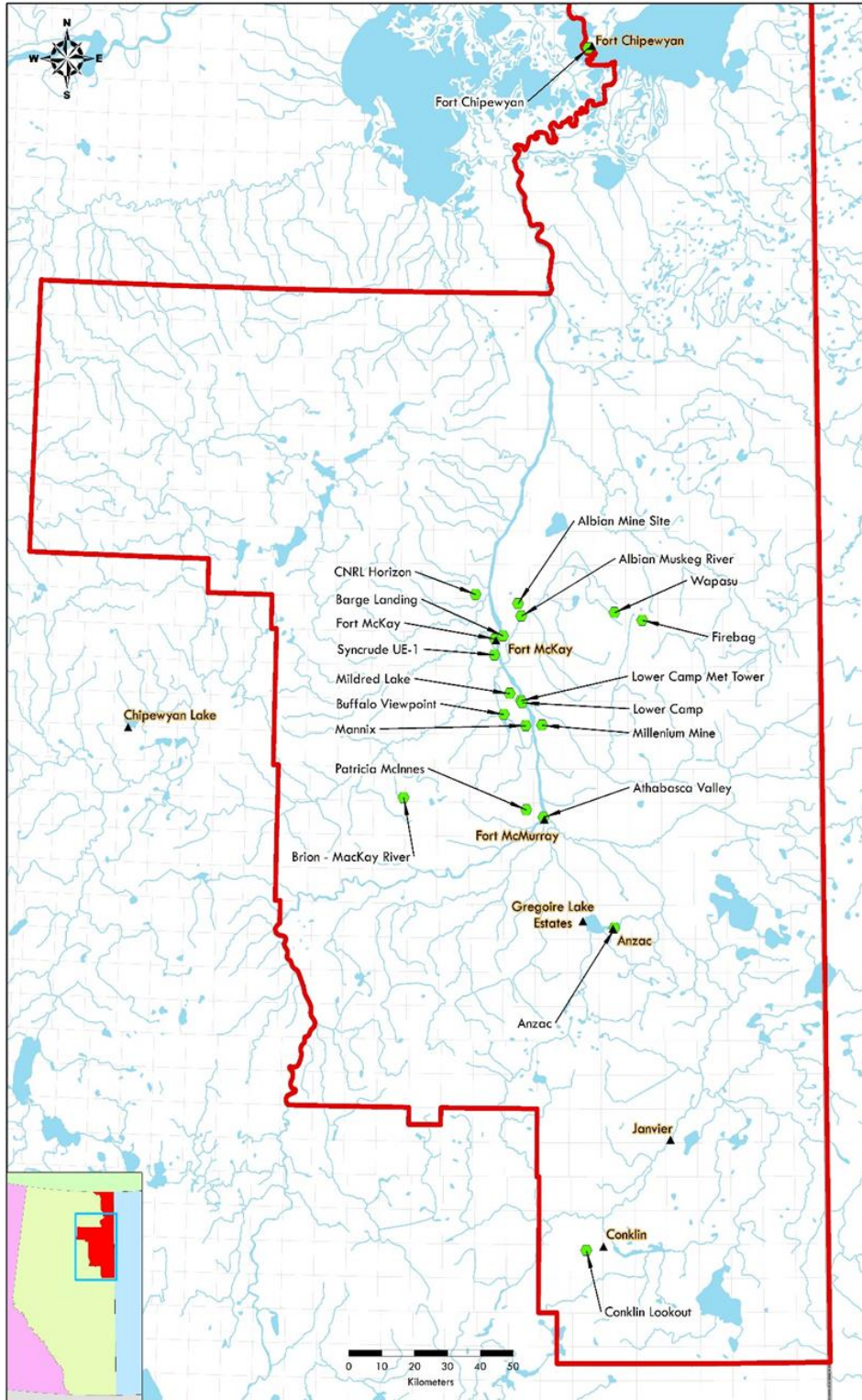


Figure 1.0 – WBEA Monitoring Network Sites



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AMS 19 – Firebag Station Details

General Site Information

The Firebag station was installed in 2014 as an Industrial station to monitor in the region of the Suncor Firebag facility. It is situated by the Noralta Lodge Camp.

Item	Description
Station Information	
Station ID	AMS 19
Station Name	Firebag
General description	The site is located northeast of the Noralta Lodge
Station Install Date	July 1, 2014
Station Origin	Purchased new
Station Commissioned by	WBEA
Site Location Information	
Site Preparation	Level limestone pad
Site Preparation completed by	Suncor
Closest Community	N/A
Municipality	Regional Municipality of Wood Buffalo
Municipal Population	125,032 - 2015
Station Coordinates	57°14'14.34"N North 110°54'0.16"W West
Elevation	587 m
Station Address	NA
Station Type	Industrial
Area Land Use	SAGD
Angle of elevation to nearby buildings	0 degrees
Average building height in area	NA
Airflow Restrictions (yes/no)	North no East no South no West no
Nearest Tree	Distance 10 meters Height 5 meters
Sample Manifold Type	All glass manifold system
Meteorological Tower Information	Height 10 meters Type Aluma crank-up tower Position Attached to South end of monitoring shelter

Table 2.0 – Station Information

Local Source Information				
Type	Distance	Description		
Water treatment plant	123metres East of the monitoring station	Water treatment plant for Noralta Lodge		
Water treatment plant holding ponds	10m SE of station	2 ponds with water		
Noralta Lodge	230m SE of station	Housing Camp		
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Access road	low	2m	Gravel access roads
Bus Parking	Parking Lot	Medium	56m	Buses parking lot
Roadway	Access road	High	70m	Main Road around the camp

Table 3.0 – Local Source Information



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Station Number and Name	AMS 19 - Firebag Page 256 of 357
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Area Topographic Map

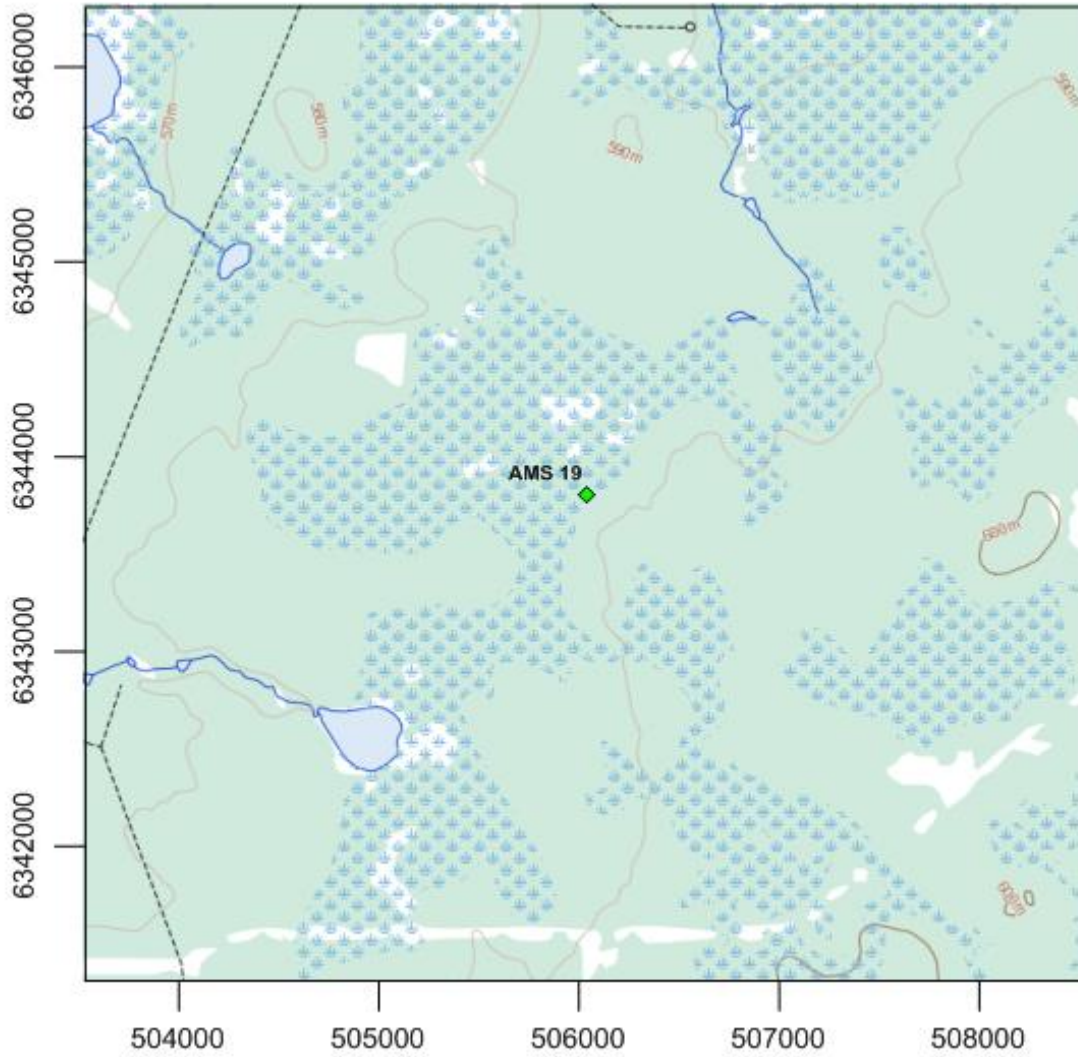



Figure 2.0 – Area Topographic map showing AMS 19 – Firebag Station

	Page 9 of 16	Station Number and Name	AMS 19 - Firebag Page 257 of 357
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		Last Update Date	March 10, 2016
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Aerial Photos

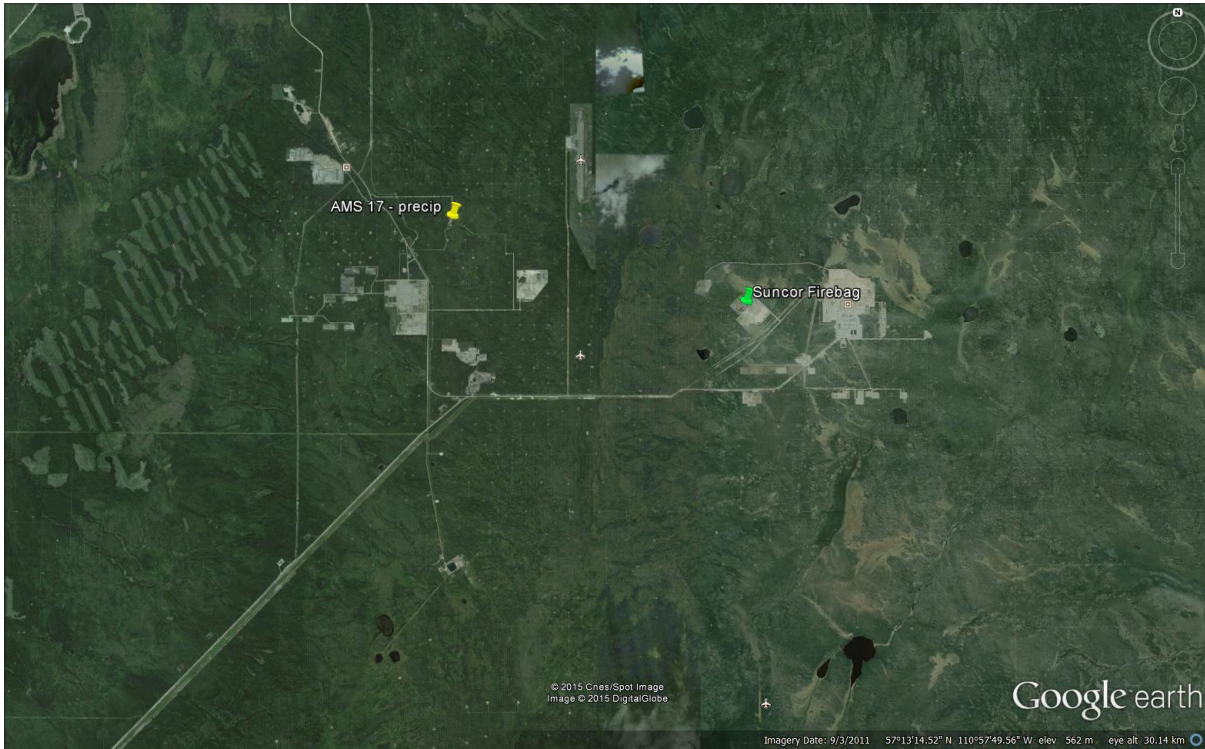


Figure 3.0 – Aerial photo showing area around AMS 19 – Firebag Station



Figure 3.1 – Aerial photo showing local area around AMS 19 – Firebag Station



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Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – monitoring station looking east



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Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east



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Figure 4.4 – Environ looking south



Figure 4.5 – Environ looking west




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Figure 4.6 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.7 – Instrument Racks

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Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Thermo Instruments	43i	1410661308	0 – 1000 ppb	Pulsed fluorescence	4	1
H2S	Hydrogen Sulfide	Thermo Instruments	450i	815129098	0 – 100 ppb	Pulsed fluorescence	4	1
NO2	Nitrogen Dioxide	Thermo Instruments	42i	1410661309	0 – 1000 ppb	Chemiluminescence	4	1
THC	Total Hydrocarbons	Thermo Instruments	51i-LT	1336160089	0 – 25 ppm	Flame Ionization	4	1
WS	Wind speed	Met One	010C-1	P22394	0 – 80m Km/hr	Chopped optical	10	
WD	Wind Direction	Met One	020C-1	P22885	0 – 360 degrees	Resistive (Potentiometer)	10	
AT	AT/RH	Vaisala	HMP155	G4340067	-40 to +50 degrees // 0 – 100 %	Thermistor / Humicap	4	1

Table 4.0 - Analytical Equipment in AMS 19

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	6466
Zero Air Generator	Zero Air Generator	API	M701	4891
HVAC	Heating/cooling unit	BARD	NA	330B143093513-01
Shelter / Building	8' x 16' skid building	Intercontinental Truck Body	NA	1416269
Calibrator	Gas dilution calibrator	Teledyne/API	T700	996

Table 5.0 - Support Equipment in AMS 19



Station Number and Name	AMS 19 - Firebag
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Wind Rose



Wood Buffalo Environmental Association
Wind Rose July 2014 - December 2016

Wind Speed (WS) - km/h
Firebag (AMS 19)

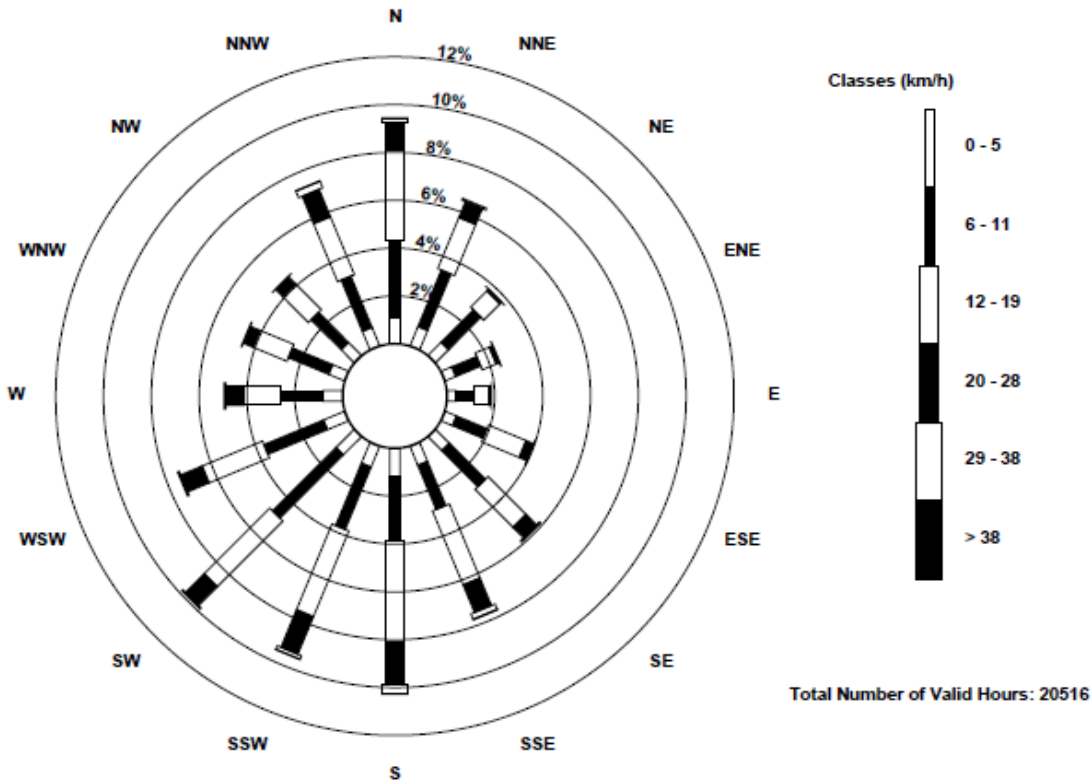


Figure 5.0 – AMS 19 Two and Half Year Wind Rose


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Figure 6.0 – Plan view sketch showing a 500m radius around Firebag station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 20 – Brion Mackay River

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																							
WBEA Program - X														Enhanced Deposition Program - X																									
CONTINUOUS MONITORED PARAMETERS														INTEGRATED SAMPLING																									
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/O ₃	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP				
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X	X	X	X															
Lower Camp	3	Meteorological																	X	X	X	X	X																
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X																
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X												X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X						X	X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X							X	X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X	X		X							X	X	X	X	X	X	X	X	X												
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X										X			
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X											X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X	X	X	X	X	X
Anzac	14	Attribution	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							X	X	X	X	X
CNRL - Horizon	15	Compliance	X		X		X	X	X	X		X	X						X	X	X	X	X	X			X						X		X				
Shell Muskeg River	16	Compliance	X				X	X	X	X		X	X						X	X	X	X	X			X													
Wapasu Creek	17	Compliance	X	X			X	X	X	X		X	X						X	X	X	X	X				X												
Conklin	18	Background	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X	X		X							X	X	X	X	X																
Brion Energy	20	Compliance	X	X			X	X	X	X		X							X	X	X	X	X			X													
Cenovus Christina Lake	500	Portable-Compliance	X	X			X	X	X	X		X							X	X	X	X	X																
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X	X									X	X	X	X	X																
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X	X									X	X	X	X	X																
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X																

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

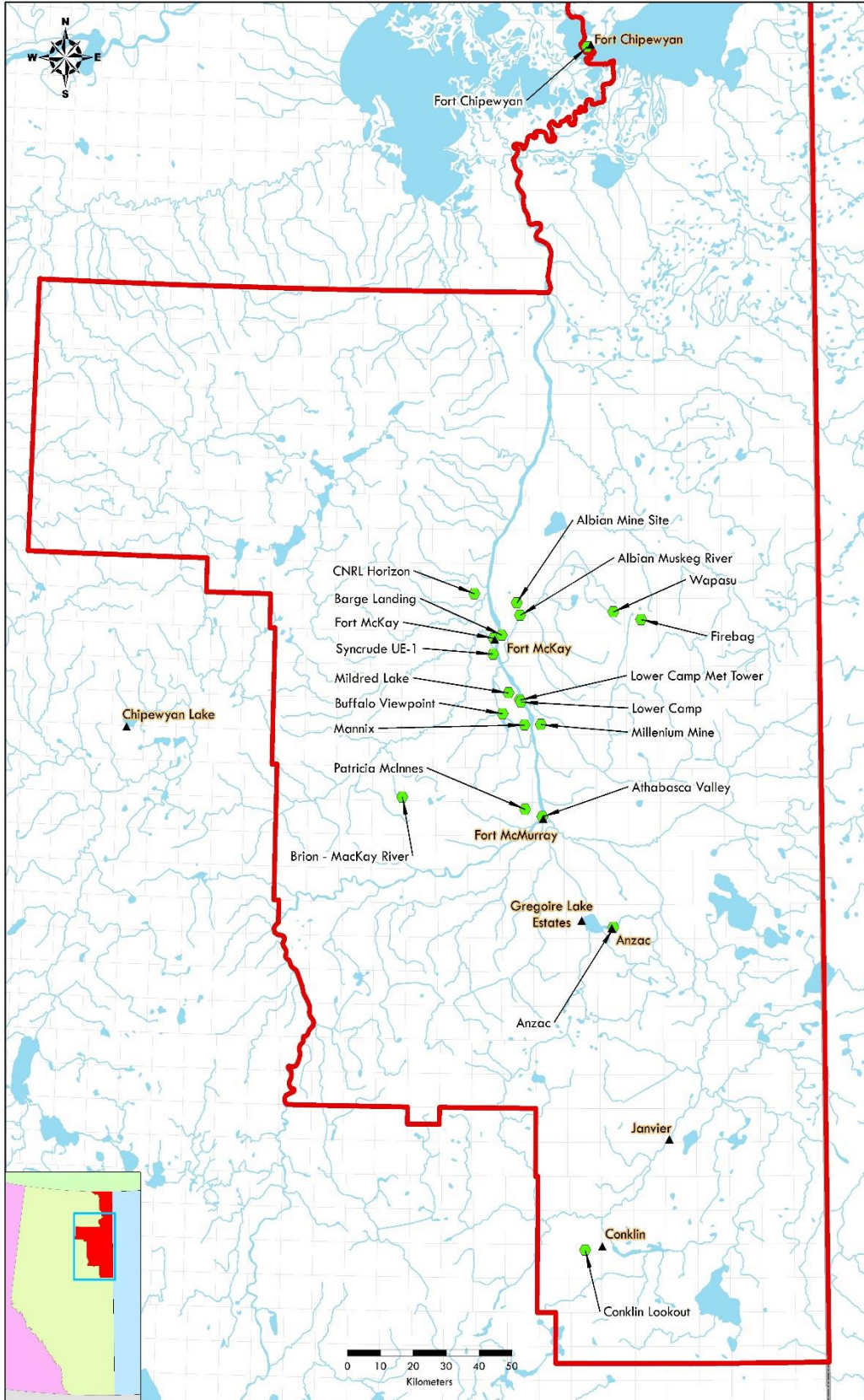


Figure 1.0 – WBEA Monitoring Network Sites

AMS 20 – Brion Mackay River Station Details

General Site Information

The Brion Mackay River station was installed in 2016 as a compliance station. It is located 30 km northwest of Fort McMurray at the Brion Energy facility.

Item	Description			
Station ID	AMS 20			
Station Name	Brion Mackay River			
General description	Located south of the Brion SAGD project, about 1 kmm west of well pad AH.			
Community	NA			
Station Coordinates	56°46'45.86"	North	112°5'19.79"	West
Station elevation	500			Meters
Station Address	NA			
Station Type	Compliance			
Initial Commission Date	February 01, 2016			
Area Land Use	Oil sands lease / Industrial			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	NA			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	30 metres	Height	10 metres
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 metres		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	January 2016			
Station Origin	Purchased new			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
SAGD operations	Approx.1 Km east		Well pad AH.	
Pond	300 m west		Open water pond	
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Access road	low	30	Gravel access roads
Roadways	Access road	Low	5	Temporary winter road

Table 3.0 – Local Source Information

Area Topographic Map

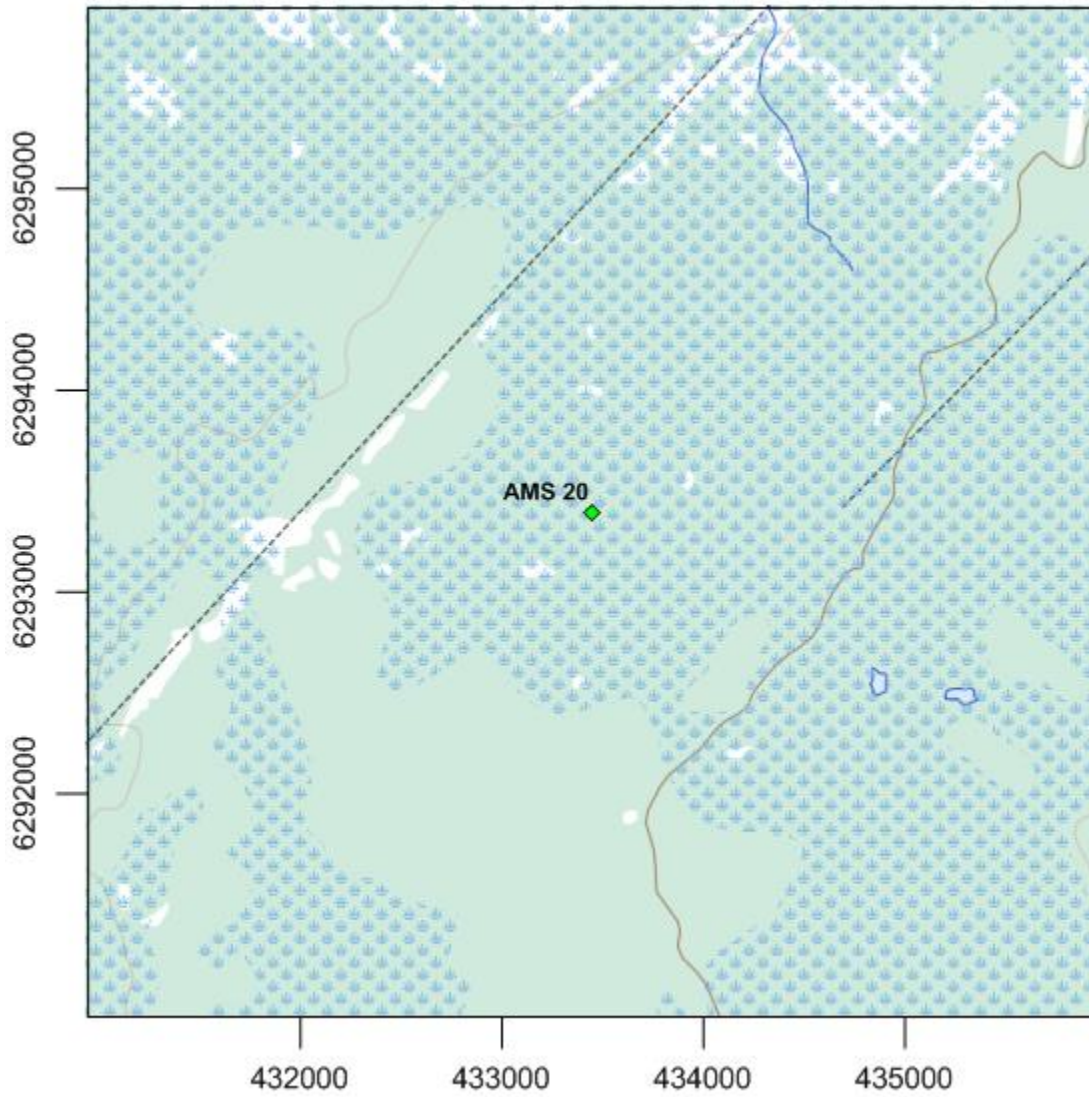


Figure 2.0 – Area Topographic map showing AMS 20 – Brion Mackay River

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 20 – Brion Mackay River

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Environ looking south



Figure 4.2 – Environ looking north



Figure 4.3 Environ looking east



Figure 4.4 – Environ looking west

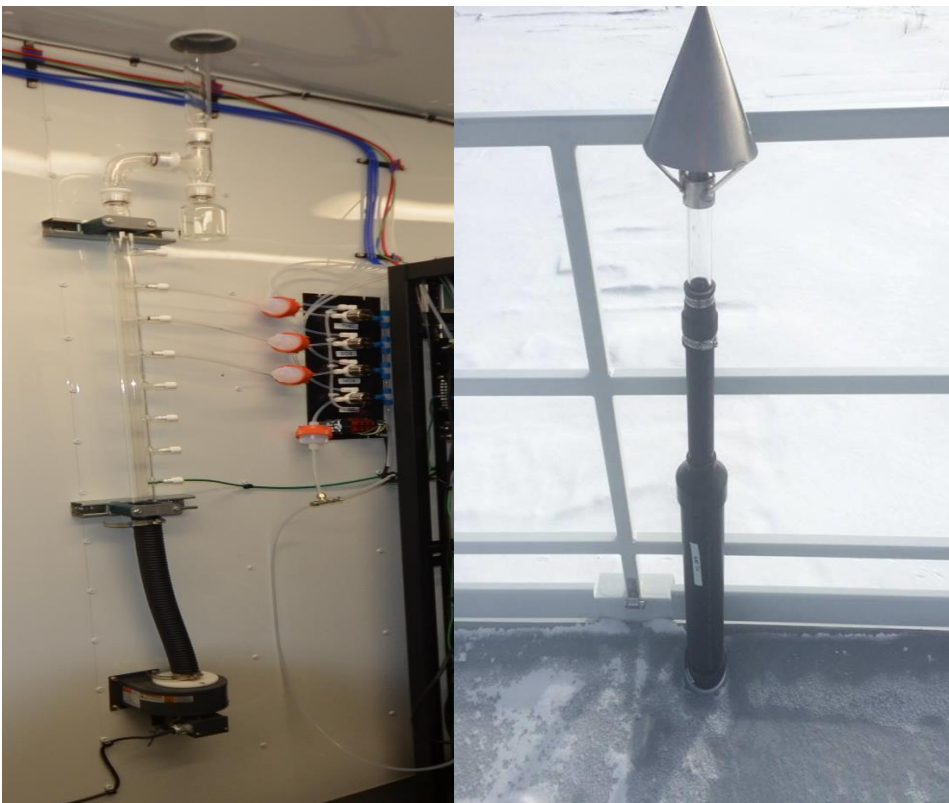


Figure 4.5 – Indoor sample manifold setup and outdoor sample inlet



Figure 4.6 – Instrument rack



Figure 4.7 – Pump cabinet

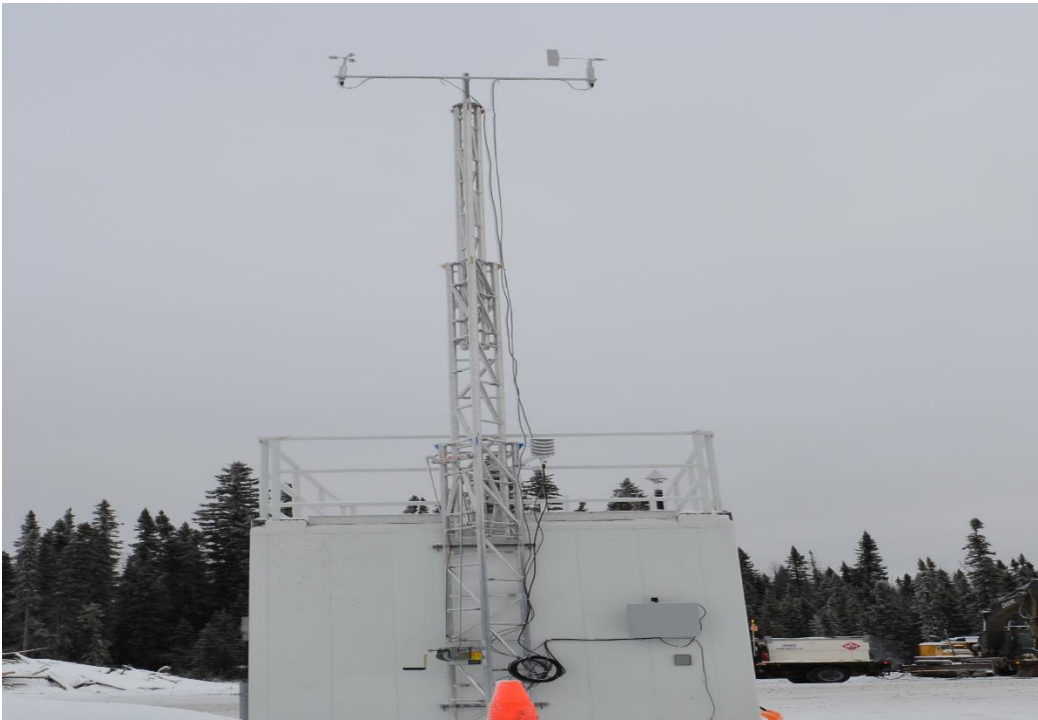


Figure 4.8 – Setup of the MET tower

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Thermo Instruments	43i	JC1501301450	0-1000ppb	Pulsed Fluorescence	4	1
H2S	Hydrogen Sulfide	Teledyne API	T101	196	0-100ppb	Pulsed Fluorescence	4	1
NO2	Nitrogen Dioxide	Thermo Instruments	42i	1505164379	0-1000ppb	Chemiluminescence	4	1
THC	Total Hydrocarbons	Thermo Instruments	51i-LT	1501663727	0-50ppm	Gas Chromatography and Flame Ionization	4	1
AT/RH	Ambient temperature and relative humidity.	Vaisala	HMP155	K14200412014	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	1
WS	Wind speed	Met One	010C-1	A3111	0-80kph	Chopped optical	10	
WD	Wind direction	Met One	020C-1	N9937	0-360 degrees	Resistive (potentiometer)	10	

Table 4.0 - Analytical Equipment in AMS 20

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	9627
ZAG	Zero Air Generator	Teledyne API	T701	4766
HVAC	Heating and Air Conditioning system. Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring trailer	ITB	NA	ITB-15-16552
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	1220

Table 5.0 - Support Equipment in AMS 20

Wind Rose



Wood Buffalo Environmental Association
Wind Rose January 2016 - December 2016

Wind Speed (WS) - km/h
Brion MacKay River (AMS 20)

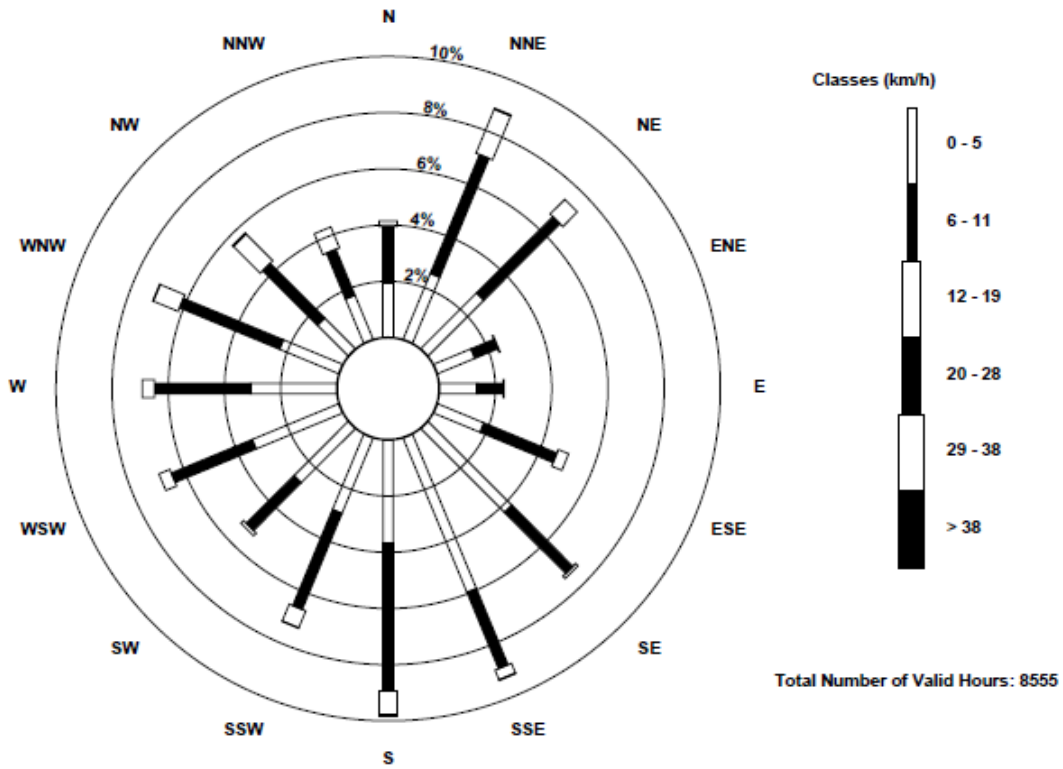


Figure 5.0 –AMS 20 One Year Wind Rose



Figure 6.0 – Plan view sketch showing a 500m radius around Brion station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 21 – CONKLIN COMMUNITY

2017

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WBEA Network

The map below shows the location of each air monitoring station.

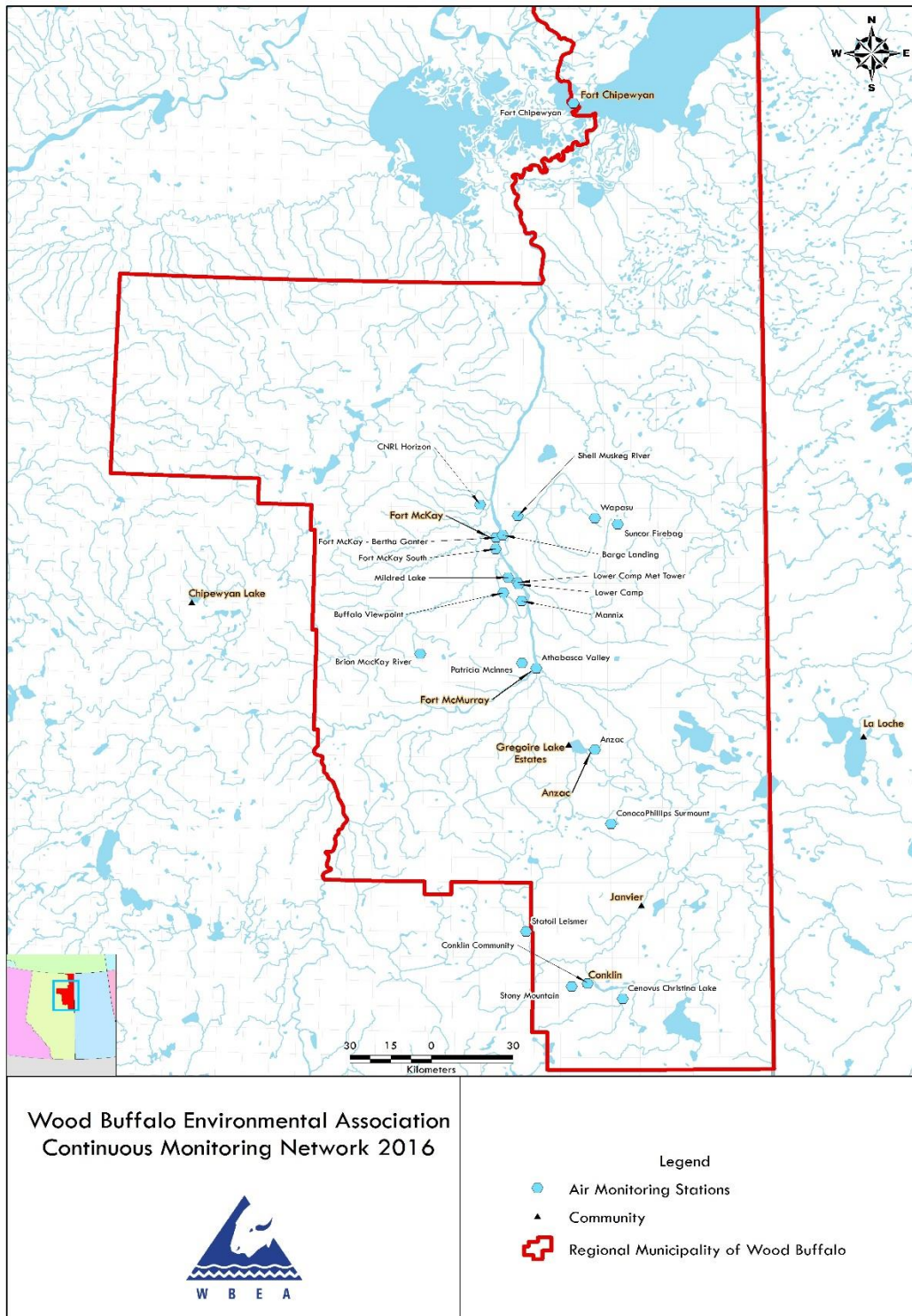


Figure 1.0 – WBEA Monitoring Network Sites

Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA’s mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA’s Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

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AMS 21 – Conklin Community Station Details

General Site Information

The Conklin Community Air Monitoring Station (AMS) is located near the Conklin Resource Development Advisory Committee (CRDAC) office, on Father Mercredi’s Trail, in the community of Conklin.

Item	Description			
Station ID	AMS 21			
Station Name	Conklin Community			
General description	This is a community station to monitor the air quality where the residents live work and play			
Community	Conklin			
Station Coordinates	55°37'56.39"	North	111° 4'43.84"	West
Station elevation	562			Meters
Station Address	114 Father Mercredi Trail			

Station Type	Community			
Initial Commission Date	April 01, 2016			
Area Land Use	Residential			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	4 Metres			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	6 meters	Height	6 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	March 20, 2016			
Station Origin	Originated as a component of the South Wood Buffalo Monitoring Plan. It is a community station for Conklin.			
Site Preparation	Level gravel pad			

Table 1.0 – General Site Information

Localized Sources

Type	Distance	Description		
Admin Building	20 meters towards south	Conklin Resource Development Advisory Committee Office		
Wetland	10 meters towards North and East	Peat bog / Marshes – Variety of reeds and grasses.		
Rail track	15 meters to the West	Railway track		
Name	Type	Traffic Volume	Distance (m)	Description
Roadways	Access	Low	70 meters to the south	Gravel/dirt road

Table 2.0 – Local Source Information

Area Topographic Map

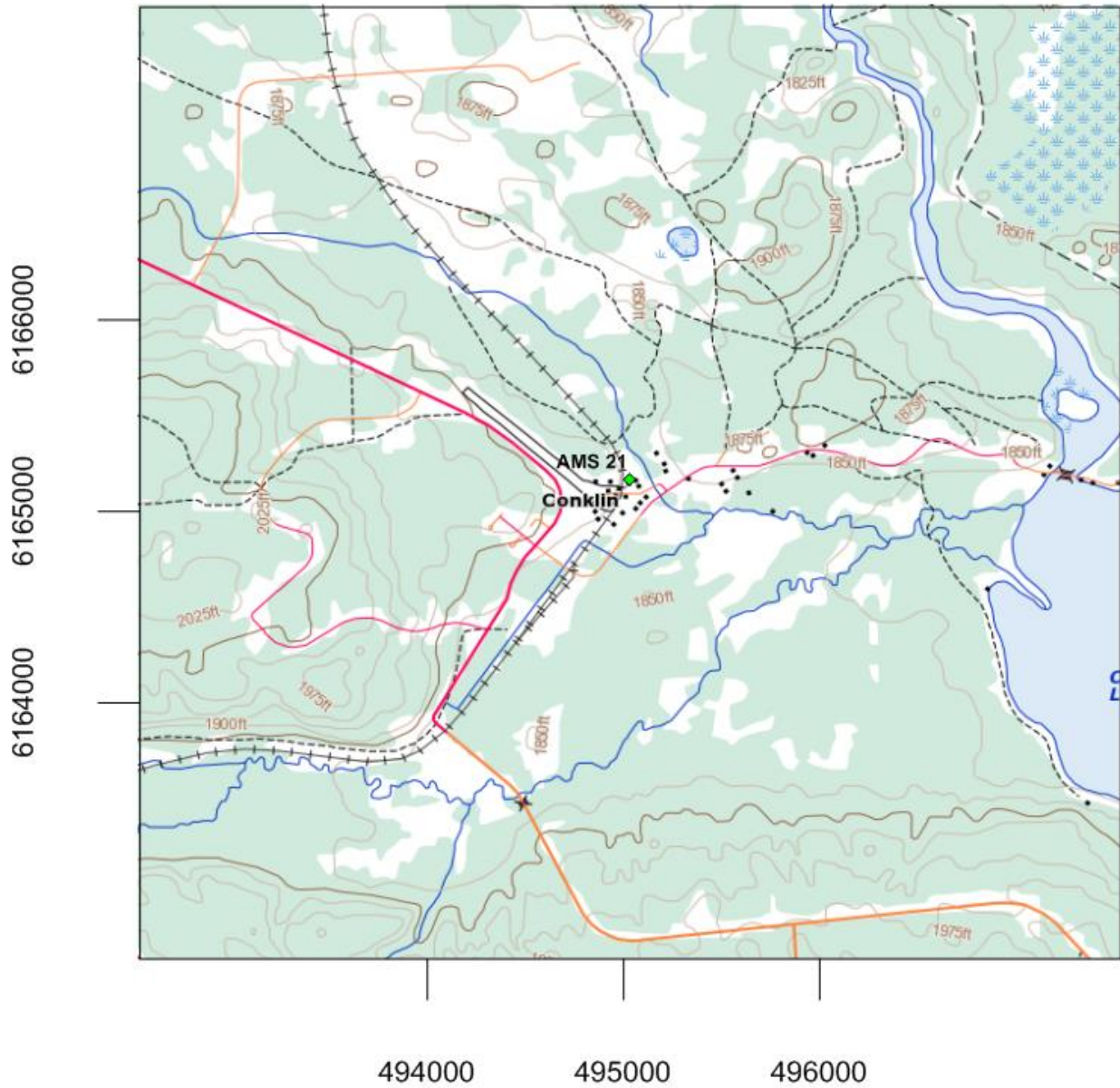


Figure 2.0 – Area Topographic map showing AMS 21 – Conklin Community Station

Aerial Photo

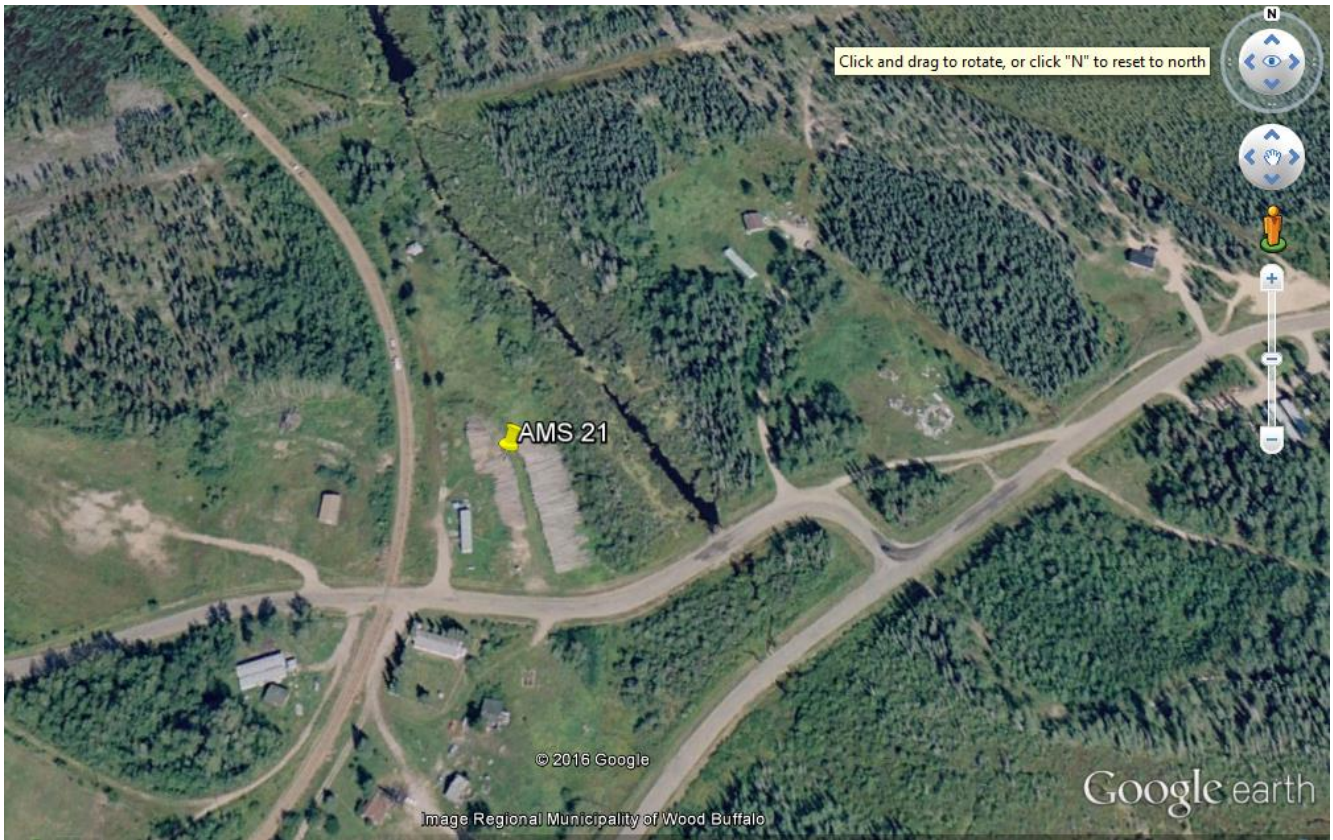


Figure 3.0 – Aerial photo showing AMS 21 – Conklin Community Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Exterior of AMS 21 looking east



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking south



Figure 4.4 –Environ looking west



Figure 4.5 –Environ looking east

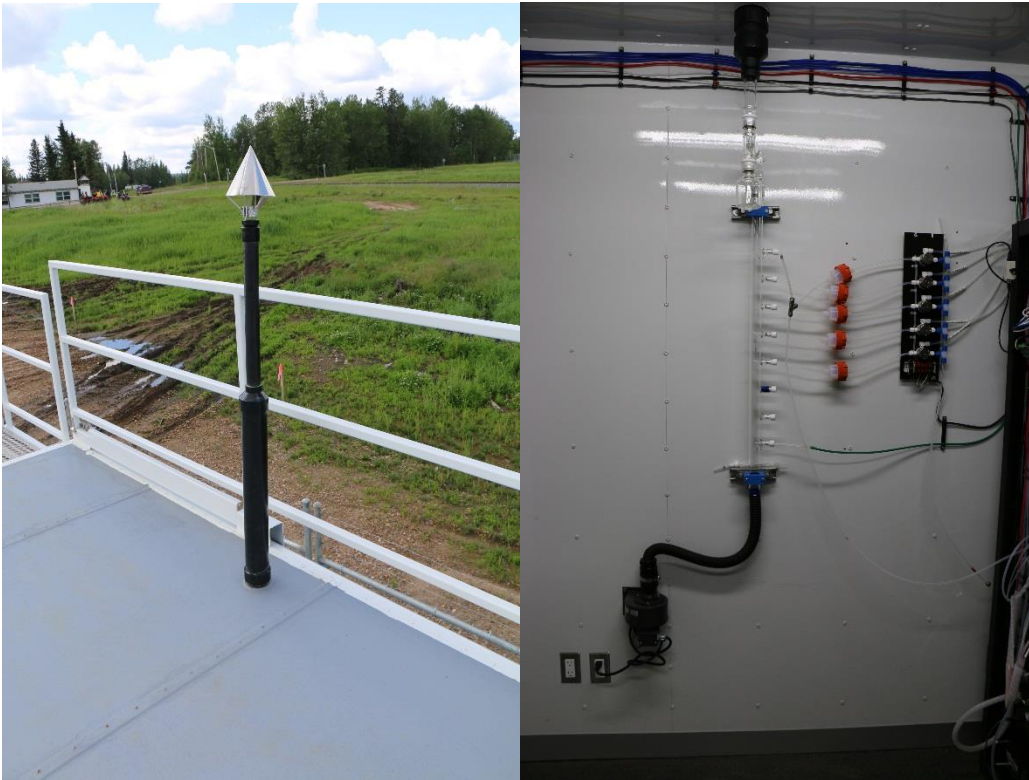


Figure 4.6 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.7 – MET tower



Figure 4.8 – Instrument racks

Equipment Inventory

Parameter Measured	Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)		
						Ground	Shelter	
SO2	Sulphur Dioxide	Thermo Instruments	43i	1428701363	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1236656116	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	Thermal oxidizer	CD Nova	CDN101	NA	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		
NOx	Nitrogen Dioxide	Thermo Instruments	42i	1501663731	0-1000ppb	Chemiluminescence	4	1
NMHC	Non-Methane Hydrocarbon	Thermo Instruments	55i	1152430011	0-50ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	Thermo Instruments	42i	150663734	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	CM-0404	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
RH/Temp	Relative humidity / external temp	Vaisala	HMP155	K28700112014	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind Speed<10um	Met One	010C-1	A1406	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	P22886	0-360 degrees	Resistive (potentiometer)	10	

Table 3.0 - Analytical Equipment in AMS 21

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	9628
ZAG	Zero Air Generator	Teledyne API	T701	5611
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	2 Ton	NA
Shelter / Building	Air monitoring trailer	Intercontinental Truck Body	Standard 10 x 20	ITB 14 16423
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	2658

Table 4.0 - Support Equipment in AMS 21

Wind Rose



Wood Buffalo Environmental Association
Wind Rose April 2016 - December 2016

Wind Speed (WS) - km/h
Conklin Community (AMS 21)

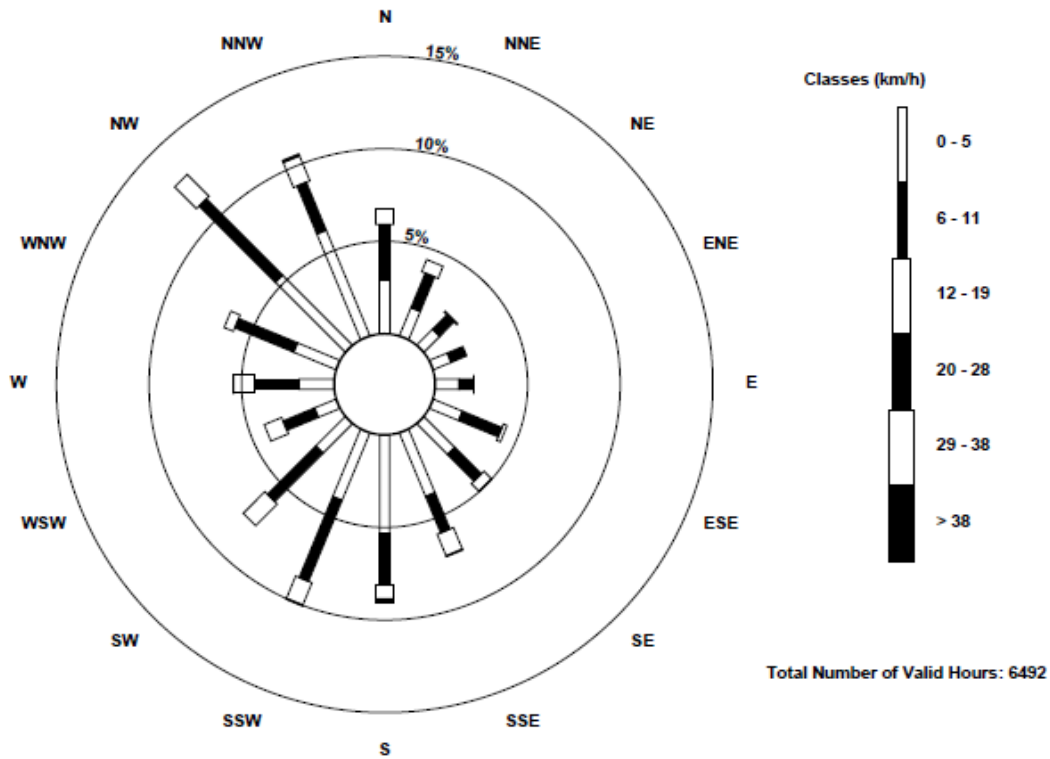


Figure 5.0 – AMS 21 8 Months Wind Rose

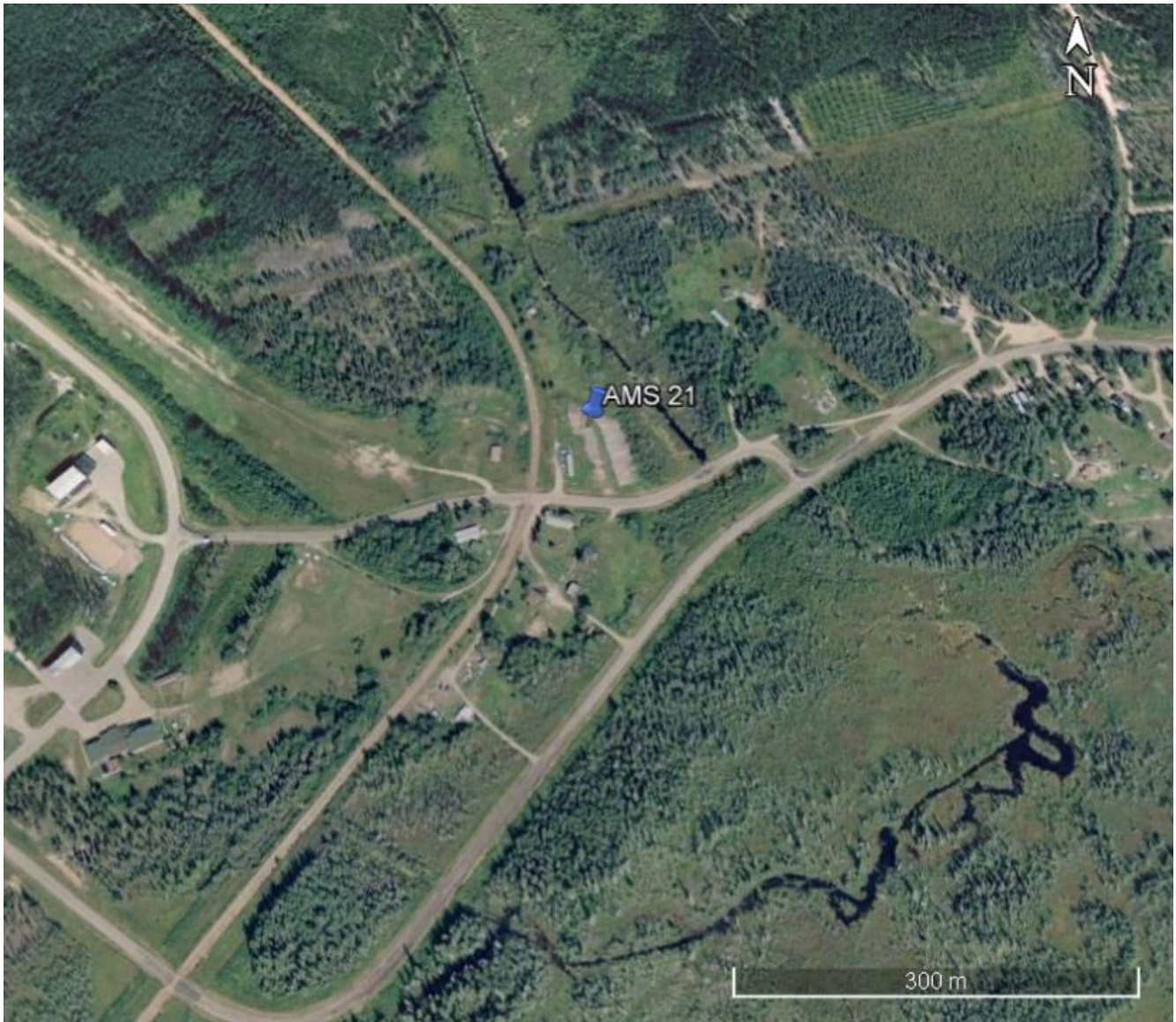


Figure 6.0 – Plan view sketch showing a 500m radius around Conklin Community station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 22 – JANVIER

2017

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WBEA Network

The map below shows the location of each air monitoring station.

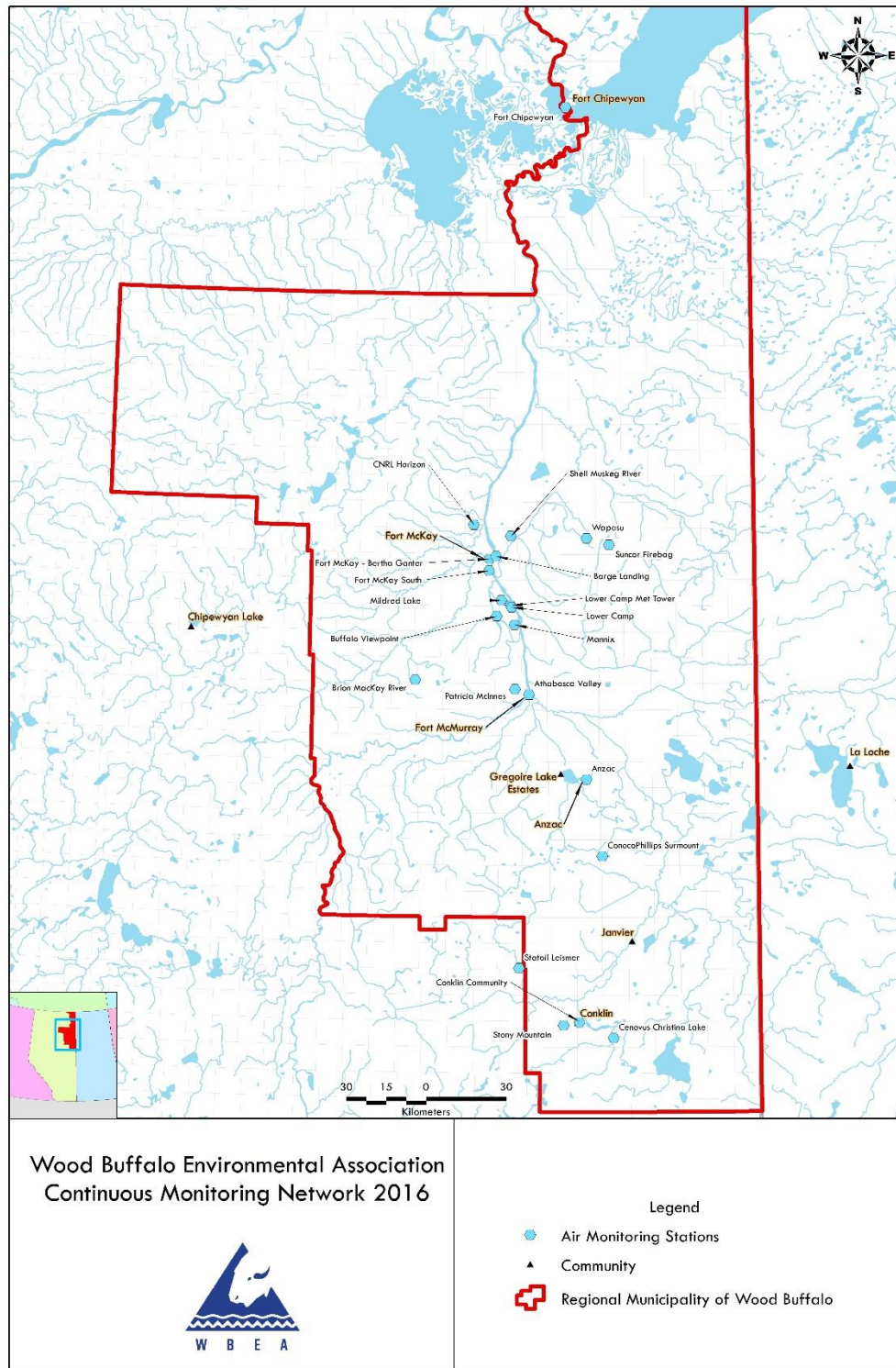


Figure 1.0 – WBEA Monitoring Network Sites

Network Background

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AMS 22 – Janvier Community Station Details

General Site Information

The Janvier Air Monitoring Station (AMS) is a community site located at the intersection of Teed Avenue and Nokohoo Road in the hamlet of Janvier, within the Regional Municipality of Wood Buffalo.

Item	Description			
Station ID	AMS 22			
Station Name	Janvier Community			
General description	This station is intended to collect ambient air quality data from a local community perspective to measure where people live, work and play.			
Community	Janvier			
Station Coordinates	55°54'11.67"	North	110° 44'59.08"	West
Station elevation	471			Meters
Station Address	Block 4; Lot 135 - Adjacent to Nokohoo Road between Teed Ave and Lapouse Ave.			
Station Type	Community			

Initial Commission Date	January 01, 2017			
Area Land Use	Residential			
Angle of elevation to nearby buildings	10°			
Average building height in area	4 metres			
Airflow Restrictions (yes/no)	North	no	East	No
	South	no	West	No
Nearest Tree	Distance	20 meters	Height	25 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to west end of monitoring shelter		
Station Install Date	October 2016			
Station Origin	The Janvier Community station was a need identified in the WBEA strategic plan and became part of the Southern Monitoring plan that was approved in the 2015/16 budget year.			
Site Preparation	Level gravel pad			

Table 1.0 – General Site Information

Localized Sources

Type	Distance	Description		
Residence	20 meters towards west	Residential housing area		
Main road in town	25 meters east	Main road		
Name	Type	Traffic Volume	Distance (m)	Description
Roadway	Main access	Low	25 meters	Paved

Table 2.0 – Local Source Information

Area Topographic Map

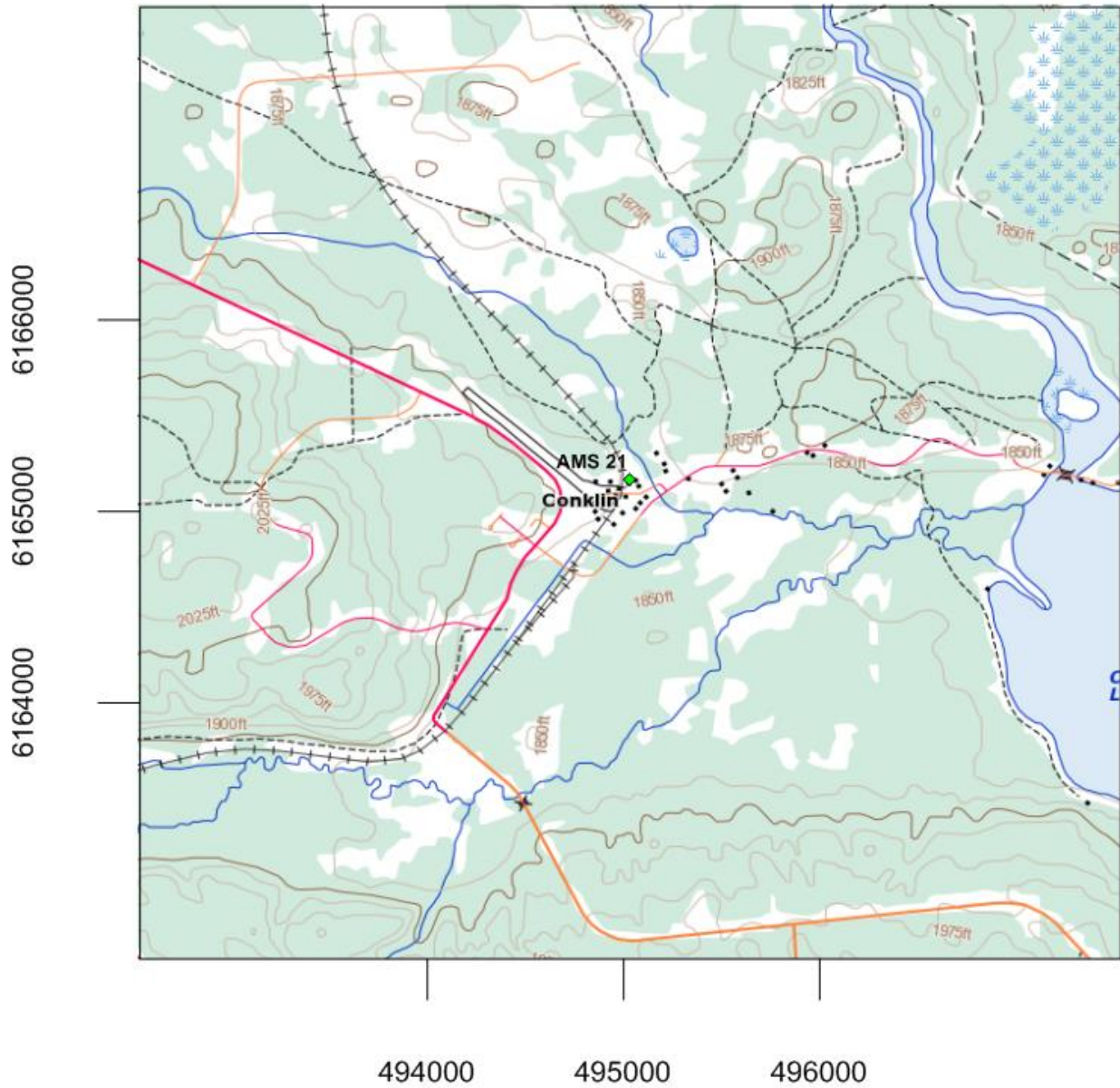


Figure 2.0 – Area Topographic map showing AMS 21 – Conklin Community Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 22 – Janvier Community Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Exterior of AMS 22 looking north



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking south



Figure 4.4 –Environ looking west



Figure 4.5 –Environ looking east



Figure 4.6 – Outdoor Sample Inlet & Indoor Sample Manifold



Figure 4.7 – MET tower



Figure 4.8 – Instrument racks

Equipment Inventory

Parameter Measured	Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)		
						Ground	Shelter	
SO2	Sulphur Dioxide	Thermo Instruments	43i	1152430006	0-1000ppb	Pulsed Fluorescence	4	1
TRS	Total Reduced Sulfur	Thermo Instruments	43i-TLE	1151680031	0-100ppb	Pulsed Fluorescence	4	1
TRS converter	Thermal oxidizer	CD Nova	CDN101	503	NA	Thermal Oxidizer paired with 43iTLE for TRS measurement		
NOx	Nitrogen Dioxide	Thermo Instruments	42i	1228254994	0-1000ppb	Chemiluminescence	4	1
NMHC	Non-Methane Hydrocarbon	Thermo Instruments	55i	1501663728	0-50ppm	Gas Chromatography and Flame Ionization	4	1
O3	Ozone	Thermo Instruments	42i	1227254861	0-500 ppb	UV Photometric	4	1
PM2.5	PM <2.5 um in diameter	Thermo Instruments	5030	E-1333	0-1000ug/m3	Synchronized Nephelometric/Radiometric Particulate Mass Monitor	4	1
RH/Temp	Relative humidity / external temp	Vaisala	HMP155	N2860003	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind Speed<10 um	Met One	010C-1	U11126	0-80kph	Chopped optical	10	
WD	Wind Direction	Met One	20C-1	U11346	0-360 degrees	Resistive (potentiometer)	10	

Table 3.0 - Analytical Equipment in AMS 22

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	13618
ZAG	Zero Air Generator	Teledyne API	T701	135
HVAC	Air Conditioner/Heater .Wall mount unit	BARD	2 Ton	NA
Shelter / Building	Air monitoring trailer	Intercontinental Truck Body	8 x 12	1516494
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	2464

Table 4.0 - Support Equipment in AMS 22

Wind Rose

A wind rose will be provided from a nearby site.



Wood Buffalo Environmental Association
Wind Rose April 2016 - January 2017

Wind Speed (WS) - km/h
Conklin Community (AMS 21)

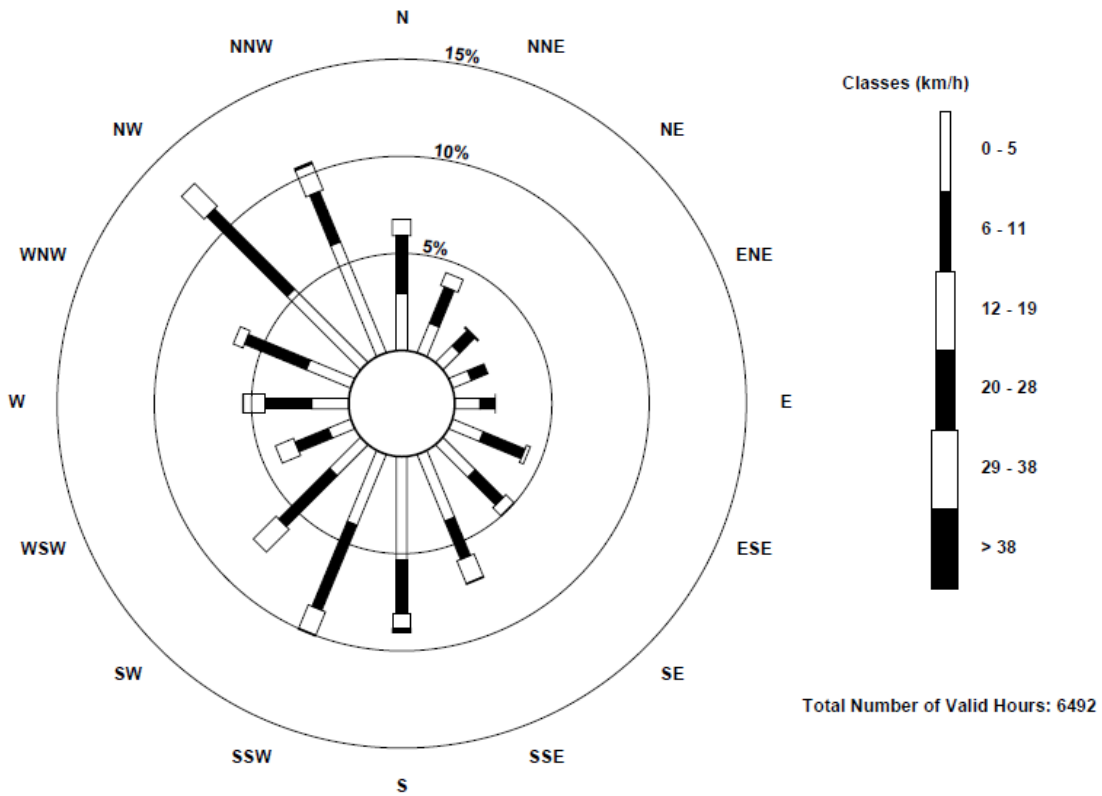


Figure 5.0 – Nearby site (AMS 21) 9 months Wind Rose



Figure 6.0 – Plan view sketch showing a 500m radius around the Janvier Community station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 103 – NISKA

(Portable Monitoring Station –AMS 500)

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable monitoring stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oilsands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																					
WBEA Program - X															Enhanced Deposition Program - X																						
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																						
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP		
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X													
Lower Camp	3	Meteorological																	X	X	X	X	X														
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X														
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X										X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X										
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X									X		
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X										X		X	X	
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X	X
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X	
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X					X	X				
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X										
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X	X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X				X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X														
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X			X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X														
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X														

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

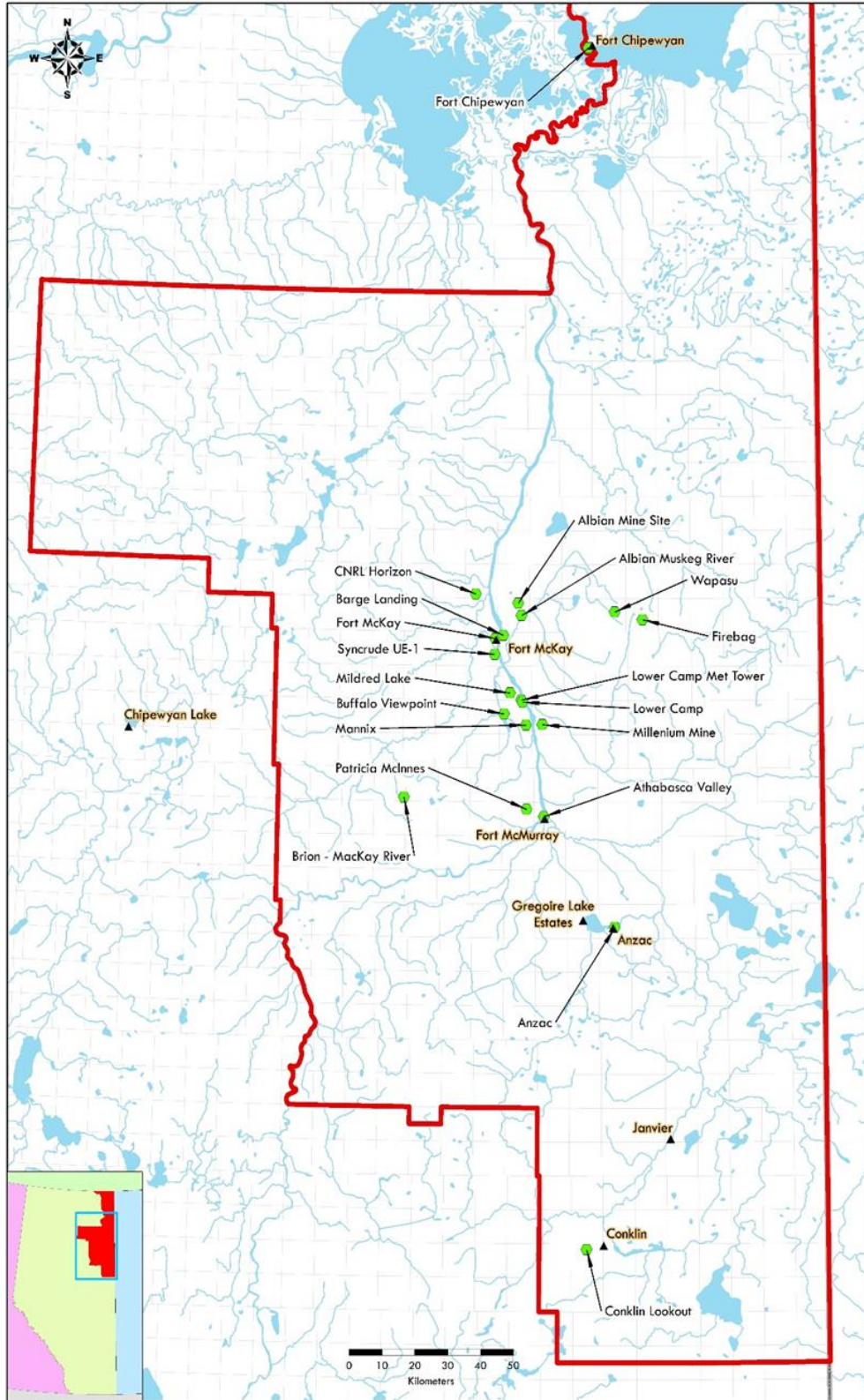


Figure 1.0 – WBEA Monitoring Network Sites

AMS 103 – Niska Station Details

General Site Information

The Niska Portable AMS is currently deployed at the Cenovus Christina Lake location. The Northern Lights station contains analyzers and sensors that continuously measure SO₂, H₂S, NO_x, Wind speed, Wind direction, External temperature, and Relative humidity.

Item	Description			
Station ID	AMS 500			
Station Name	Niska			
General description	Located close to a non-operational well-pad 316 at Cenovus SAGD site.			
Community	NA			
Station Coordinates	55° 34' 44.00"	North	110° 52' 34.00"	West
Station elevation	576			Meters
Station Address	NA			
Station Type	Portable-Compliance			
Initial Commission Date	NA			
Area Land Use	Industrial – SAGD			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	0 meters			
Airflow Restrictions (yes/no)	North	no	East	No
	South	No	West	No
Nearest Tree	Distance	100 meters	Height	15 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	November 27, 2015			
Station Origin	NA			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
Well-pad.	100 m west		Non-operational well pad. Capped.	
Name	Type	Traffic Volume	Distance (m)	Description
Roadway	Dirt/gravel road	Medium	20	Used by workers to access many areas of the plant.

Table 3.0 – Local Source Information

Area Topographic Map

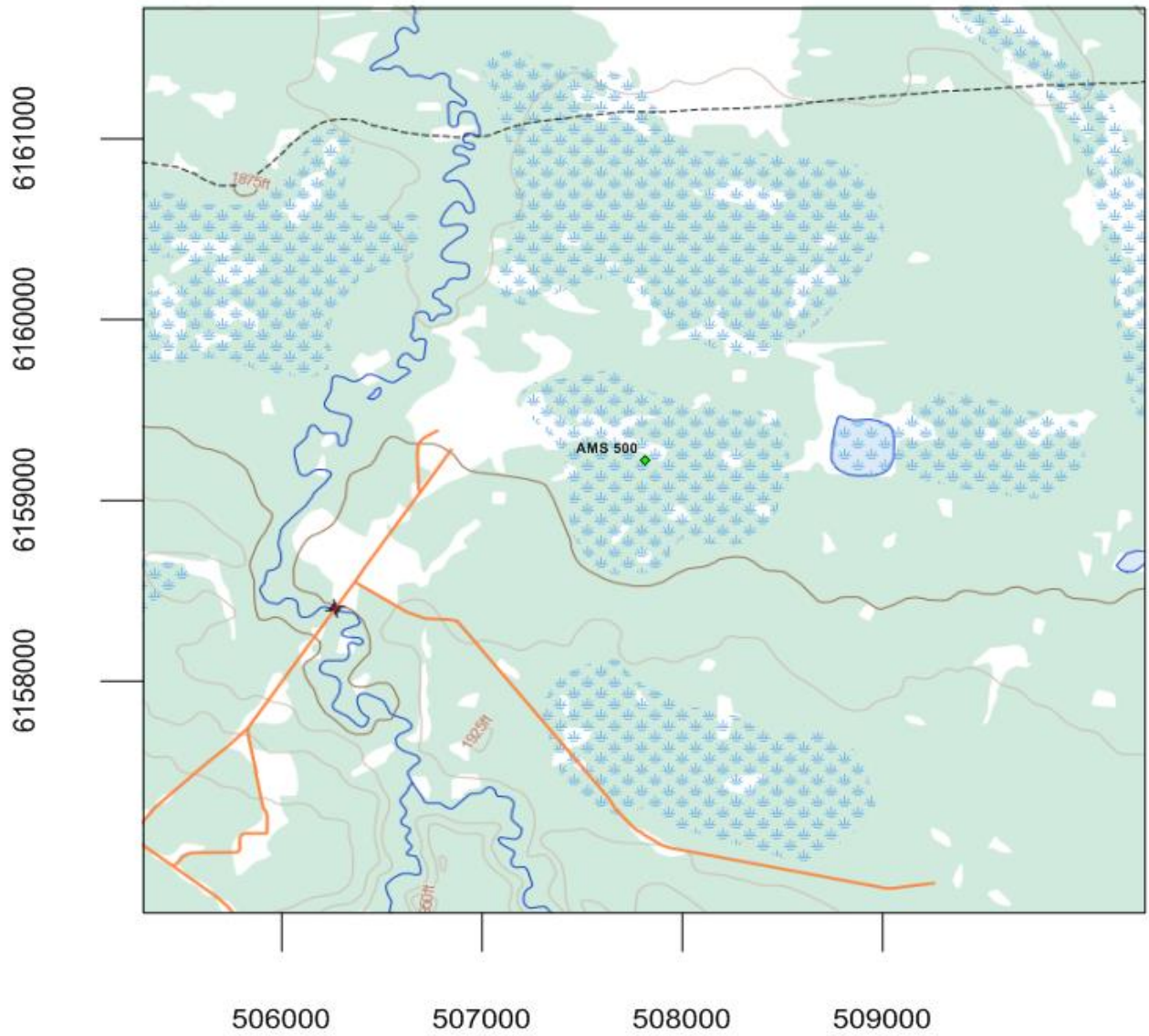


Figure 2.0 – Area Topographic map showing AMS 103 – Niska Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 103 – Niska Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Monitoring compound looking south



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east

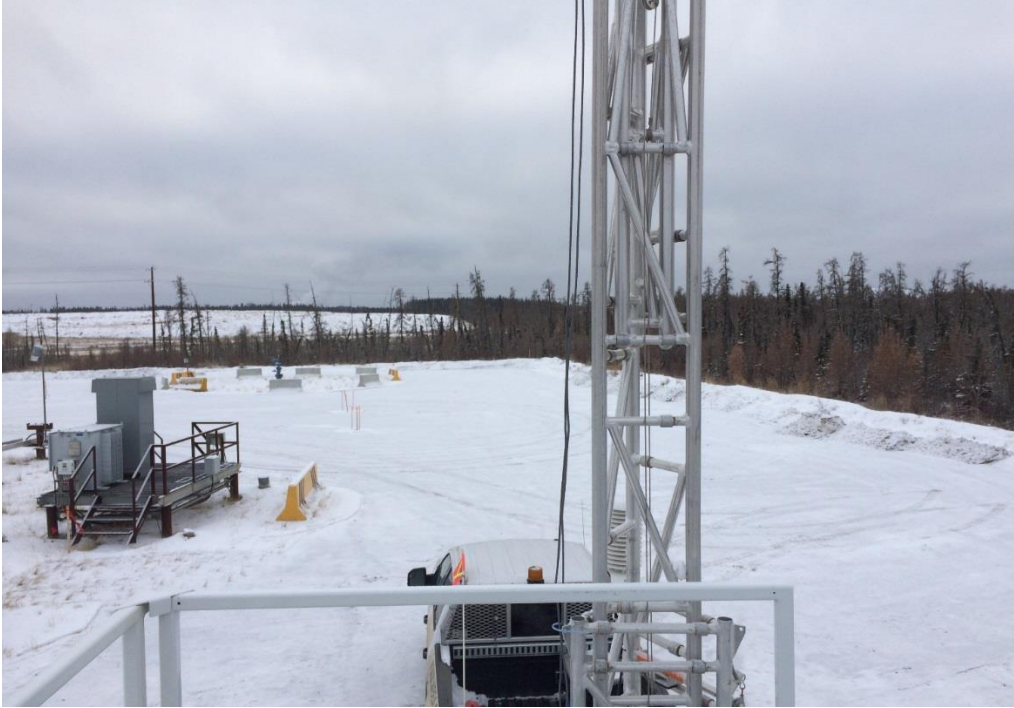


Figure 4.4 – Environ looking south



Figure 4.5 – Environ looking west

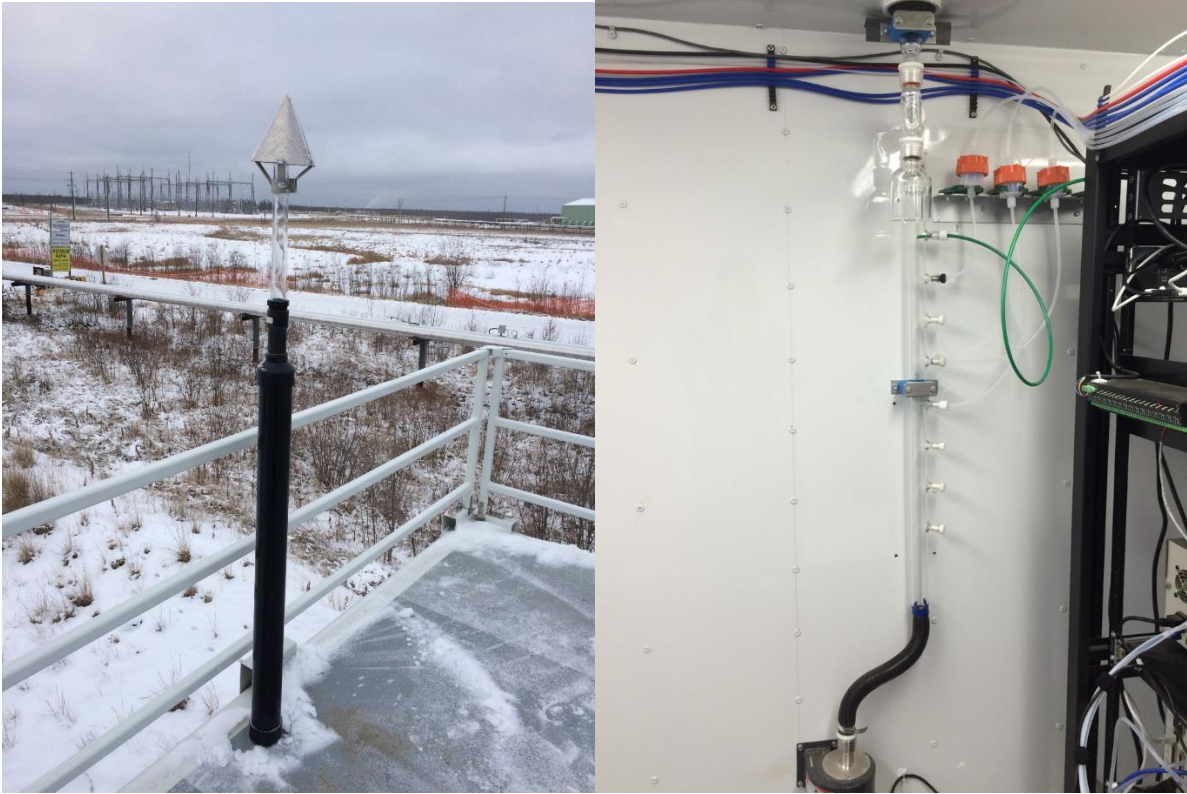


Figure 4.6 – Outdoor Sample Inlet and Indoor manifold setup



Figure 4.7 – Instrument rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Thermo Instruments	43i	1118148497	0-1000ppb	Pulsed Fluorescence	4	1
H2S	Hydrogen Sulfide	Thermo Instruments	43i-TLE	1008841400	0-100ppb	Pulsed Fluorescence	4	1
H2S converter		Thermo Instruments	340	328702539	NA		4	1
NOx	NO/NO2/NOx	Teledyne API	T200	723	0-1000ppb	Chemiluminesense	4	1
AT/RH	Ambient temp and relative humidity.	Vaisala	HMP155	NA	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind speed	Met One	010C-1	P22393	0-80kph	Chopped optical	10	
WD	Wind direction	Met One	020C-1	P10614	0-360 degrees	Resistive (potentiometer)	10	

Table 4.0 - Analytical Equipment in AMS 103

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	2575
ZAG	Zero Air Generator	Teledyne API	M701	4604
HVAC	Heating and air conditioning system. Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring portable	ITB	NA	ITB1316018
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	1221

Table 5.0 - Support Equipment in AMS 103

Wind Rose



Wood Buffalo Environmental Association
Wind Rose 2016

Wind Speed (WS) - km/h
Cenovus - Christina Lake (AMS500)

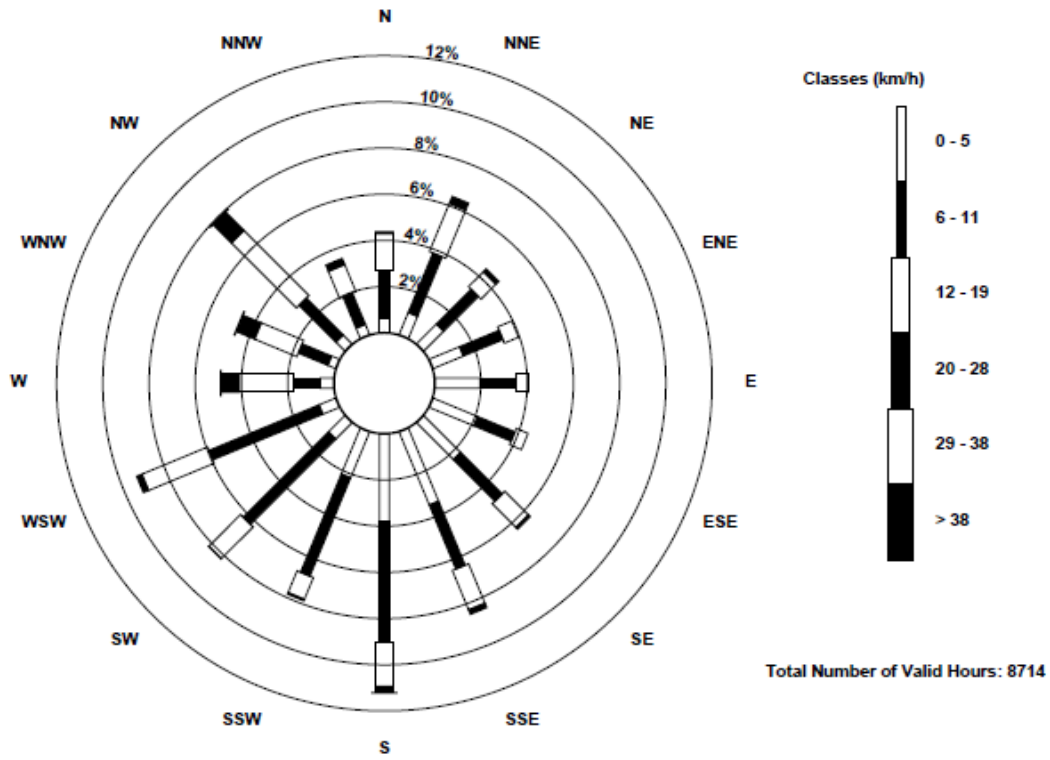


Figure 5.0 – AMS 500 2016 Wind Rose



Figure 6.0 – Plan view sketch showing a 500m radius around Niska – Cenovus Christina Lake station



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 101 – MAHIHKAN **(Portable Monitoring Station –AMS 501)**

March 2016

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

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WBEA AMBIENT AIR MONITORING NETWORK																																						
WBEA Program - X															Enhanced Deposition Program - X																							
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																							
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP			
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X														
Lower Camp	3	Meteorological																	X	X	X	X	X															
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X															
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X											X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X			X					X	X	X	X	X	X	
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X											
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X										X		
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X											X		X	X	
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X									X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X					X	X	X	X	X		
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X			X					X	X					
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X			X											
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X				X									X		X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X															
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X				X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X															
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X															
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X															

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

AMS 101 –Mahihkan Station Details

General Site Information

The Mahihkan Portable AMS is currently deployed at the Statoil Leismer site. The Mahihkan station contains analyzers and sensors that continuously measure SO₂, H₂S, NO_x, Wind speed, Wind direction, External temperature, and Relative humidity.

Item	Description			
Station ID	AMS 501			
Station Name	Mahihkan			
General description	Located just outside the main entrance gate of Statoil Leismer SAGD plant site.			
Community	NA			
Station Coordinates	55° 48' 46.5834"	North	111° 26' 25.962"	West
Station elevation	668			Meters
Station Address	NA			
Station Type	Portable-Compliance			
Initial Commission Date	NA			
Area Land Use	Industrial – SAGD			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	0 meters			
Airflow Restrictions (yes/no)	North	no	East	No
	South	No	West	No
Nearest Tree	Distance	50 meters	Height	15 meters
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	NA			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
SAGD plant site	100 m west		Statoils SAGD operations.	
Name	Type	Traffic Volume	Distance (m)	Description
Roadway	Dirt/gravel road	Medium	15 meters	Used by workers to get access to the plant.

Table 3.0 – Local Source Information

Area Topographic Map

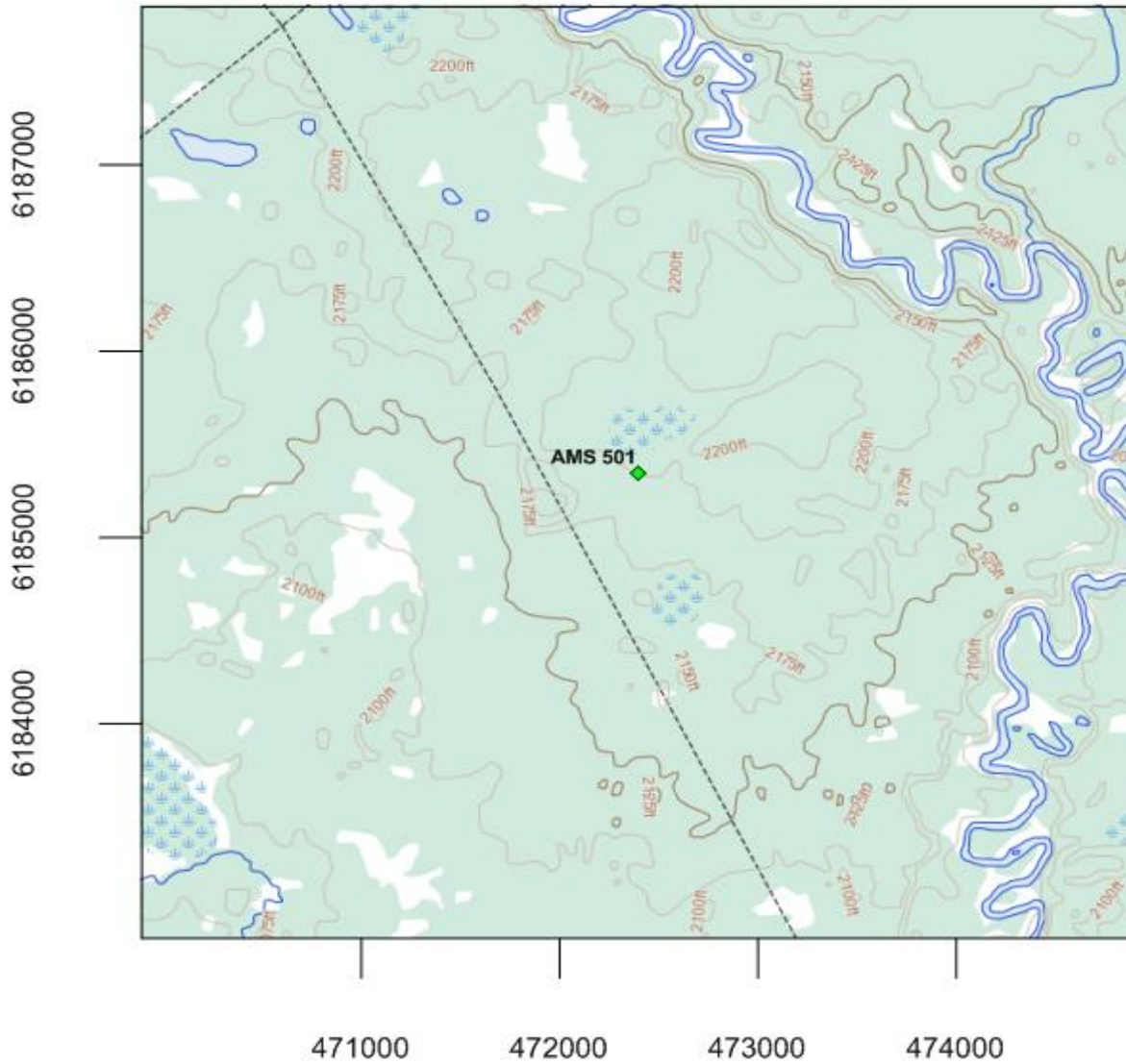


Figure 2.0 – Area Topographic map showing AMS 101 –Mahihkan Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 101 –Mahihkan Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Monitoring compound looking north



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east



Figure 4.4 – Environ looking south



Figure 4.5 – Environ looking west

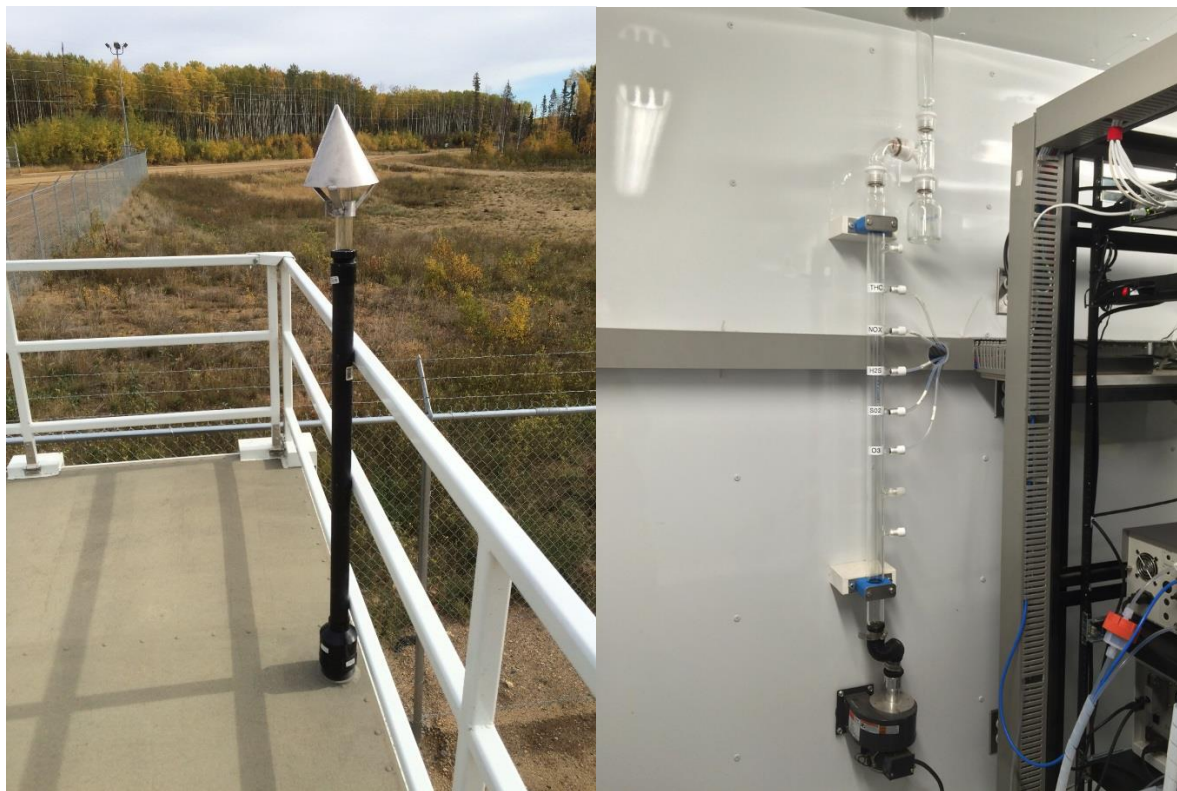


Figure 4.6 – Outdoor Sample Inlet and Indoor manifold setup



Figure 4.7 – Instrument rack

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Teledyne API	T100	721	0-1000ppb	Pulsed Fluorescence	4	1
H2S	Hydrogen Sulfide	Thermo Instruments	450i	922436966	0-100ppb	Pulsed Fluorescence	4	1
NOx	NO/NO2/NOx	Thermo Instruments	42i	1118148496	0-1000ppb	Chemiluminescence	4	1
AT/RH	Ambient temp and relative humidity.	Vaisala	HMP155	KC2860019	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind speed	Met One	010C-1	P22395	0-80kph	Chopped optical	10	
WD	Wind direction	Met One	020C-1	R14656	0-360 degrees	Resistive (potentiometer)	10	

Table 4.0 - Analytical Equipment in AMS 101

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	2579
ZAG	Zero Air Generator	Teledyne API	M701	4522
HVAC	Heating and air conditioning system. Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring portable	ITB	NA	2C9UAB2G9B1044004
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Thermo Instruments	SABIO 4010	11581008

Table 5.0 - Support Equipment in AMS 101

Wind Rose

Figure 5.0 – AMS 101 Five Year Wind Rose



AMBIENT MONITORING STATION SITE DOCUMENTATION

AMS 102 – NORTHERN LIGHTS

(Portable Monitoring Station –AMS 502)

2017

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Network Background

The WBEA vision is to operate a state of the art monitoring system that meets the needs of residents and stakeholders in the Wood Buffalo Region. WBEA's mission is to monitor air quality and air quality related environmental indicators, to generate accurate and transparent information which enables stakeholders to make informed decisions.

Continuous ambient air quality and meteorological data are collected through a program administered by the WBEA's Ambient Air Technical Committee (AATC). The WBEA currently operates 20 continuous monitoring stations, each measuring from 5 to 15 continuous and intermittent air quality parameters. The continuously measured air quality parameters include SO₂, H₂S, TRS, O₃, NO_x, NO, NO₂, NH₃, CO, PM_{2.5}, THC, NMHC, and CH₄. All sites also measure temperature, wind speed, wind direction, ambient temperature and relative humidity. Selected sites measure barometric pressure, global radiation, precipitation, surface wetness, vertical wind speed, vertical temperature gradient, and visibility. The ambient air monitoring parameters for each station are summarized in Table 1.

The WBEA also maintains and operates several portable stations, equipped to measure SO₂, H₂S, O₃, NO_x, NO, NO₂, NH₃, PM_{2.5}, THC, wind speed, wind direction, temperature and GPS location. The unit is available to WBEA member companies for private, facility-associated monitoring, or can be deployed for public monitoring in areas of special need or interest.

Since 1998 WBEA has maintained semi-continuous (intermittent) sampling for PM_{2.5}, PM₁₀, VOC and PAH. The sampling for intermittent monitoring has evolved with a better understanding of technology, analytical laboratory methods and sample deployment and collection methods. Intermittent samples in the WBEA ambient air monitoring network are taken every 6 days for a 24-hour period. The sampling schedule and procedures are consistent with Environment Canada's National Air Pollution Surveillance (NAPS) program. Since the planning process of the Joint Oil Sands Monitoring Plan, additional sampling has been added at selected sites and has been included in the list in table 1.0. Some of the additional monitoring includes speciated ionic analysis and dichotomous sampling for coarse and fine particulate on a three day sampling schedule.

WBEA AMBIENT AIR MONITORING NETWORK																																					
WBEA Program - X															Enhanced Deposition Program - X																						
CONTINUOUS MONITORED PARAMETERS															INTEGRATED SAMPLING																						
STATION NAME	STATION #	TYPE	SO ₂	H ₂ S	TRS	O ₃	NO _x	NO	NO ₂	NH ₃	CO	PM _{2.5}	THC	NMHC	CH ₄	PAH	BTEX	Calib	WS	WD	VWS	AT	RH	GR	SW	BP	PRECIP	EC/OD	SASS	Dichro	PM ₁₀	PM _{2.5}	VOC	PAH	PRECIP		
Fort McKay - Bertha Ganter	1	Health	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mildred Lake	2	Compliance	X	X									X						X	X	X		X	X													
Lower Camp	3	Meteorological																	X	X	X	X	X														
Buffalo Viewpoint	4	Compliance	X	X									X						X	X	X	X	X														
Mannix	5	Compliance/Meteorological	X	X									X						X	X	X	X	X										X		X	X	
Patricia McInnes	6	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X				X				X	X	X	X	X	X	X
Athabasca Valley	7	Health	X		X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X			X					X	X	X	X	X	X	X
Fort Chipewyan	8	Background/Health	X			X	X	X	X			X							X	X	X	X	X	X	X	X	X										
Barge Landing	9	Attribution			X								X						X	X	X	X	X			X									X		
Lower Camp B	11	Compliance	X	X									X						X	X	X	X	X									X		X	X		
Fort McKay South	13	Attribution	X		X	X	X	X	X			X	X						X	X	X	X	X								X	X	X	X	X	X	
Anzac	14	Attribution	X		X	X	X	X	X			X	X	X	X				X	X	X	X	X	X	X	X	X				X	X	X	X	X		
CNRL - Horizon	15	Compliance	X		X		X	X	X			X	X						X	X	X	X	X	X		X				X	X						
Shell Muskeg River	16	Compliance	X				X	X	X			X	X						X	X	X	X	X	X		X					X						
Wapasu Creek	17	Compliance	X	X		X	X	X	X			X	X						X	X	X	X	X			X										X	X
Conklin	18	Background	X		X	X	X	X	X			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Suncor Firebag	19	Compliance	X	X			X	X	X				X						X	X	X	X	X														
Brion Energy	20	Compliance	X	X			X	X	X				X						X	X	X	X	X			X											
Genovus Christina Lake	500	Portable-Compliance	X	X		X	X	X	X			X							X	X	X	X	X														
Stat Oil Leismer	501	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
ConocoPhillips Surmont	502	Portable-Compliance	X	X			X	X	X										X	X	X	X	X														
HEMP	104	Portable-Health			X								X	X	X				X	X	X	X	X														

Table 1.0 - Ambient Air monitoring Parameters in the WBEA Network

All the stations listed in table 1 are located throughout the Wood Buffalo Region. The map below shows the location of each station.

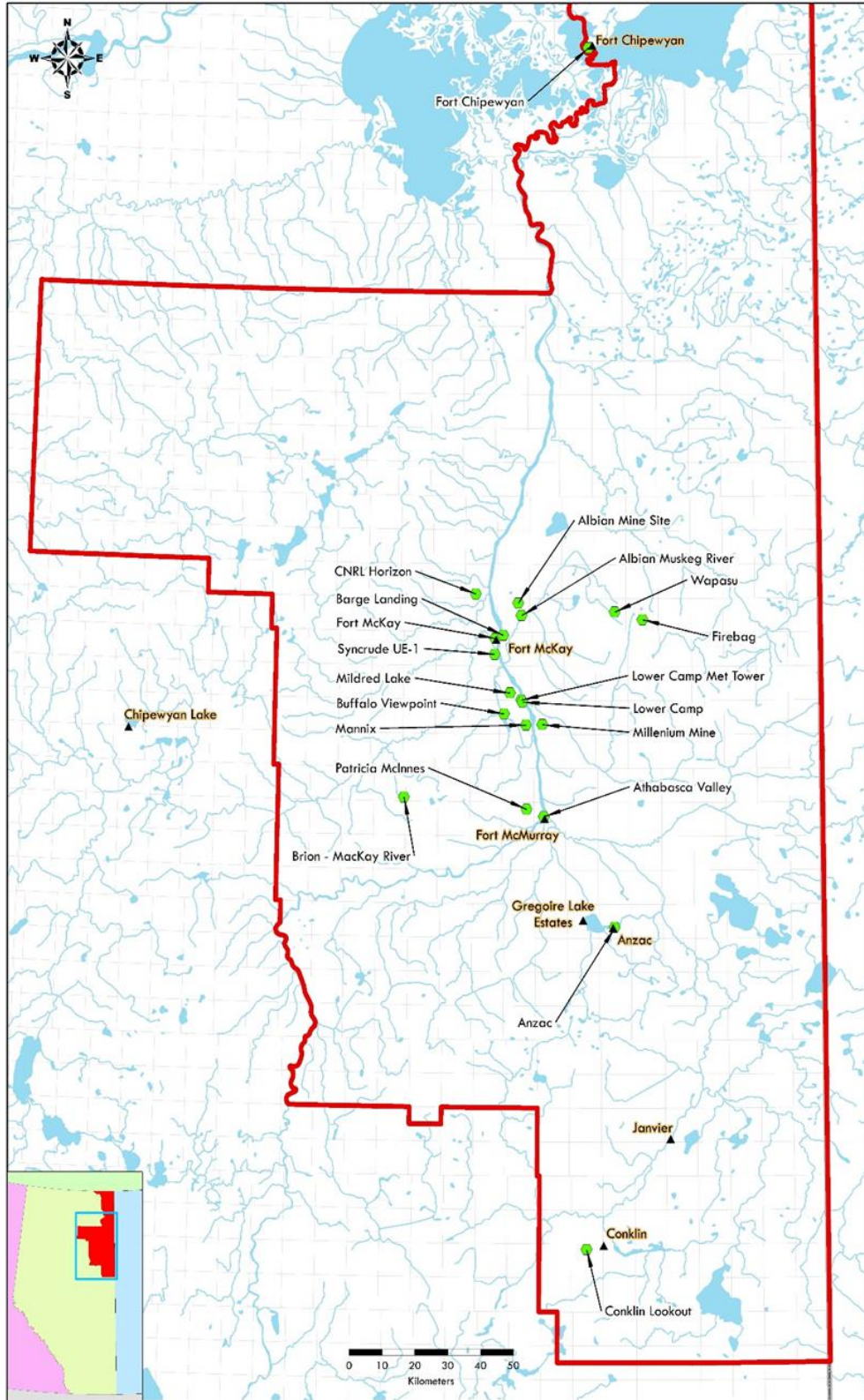


Figure 1.0 – WBEA Monitoring Network Sites

AMS 102 – Northern Lights Station Details

General Site Information

Northern Lights Portable AMS is currently collecting data at the ConocoPhillips Surmont site. The Northern Lights station contains analyzers and sensors that continuously measure SO₂, H₂S, NO_x, Wind speed, Wind direction, External temperature, and Relative humidity.

Item	Description			
Station ID	AMS 502			
Station Name	Northern Lights			
General description	Located at CononoPhillips Surmont site in area 500 by the blowdown pond.			
Community	NA			
Station Coordinates	56° 11' 26.4984"	North	110° 56' 31.3974"	West
Station elevation	634			Meters
Station Address	NA			
Station Type	Portable-Compliance			
Initial Commission Date	NA			
Area Land Use	Industrial – SAGD			
Angle of elevation to nearby buildings	0 degrees			
Average building height in area	0 meters			
Airflow Restrictions (yes/no)	North	no	East	No
	South	No	West	No
Nearest Tree	Distance	NA	Height	NA
Sample Manifold Type	Glass			
Meteorological Tower Information	Height	10 meters		
	Type	Aluma crank-up tower		
	Position	Attached to North end of monitoring shelter		
Station Install Date	NA			
Station Origin	NA			
Site Preparation	Level gravel pad			

Table 2.0 – General Site Information

Localized Sources

Type	Distance		Description	
Blowdown pond	50 m west		Pond used to store water that accumulates during normal plant operations.	
Steam generation boilers	150 m northwest		Boilers used to produce steam for SAGD process.	
Name	Type	Traffic Volume	Distance (m)	Description
Roadway	Dirt/gravel road	Medium	20	Used by workers to access many areas of the plant.

Table 3.0 – Local Source Information

Area Topographic Map

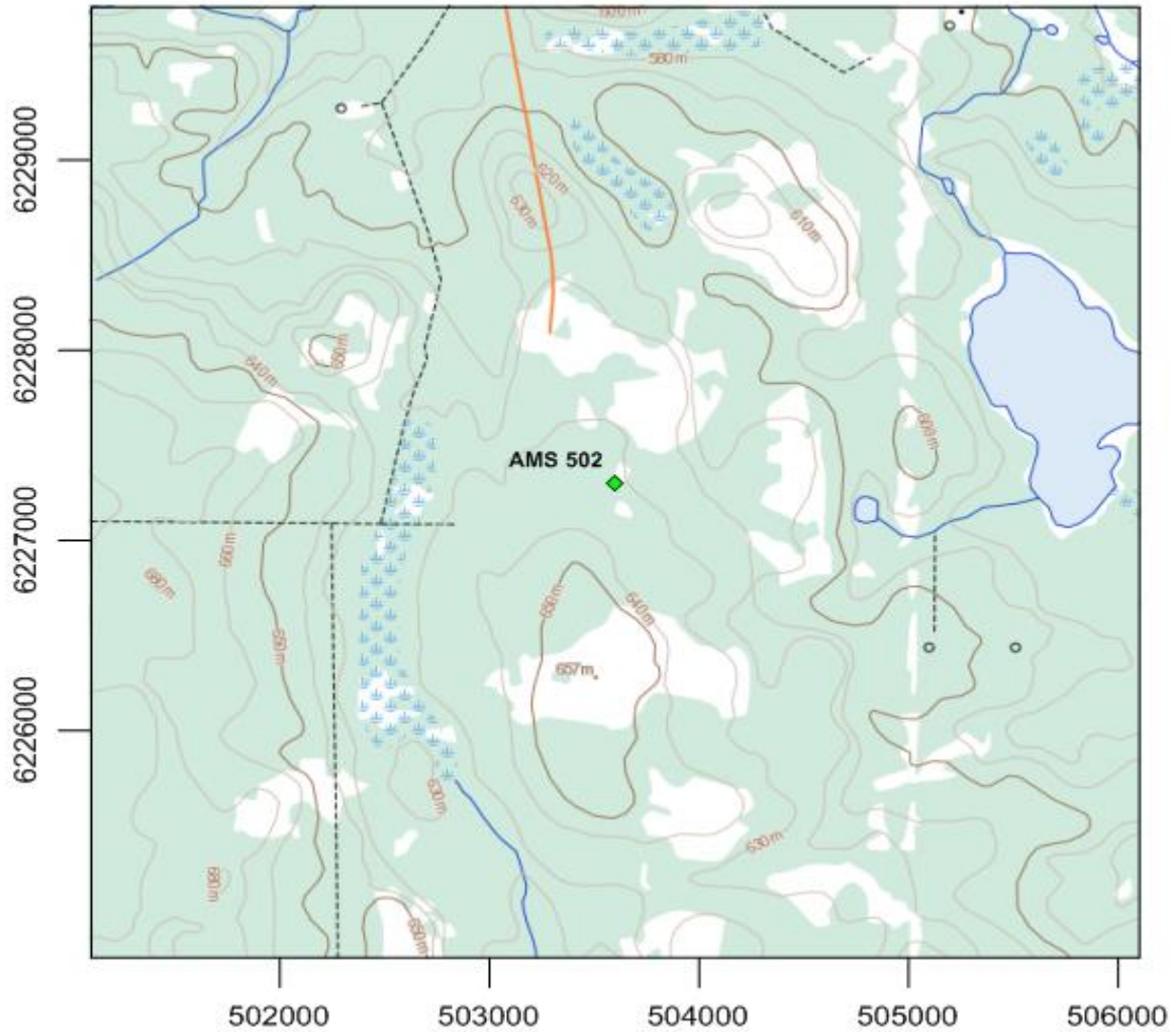


Figure 2.0 – Area Topographic map showing AMS 102 – Northern Lights Station

Aerial Photo



Figure 3.0 – Aerial photo showing AMS 102 – Northern Lights Station

Site photos

The following show photos of the station surroundings as well as the exterior and interior of the station itself.



Figure 4.0 – Exterior of monitoring station



Figure 4.1 – Monitoring compound looking south



Figure 4.2 – Environ looking north



Figure 4.3 – Environ looking east



Figure 4.4 – Environ looking south



Figure 4.5 –Environ looking west



Figure 4.6 – Outdoor Sample Inlet and Indoor manifold setup

Equipment Inventory

Parameter Measured		Make	Model	Serial Number	Range	Detection Principle	Sampling Height (m)	
							Ground	Shelter
SO2	Sulfur Dioxide	Teledyne API	T100	598	0-1000ppb	Pulsed Fluorescence	4	1
H2S	Hydrogen Sulfide	Teledyne API	T101	197	0-100ppb	Pulsed Fluorescence	4	1
NOx	NO/NO2/NOx	Thermo Instruments	42i	1218153356	0-1000ppb	Chemiluminescence	4	1
AT/RH	Ambient temp and relative humidity.	Vaisala	HMP155	J3310031	Temp: -80 - +60 C RH: 0-100%	Thermometer. Measurement is based on measuring voltage across a capacitive film polymer sensor.	4	
WS	Wind speed	Met One	010C-1	G3212	0-80kph	Chopped optical	10	
WD	Wind direction	Met One	020C-1	G3858	0-360 degrees	Resistive (potentiometer)	10	

Table 4.0 - Analytical Equipment in AMS 102

Name	Description	Make	Model	Serial Number
Datalogger	Datalogger	Campbell Scientific	CR3000	9035
ZAG	Zero Air Generator	Teledyne API	M701	196
HVAC	Heating and air conditioning system. Wall mount unit	BARD	NA	NA
Shelter / Building	Air monitoring portable	ITB	NA	ITB1315940
Gas Dilution Calibrator	Uses Mass Flow Controllers to dilute and deliver calibration gasses at concentrations required for multipoint instrument calibrations, troubleshooting and daily reference points.	Teledyne API	T700	622

Table 5.0 - Support Equipment in AMS 102

Wind Rose



Wood Buffalo Environmental Association
Wind Rose July 2014 - December 2016

Wind Speed (WS) - km/h
ConocoPhillips - Surmont (AMS502)

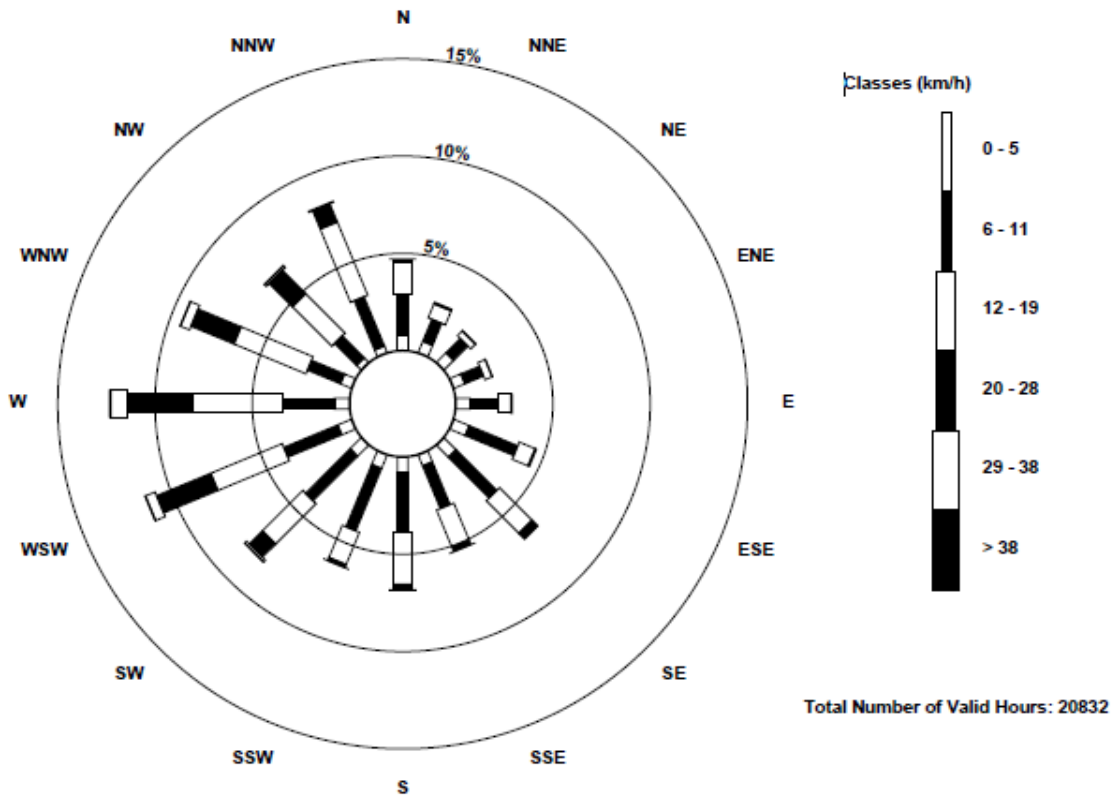


Figure 5.0 – AMS 502 2.5 Year Wind Rose



Figure 6.0 – Plan view sketch showing a 500m radius around Northern Light – ConocoPhillips station