Review of Water and Effluent Management

Alunorte
Barcarena/PA

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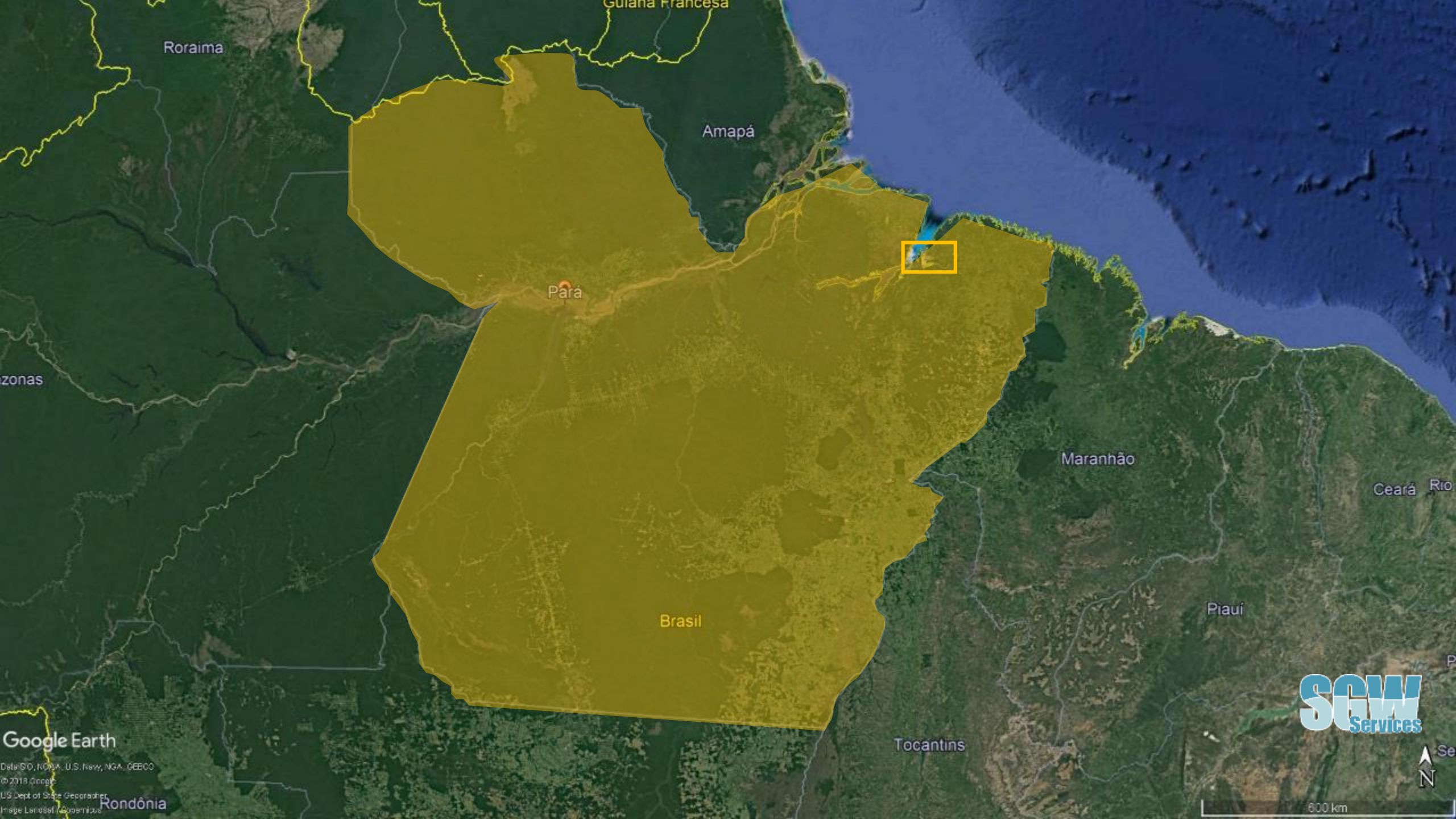
Scope and Objectives

- ✓ Independent Assessment of the Refinery Water and Effluent treatment management system.
- ✓ Focus on the intense rain event occurred on February 16th and 17th that caused flood at Barcarena region.
- ✓ **This review is preliminary and the works are ongoing.**
- ✓ The objective is to verify if the intense rain event resulted in environment contamination related to Alunorte leakages or operational and procedural failures.


Guiana Francesa
Roraima
Amapá
Pará
Brasil
Maranhão
Ceará
Piauí
Tocantins
Rondônia
Google Earth
SGW Services
N
600 km


Vila Nova community
Pará River
Murucupi River
Bom Futuro community
Burajuba community
Open dump
Port Area
ALUNORTE Refinery
CDP
BC5
BC6
DRS 1
Storage Basin
DRS-2
BC-201
BC-202
ALUBAR
BC1
BC2
BC3
ALBRAS
Transalumina highway
PA-483
PA-483


Pará River
EDB
WWTP
SUMP 2
Hydrate storage area
Bauxite storage area
Bauxite storage area
Port Area
Coal storage area
Final product storage area
Digestion
45 Area
SUMP 1
Decantation and Washing
Press filter
Calcination
Classification
Precipitation
Administrative area
SUMP B
SUMP A
Access to the port
Transalumina highway
Murucupi River
BC5
BC6
DRS
BC1
0 100 200 300 400 m
N
SGW Services

Rain events on Feb 16th and 17th

224mm rain in 10 hours

- ✓ There was no overflow at the solid waste basins - DRSs
- ✓ There was a Flood in Area 45 - The rainwater leakage occurred by a cracked deactivated pipe. Visual inspections and soil pH measurements results did not identify environmental alterations. **There was no overflow towards the Murucupi River. There are no evidences of environmental impacts in the river due to the deactivated pipe leakage.**
- ✓ Untreated rainwater was discharged into the **Pará River** by the *Canal Velho* in order to avoid WWTP basins overflowing. The discharge also received alkaline effluents from the process and there was a pH control and neutralization during this discharge.


Pará River
EDB
WWTP
SUMP 2
Hydrate storage area
Bauxite storage area
Bauxite storage area
45 Area
SUMP 1
Port Area
Coal storage area
Final product storage area
Digestion
Decantation and Washing
Press filter
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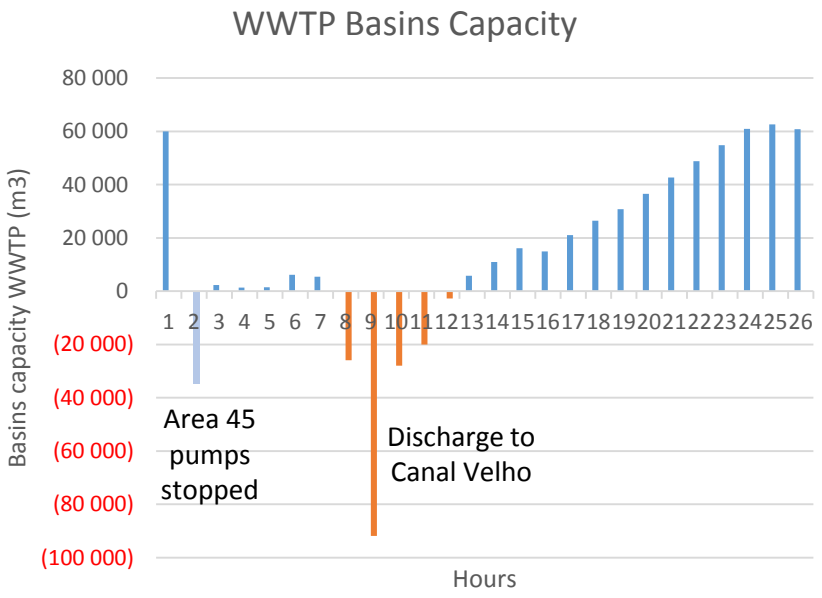
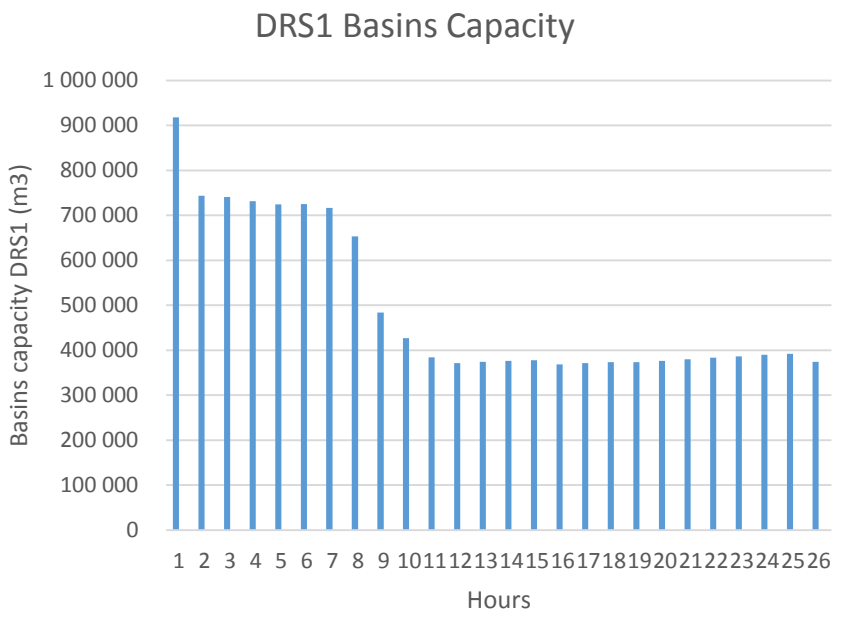
BC5
BC6
DRS
BC1
SGW Services
0 100 200 300 400 m
N

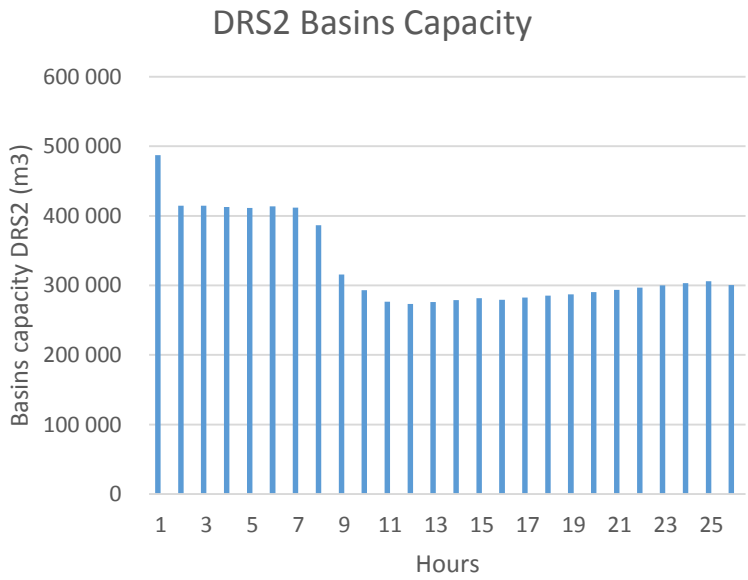
Water Balance Simulation performed by SGW

SGW performed a Water Balance simulation of the days16 and 17

- ✓ WWTP basins volumes did not have capacity to handle the unusual rainfall event;
- ✓ DRSs capacities sufficient







Sampling

As the existing data was not enough for a precise analysis of the Alunorte's contamination potential, SGW carried out a sampling in the environmental:

Surface water (Para and Murucupi rivers), effluents and mining pipeline;

Soil, Bauxite, Coal, Ashes, Red Mud.

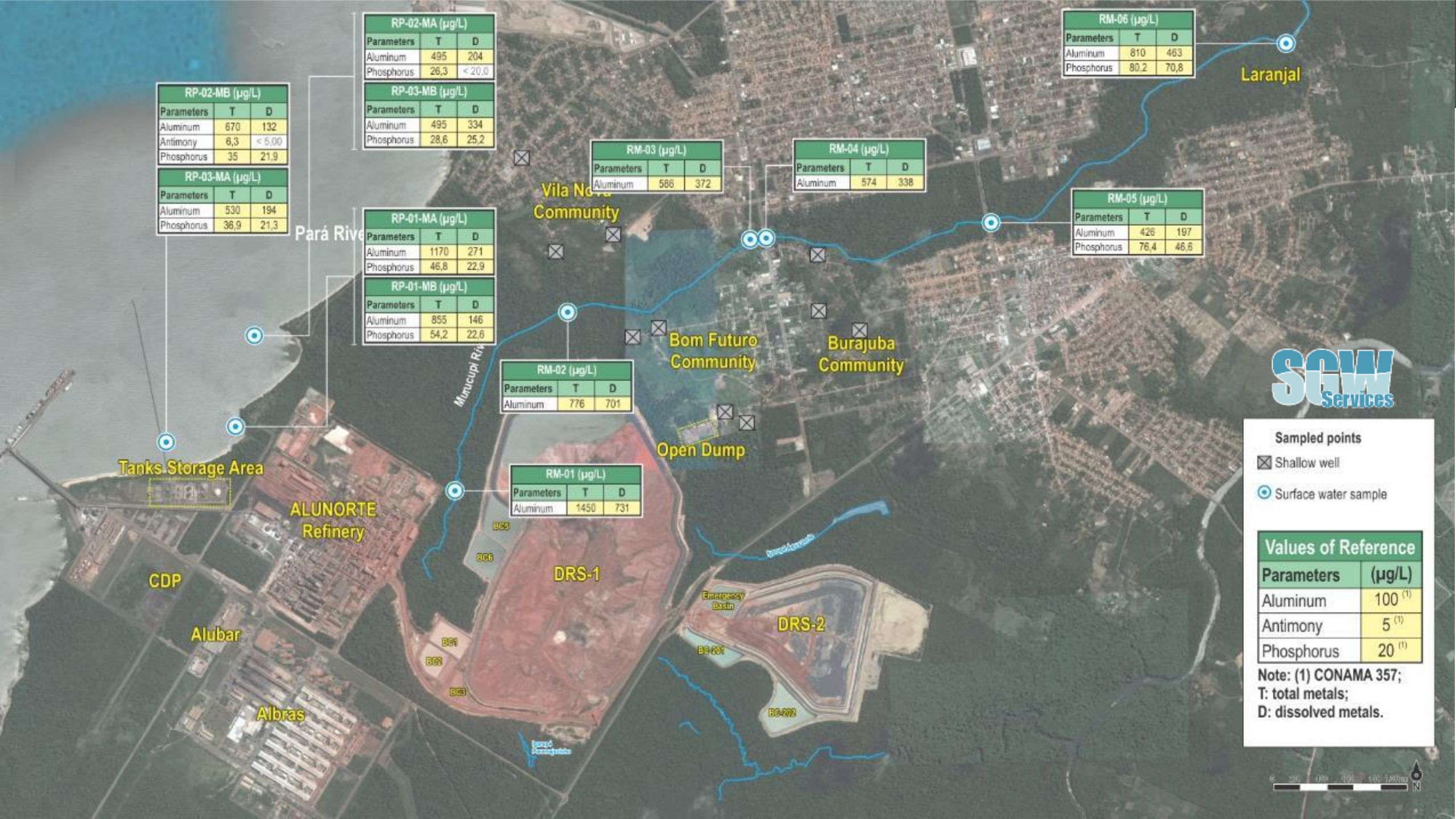
Well water from the Bom Futuro, Burajuba and Vila Nova communities

Preliminary results indicate impact absence on water bodies and point to region's natural anomalies (Al and Fe)*

The metals results are n/d or below the legal levels in the community wells - except 1 spot (Al = 220 ppb - Standard 200 ppb).

*Master thesis – Multielementary Regional Geochemistry applied to the Human and Environmental Health Fields in the Continental Portion of the Leaf AS.22-X-D – Belém – Northeast Region of Pará – Volume I; Author: Eduardo Paim Viglio, Belém – 2008; Pará University – Geosciences Institute


Sampling points
Shallow well
Surface water sample
Laranjal
Vila Nova Community
Pará River
Bom Futuro Community
Burajuba Community
Murucupi River
Open Dump
Tanks Storage Area
ALUNORTE Refinery
CDP
Alubar
Albras
DRS-1
DRS-2
Emergency Basin
SGW Services


RP-02-MA (µg/L)
Parameters T D
Aluminum 495 204
Phosphorus 26,3 < 20,0
RP-02-MB (µg/L)
Parameters T D
Aluminum 670 132
Antimony 6,3 < 5,00
Phosphorus 35 21,9
RP-03-MB (µg/L)
Parameters T D
Aluminum 495 334
Phosphorus 28,6 25,2
RP-03-MA (µg/L)
Parameters T D
Aluminum 530 194
Phosphorus 36,9 21,3
RP-01-MA (µg/L)
Parameters T D
Aluminum 1170 271
Phosphorus 46,8 22,9
RP-01-MB (µg/L)
Parameters T D
Aluminum 855 146
Phosphorus 54,2 22,6
RM-03 (µg/L)
Parameters T D
Aluminum 586 372
RM-04 (µg/L)
Parameters T D
Aluminum 574 338
RM-06 (µg/L)
Parameters T D
Aluminum 810 463
Phosphorus 80,2 70,8
RM-05 (µg/L)
Parameters T D
Aluminum 426 197
Phosphorus 76,4 46,6
RM-02 (µg/L)
Parameters T D
Aluminum 776 701
RM-01 (µg/L)
Parameters T D
Aluminum 1450 731
Laranjal
Vila Nova Community
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DRS-1
DRS-2
Emergency Basin
SGW Services
Sampled points
Shallow well
Surface water sample
Values of Reference
Parameters (µg/L)
Aluminum 100 (1)
Antimony 5 (1)
Phosphorus 20 (1)
Note: (1) CONAMA 357;
T: total metals;
D: dissolved metals.
N


Laranjal
Vila Nova Community
Pará River
CVN-01D (µg/L)
Parameters | T
Aluminum | < 100
Lead | < 10,0
Iron | < 300
CB-01D (µg/L)
Parameters | T
Aluminum | < 100
Lead | < 10,0
Iron | < 300
Bom Futuro Community
Burajuba Community
Murucupi River
CBF-01D (µg/L)
Parameters | T
Aluminum | 221
Lead | < 10,0
Iron | < 300
Open Dump
Tanks Storage Area
ALUNORTE Refinery
CDP
Alubar
Albras
DRS-1
DRS-2
Emergency Basin
SGW Services
Sampled points
Shallow well
Surface water sample
Values of Reference
Parameters | (µg/L)
Aluminum | 200 (1)
Lead | 10 (1)
Iron | 300 (1)
Note: (1) Drinking water standards (ANEXO XX DA PORTARIA DE CONSOLIDAÇÃO Nº 5, de 28 de Setembro de 2017)
T: total metals
D: dissolved metals
N

Conclusions

- ✓ Leakage from Sump 45 is not sufficient to cause significant environmental contamination.
- ✓ Emergencial discharge into Canal Velho – mainly stormwater – no significant impact in the Pará river
- ✓ Volumes discharge x river flow
- ✓ There was no overflow at the solid waste basins - DRSs
- ✓ Environment Diagnostic and monitoring expansion.
- ✓ The metals results are n/d or below the legal levels in the community wells - except 1 spot (Al = 220 ppb - Standard 200 ppb) – source not clear
- ✓ Preliminary results yet, so far not indicating any significant impacts

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