# Wastewater-based epidemiology for SARS-CoV-2 surveillance in South Africa

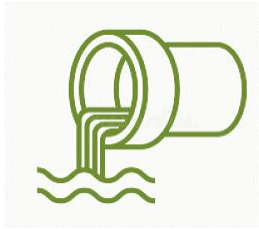
**Report date: 18 March 2022**

**Sample collection dates up to 15 March 2022 (epidemiological week 11)**

Centre for Vaccines and Immunology
National Institute for Communicable Diseases

# Wastewater-based Epidemiology for COVID-19

## *Why test wastewater for SARS-CoV-2?*



SARS-CoV-2 virus is excreted in stool by persons with active and recovering COVID-19 and can be found in wastewater

SARS-CoV-2 is not transmitted by faeco-oral route. Wastewater with SARS-CoV-2 is **not infectious**

Levels of SARS-CoV-2 in wastewater reflect population changes in case load and geographical distribution of cases

SARS-CoV-2 can be detected in wastewater before clinical cases appear

Increases in SARS-CoV-2 levels will appear before increases in clinical case load

Monitoring changes in SARS-CoV-2 levels can support public health preparedness and response activities

health
Department:
Health
REPUBLIC OF

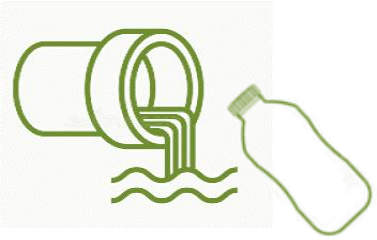
SACCESS

WATER
RESEARCH
COMMISSION

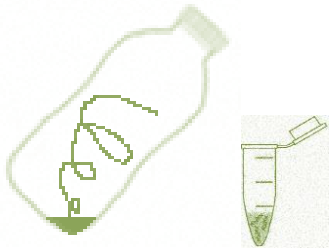
NATIONAL INSTITUTE FOR
COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Wastewater-based Epidemiology for COVID-19

## *How is wastewater tested for SARS-CoV-2?*

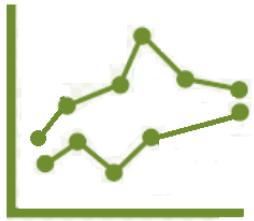


One litre of influent wastewater is collected in the morning (a 'grab' sample) and transported on ice to the lab



The one litre sample is concentrated

Viral RNA is extracted and PCR for SARS-CoV-2 is done



Results are visualised in a graph

SARS-CoV-2 is not transmitted by faeco-oral route.
Wastewater with SARS-CoV-2 is not infectious

health Department: Health REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

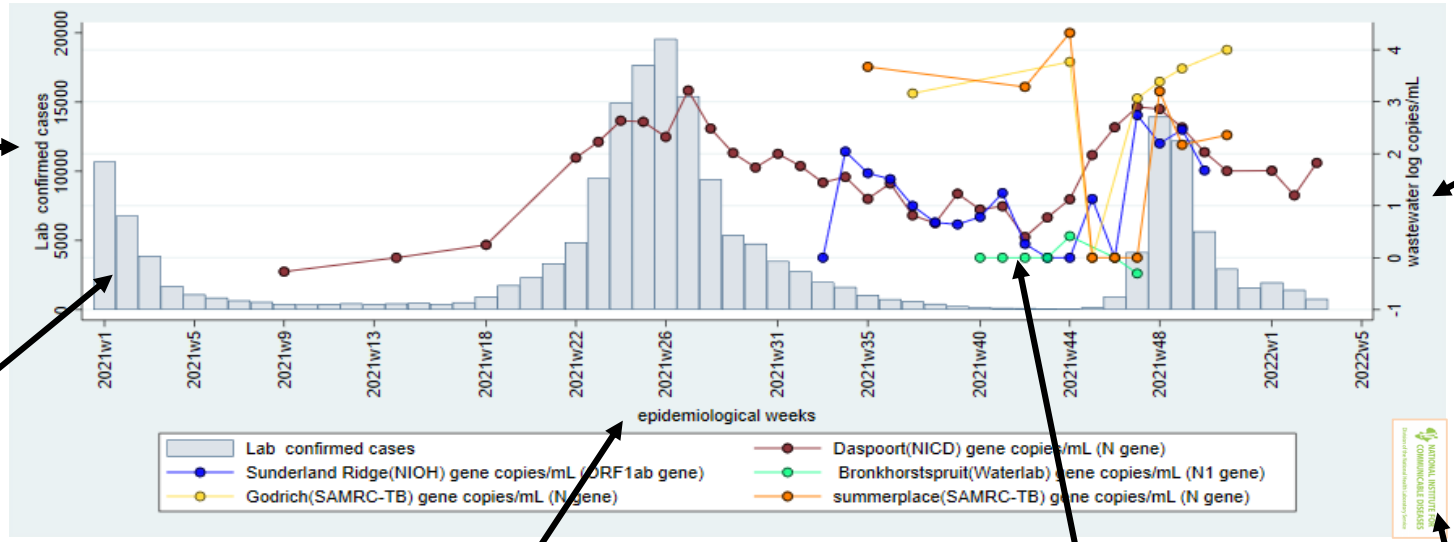
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Wastewater-based Epidemiology for COVID-19

## *What does wastewater testing for SARS-CoV-2 mean?*

**Left vertical axis:**

Number of lab confirmed cases in *the metro or district where the water treatment plant is located*




**Right vertical axis:**

Log (ie 10 to the power x) copies of SARS-CoV-2 genome per ml of wastewater. So log $2=10^2$ =100 copies per millilitre, log $3=10^3$=1000 copies per millilitre

**Bars:**

Number of lab confirmed clinical cases in specimens submitted to NICD from persons in the metro/subdistrict where the plant is located

**Horizontal axis:**

Epidemiological weeks from 2021 to 2022

**Coloured lines:**

Changes in wastewater SARS-CoV-2 results over time for different treatment facilities

**Laboratory logo:**

Laboratory producing the graphs for SARS-CoV-2 quantification

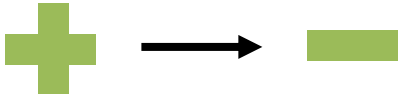
# Wastewater-based Epidemiology for COVID-19

## *How can we use wastewater testing for strengthening public health responses*

- What should we do if levels go from **negative** to **positive**?
  - Inform public
  - Strengthen health promotion messages regarding NPIs and vaccination
  - Strengthen testing in affected areas

- What should we do if levels are **increasing**?
  - Inform public
  - Identify where NPIs are not being adhered to and target these areas for strengthened health promotion messages regarding NPIs and vaccination
  - Strengthen testing in affected areas
  - Prepare hospitals for overflow

- What should we do if levels are **decreasing**?
  - Inform and congratulate public
  - Reinforce public health messaging regarding NPIs
  - Strengthen vaccination to ensure population is protected for the next wave

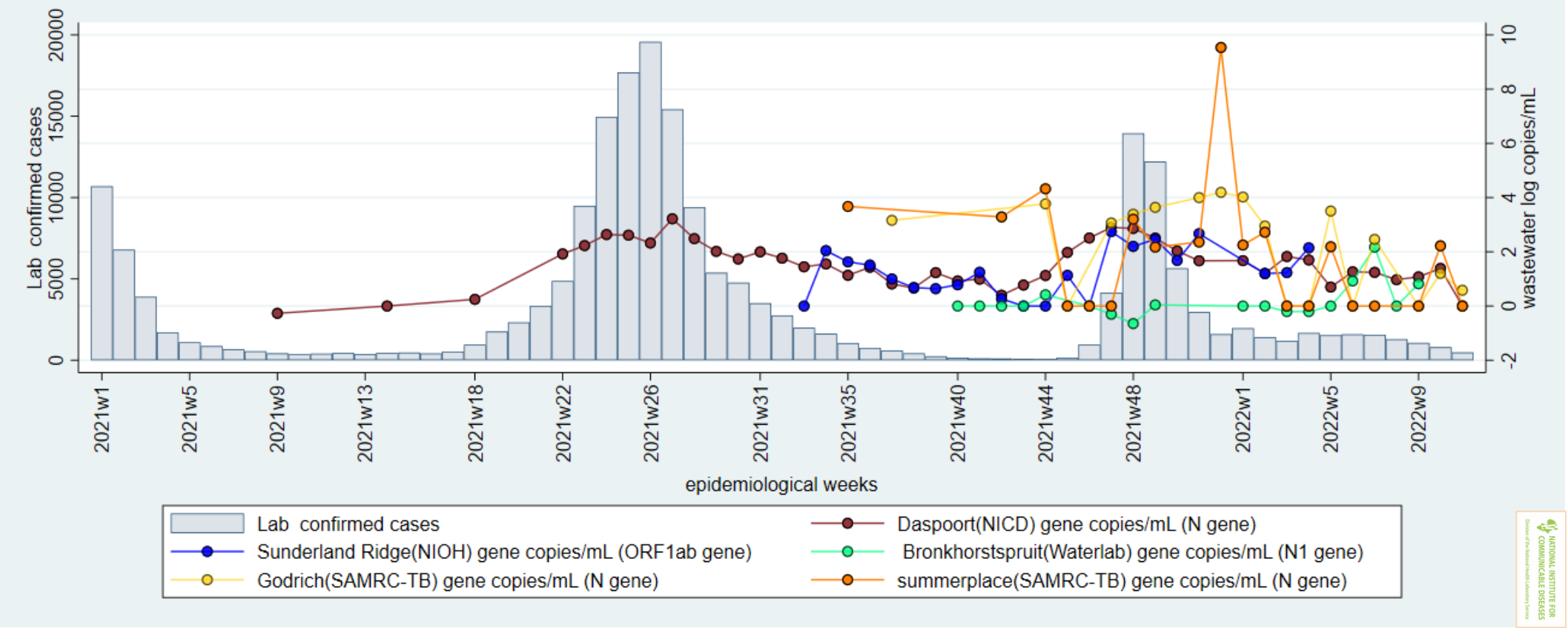


- What should we do if levels go from **positive** to **negative**?
  - Inform public
  - Redirect resources from NPIs to vaccination to ensure population is protected for the next wave

health
Department:
Health
REPUBLIC OF SOUTH AFRICA

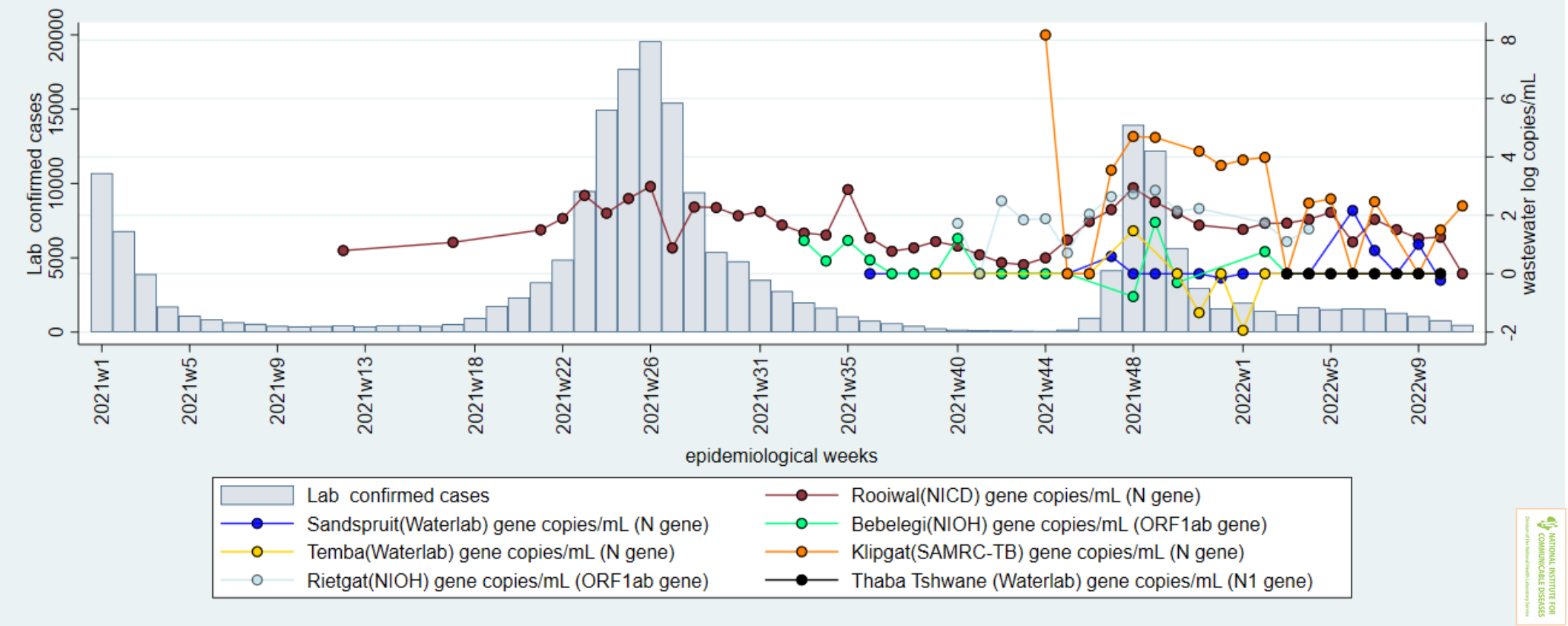
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Gauteng - Tshwane South (sub-district 3, 4, 6 & 7)




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Tshwane, compared with laboratory-confirmed cases resident in City of Tshwane (grey bars), by epidemiological week, 2021.

# Gauteng – Tshwane North (sub-district 1 & 2)




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Tshwane, compared with laboratory-confirmed cases resident in City of Tshwane (grey bars), by epidemiological week, 2021

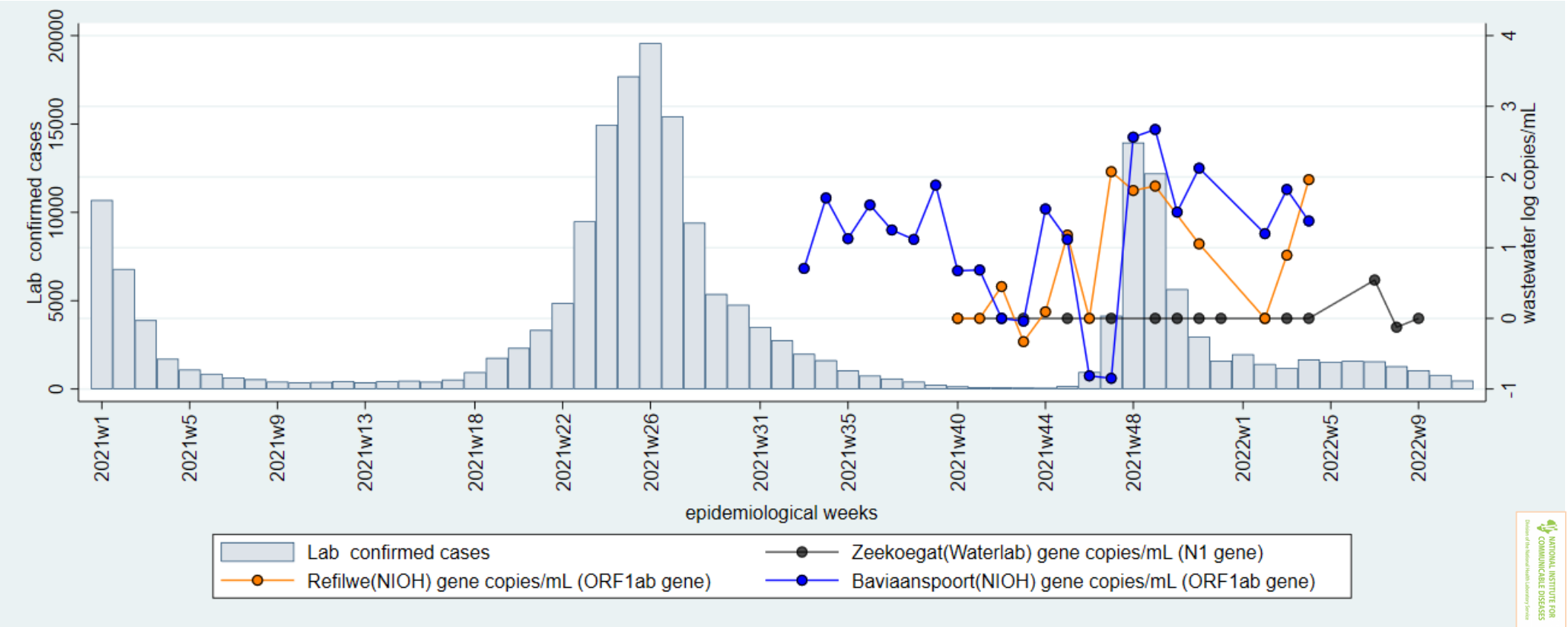
health
Department:
Health
REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

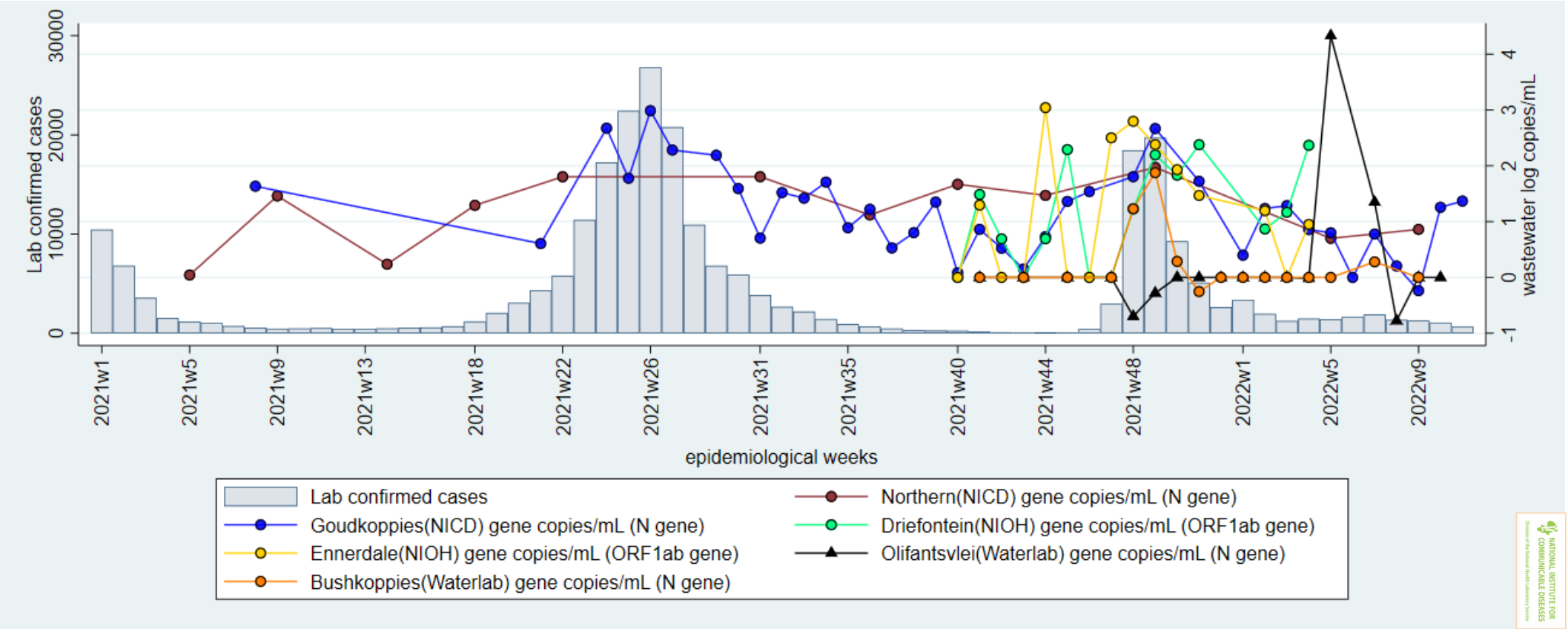
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Gauteng – Tshwane North (sub-district 5)



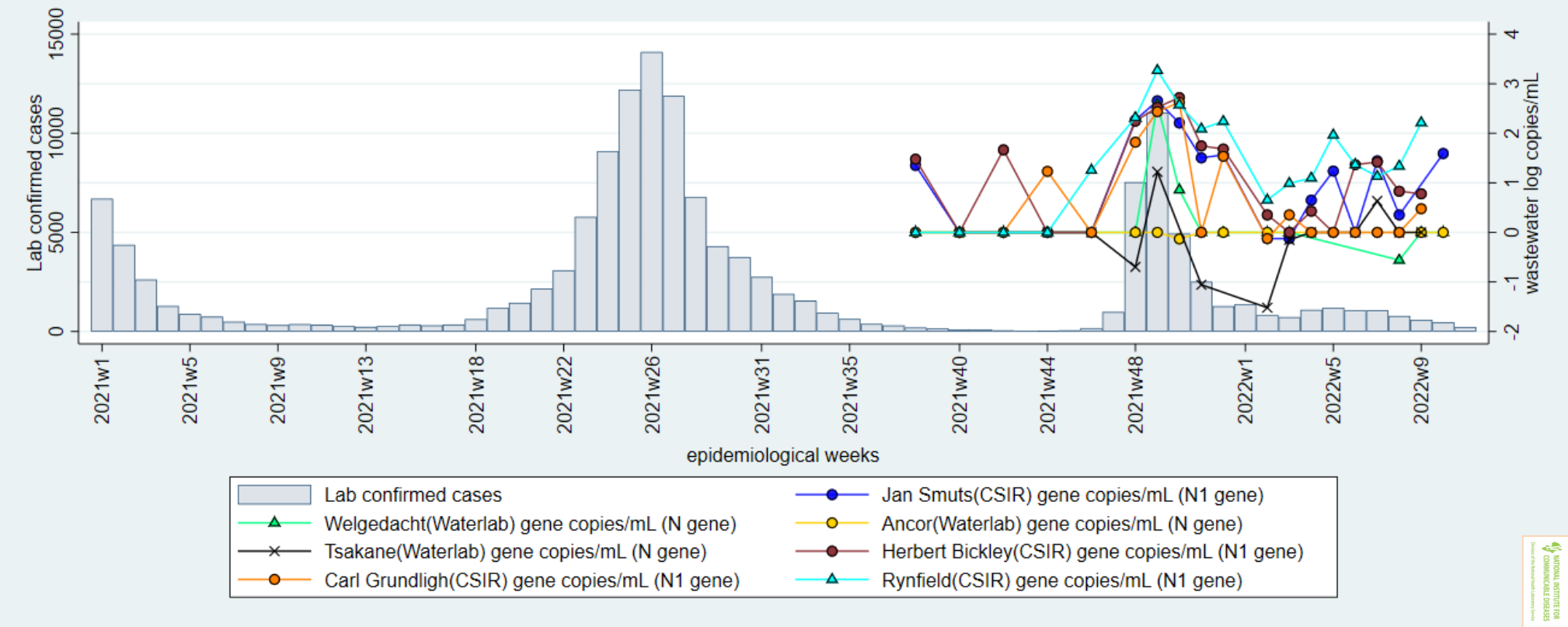

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Tshwane, compared with laboratory-confirmed cases resident in City of Tshwane (grey bars), by epidemiological week, 2021

# Gauteng - Johannesburg




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in City of Johannesburg, compared with laboratory-confirmed cases resident in City of Johannesburg (grey bars), by epidemiological week, 2021

# Gauteng – Ekurhuleni East (sub-district D, E, or E1, E2 )




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Ekurhuleni, compared with laboratory-confirmed cases resident in Ekurhuleni (grey bars), by epidemiological week, 2021

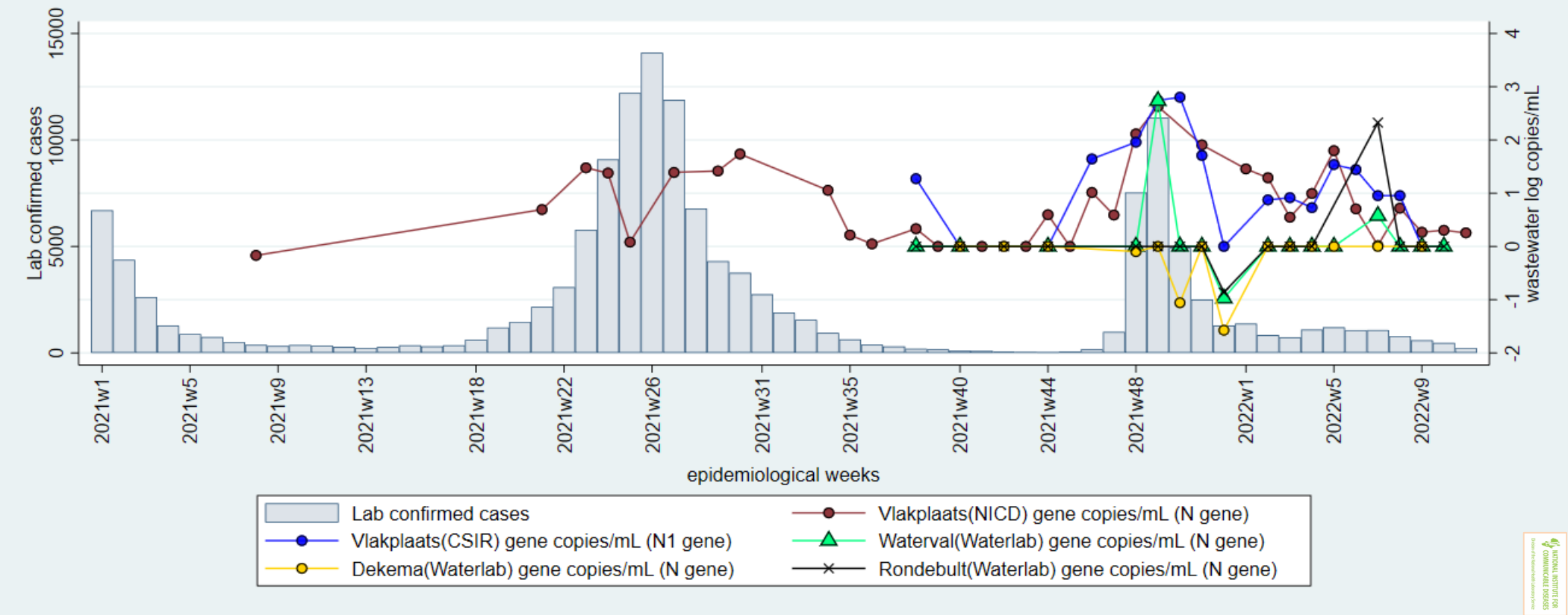
health Department: Health REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Gauteng – Ekurhuleni South (sub-district A, F, or S1, S2 )




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Ekurhuleni, compared with laboratory-confirmed cases resident in Ekurhuleni (grey bars), by epidemiological week, 2021

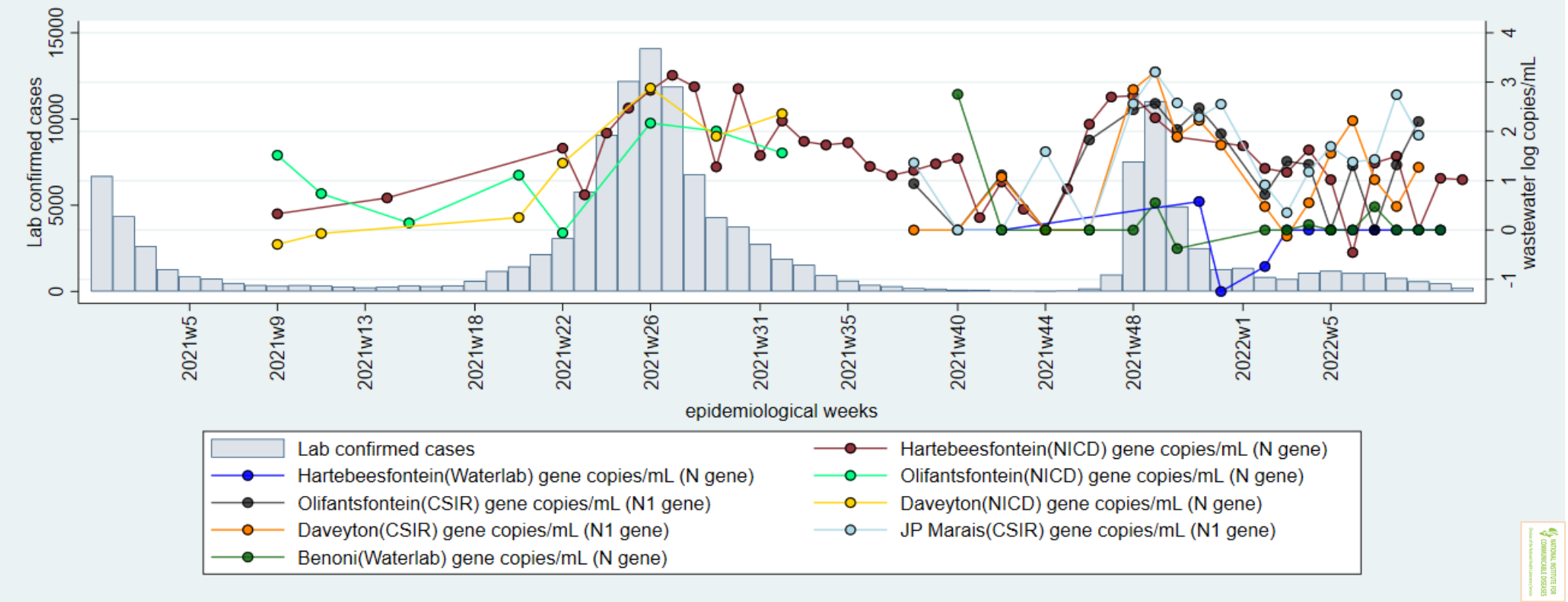
health Department: Health REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

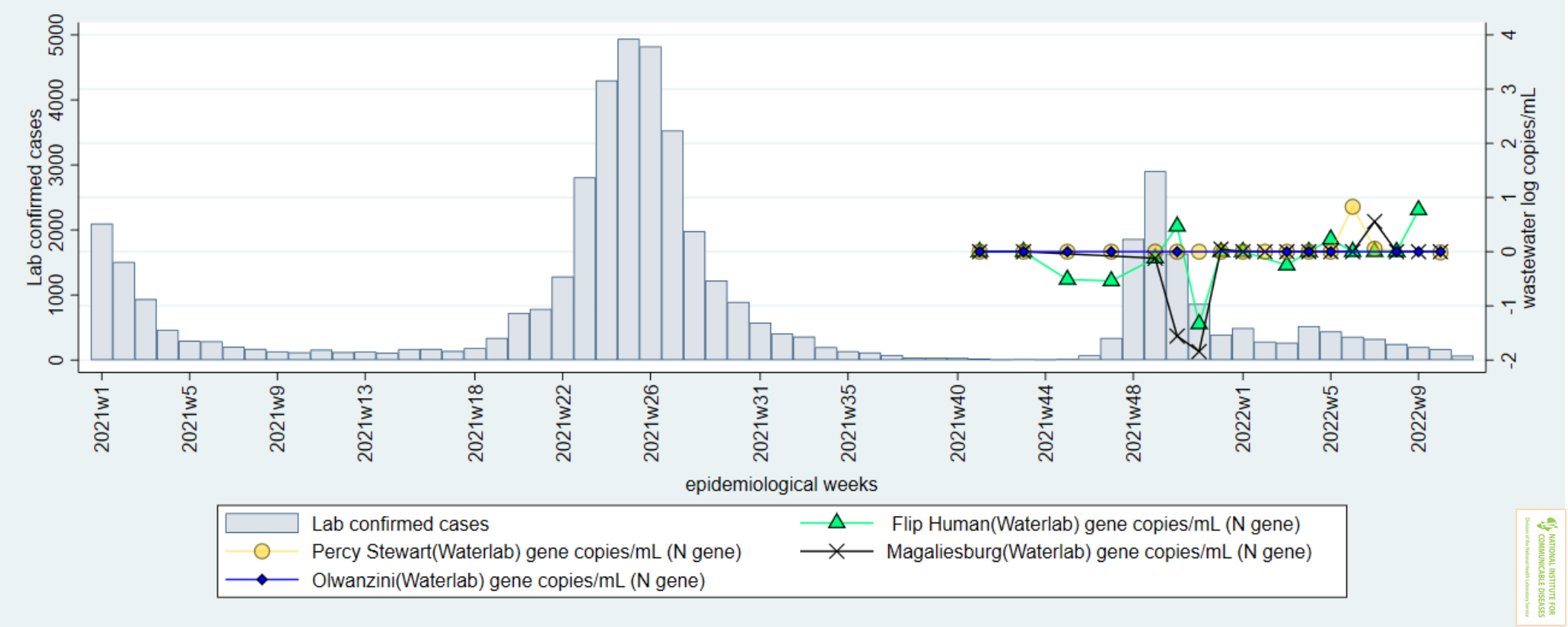
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Gauteng – Ekurhuleni North (sub-district B, C, or N1, N2 )



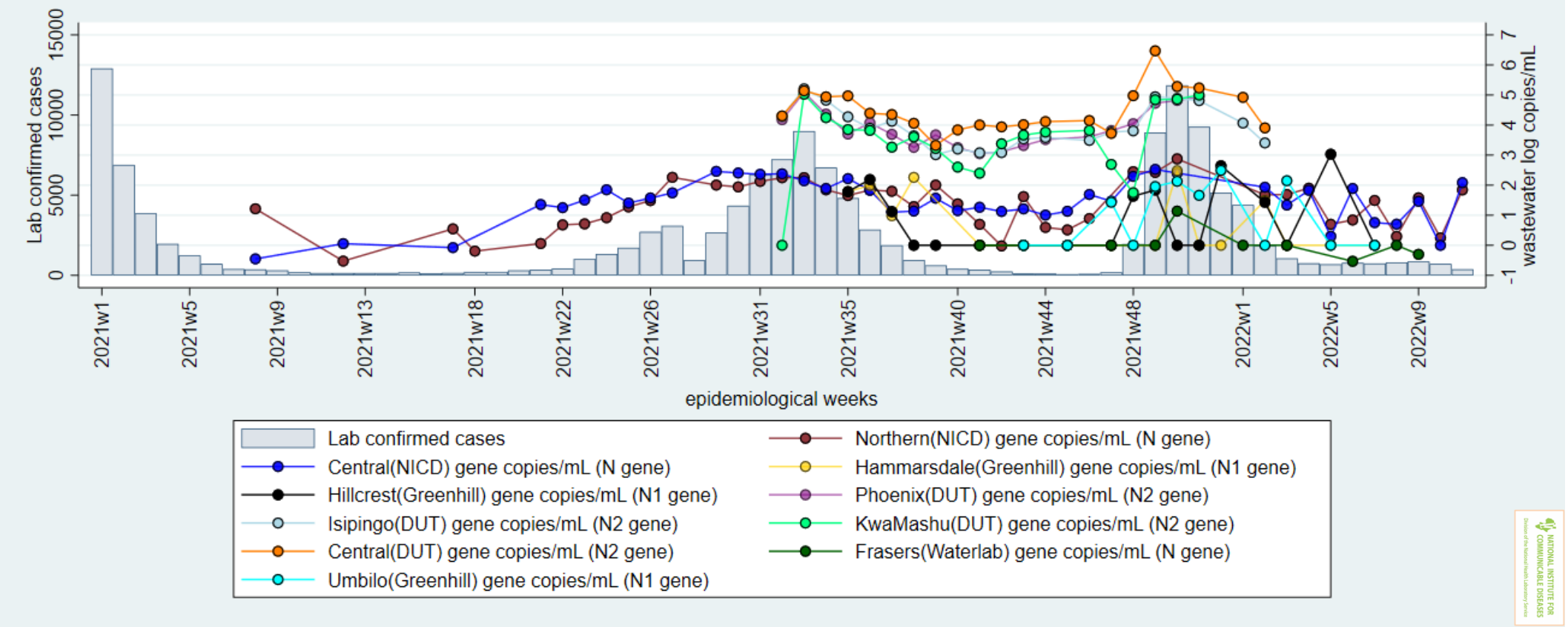

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Ekurhuleni, compared with laboratory-confirmed cases resident in Ekurhuleni (grey bars), by epidemiological week, 2021

# Gauteng – West Rand



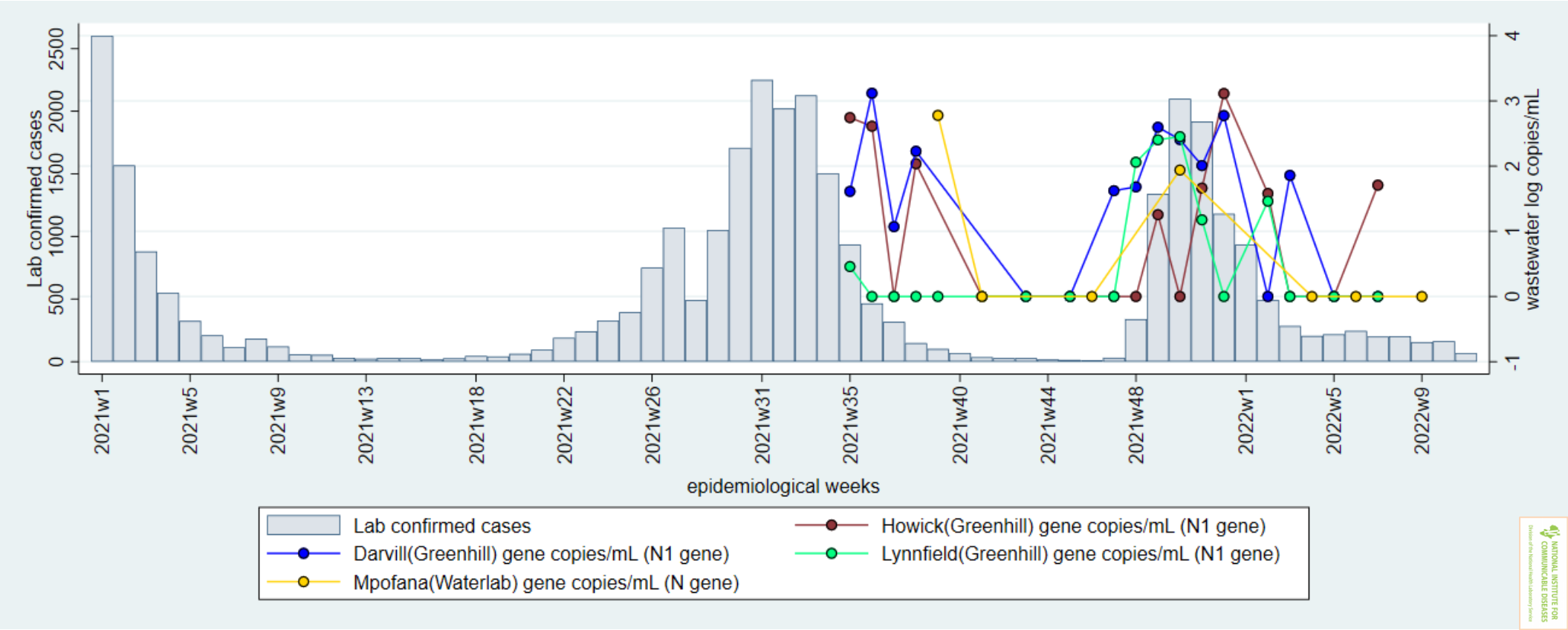

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in West Rand, compared with laboratory-confirmed cases resident in West Rand (grey bars), by epidemiological week, 2021

# Results: KwaZulu-Natal - eThekwini



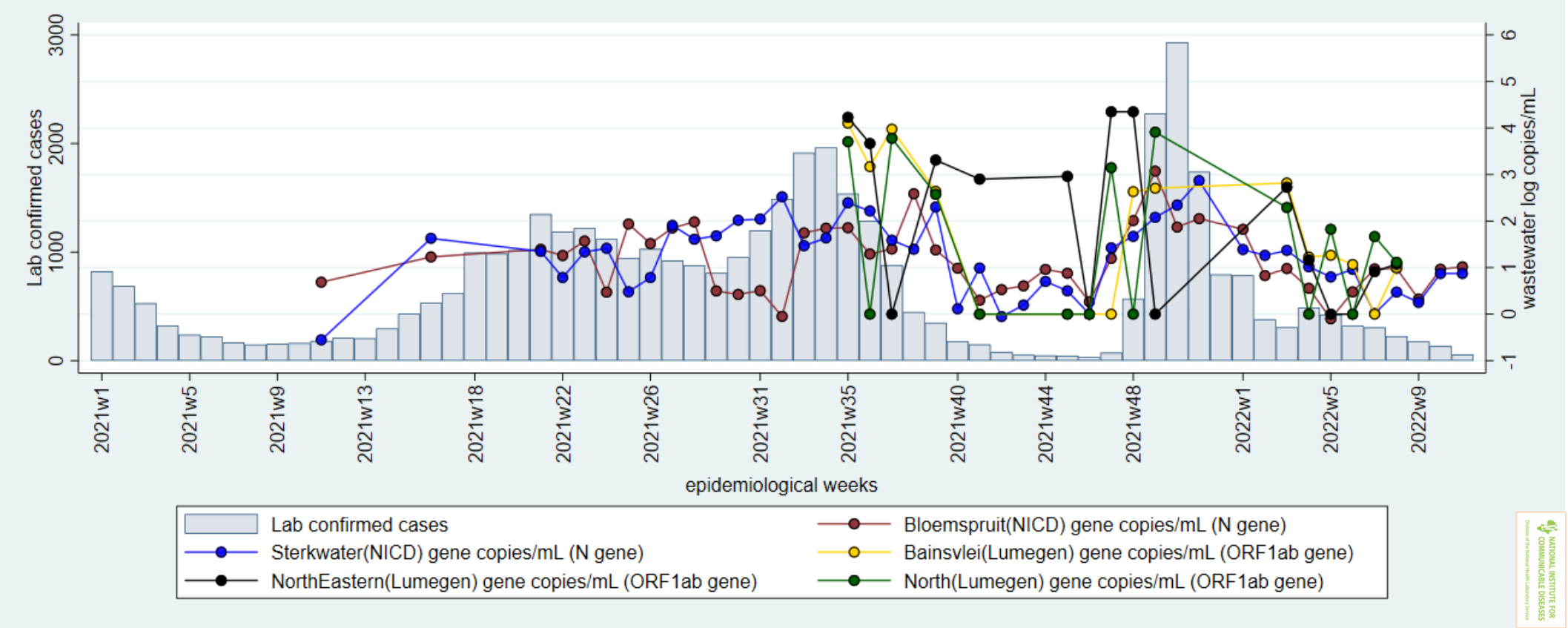

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in eThekwini, compared with laboratory-confirmed cases resident in eThekwini (grey bars), by epidemiological week, 2021

# KwaZulu-Natal - Umgungundlovu



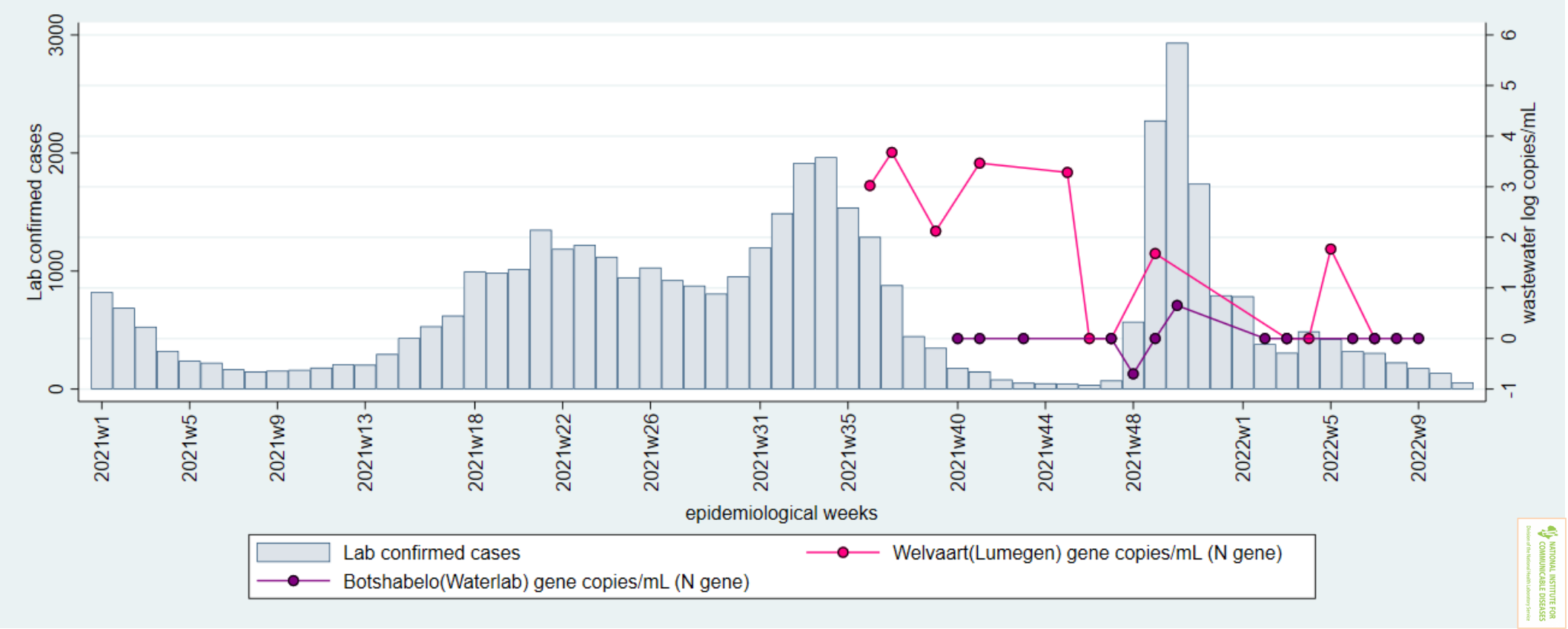

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Mgungundlovu, compared with laboratory-confirmed cases resident in Umgungundlovu (grey bars), by epidemiological week, 2021

# Free State – Mangaung (Bloemfontein SD)



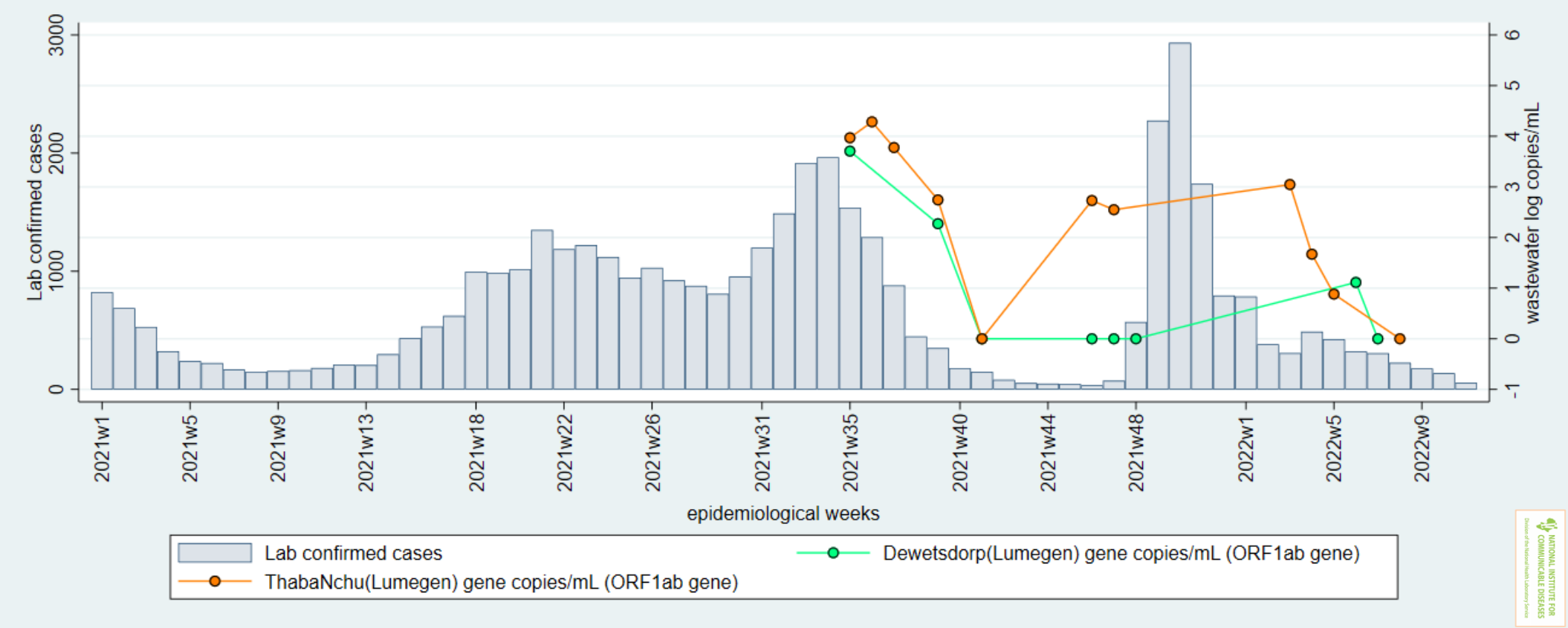

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Mangaung, compared with laboratory-confirmed cases in Mangaung (grey bars), by epidemiological week, 2021

# Free State – Mangaung (Botshabelo SD)



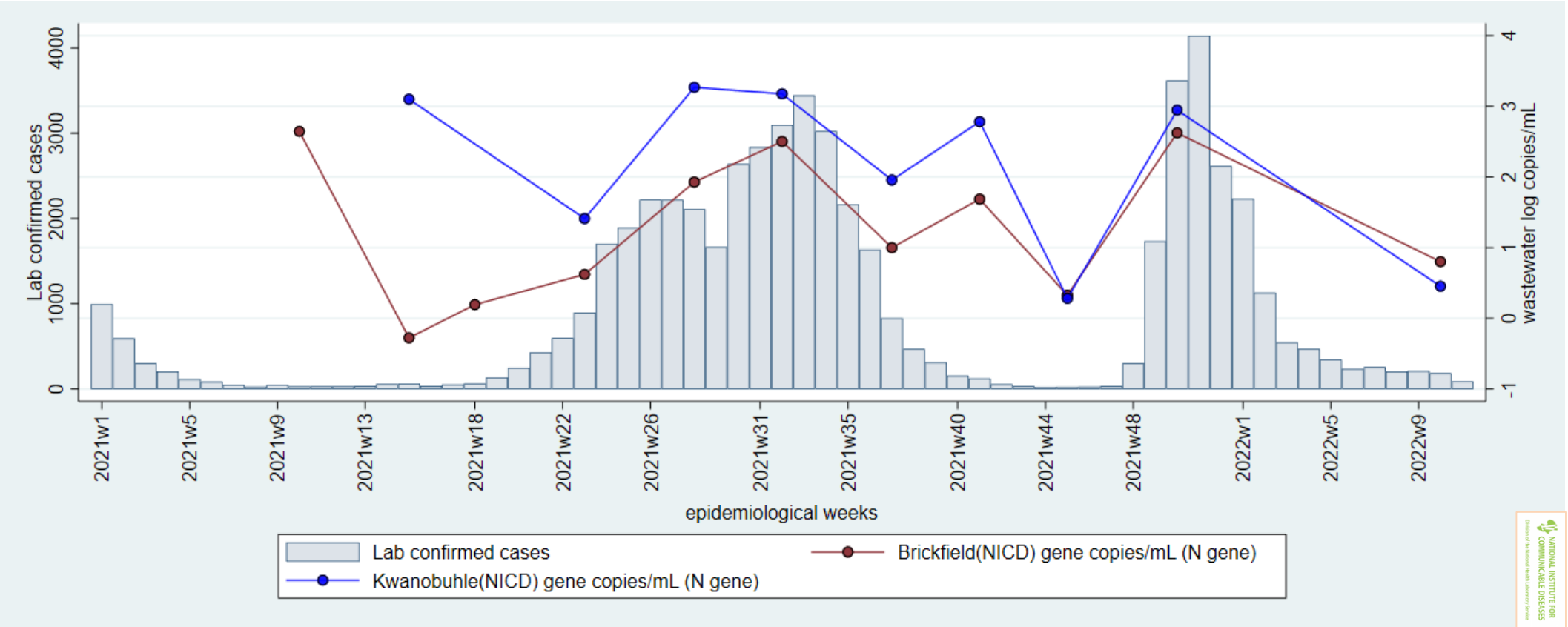

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Mangaung, compared with laboratory-confirmed cases in Mangaung (grey bars), by epidemiological week, 2021

# Free State – Mangaung (Neledi & ThabaNchu)




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Mangaung, compared with laboratory-confirmed cases in Mangaung (grey bars), by epidemiological week, 2021

# Eastern Cape – Nelson Mandela




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Nelson Mandela Metro, compared with laboratory-confirmed cases resident in Nelson Mandela Metro (grey bars), by epidemiological week, 2021

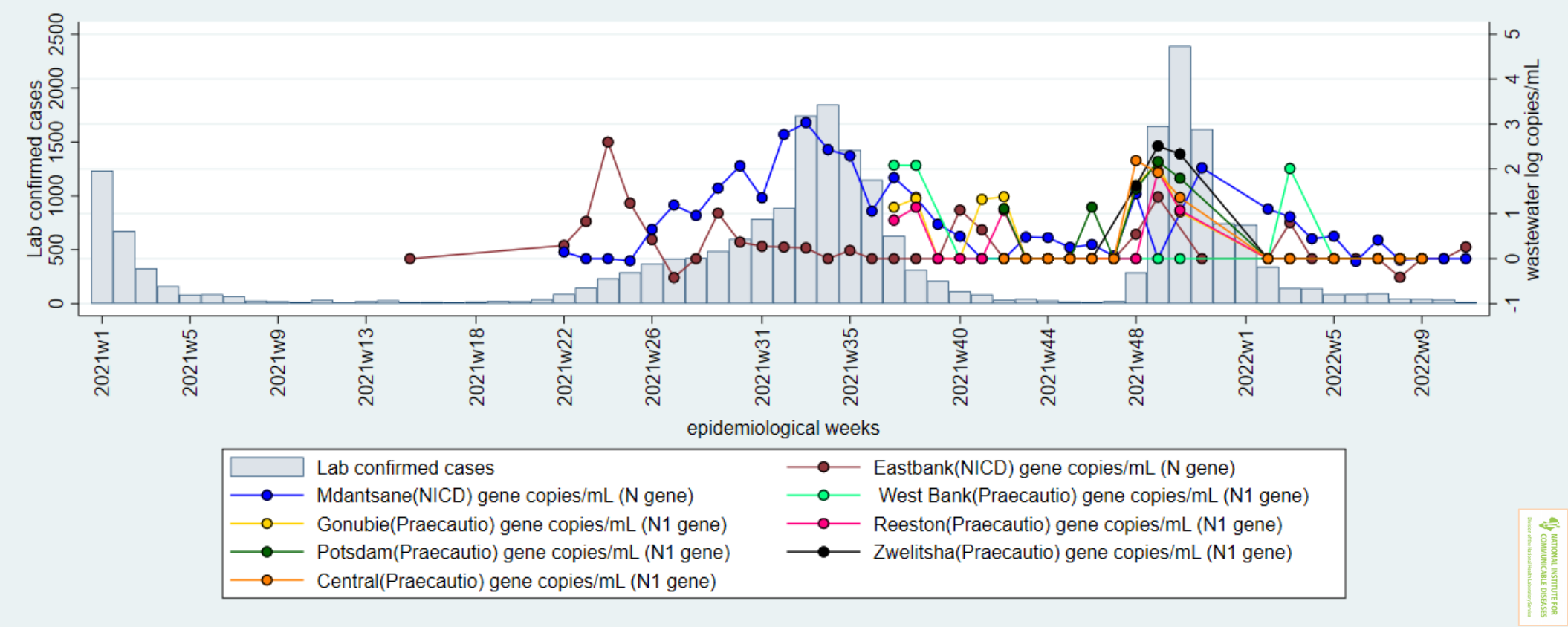
health
Department:
Health
REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Eastern Cape – Buffalo City




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Buffalo City Metro, compared with laboratory-confirmed cases resident in Buffalo City (grey bars), by epidemiological week, 2021

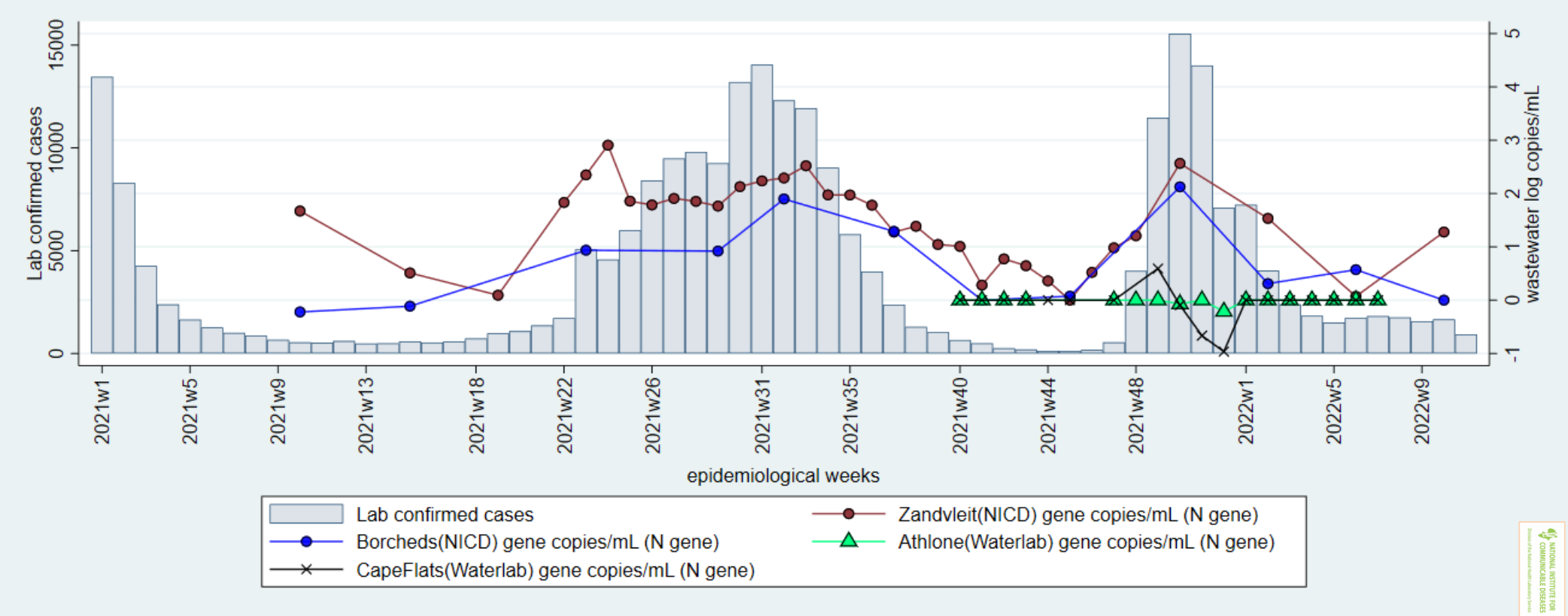
health
Department:
Health
REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Western Cape – City of Cape Town




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from plants in Western Cape Province, compared with laboratory-confirmed cases resident in City of Cape Town (grey bars), by epidemiological week, 2021

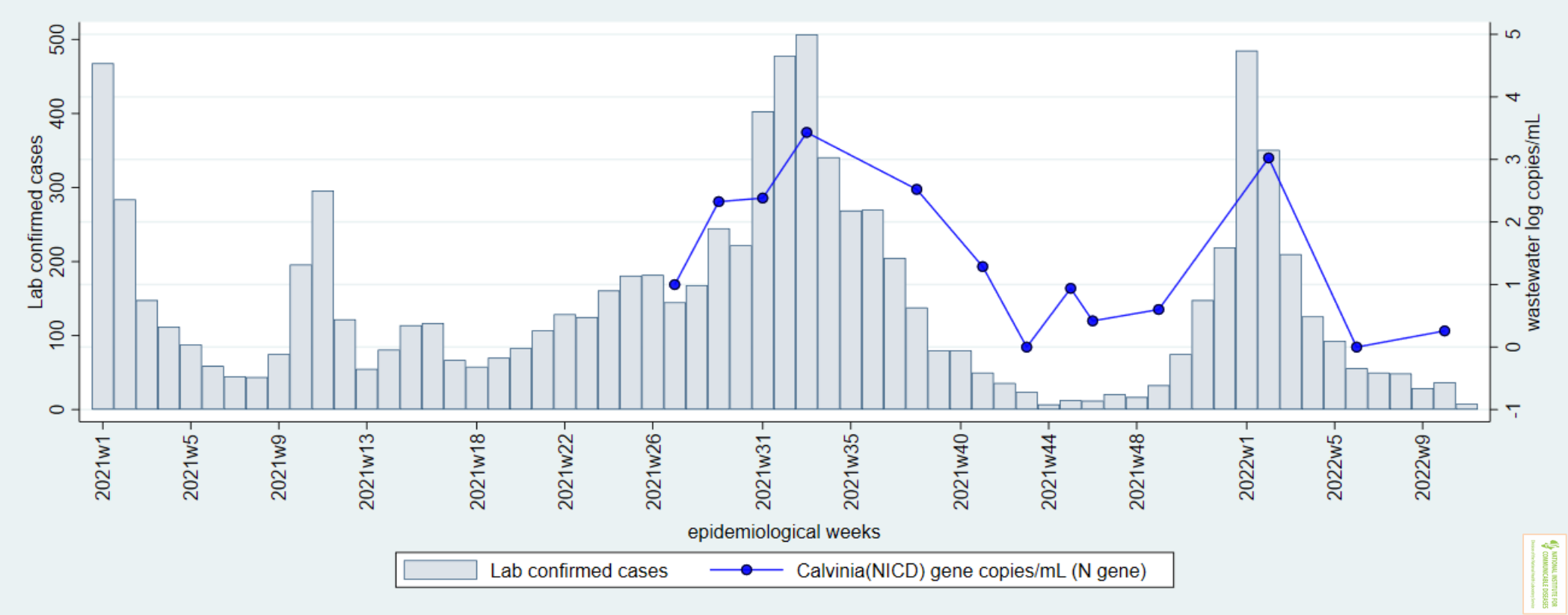
health
Department:
Health
REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

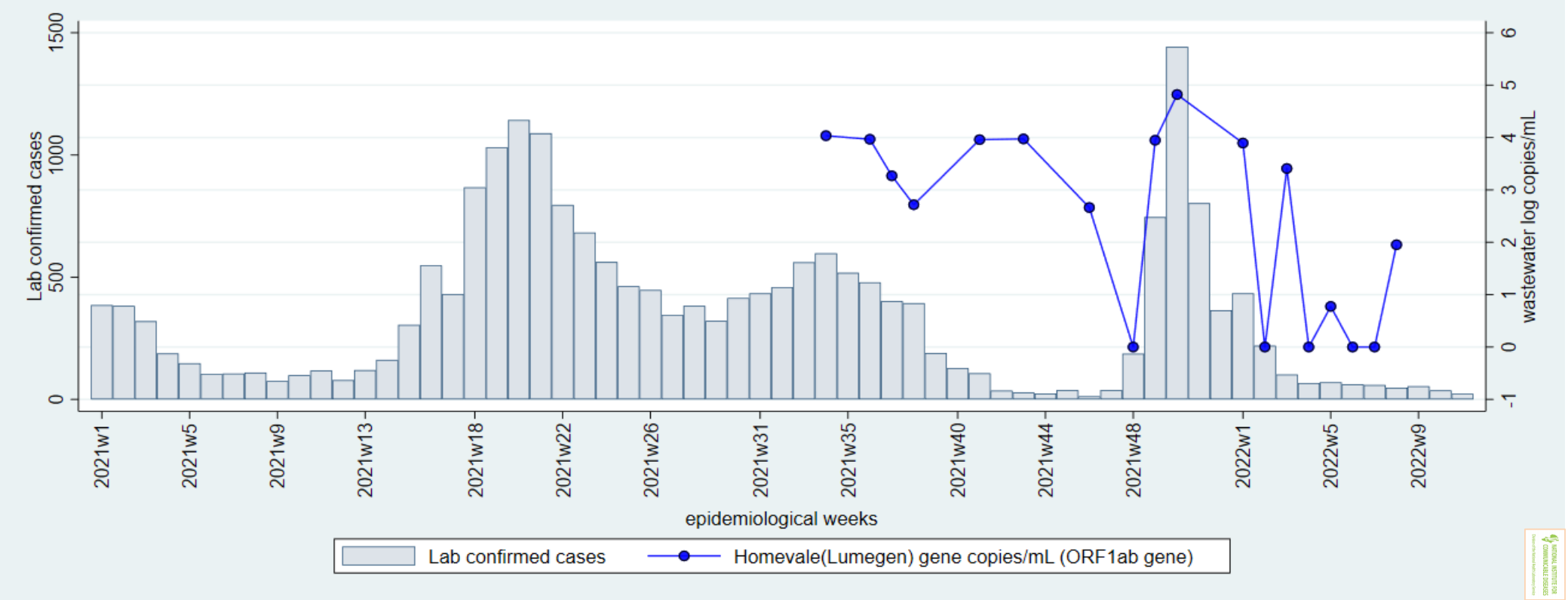
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Northern Cape - Namakwa




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Northern Cape Province, compared with laboratory-confirmed cases resident in Namakwa (grey bars), by epidemiological week, 2021

# Northern Cape – Frances Baard




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Northern Cape Province, compared with laboratory-confirmed cases resident in Frances Baard (grey bars), by epidemiological week, 2021

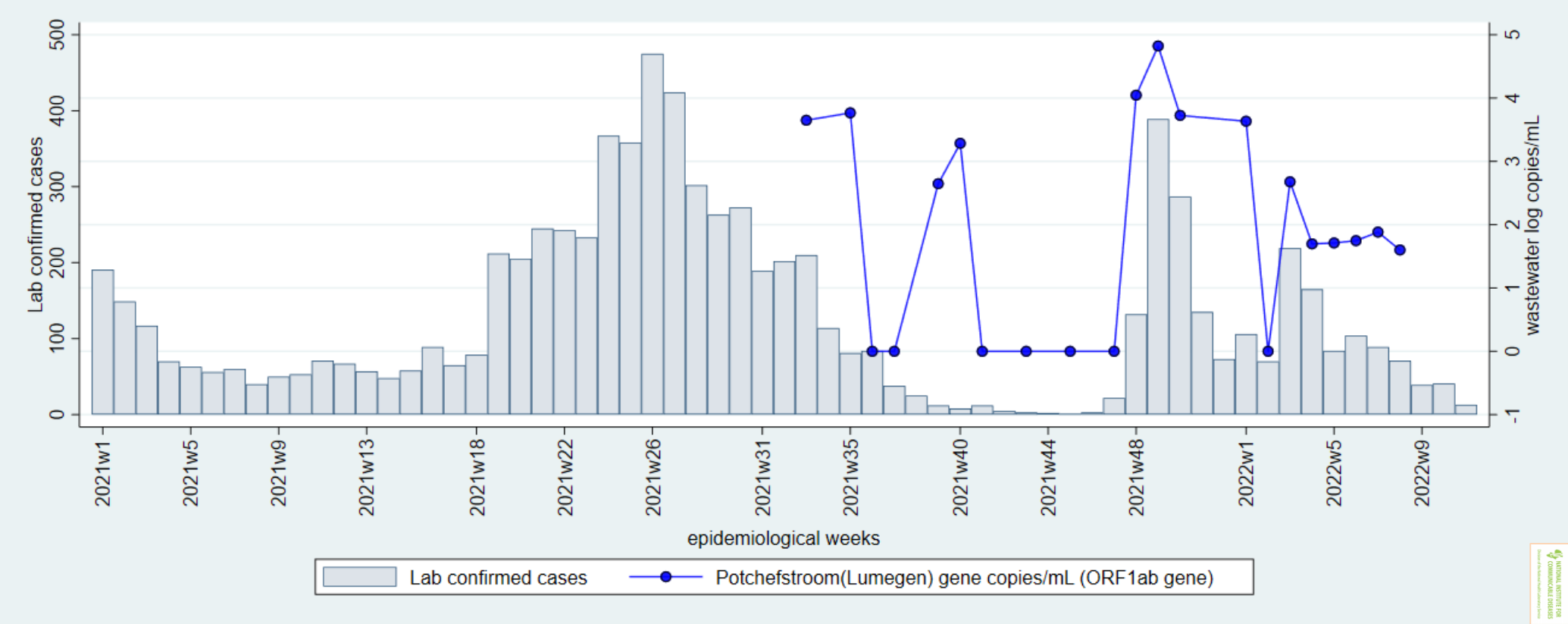
health
Department:
Health
REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# North West – JB Marks




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the North West Province, compared with laboratory-confirmed cases resident in JB Marks (grey bars), by epidemiological week, 2021

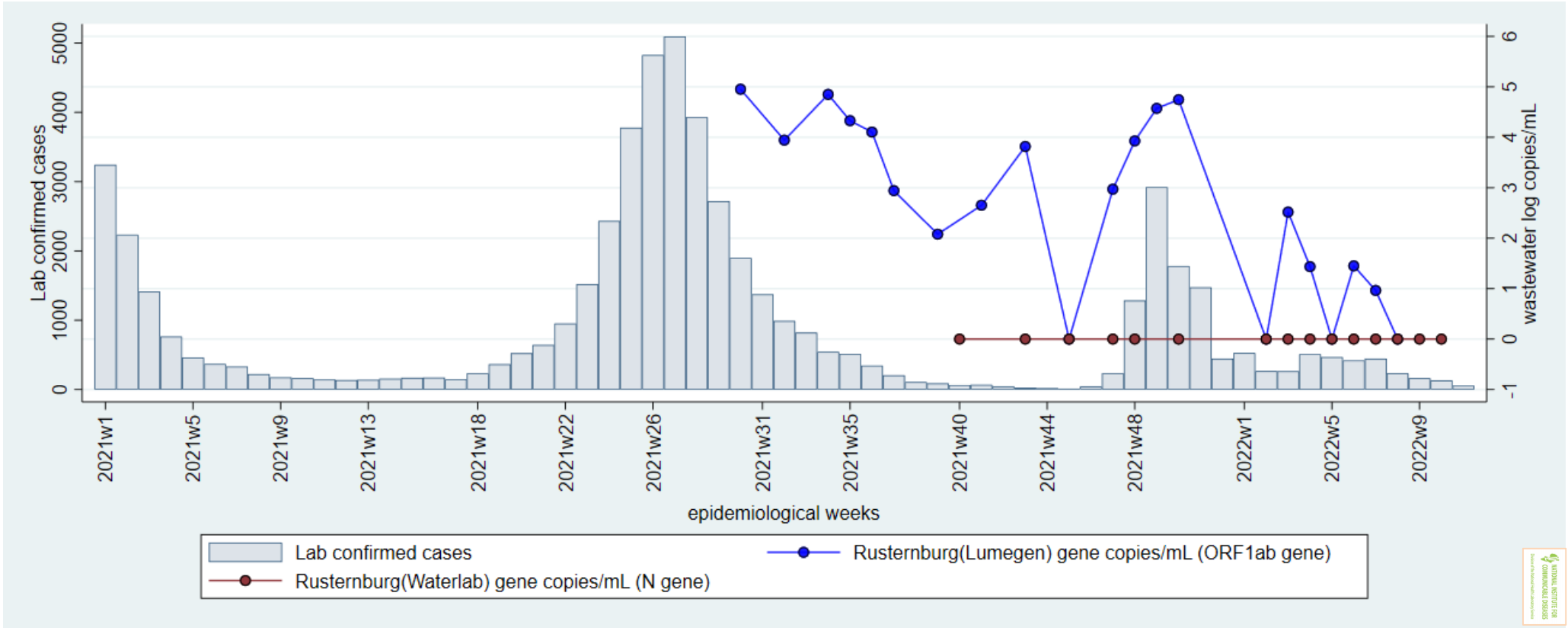
health
Department:
Health
REPUBLIC OF

SACCESS

WATER RESEARCH COMMISSION

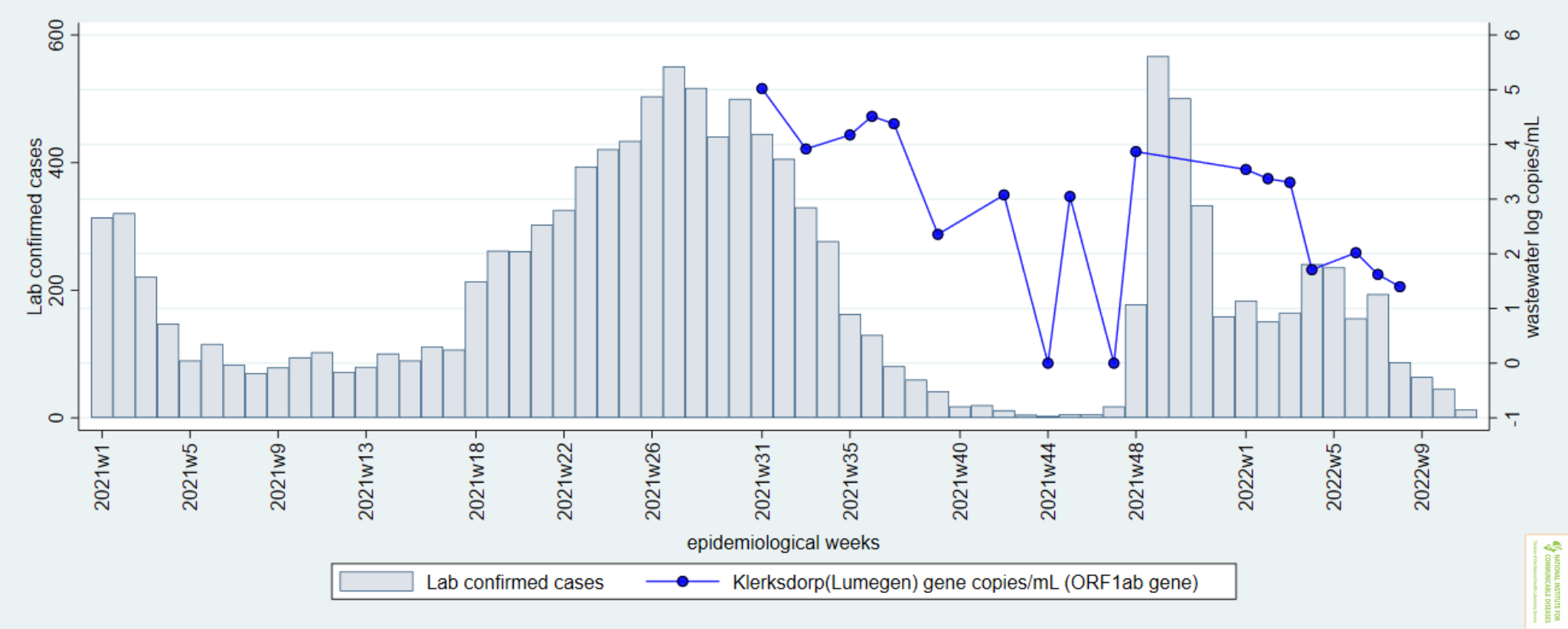
NATIONAL INSTITUTE FOR COMMUNICABLE DISEASES
Division of the National Health Laboratory Service

# Results: North West - Bojanala



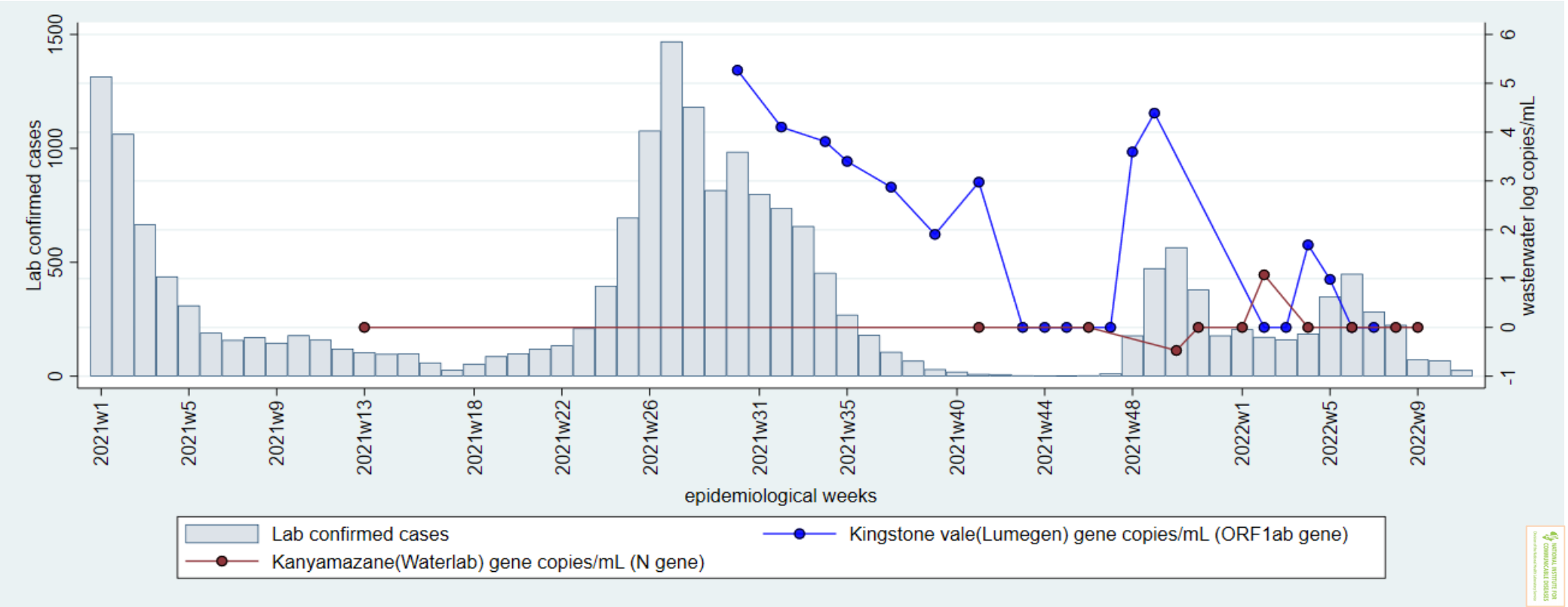

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the North West Province, compared with laboratory-confirmed cases resident in Bojanala (grey bars), by epidemiological week, 2021

# North West - Matlosana



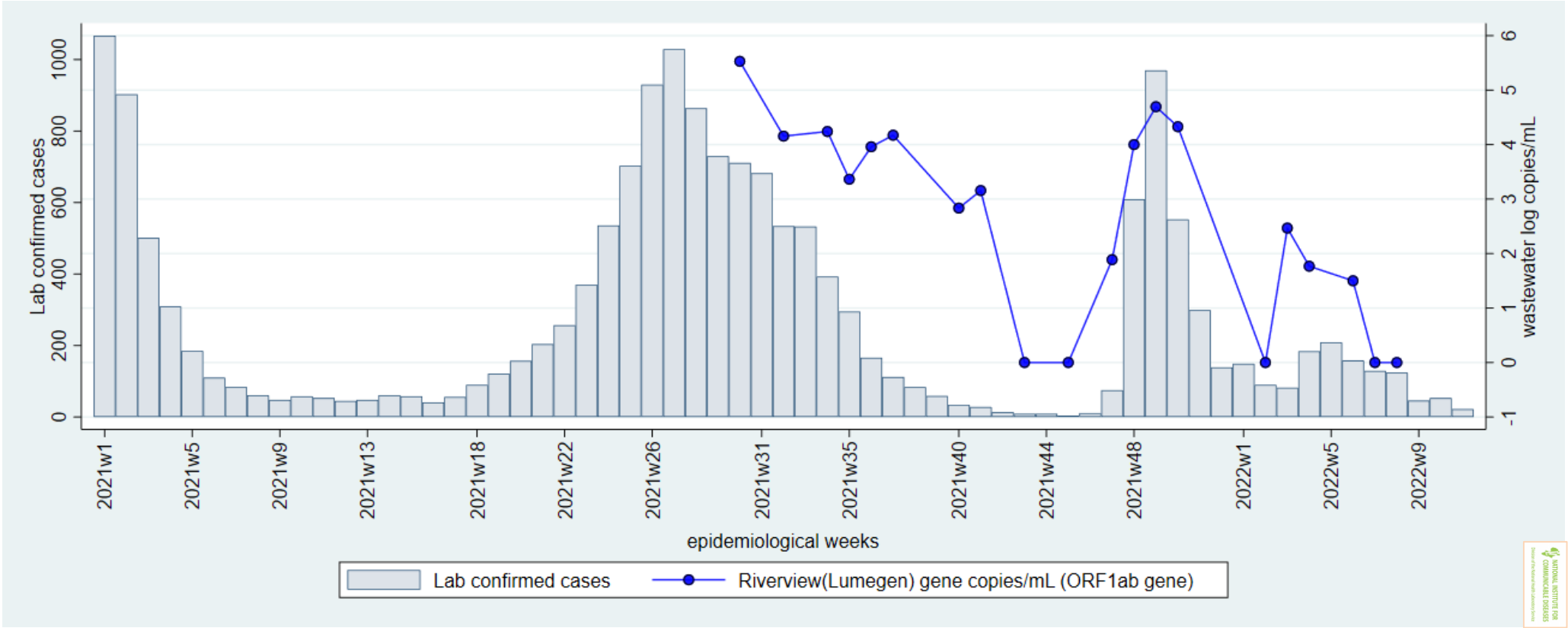

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the North West Province, compared with laboratory-confirmed cases resident in Matlosana (grey bars), by epidemiological week, 2021

# Mpumalanga - Mbombela



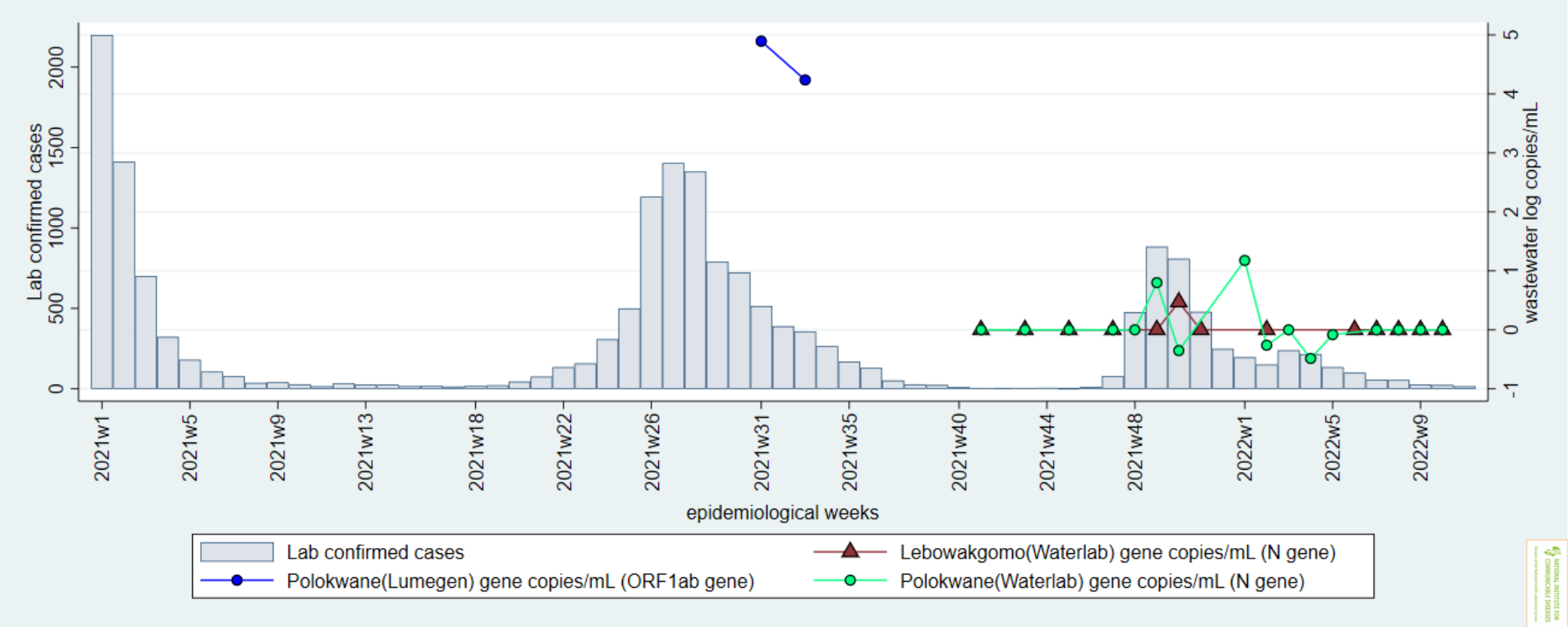

Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Mpumalanga Province, compared with laboratory-confirmed cases resident in Mbombela (grey bars), by epidemiological week, 2021

# Mpumalanga - Emalahleni




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Mpumalanga Province, compared with laboratory-confirmed cases resident in Emalahleni (grey bars), by epidemiological week, 2021

# Limpopo - Polokwane




Changes in SARS-Cov-2 viral load (data points and coloured lines) in in-flowing untreated wastewater from a plant in the Limpopo Province, compared with laboratory-confirmed cases resident in Polokwane (grey bars), by epidemiological week, 2021

# Acknowledgements


- NICD – Center for Vaccines and Immunology, Administration, Finances and Procurement
- Water Research Commission
- Laboratory partners