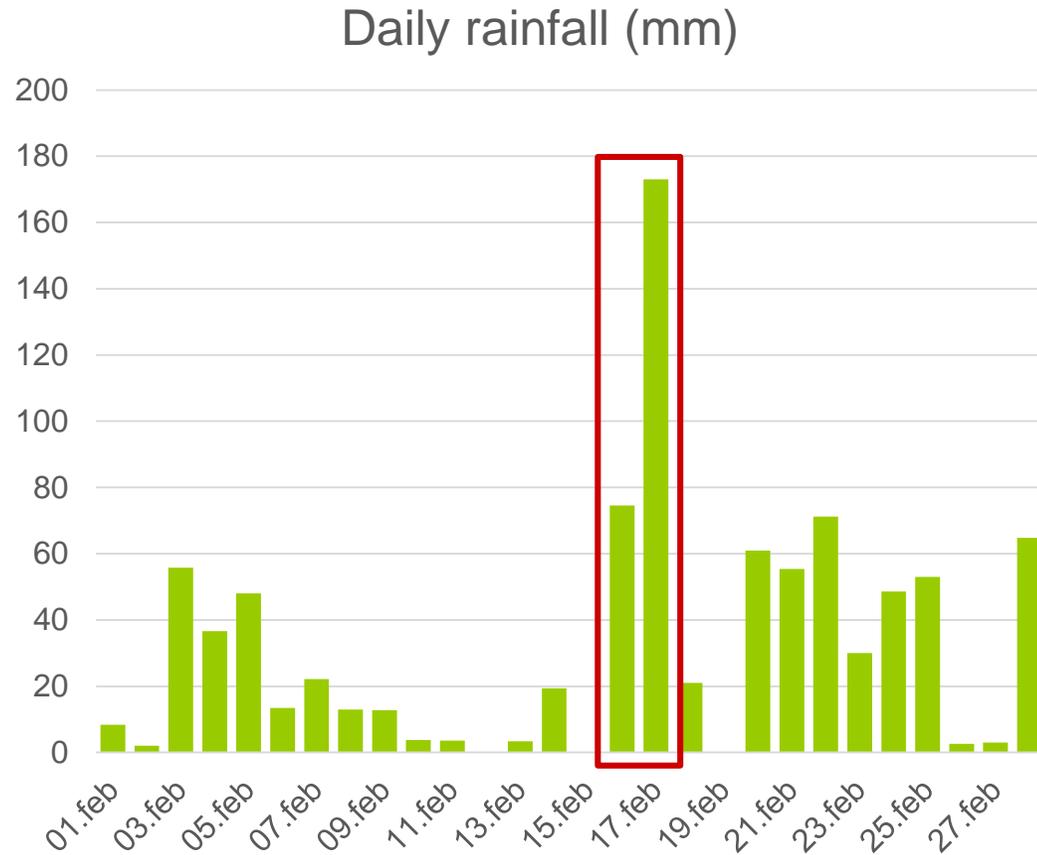




# Alunorte

15 March, 2018

# More than 200 mm of rainfall in 12 hours (16-17 February)

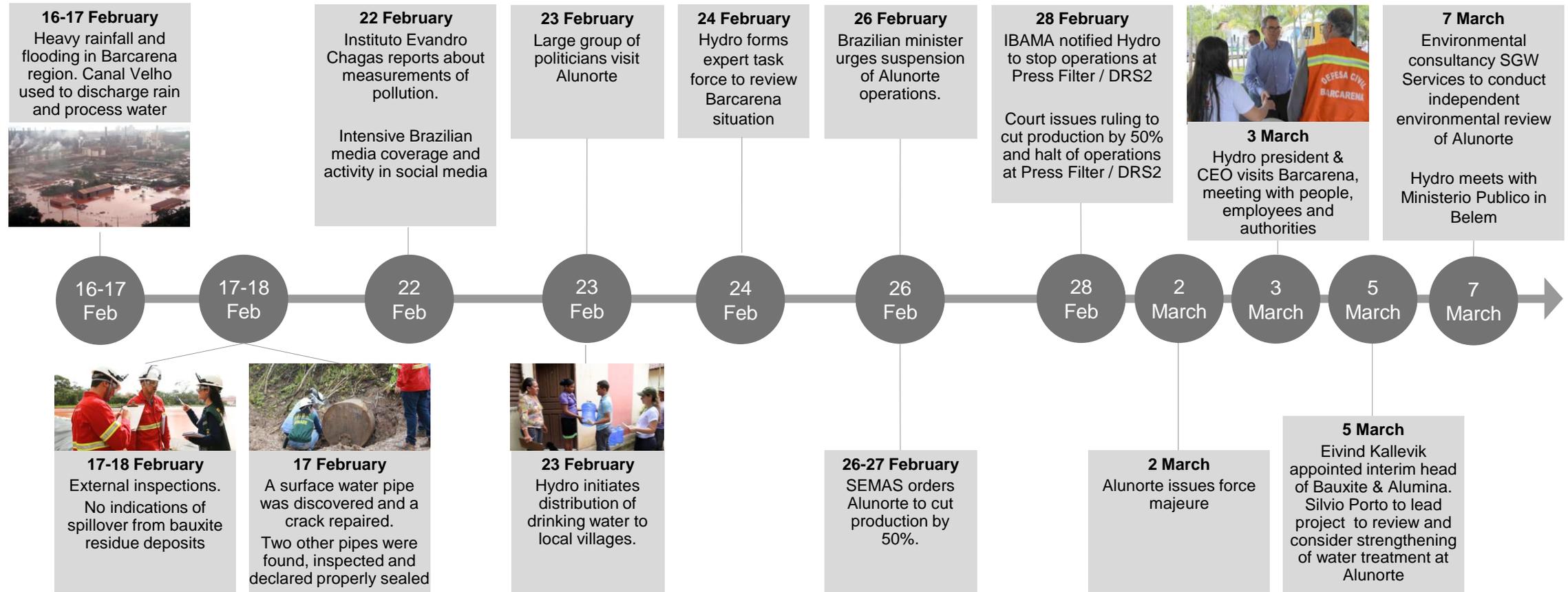


*The industrial premises inside Alunorte after the heavy rain fall, followed by extensive external inspections*



# Timeline of events

## Brief summary of the Alunorte situation



# Barcarena site layout



Pará River

Vila Nova

Burajuba

Port

Water  
treatment plant

Bom Futuro

Porto Vila do Conde

Bovic - Vila Do  
Conde, Barcarena - PA

Tecon, Vila do  
Conde Santos Brasil

Alunorte  
alumina refinery

Bauxite residue  
deposit DRS1

ALUBAR Metals  
and Cables

Bauxite residue  
deposit DRS2

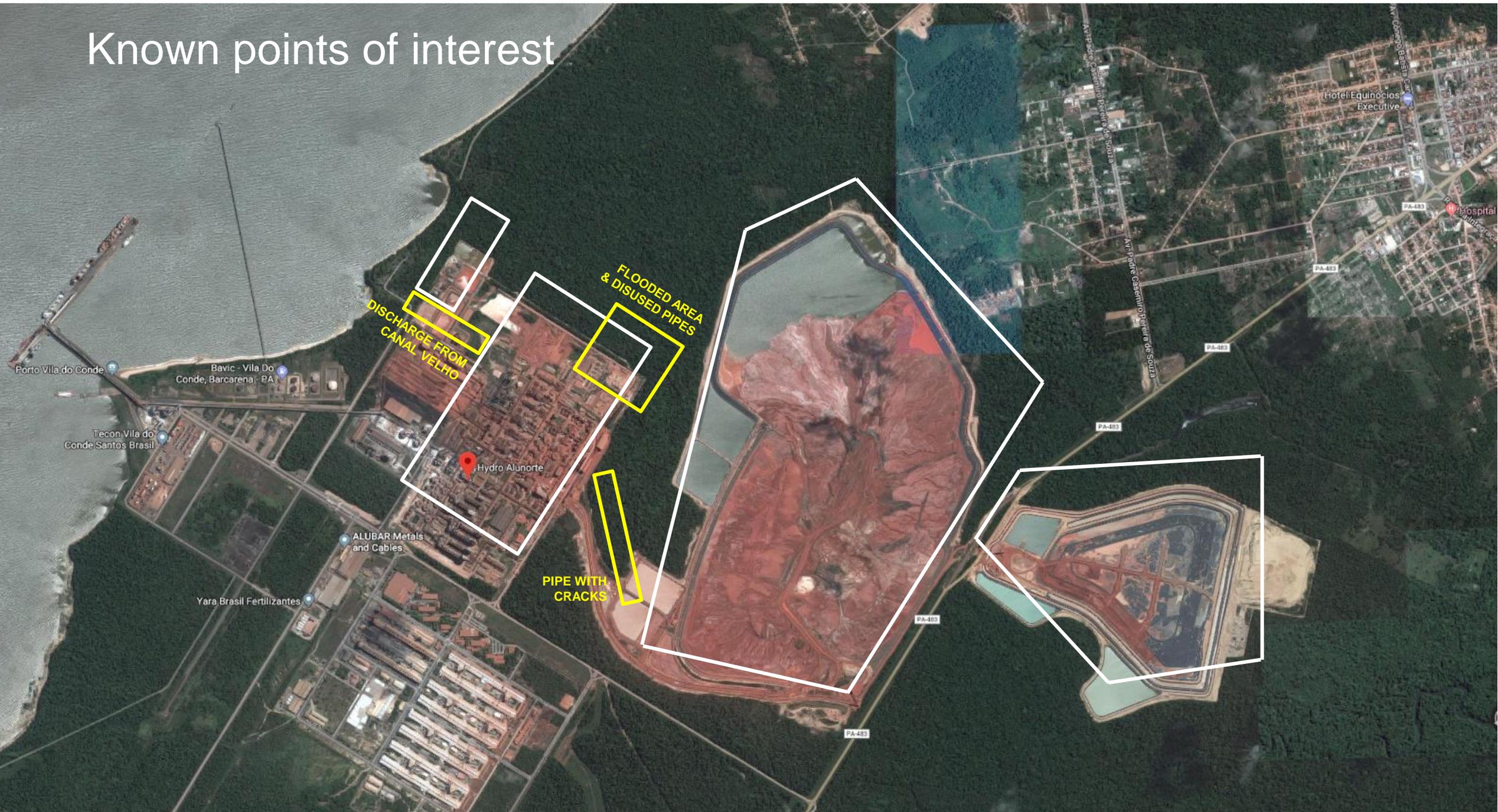
Yara Brasil Fertilizantes

Albras primary  
aluminium plant

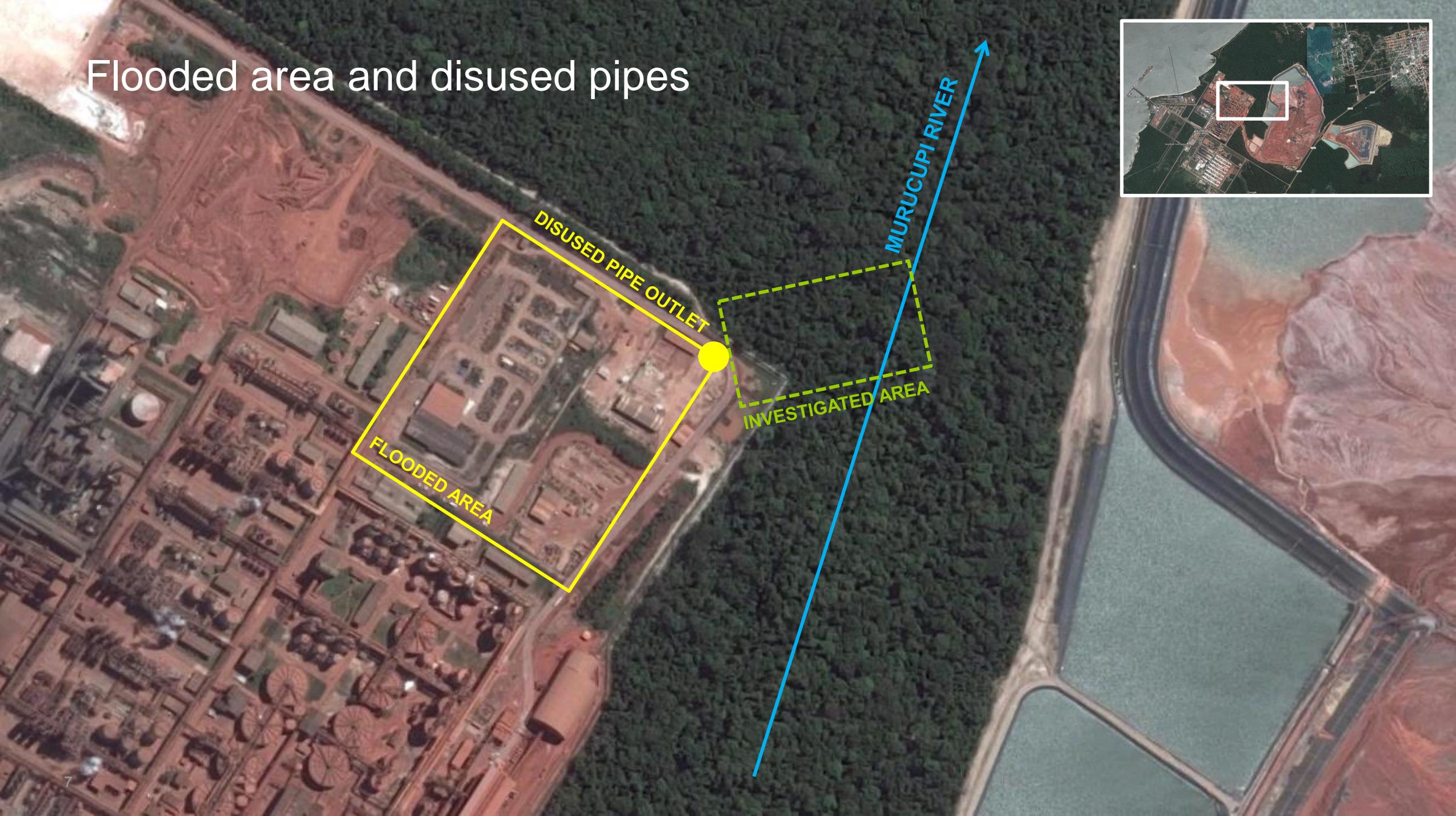
# Schematic of key water streams



# Known points of interest



# Flooded area and disused pipes



DISUSED PIPE OUTLET

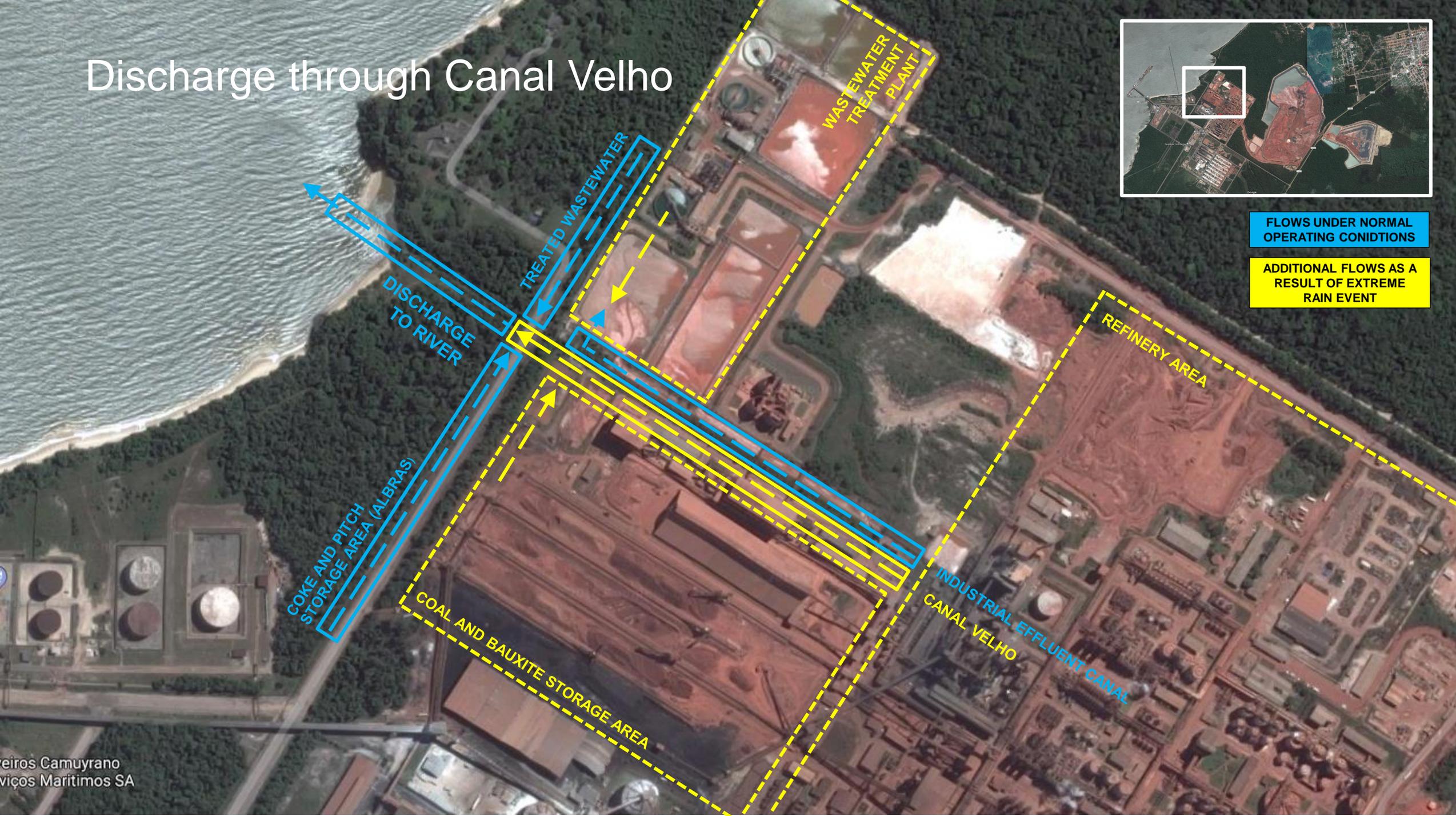
FLOODED AREA

INVESTIGATED AREA

MURUCUPI RIVER



# Discharge through Canal Velho



WASTEWATER TREATMENT PLANT

REFINERY AREA

COKE AND PITCH STORAGE AREA (ALBRAS)

COAL AND BAUXITE STORAGE AREA

INDUSTRIAL EFFLUENT CANAL CANAL VELHO

DISCHARGE TO RIVER

TREATED WASTEWATER

FLOWS UNDER NORMAL OPERATING CONIDCTIONS

ADDITIONAL FLOWS AS A RESULT OF EXTREME RAIN EVENT

# Summary of incidents

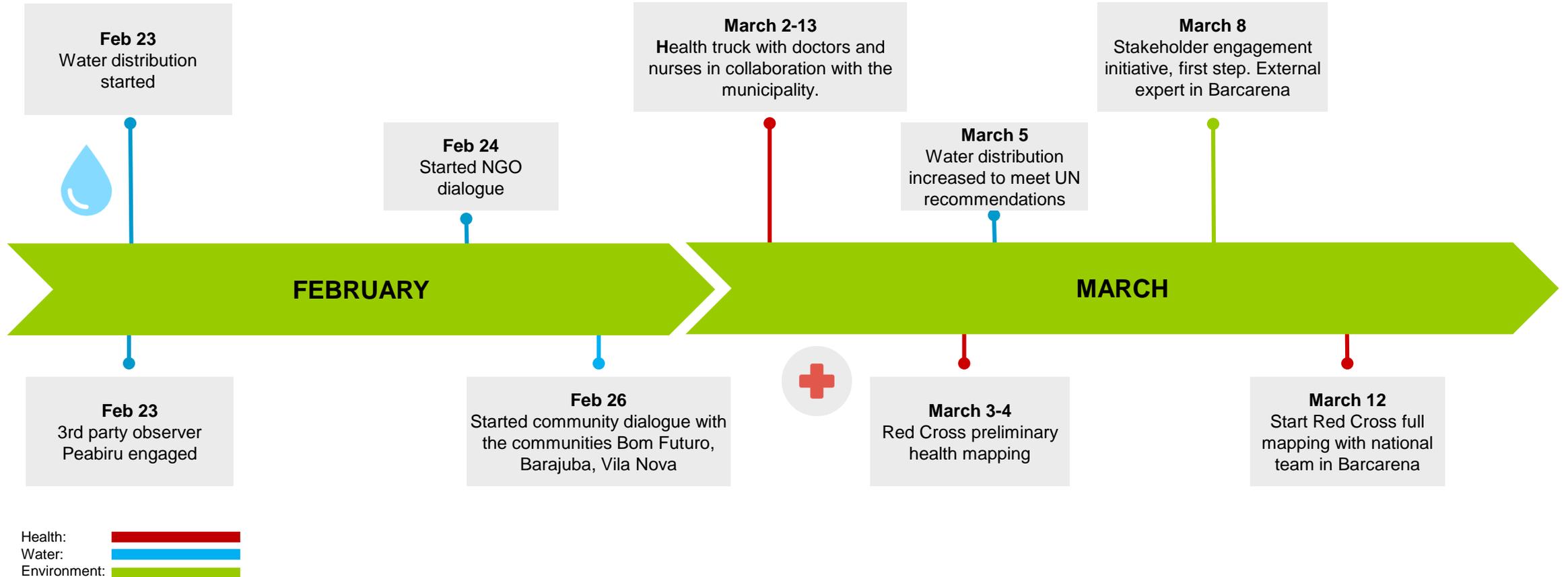
#	Where	What	Leakage	Content	Consequences
1	<b>Bauxite residue deposits (DRS1 and DRS2)</b>		No indications of leakage or spill		
2	<b>Flooded area (Sump 45) and disused pipes</b>	Broken sealing in 1 of 5 pipes	Surface water that went above normal levels in Sump 45	Surface water	No significant environmental impact from a pH perspective within sampled area
3	<b>Canal Velho (outside lisenca)</b>	Discharge of partly untreated rainwater	Surface water and process water.  Power outage in the refinery caused a spill of process liquor with high caustic soda concentration that mixed with the surface water	Dust of bauxite, dust of mineral coal and process water with high caustic soda content that was naturally thinned by the large amounts of surface water	Increased levels of turbidity, at one measuring point above limit.  Basic pH monitoring over the relevant period indicates that, with the exceptions of a few spikes, the discharge to the river was within pH limits.
4	<b>DRS1 pipe</b>	Crack in pipe	Rain water from deposit leaked from pipe, but contained in containment box	Rainwater from containment basin of DRS1 with traces of residue on the way to the effluent treatment station	No contact with environment

# Hydro has initiated a series of measures to resolve Alunorte situation

- Appointed CFO Eivind Kallevik interim head of Bauxite & Alumina
- Established project to assess and consider further strengthening of the robustness of Alunorte water treatment system
- Reviewing the situation:
  - Established internal expert task force to lead a comprehensive review of the situation, to assess available data and propose actions for possible improvements
  - Commissioned independent review to be conducted by Brazilian environmental consultancy SGW Services
  - Internal review and first phase external review to be presented April 9
- Launched clean water initiatives and committed to work together with social partners to invest in proper water supply for neighboring communities of Alunorte



# Health, water and environmental initiatives in Barcarena





Get the facts on the table to resolve issues related to safe operations for health, environment, community and employees

Results from internal review and external review phase 1 to be presented April 9

Second phase external review to be presented early May

