

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA



**NATIONAL INSTITUTE FOR
COMMUNICABLE DISEASES**

Division of the National Health Laboratory Service

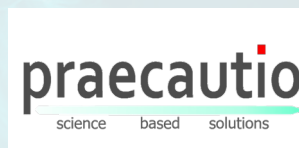
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OVERVIEW

This report summarises and interprets findings from detection and quantification of SARS-CoV-2 levels by the NICD Centre for Vaccines and Immunology in influent (untreated) wastewater in 17 wastewater treatment plants (WWTP) across five provinces tested by the NICD, and 70 additional plants tested by SACCESS partners including the National Institute for Occupational Health, Lumegen Laboratories, GreenHill Laboratories and Praecautio to cover all provinces. Levels of SARS-CoV-2 in wastewater correlate with population levels of SARS-CoV-2 over time and indicate the geographic distribution of disease. SARS-CoV-2 is shed from symptomatic and asymptomatic persons in stool but is not transmitted by faecal-oral route nor via wastewater. This report is based on data collected from June 2021 until 18th February 2022 (epidemiological week 7). Generally, levels of SARS-CoV-2 continue to decrease across the country corresponding to the decrease in clinical cases and the exit from the 4th wave. Detailed analyses are described below.

HIGHLIGHTS

- Although the wastewater levels of SARS-CoV-2 continue to decrease or remain low, in majority of plants, we are seeing low level increases in some wastewater plants across various parts of the country including
 - ◇ Gauteng province, particularly Tshwane South (Godrich and Daspoort wastewater plants); Tshwane North (Klipgat and Rooiwal wastewater plants) and Ekurhuleni (South region, Vlaplaats), North (Hartebeesfontein, Daveyton)
 - ◇ eThekweni (Northern wastewater plant) in Kwazulu-Natal Province
 - ◇ Mangaung (Bloemspuit wastewater plant) in Free State Province
- The significance of these increases is uncertain, but may be attributed to circulation of the Omicron sub-variant, mostly among the asymptomatic population.
- There are delays in submission of results from partner laboratories from non-metro plants due to reagent supply problems.
- The public health authorities are urged to continue to strengthen surveillance for clinical cases in these areas, promote vaccination and non-pharmaceutical interventions in all areas.



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DETECTION AND QUANTITATION OF SARS-COV-2 AT SENTINEL WASTEWATER TREATMENT SITES IN SOUTH AFRICAN URBAN AREAS, MARCH 2021- JANUARY 2022

CO-FUNDED BY THE WATER RESEARCH COMMISSION AND THE NICD

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10. Praecautio
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BACKGROUND

The detection and monitoring of SARS-CoV-2 through wastewater was first proposed in April 2020. Initial reports describing the feasibility and practical usefulness of this approach emerged simultaneously from several countries during August 2020. Recent evidence has shown that SARS-CoV-2 can be detected in wastewater prior to the appearance of clinical cases, and longitudinal tracking of SARS-CoV-2 viral load in wastewater correlates with the burden of clinically diagnosed cases. Furthermore, the sequencing of SARS-CoV-2 RNA fragments in wastewater has identified variants of concern as well as mutations not detected in clinical cases.

In South Africa, SARS-CoV-2 epidemiology is monitored through laboratory testing of clinical cases using reverse-transcriptase polymerase chain reaction (RT-PCR) tests and rapid antigen tests, COVID-19 hospital admissions and COVID-19 - related deaths. Laboratory testing data is relayed by testing laboratories to the National Institute for Communicable Diseases (NICD) via the DATCOV system. From these data sources,

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epidemiological indicators including incidence rates of testing and case detection, hospitalisation and death rates are made available to key stakeholders and the general public.

Clinical epidemiology based on reporting of laboratory-confirmed cases of SARS-CoV-2 has limitations. Household transmission studies in South African urban and rural settings have demonstrated that a large proportion of cases are asymptomatic or so mild as not to elicit health-seeking, and that laboratory-confirmed cases likely represent less than 10% of SARS-CoV-2 cases prevalent in a community at any given time. Secondly, there is increasing use of rapid antigen detection tests in clinical settings. Results of these tests may not be reported to surveillance networks. Consequently, laboratory diagnosis is increasingly less representative of the burden of disease.

In November 2020, a network of testing laboratories, which became known as the South African Collaborative COVID-19 Environmental Surveillance System (SACCESS) network, was established in order to support the development of a common testing methodology, identify and address challenges, and share best practices related to qualitative, quantitative and RNA sequencing of SARS-CoV-2 in wastewater. Treatment of wastewater in South Africa is the responsibility of local government. Approximately 1050 wastewater treatment works (WWTPs) are administered by metropolitan councils and local government and treat industrial and domestic waste. SACCESS partners and the NICD have engaged with local government to support sample collection, interpretation and utilisation of the results for public health purposes.

The SACCESS network aims to detect and quantify SARS-CoV-2 in wastewater in urban settings in South Africa, to compare trends, temporal and geographic distribution of SARS-CoV-2 levels in wastewater with trends in clinical epidemiology so as to support the use of wastewater-based epidemiology for COVID-19 outbreak prevention and response activities.

METHODS

Outbreak context and clinical case epidemiology

Since the first case of SARS-CoV-2 in South Africa was detected on 3rd March 2020, laboratories in the country have conducted over 22 million RT-PCR and antigen tests. Four distinct waves of SARS-CoV-2 infection occurred, peaking in June 2020, December 2020, July 2021, and December 2021 respectively. The current de-duplicated and geospatially allocated national line list of laboratory-confirmed cases of SARS-CoV-2 (identified by RT-PCR or antigen test) is provided by the NICD for comparison with results from SARS-CoV-2 testing of wastewater.

Establishment of the laboratory testing network

Commencing in 2018, the NICD had been conducting testing of wastewater for poliovirus as part of the National Department of Health's polio surveillance programme. In 2020, the NICD commenced testing of influent wastewater samples from these 18 sites, including eight in Gauteng Province, two in the City of Cape Town (Western Cape Province), two in Mangaung (Free State Province), two in eThekweni (KwaZulu-Natal Province) and four in Eastern Cape Province (two in Buffalo City Metro and two in Nelson Mandela Metro). Quantitative testing results for these sites are available from week 8 of 2021, onwards.

Additional plants across all metropolitan areas as well as sentinel site plants in smaller provinces were included from February 2021. From August 2021, quantitative testing was conducted on all specimens submitted to partner laboratories for testing. Presently, samples from 87 WWTPs are being tested for SARS-CoV-2. The supplementary Table 1 at the bottom of the page shows all the data for these plants, including their geographical location, the surrounding suburbs, water service authority, the testing laboratory, and dates testing began in these sites.

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SARS-CoV-2 detection and quantitation methodology

The general approach of SARS-CoV-2 detection in wastewater used at all network laboratories is virus concentration, followed by nucleic acid extraction and molecular detection. At the identified wastewater treatment facilities grab or passive samples of influent are collected and transported at <5°C to the testing facility. Table 1 summarises the sample collection, processing and detection methodology used by laboratories involved in the surveillance project. The levels of SARS-CoV-2 in wastewater are reported in copies/mL of wastewater. These values are log-transformed before constructing the graphs.

Table 1. Sampling and methodology used by laboratories involved in the NICD-WRC led COVID-19 wastewater surveillance project.

Name of laboratory	Sampling	Virus concentration	Nucleic acid extraction	Molecular analysis	Molecular analysis platform
National Institute for Communicable Diseases (NICD)	Grab	Ultrafiltration (Centricon® Plus-70 centrifugal ultra-filter device)	QIAamp® viral RNA mini kit	RT-qPCR ^a using the Allplex™ 2019-nCoV Assay and the EDX SARS-CoV-2 standard	7500 Real-Time PCR System (Applied Biosystems)
GreenHill Laboratories / Praecautio	Grab	Ultrafiltration (Amicon® Ultra-15 Centrifugal Filter Unit)	Omega Bio-Tek Mag-Bind® Viral DNA/RNA 96 Kit	RT-qPCR using the CDC 2019-nCoV Assay and the EDX SARS-CoV-2 standard	Rotor-Gene Q (Qiagen)
National Institute for Occupational Health (NIOH)	Grab	Skim milk flocculation	MagMAX Viral and Pathogen Nucleic Acid Isolation Kit	RT-qPCR using the TaqPath COVID-19 CE-IVD RT-PCR Kit (Thermo Fisher)	QuantStudio™ 5 Real-Time PCR System 96-well, 0.1 mL, desktop (Applied Biosystems)
Waterlab/University of Pretoria	Grab	Skim milk flocculation	QIAamp® Ultrasens® Virus kit	RT-qPCR using the Allplex™ 2019-nCoV Assay and the using the 2019-nCoV_N positive control plasmid (Integrated DNA Technologies, Inc, Coralville, IA)	QuantStudio™ 5 Real-Time PCR System (Applied Biosystems)
South African Medical Research Council – Tuberculosis platform (SAMRC-TB)	Grab	None – sample is centrifuged then supernatant analysed	ZymoBiomix RNA Extraction Kit	RT-qPCR ^a using the Allplex™ 2019-nCoV Assay and the EDX SARS-CoV-2 standard	QuantStudio 5 (Applied Biosystems)
Lumegen	Passive	Passive sampler and resuspension in phosphate buffered saline	MN DNA/RNA pathogen extraction Kit	RT-qPCR using the TaqPath COVID-19 CE-IVD RT-PCR Kit (Thermo Fisher)	QuantStudio 5 (Applied Biosystems)
Council for Scientific and Industrial Research (CSIR)	Grab	Polyethylene Glycol precipitation	Omega Bio-tek ENZA total RNA Kit II	RT-qPCR using the 2019-nCoV CDC EUA Kit	Qiagen Rotor-Gene 6000 (5-plex) (Qiagen)
Durban University of Technology – Institute of Wastewater Management	Grab	Ultrafiltration (Centricon® Plus-70 centrifugal ultra-filter device)	QIAamp® viral RNA mini kit	RT-ddPCR ^b using CDC 2019-nCoV_N2 Primers, Fam Labelled, double quenched probes	QX200 AutoDG Droplet Digital PCR System (Bio-rad)

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Interpretation of SARS-CoV-2 levels in wastewater

Interpretation of SARS-CoV-2 wastewater levels is evolving. We have elected to use interpretive principles outlined in Table 2 to support public health preparedness and response activities. In general, increasing or decreasing trends in levels are reported based on two or more results, as a single sample that increases or decreases compared with the result from the previous week may represent an outlier. Small changes (up to 0.5log copies/ml) are not regarded as significant changes unless they form part of a general upward or downward trend. Comparison of results over time when quantification is done by the same laboratory using the same quantitative methodology is meaningful. The use of different methodologies by different laboratories precludes comparison of quantitative results across laboratories.

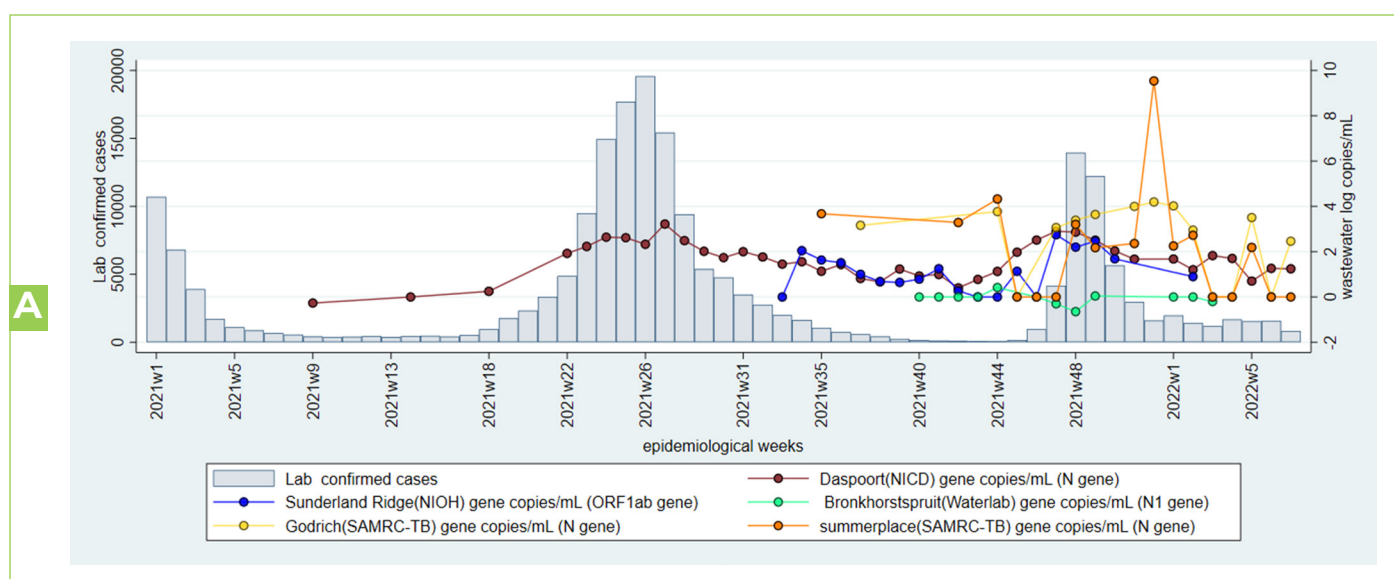
Table 2. Principles of SARS-CoV-2 detection and quantification on influent samples from wastewater treatment plants and interpretive principles to guide application of test results to support COVID-19 public health responses, South Africa.

Testing modality	Interpretive principles to support public health responses
	When a test result changes from
Detection of SARS-CoV-2	<ul style="list-style-type: none"> positive to negative, this signifies fewer/no cases in population negative to positive, this indicates the need for increased population awareness and action Qualitative results (presence or absence) are comparable between laboratories
Quantification of SARS-CoV-2	<ul style="list-style-type: none"> *The concentration of SARS-CoV-2 at a particular facility may be used to infer the burden of SARS-CoV-2 in the population served by the wastewater treatment facility. *Changes in the concentration of SARS-CoV-2 give an indication of whether the burden of disease is increasing or decreasing *Quantitative results between laboratories are not comparable. *Quantitative results should be interpreted for a single wastewater treatment plant tested by the same laboratory using the same methodology over time

RESULTS

Gauteng Province

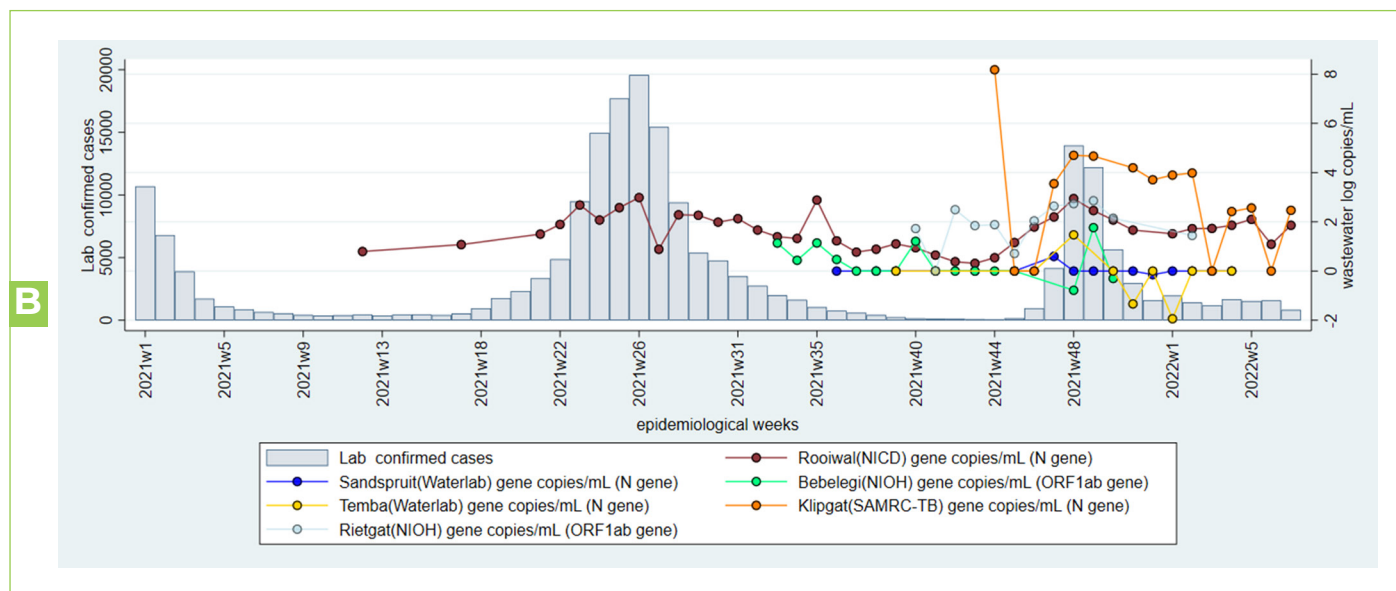
A: City of Tshwane South (sub-districts 3, 4, 6, and 7)



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B: City of Tshwane North (sub-districts 1 & 2)



C: City of Tshwane North (sub-district 5)

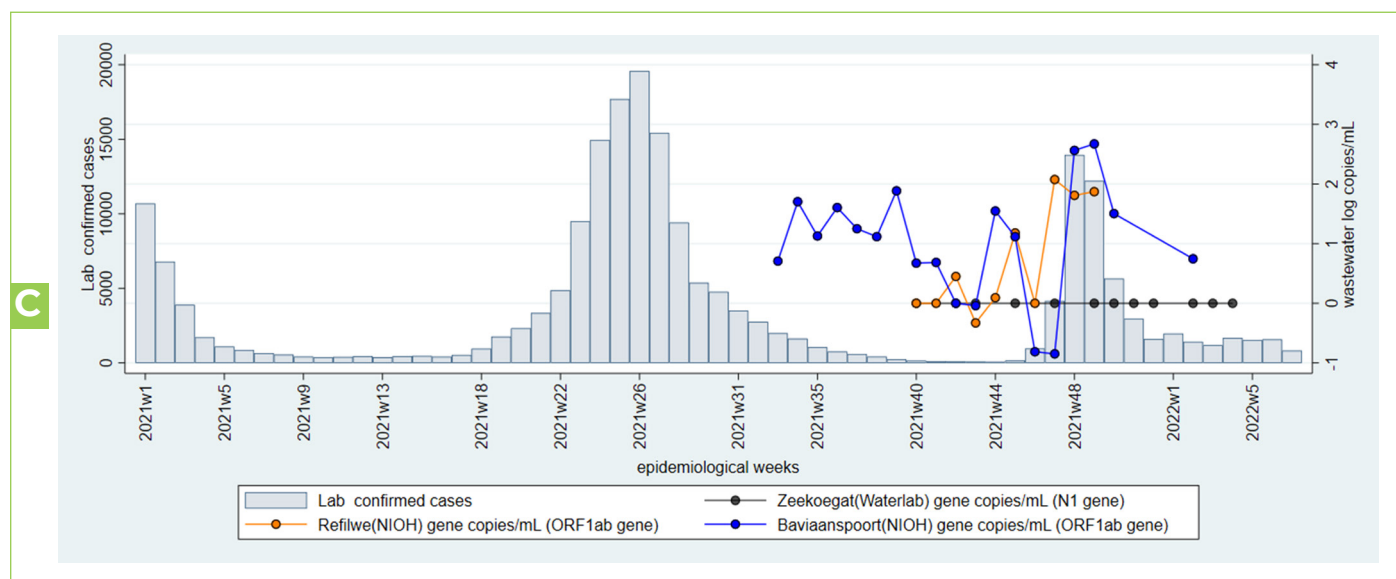


Figure 1 A-C. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) for selected wastewater treatment plants (WWTP) and metropolitan areas in Tshwane District Municipality (Tshwane South and North), Gauteng Province during epidemiological weeks 1 of 2021 to week 7 of 2022. The testing laboratory and quantified SARS-CoV-2 gene is named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be done for specimens tested in the same laboratory.

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D: City of Johannesburg Metropolitan Municipality

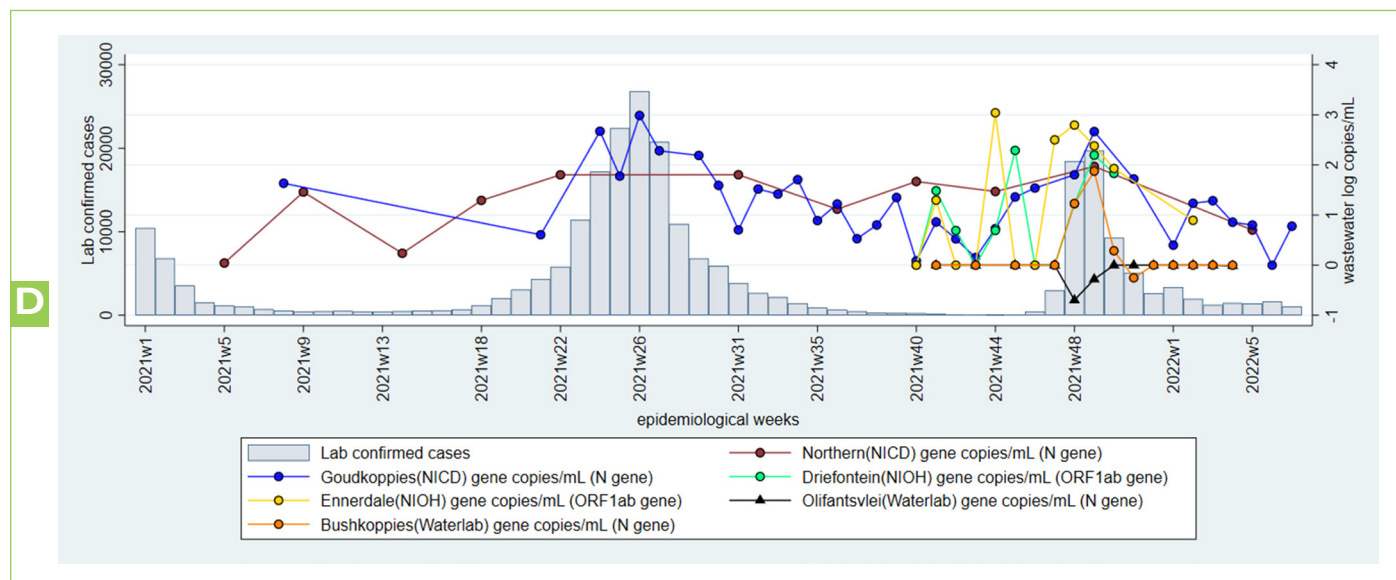
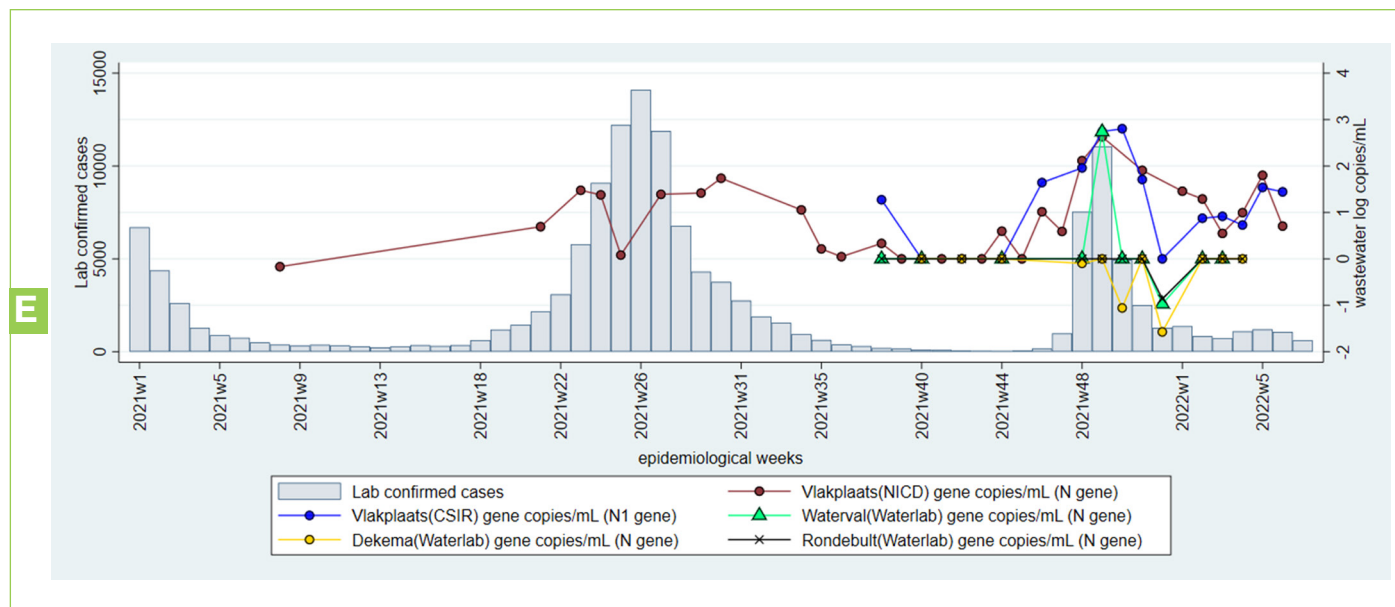


Figure 1 D. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/mL of wastewater (coloured lines) for selected wastewater treatment plants (WWTPs) in the City of Johannesburg Metropolitan Municipality, Gauteng Province during epidemiological weeks 1 of 2021 to week 7 of 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels overtime should only be made for specimens tested in the same laboratory.

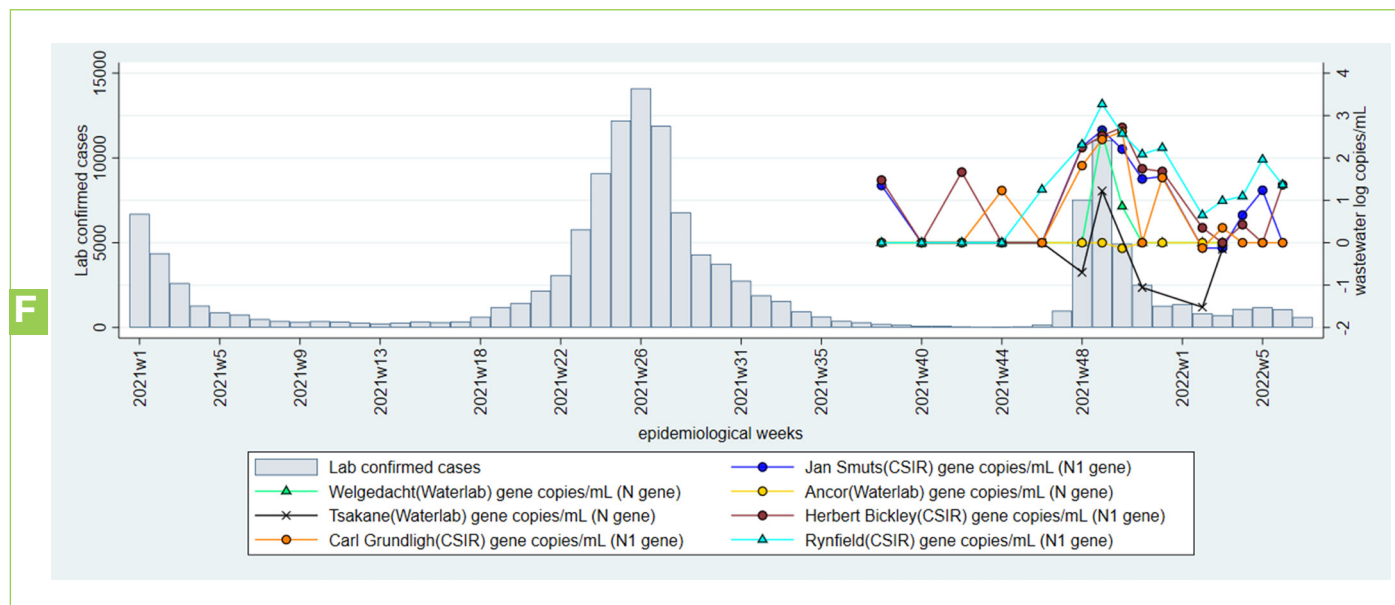
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E: Ekurhuleni East (sub-districts D, E or E1, E2)



F: Ekurhuleni South (sub-districts A, F or S1, S2)



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G: Ekurhuleni North (sub-districts B, C or N1,N2)

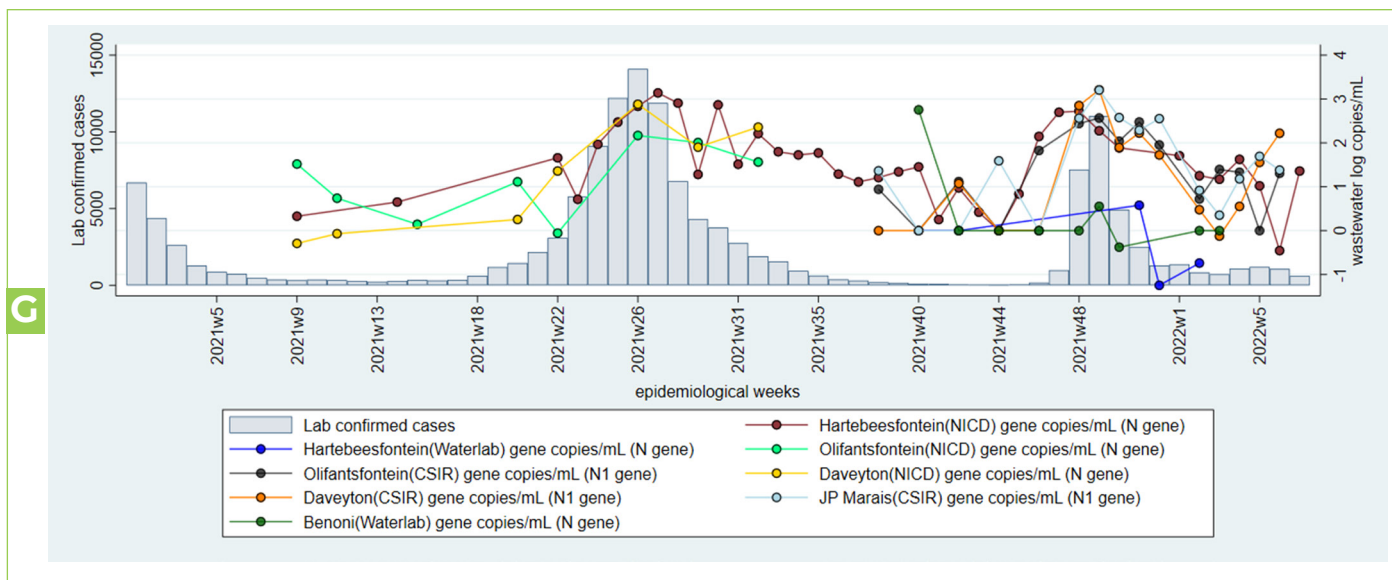


Figure 1 E-G. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/mL of wastewater (coloured lines) for selected wastewater treatment plants (WWTP) in Ekurhuleni Metropolitan Municipality, Gauteng Province during epidemiological weeks 1 of 2021 to week 7 of 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

H: West Rand District Municipality

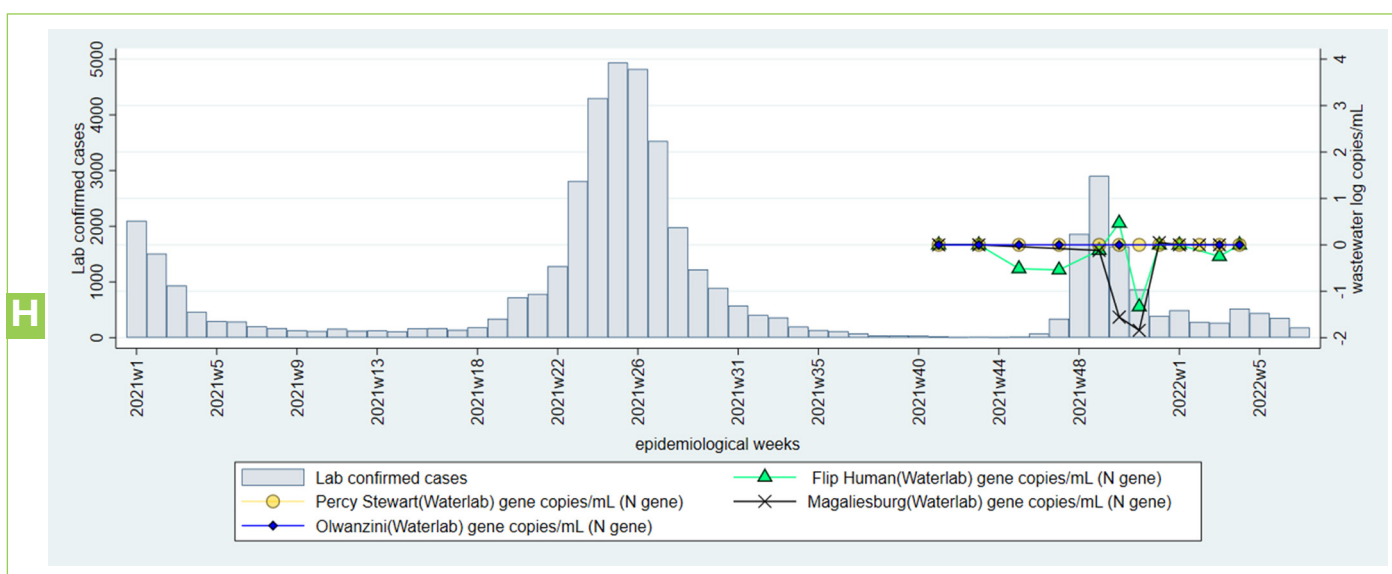


Figure 1 H. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/mL of wastewater (coloured lines) for selected wastewater treatment plants (WWTP) in West Rand District Municipality, Gauteng Province during epidemiological weeks 1 of 2021 to week 4 of 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

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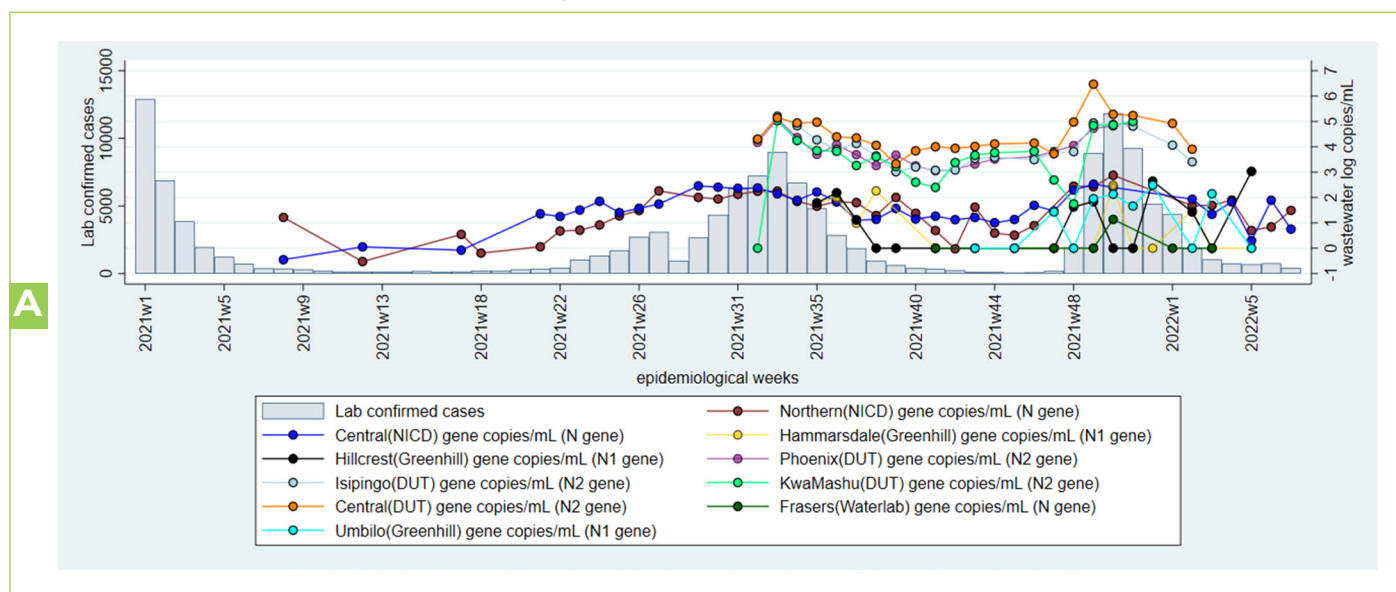
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SARS-CoV-2 levels are increasing in Godrich and Daspoort (Tshwane South); Klipgat and Rooiwal in Tshwane North; Goudkoppies in Johannesburg and maybe increasing, requiring close monitoring. SARS-CoV-2 may be still be circulation in areas that are served by the Vlakplaats WWTP in Ekurhuleni South. Also, in Ekurhuleni North, the levels in Hartebeesfontein and Daveyton are increasing, with the later having three successive increases between week Epi 3 and 6, 2022.

The public health authorities should continue to strengthen surveillance for clinical cases in these areas, promote vaccination and non-pharmaceutical interventions in all areas.

KwaZulu-Natal Province

2A: eThekweni Metropolitan Municipality



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B: uMgungundlovu District Municipality

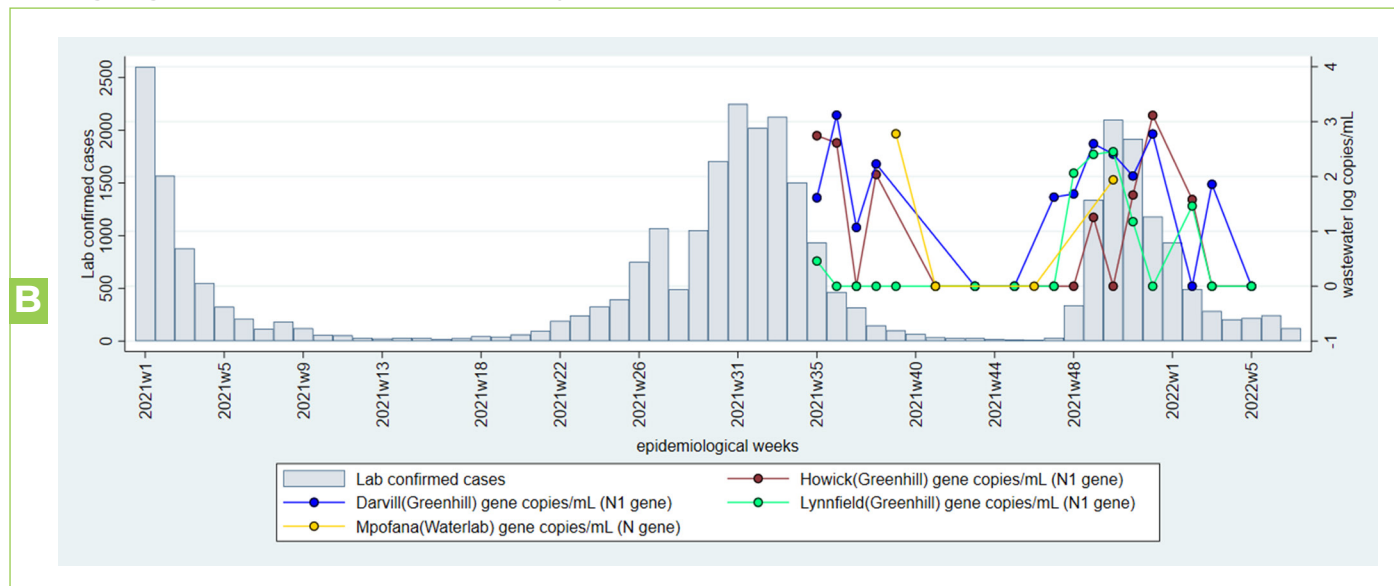


Figure 2A-B. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) from wastewater treatment plants (WWTP) in Ethekewini, (A-B) and uMgungundlovu Metro (C), KwaZulu Natal Province during epidemiological weeks 1-51, 2021 and week 7, 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

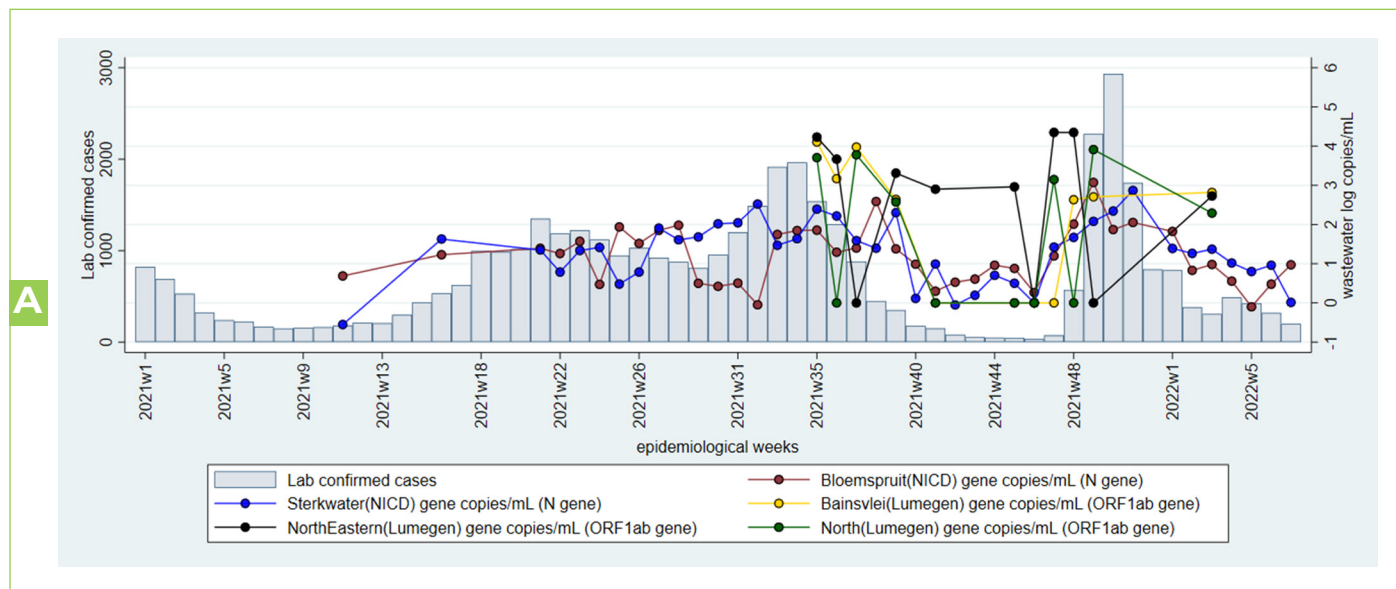
While the SARS-CoV-2 levels may be decreasing in majority of the plants, there may still be ongoing transmission in some areas around eThekweni as the levels in Northern WWTP are rising. These SARS-CoV-2 levels may be attributed to the Omicron subvariant. Therefore, the authorities should continue to strengthen surveillance for clinical cases in this area and promote vaccination and non-pharmaceutical interventions in all areas.

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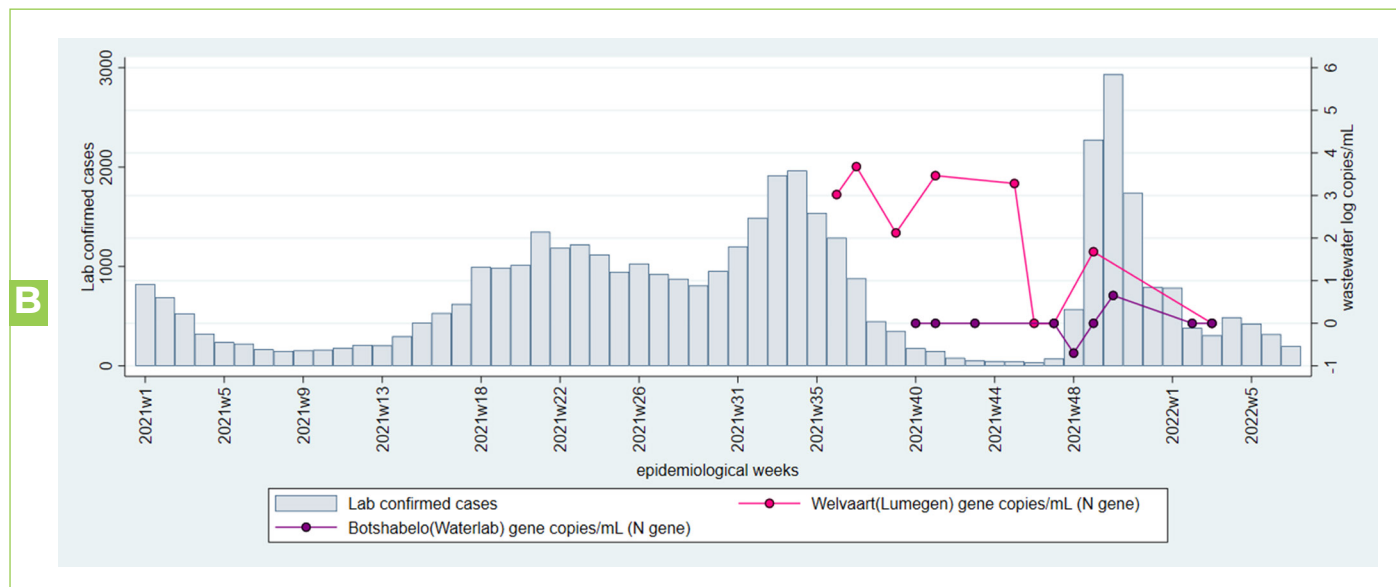
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Free State Province- Mangaung

A: Bloemfontein sub-district



B. Botshabelo sub-district



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C. Naledi & ThabaNchu sub-districts

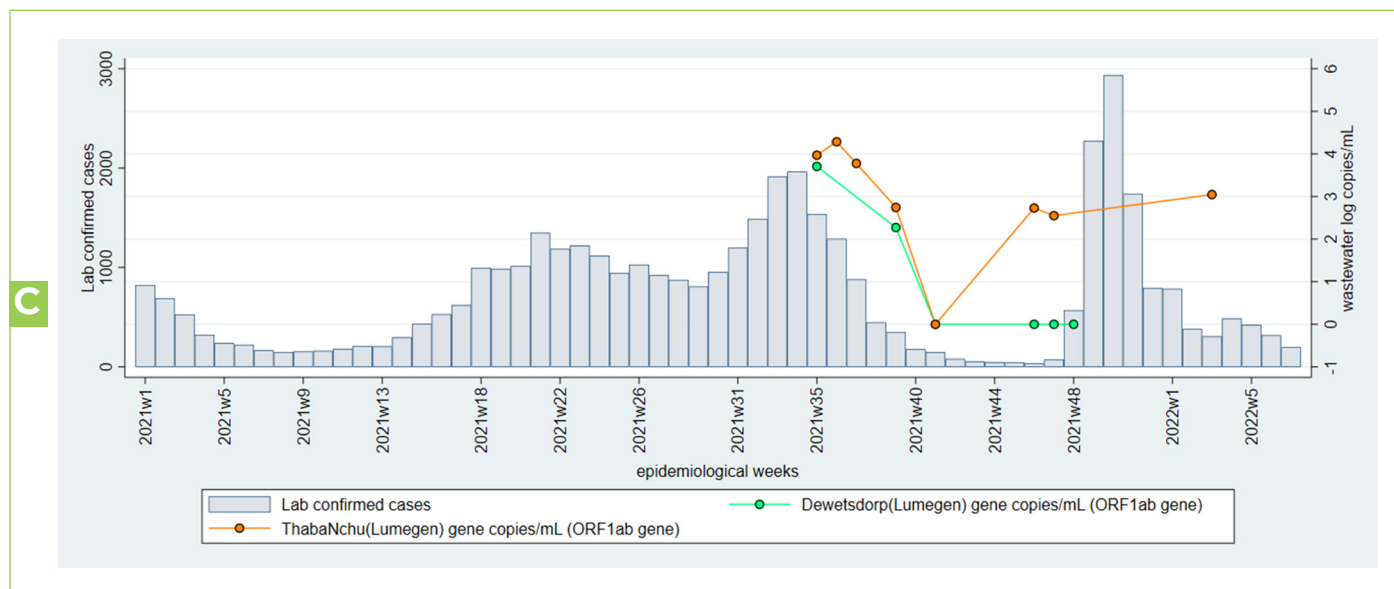


Figure 3 A-C. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) from wastewater treatment plants (WWTPs) in Mangaung, Free State Province (Bloemfontein, Botshabelo, Naledi and ThabaNchu) during epidemiological weeks 1, 2021 to 6, 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

The recent SARS-CoV-2 levels in all the plants in the three sub-districts in Free State continue to decline or remain stable at low levels, corresponding to the decreases in clinical cases. However, the SARS-CoV-2, the levels in Bloemfontein in Mangaung, may be increasing slowly, requiring close monitoring. The public health authorities should continue surveillance for cases, promote vaccination and non-pharmaceutical interventions.

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Eastern Cape Province

A: Nelson Mandela Metropolitan Municipality

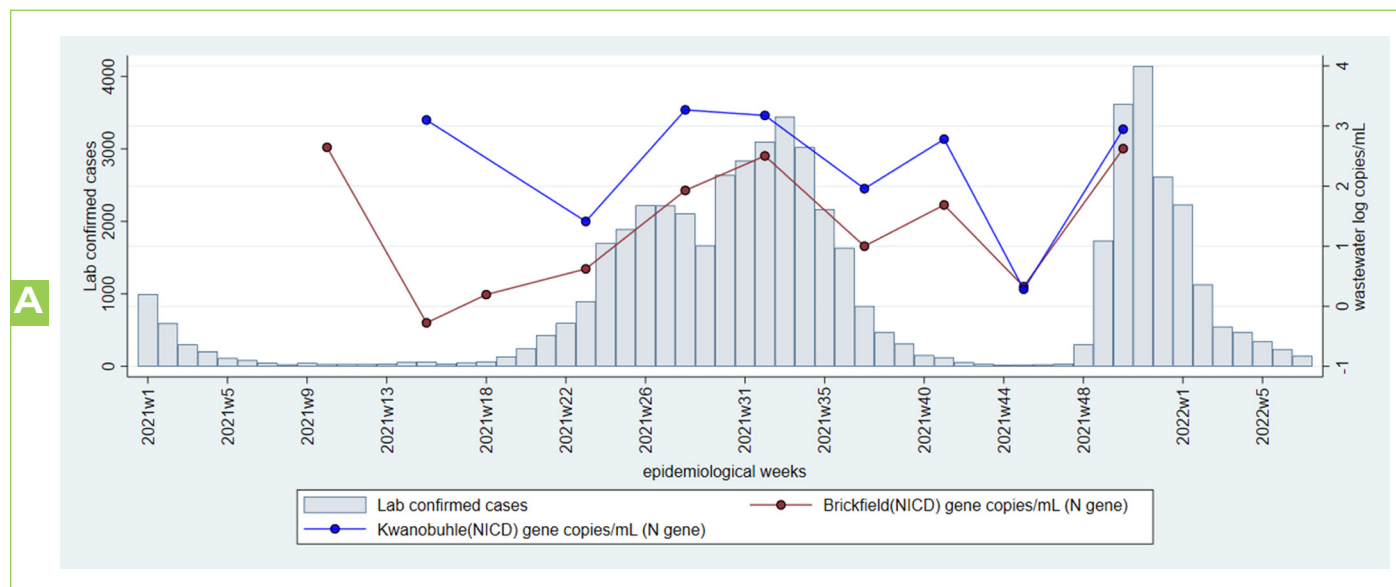


Figure 4A. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) from wastewater treatment plants (WWTPs) in Nelson Mandela Metro, Eastern Cape Province during epidemiological weeks 1-45, 2021. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

B: Buffalo City Metropolitan Municipality

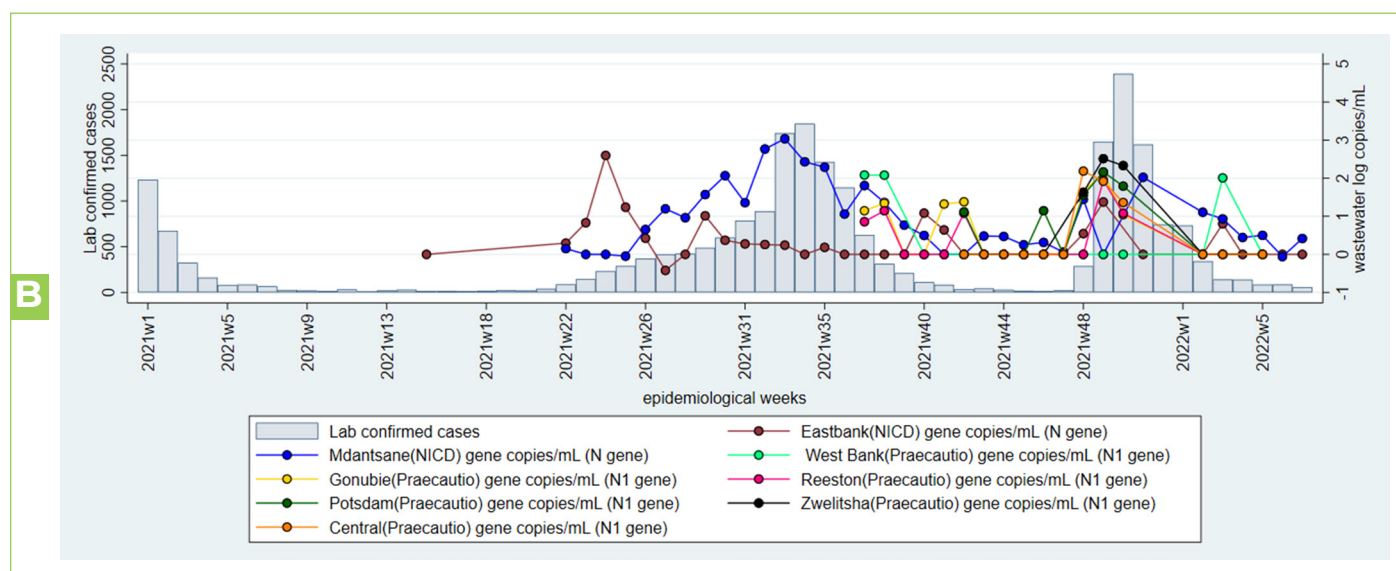


Figure 4B. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) from wastewater treatment plants (WWTPs) in Nelson Mandela Metro, Eastern Cape Province during epidemiological weeks 1, 2021 to 7, 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

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In Buffalo City Metro, results show that SARS-CoV-2 levels in all WWTPs have steadily decreased and remained at zero levels, corresponding to the decline in clinical cases. The SARS-CoV-2 levels in Mdantsane may be rising but will require close monitoring and subsequent samples for confirmation. The public health authorities should continue to promote vaccination and non-pharmaceutical interventions. In Nelson Mandela Metro, assessment cannot be made due to absence of recent results. Readers are referred to the SA MRC wastewater dashboard for more in-depth data regarding levels of SARS-CoV-2 in wastewater plants in Nelson Mandela Metro (<https://www.samrc.ac.za/wbe/>).

Western Cape Province

City of Cape Town:

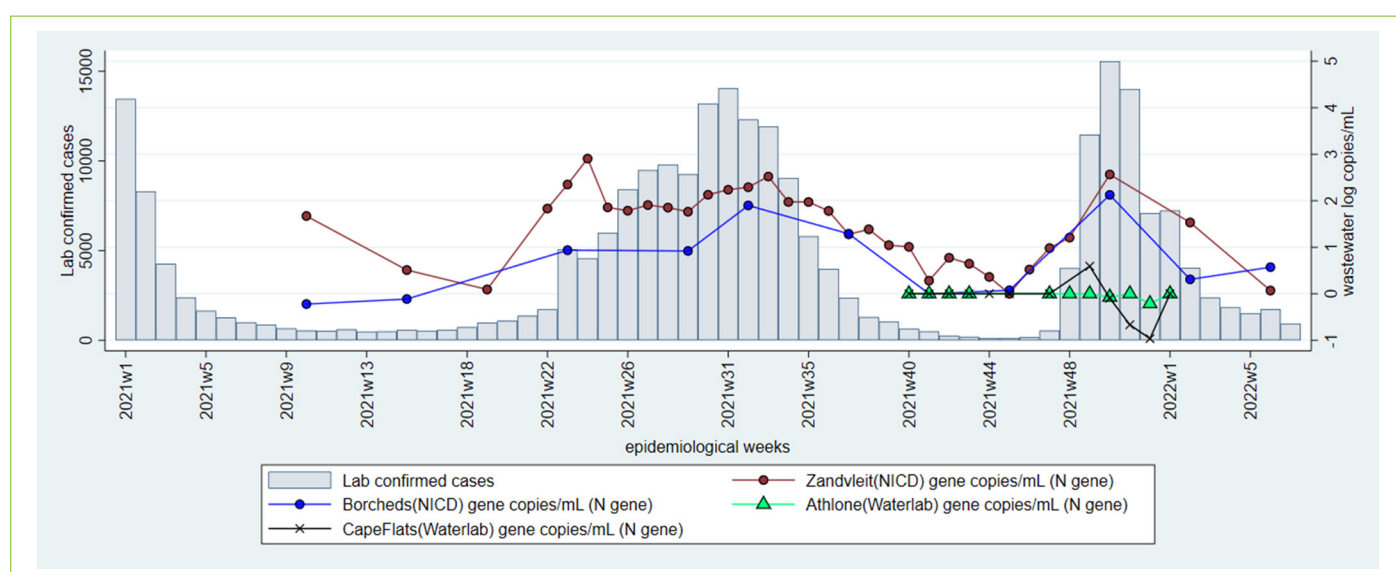


Figure 5. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) from wastewater treatment plants (WWTPs) in the City of Cape Town, Western Cape Province during epidemiological weeks 1, 2021 to 6, 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP.

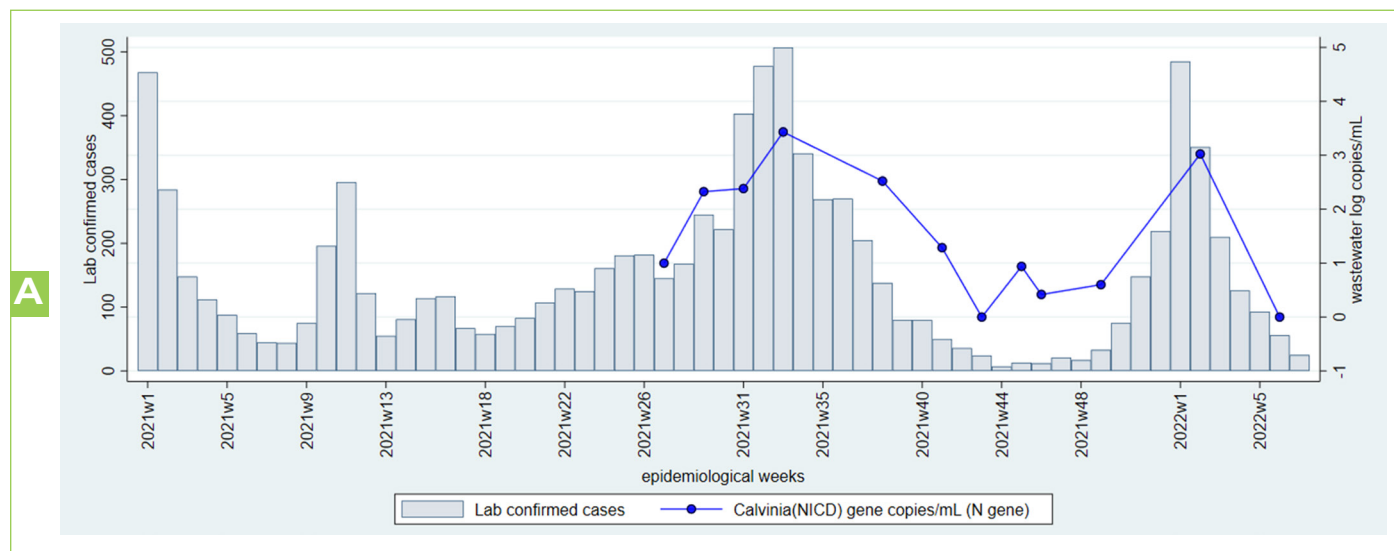
The SARS-CoV-2 levels in Borchers and Zandvleit have also declined to below 1 gene copy/ml of wastewater, corresponding to the decline in clinical case load. Readers are referred to the MRC website, which provides data from additional wastewater treatment plants in the City of Cape Town and other Western Cape districts (<https://www.samrc.ac.za/wbe/>) to contextualise the results. The public health authorities should continue surveillance for cases, promote vaccination and non-pharmaceutical interventions.

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Northern Cape Province

A: Namakwa District Municipality



B: Frances Baard District Municipality

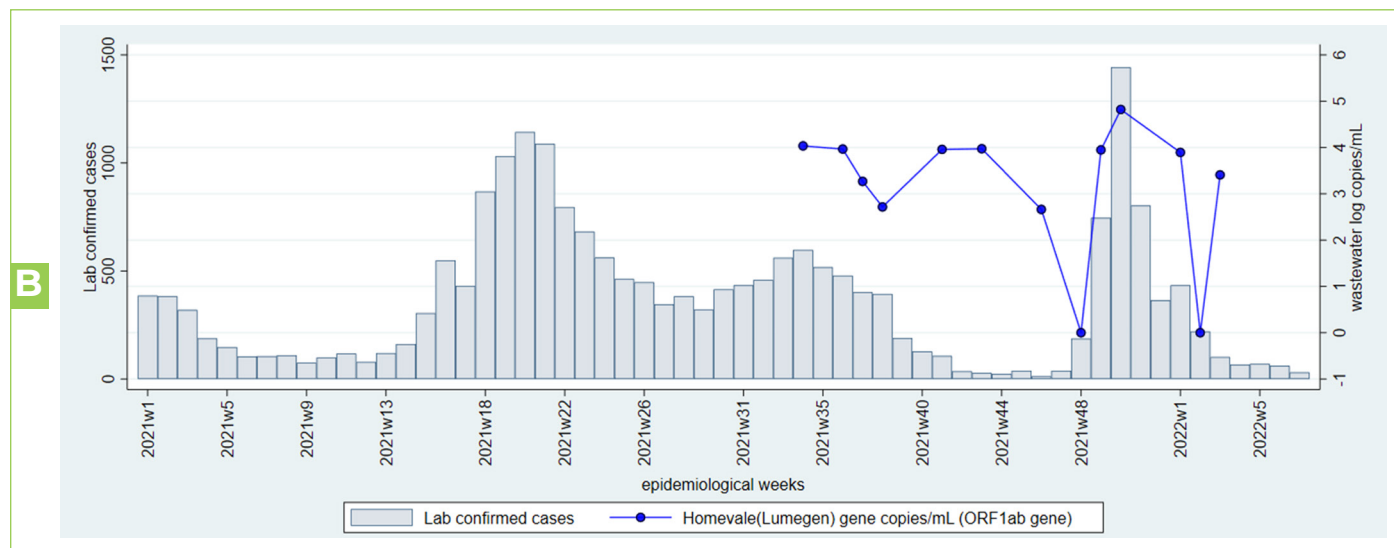


Figure 6A-B. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) in wastewater treatment plants (WWTPs) from Calvinia in Namakwa Metro (a) and Kimberly in Frances Baard District (b), Northern Cape Province during epidemiological weeks 1, 2021 to week 2, 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

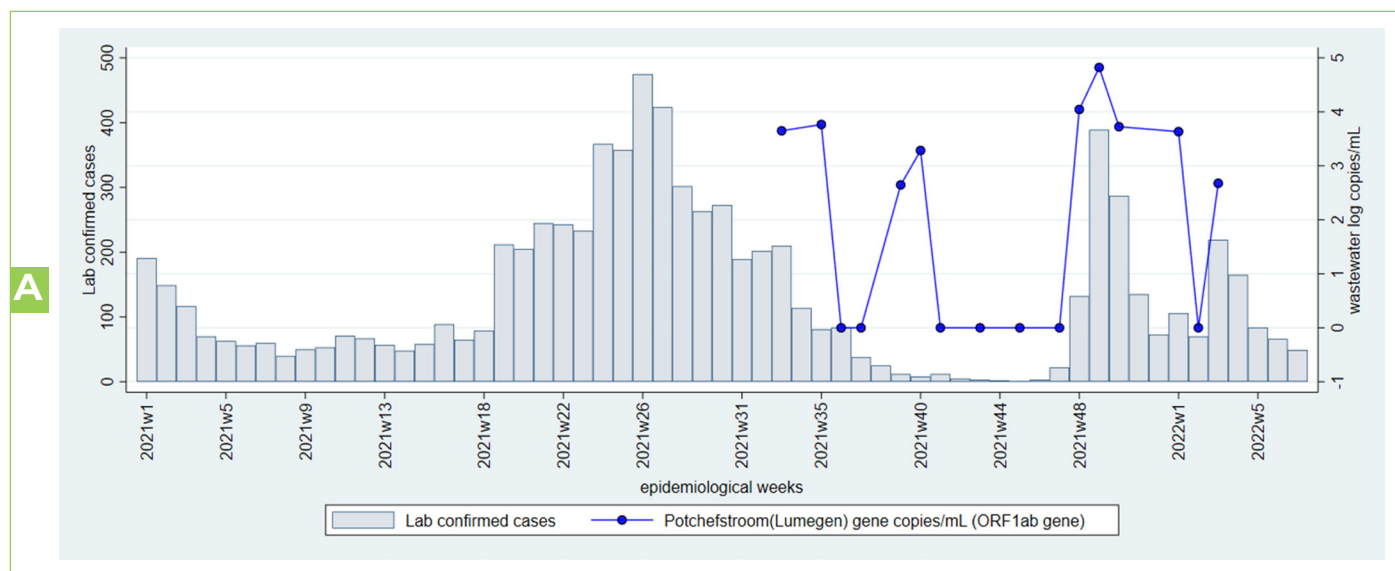
Up until week 49, 2021, SARS-CoV-2 levels were rising or high and suggested ongoing transmission. In Namakwa (Calvinia), the levels were as high as 3 log copies/ml in week 2, 2022. More results are required to compare with the latest number of clinical cases. On the other hand, a current assessment cannot be made for France Baard due to the absence of recent results. The public health authorities should continue surveillance for cases, promote vaccination and non-pharmaceutical interventions.

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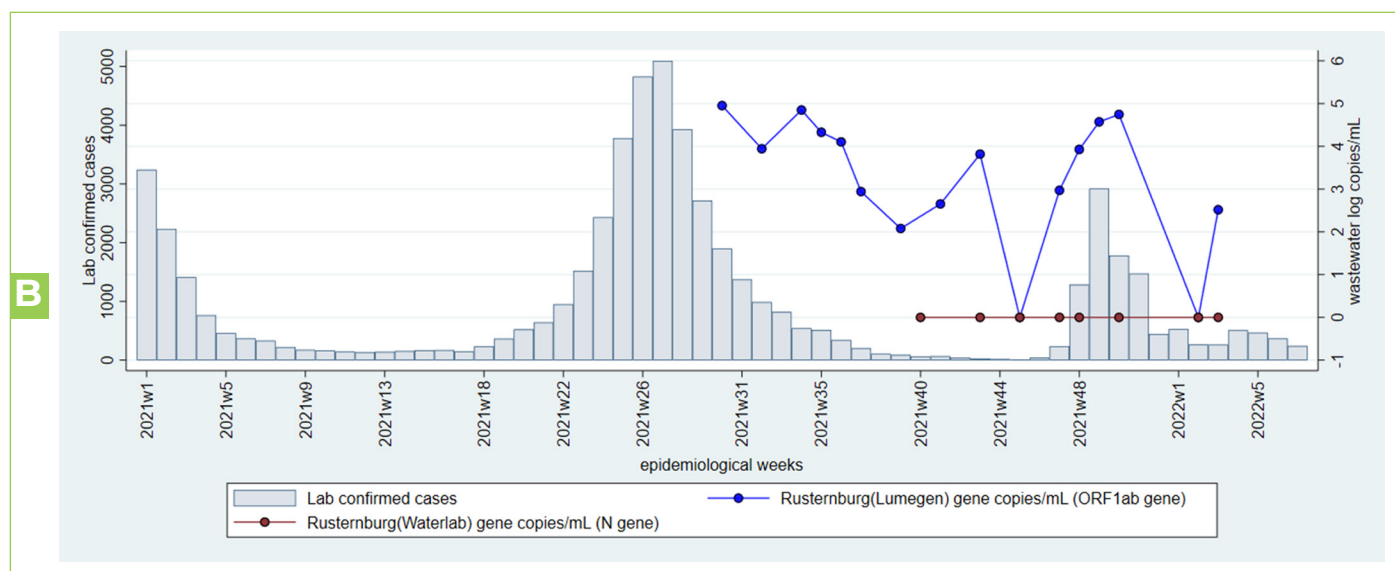
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North West Province

A: JB Marks Local Municipality



B: Bojanala District Municipality



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C: City of Matlosana Municipality

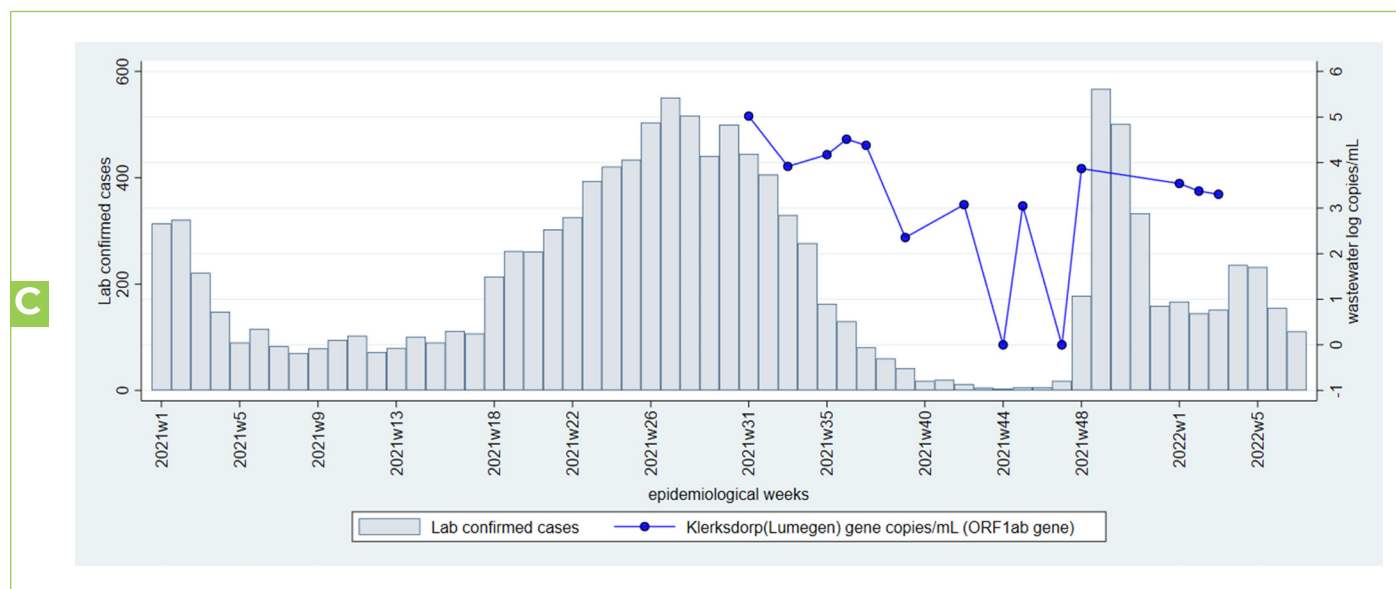


Figure 7A-C. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) in wastewater treatment plants (WWTPs) from Potchefstroom, JB Marks District (A) Rustenburg, Bojanala District (B), and City of Matlosana, Northwest Province during epidemiological weeks 1, 2021 to 3, 2022. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

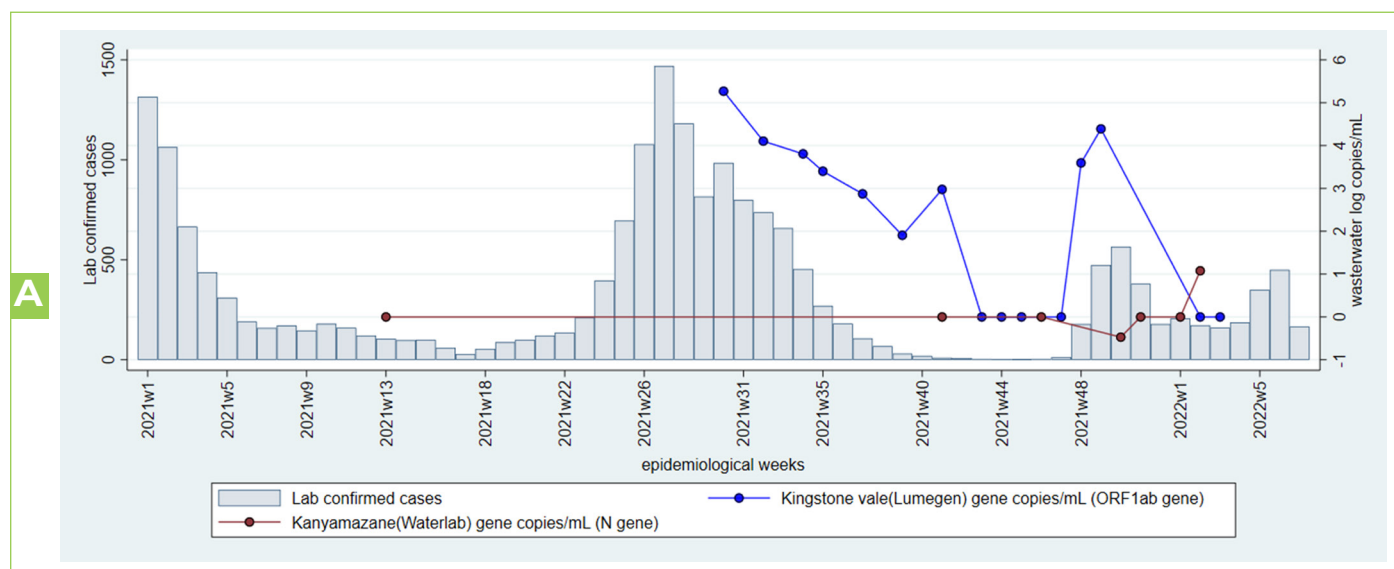
The SARS-CoV-2 levels in Potchefstroom (JB Marks), Rustenburg (Bojanala) and Klerksdorp (Matlosana) as of week 3 were around 3log copies/ml of wastewater suggesting ongoing population transmission by the Omicron subvariant. However, more recent and consistent results are required in this area. The public health authorities should continue surveillance for cases, promote vaccination and non-pharmaceutical interventions.

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

WEEK 7 2022

Mpumalanga Province

A: Mbombela Local Municipality



B: Emalahleni Local Municipality

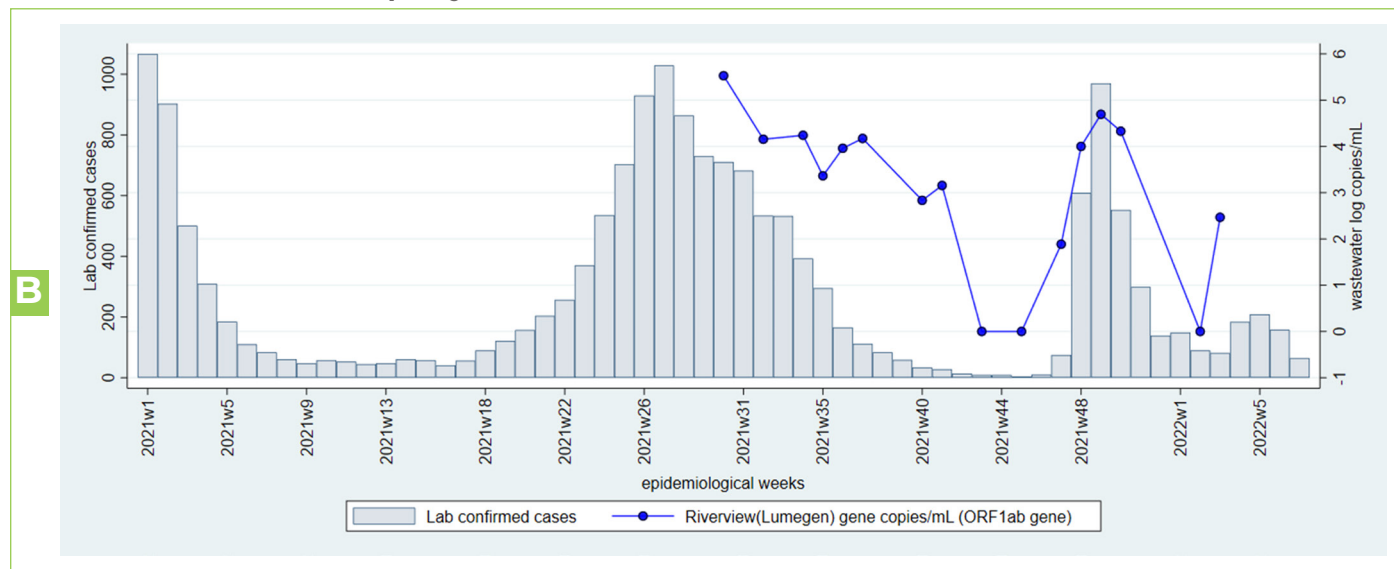


Figure 8A-B. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) in wastewater treatment plants (WWTPs) from Mbombela and Emalahleni Local Municipality, Mpumalanga Province during epidemiological weeks 30-45, 2021. The testing laboratory and quantified SARS-CoV-2 gene are named in brackets after the name of the WWTP. Note that comparisons of levels over time should only be made for specimens tested in the same laboratory.

The SARS-CoV-2 levels in Mbombela (Kingstonvale) have consistently decreased corresponding to the decrease in clinical cases. Although the levels in Riverview increased in week 3 suggesting ongoing population transmission by the Omicron subvariant, more recent and consistent results are required in this area. The public health authorities should continue surveillance for cases, promote vaccination and non-pharmaceutical interventions.

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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Limpopo Province

Polokwane Local Municipality

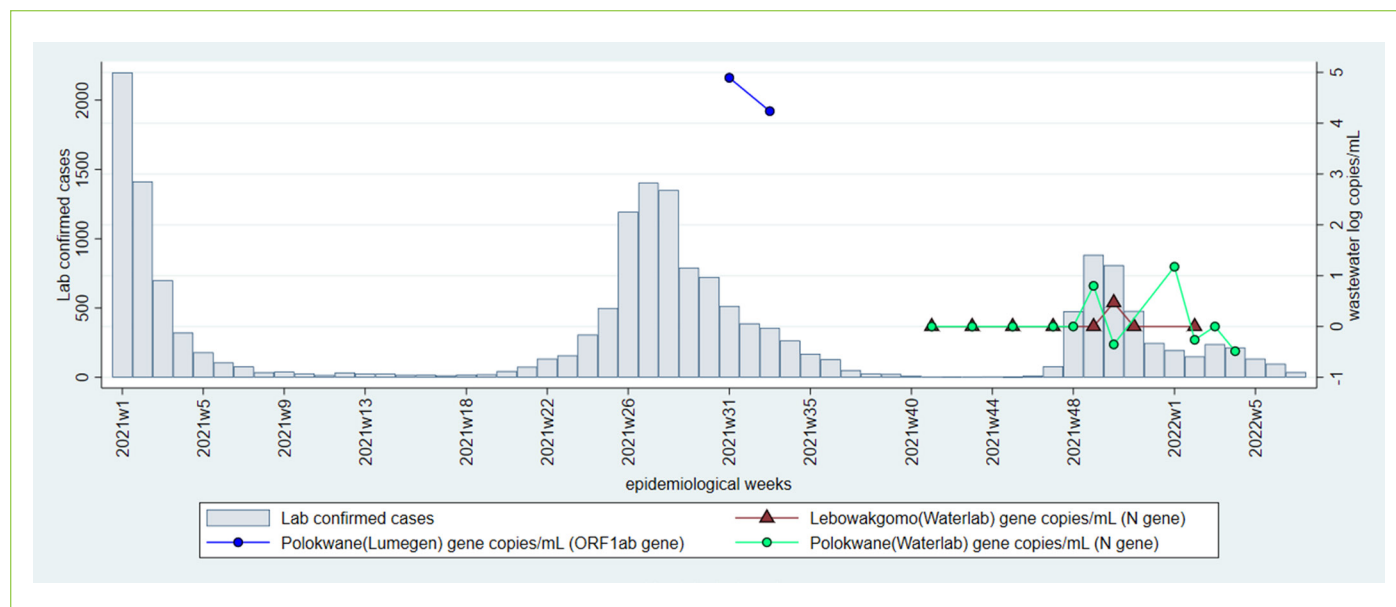


Figure 9. Laboratory confirmed cases of SARS-CoV-2 (bars) and levels of SARS-CoV-2 in log copies/ml of wastewater (coloured lines) in wastewater treatment plants (WWTPs) from Polokwane Local Municipality, Limpopo Province during epidemiological weeks 31-33, 2021.

Results are difficult to interpret, but levels are declining in Polokwane corresponding to decline in clinical case load. Current samples are needed for this area.

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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LIMITATIONS

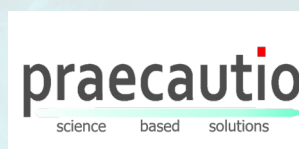
It is not possible to estimate population burden of disease using wastewater testing of SARS-CoV-2 as sources of variability are multiple, including variation in length and concentration of SARS-CoV-2 excretion by infected persons, variation in degradation rate of viral RNA in wastewater and sampling error. Interpretation of results from quantitative testing of SARS-CoV-2 in wastewater is enhanced when the population served by the wastewater treatment plants is well characterised in terms of SARS-CoV-2 testing rates, health seeking behaviour, hospital admissions and deaths due to SARS-CoV-2, as well as other general indicators of health. Further exploration of the relationship between quantitative SARS-CoV-2 results, local trends in clinical case burden, environmental factors, and test methodology will support the interpretation of observed fluctuations in RNA levels. Quality assessment and inter-laboratory comparisons are underway to ensure participating laboratories are providing consistent and comparable results.

CONCLUSION

SARS-CoV-2 data from wastewater at South African sentinel sites show concordance with clinical, epidemiologic curves in the respective locations, illustrating the potential of the SACCESS network to provide descriptive epidemiological data pertaining to geographic variation and burden of SARS-CoV-2.

ACKNOWLEDGEMENTS

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- The NICD Centre for Respiratory Disease and Meningitis are thanked for their assistance in setting up and troubleshooting PCR testing, and ongoing supportive collaboration.
- Staff of SACCESS network laboratories are thanked for their assistance in generating these results.



WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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Supplementary Table: Data for all wastewater treatment plants tested by SACCESS network

S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
1	Central	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Wisonia, Dawn, Summer Pride, Amalinda Forest, Haven Hills, Buffalo flats ext, Scenery Park	Praecautio	20-10-2021
2	East Bank	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Blue Bend, Bonza Bay, Nahoon, Beacon Bay	NICD	13-04-2021
3	Gonubie	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Sunrise-on-Sea, Gonubie Manor, Thorn Ridge, Cyprus Dale, Bay View, Donny-brook, Gonubie, Gonubie Park	Praecautio	15-09-2021
4	Mdantsane	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Mdantsane Newlands	NICD	01-06-2021
5	Potsdam	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Zone 12 to Zone 18, Unit P, Potsdam, Khayelitsha, WSU Potsdam, Campus, Mbekweni	Praecautio	20-10-2021
6	Reeston	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Reeston, Chicken Farm, Newlife	Praecautio	15-09-2021
7	West Bank	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Duncan Village, Leach Bay, Nahoon	Praecautio	15-09-2021
8	Zwelitsha	Eastern Cape	Buffalo City Local Municipality	Amathole district municipality	No subdistrict	Buffalo City Local Municipality	Sweet Waters, Zwelitsha, Phakamisa, Ilitha Park	Greenhill and Praecautio	20-10-2021
9	Brickfield	Eastern Cape	Nelson Mandela Metropolitan Municipality	N Mandela A SD	No subdistrict	Nelson Mandela Metropolitan Municipality	KwaNobuhle, Uitenhage, Van Riebeeckhoogte	NICD	13-04-2021
10	KwaNobuhle	Eastern Cape	Nelson Mandela Metropolitan Municipality	N Mandela A SD	No subdistrict	Nelson Mandela Metropolitan Municipality	KwaNobuhle, Uitenhage	NICD	13-04-2021

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
11	Bainsvlei	Free State	Mangaung	Bloemfontein SD	Bloemfontein	Mangaung	Bloemfontein, Bain's Vlei	Lumegen	01-09-2021
12	Bloemspruit	Free State	Mangaung	Bloemfontein SD	Bloemfontein	Mangaung	Langenhoven Park, Bloemfontein	NICD	16-03-2021
13	Northeastern works	Free State	Mangaung	Bloemfontein SD	Bloemfontein	Mangaung	Bloemfontein Maselapoort, Rustig	Lumegen	01-09-2021
14	Sterkwater	Free State	Mangaung	Bloemfontein SD	Bloemfontein	Mangaung	Fonteinjtjie, Rooidam	NICD	16-03-2021
15	Botshabelo	Free State	Mangaung	Botshabelo SD	Botshabelo	Mangaung	Bonolo, Botshabelo, Poklenberg, Dankbaar, Roodekop	Lumegen	04-10-2021
16	Welvaart	Free State	Mangaung	Botshabelo SD	Botshabelo	Mangaung	Kagisanong, Fichardtpark, Bochebela, Phahameng, Generaal deWet, Willows, Batho, Rocklands, Universitas	Lumegen	09-09-2021
17	Northern Works	Free State	Mangaung	Bloemfontein SD	Bloemfontein	Mangaung	Midway, Bloemspruit, Grasslands	Lumegen	01-09-2021
18	Dewetsdorp	Free State	Mangaung	Naledi SD	Naledi and Thabanchu	Mangaung	Dewetsdorp, Frankfort, Glengary	Lumegen	01-09-2021
19	Thaba Nchu	Free State	Mangaung	Thaba N'chu SD	Naledi and Thabanchu	Mangaung	Thaba Nchu, Mokwena, Selosesha, Abramskraal, Roodekop, Strydom College, Bultfontein Number Three, Ratlau, Serwalo, Bultfontein Number One, Bultfontein Number Two, Motlala, Lusaka	Lumegen	01-09-2021
20	Ennerdale	Gauteng	City of Johannesburg Metropolitan Municipality	Johannesburg G SD	No subdistrict	City of Johannesburg Metropolitan Municipality	Walkerville, Hartsenberfontein, Althea, Golfview, Blignautrus	NIOH	04-10-2021

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
21	Northern Wastewater Treatment Works	Gauteng	City of Johannesburg Metropolitan Municipality	Johannesburg A SD	No subdistrict	City of Johannesburg Metropolitan Municipality	Strydompark, Olivedale, Rivonia, Jukskei Park, Douglasdale, Ferndale, Lone Hill, Sandton, North Riding, Fourways, Paulshof	NICD	06-04-2021
22	Goudkoppies	Gauteng	City of Johannesburg Metropolitan Municipality	Johannesburg D SD	No subdistrict	City of Johannesburg Metropolitan Municipality	Soweto, Rivasdale	NICD	24-05-2021
23	Bushkoppies	Gauteng	City of Johannesburg Metropolitan Municipality	Johannesburg G SD	No subdistrict	City of Johannesburg Metropolitan Municipality	Baragwanath, Pimville, Johannesburg South, Dube, Willowdene, Nancefield	Waterlab/UP	11-10-2021
24	Olifantsvlei	Gauteng	City of Johannesburg Metropolitan Municipality	Johannesburg G SD	No subdistrict	City of Johannesburg Metropolitan Municipality	Soweto, Eldorado, Lenasia	Waterlab/UP	11-10-2021
25	Driefontein	Gauteng	City of Johannesburg Metropolitan Municipality	Mogale City LM	No subdistrict	City of Johannesburg Metropolitan Municipality	Kelvin, Morningside Manor, Edenburg, Lone Hill, Rivonia, Sandton, Northdene, Fourways, Paulshof	NIOH	04-10-2021
26	Bronk-hortspruit	Gauteng	City of Tshwane Metropolitan Municipality	Thembisile Hani LM	Tshwane North (sub-districts 3,4,6,7)	City of Johannesburg Metropolitan Municipality	Wilgerivier, Wonderfontein, Graley Crown Douglas, Bronkhorst	NICD and Waterlab/UP	04-10-2021
27	Klipgat	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 1 SD	Tshwane North (sub-districts 1,2)	City of Tshwane Metropolitan Municipality	Klipgat, Boekenhoutfontein, Soshanguve, Mabopane, Honeyvale, Boekenhoutfontein, Lebaleng	SAMRC-TB	02-11-2021
28	Sandspruit	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 1 SD	Tshwane North (sub-districts 1,2)	City of Tshwane Metropolitan Municipality	Medunsa, Hebron, Rosslyn, Strydfontein, Hornsnek, Kruisfontein	Waterlab/UP	11-09-2021
29	Rooiwal Eastern Works	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 2 SD	Tshwane North (sub-districts 1,2)	City of Tshwane Metropolitan Municipality	Atteridgeville, Pretoria CBD, Pretoria North, Rosslyn	NICD	23-03-2021
30	Temba	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 2 SD	Tshwane North (sub-districts 1,2)	City of Tshwane Metropolitan Municipality	Majanan, Hammanskraal, Mabopane, Soshanguve, Pyramid, Doornpoort	Waterlab/UP	26-09-2021

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
31	Daspoort Wastewater Treatment Works	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 3 SD	Tshwane North (sub-districts 3,4,6,7)	City of Tshwane Metropolitan Municipality	Groenkloof, Arcadia, Pretoria South, Gezina, Hercules, Rietfontein, Pretoria Central, Sunnyside, Pretoria East, Prinshof, Daspoort, Villieria, Capital Park, Pretoria West, Wonderboom South, Pretoria-Wes, Innesdale	NICD	02-03-2021
32	Sunderland Ridge	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 4 SD	Tshwane North (sub-districts 3,4,6,7)	City of Tshwane Metropolitan Municipality	Centurion, Olivenhoutbosch and some parts of Midrand.	NIOH	18-08-2021
33	Babelegi	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 5 SD	Tshwane North (sub-districts 5)	City of Tshwane Metropolitan Municipality	Industrial sites	NIOH	18-08-2021
34	Baviaanspoort	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 5 SD	Tshwane North (sub-districts 5)	City of Tshwane Metropolitan Municipality	Elandsfontein, Cullinan, Sonderwater	NIOH	18-08-2021
35	Refilwe	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 5 SD	Tshwane North (sub-districts 5)	City of Tshwane Metropolitan Municipality	Cullinan	NIOH	05-10-2021
36	Zeekoegat	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 5 SD	Tshwane North (sub-districts 5)	City of Tshwane Metropolitan Municipality	Zeekoegat, Magalies Water, Buffelsdrif	Waterlab/UP	04-10-2021
37	Godrich	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 7 SD	Tshwane North (sub-districts 3,4,6,7)	City of Tshwane Metropolitan Municipality	Bronkspruit town Rhema Park Caltura park Venster Park Zithobeni	SAMRC-TB	13-09-2021
38	Summer Place Pack-age Plant	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 7 SD	Tshwane North (sub-districts 3,4,6,7)	City of Tshwane Metropolitan Municipality	Summerplace	SAMRC-TB	01-09-2021
39	Rietgat	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 2 SD	Tshwane North (sub-districts 1,2)	City of Tshwane Metropolitan Municipality	Soshanguve	NIOH	05-10-2021
40	Thaba Tshwane	Gauteng	City of Tshwane Metropolitan Municipality	Tshwane 2 SD	Tshwane North (sub-districts 1,2)	City of Tshwane Metropolitan Municipality	Thaba Tshwane, Generaal Kemp Heuwel Radio Uitkyk	Waterlab/UP	05-10-2022

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
41	Daveyton WasteWater Treatment Works	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni E1 SD	Ekurhuleni East (E1, E2)	Ekurhuleni Metropolitan Municipality	Welgedag, Persida	NICD and CSIR	NICD:02-03-2021 CSIR: 21-09-2021
42	Rynfield	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni E1 SD	Ekurhuleni East (E1, E2)	Ekurhuleni Metropolitan Municipality	New Modder, Lakefield, Benoni, Boksburg, Northmead, Atlasville	CSIR	21-09-2021
43	Ancor	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni E2 SD	Ekurhuleni East (E1, E2)	Ekurhuleni Metropolitan Municipality	Welgedag, Payneville, Selcourt, Casseldale, Springs	Waterlab/UP	21-09-2021
44	Carl Grun-dlingh	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni E2 SD	Ekurhuleni East (E1, E2)	Ekurhuleni Metropolitan Municipality	Nigel, Bultfontein, Laversburg	CSIR	21-09-2021
45	Jan Smuts	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni E2 SD	Ekurhuleni East (E1, E2)	Ekurhuleni Metropolitan Municipality	Dalpark, Brakpan, Dersley, Dalview, Benoni, New Modder, Schapenrust	CSIR	21-09-2021
46	Tsakane	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni E2 SD	Ekurhuleni East (E1, E2)	Ekurhuleni Metropolitan Municipality	Benoni, Dersley, Dalpark, Brakpan, Dalview, Schapenrust	Waterlab/UP	05-10-2021
47	Welgedacht	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni E2 SD	Ekurhuleni East (E1, E2)	Ekurhuleni Metropolitan Municipality	KwaThema, Brakpan, Dersley, Schapenrust	Waterlab/UP	21-09-2021
48	Hartebees-fontein WasteWater Treatment Works	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni N1 SD	Ekurhuleni North (N1, N2)	Ekurhuleni Metropolitan Municipality	Mid-Ennerdale, Althea, Grasmere, Elandsfontein	NICD Waterlab/UP	NICD:02-03-2021 Waterlab/UP : 05-10-2021
49	Herbert Bickley	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni N1 SD	Ekurhuleni North (N1, N2)	Ekurhuleni Metropolitan Municipality	Jameson Park	CSIR	21-09-2021
50	Olifantsfontein WasteWater Treatment Works	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni N1 SD	Ekurhuleni North (N1, N2)	Ekurhuleni Metropolitan Municipality	Pinedene, Clayville, Tembisa, Midstream Estates, Olifantsfontein	CSIR and NICD	CSIR: 21-09-2021 NICD: 02-03-2021
51	Benoni	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni N2 SD	Ekurhuleni North (N1, N2)	Ekurhuleni Metropolitan Municipality	Northmead, Dalpark, Dalview, Lakefield, Benoni, New Modder	Waterlab/UP	05-10-2021

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

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S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
52	J.P. Marais	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni N2 SD	Ekurhuleni North (N1, N2)	Ekurhuleni Metropolitan Municipality	Northmead, Atlasville, New Modder, Lakefield, Benoni	CSIR	21-09-2021
53	Dekema	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni S1 SD	Ekurhuleni South (S1, S2)	Ekurhuleni Metropolitan Municipality	Katlehong, Natalspruit, Randhart, Alrode	Waterlab/UP	05-10-2021
54	Rondebult	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni S1 SD	Ekurhuleni South (S1, S2)	Ekurhuleni Metropolitan Municipality	Bartlett, Atlasville, Boksburg North, Lakefield, Bonaero Park, Ravenswood, Witfield, Boksburg	Waterlab/UP	21-09-2021
55	Vlakplaats WasteWater Treatment Works	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni S2 SD	Ekurhuleni South (S1, S2)	Ekurhuleni Metropolitan Municipality	Vosloorus	NICD and CSIR	NICD: 22-02-2021 CSIR: 21-09-2021
56	Waterval WWTW	Gauteng	Ekurhuleni Metropolitan Municipality	Ekurhuleni S2 SD	Ekurhuleni South (S1, S2)	Ekurhuleni Metropolitan Municipality	Kliprivier, Henley on Klip, Ophir, Glen Donald, Chrissiefontein, Rothdene, Riversdale, Meyerton Farms	Waterlab/UP	21-09-2021
57	Flip Human	Gauteng	West Rand	West Rand *(Johannesburg C SD)	No Subdistrict	Mogale City Local Municipality	Rietvallei, Bhongwem, Brink's Vlakfontein	Waterlab/UP	12-10-2021
58	Magaliesburg	Gauteng	West Rand	West Rand (Mogale City LM)	No Subdistrict	Mogale City Local Municipality	Magaliesburg, Mogale City	Waterlab/UP	12-10-2021
59	Percy Steward	Gauteng	West Rand	West Rand (Mogale City LM)	No Subdistrict	Mogale City Local Municipality	Lewisham, Krugersdorp North	Waterlab/UP	12-10-2021
60	Hammarsdale	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni West	eThekweni Metropolitan Municipality	Hammarsdale, Elangeni, Mpumalanga	GreenHill	02-09-2021
61	Hillcrest	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni West	eThekweni Metropolitan Municipality	New Germany, Pinetown, Clermont, Pinelands, KwaDabeka	GreenHill	02-09-2021

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

WEEK 7 2022

S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
62	Isipingo	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni South	eThekweni Metropolitan Municipality	Umbogintwini, Malukaze, Egoelokodo, KwaMakhutha, Umlazi	DUT	10-08-2021
63	Central	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni North	eThekweni Metropolitan Municipality	Brighton Beach, Grosvenor, King's Rest, Ocean View, Fynnland and Treasure Beach	NICD and DUT	NICD: 22-02-2021 DUT: 10-08-2021 for DUT
64	KwaMashu	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni South	eThekweni Metropolitan Municipality	La Lucia, Umhlanga, Prestondale, Phoenix, Duff's Road, Glen Ashley, Mount Edgecombe	DUT	10-08-2021
65	Northern	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni North	eThekweni Metropolitan Municipality	Newlands, KwaMashu, Greenwood Park, Park Hill	NICD	22-02-2021
66	Phoenix	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni South	eThekweni Metropolitan Municipality	Rietrivier, KwaMashu, Duff's Road, Mount Edgecombe, Phoenix, Richmond, Inanda	DUT	10-08-2021
67	Fraser's	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni North	iLembe District municipality	Salt Rock, Ballitoville, Umhlali, Fraser, Zimbali, Shaka's Rock, Ballito	Waterlab/UP	11-10-2021
68	Umbilo	Kwazulu-Natal	eThekweni Metropolitan Municipality	eThekweni MM Sub	eThekweni North	eThekweni Metropolitan Municipality	Acorn, Albany, Alexander Park	GreenHill	28-10-2021
69	Darvill	Kwazulu-Natal	uMgungundlovu District municipality	Msunduzi LM	No subdistrict	The Msunduzi Local Municipality	Pelham, Hayfields, New England, Northdale, Hay Paddock, Scottsville, Cleland, Bishopstowe, Sobantu	GreenHill	02-09-2021
70	Lynfield Park	Kwazulu-Natal	uMgungundlovu District municipality	Msunduzi LM	No subdistrict	The Msunduzi Local Municipality	Thornville, Hayfields, Hay Paddock, Lynnfield Park, Cleland	GreenHill	02-09-2021
71	Mpofana	Kwazulu-Natal	Umgungundlovu District municipality	Mpofana LM	No subdistrict	Mpofana Local Municipality	Bruntville, Brown Stones, Windy, Weston, Mooirivier	Waterlab/UP	28-09-2021

WASTEWATER-BASED EPIDEMIOLOGY FOR SARS-COV-2 SURVEILLANCE IN SOUTH AFRICA

WEEK 7 2022

S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
72	Howick	Kwazulu-Natal	Umgungundlovu District municipality	uMngeni LM	No subdistrict	UMgungundlovu District municipality	Riversdale, Merrivale, Cedara	GreenHill	02-09-2021
73	Polokwane	Limpopo	Capricorn District municipality	Polokwane LM	No subdistrict	Polokwane Local Municipality	Westenburg, Nirvana, Bendor, Welgelegen, Moregloed, Annadale, Ivydale, Flora Park, Fauna Park, Penina Park, Ivy Park, Ster Park, Dalmada, Broadlands, Woodlands, and Thornhill	Lumegen: /Waterlab/ UP	Lumegen: 02-08-2021 Waterlab/UP: 11-10-2021
74	Lebowakgomo	Limpopo	Capricorn District municipality	Lepelle-Nkumpi LM	No subdistrict	Lepelle-Nkumpi LM	Thabamooopo, Vaalboschlaagte, Lekhuswaneng, Moepeng, Makurung, Sekurwaneng, Ga-Matshela, Makurun	Waterlab/UP	12-10-2021
75	Emalahleni (Riverview)	Mpumalanga	Nkangala District Municipality	Emalahleni LM	No subdistrict	Emalahleni LM	Lynnville, Duvhapark, Paxton, Klipfontein	Lumegen	26-07-2021
76	Kanyamazane	Mpumalanga	Ehlanzeni District	City of Mbombela LM	No subdistrict	Mbombela/ Umjindi	Daantjiekasie, eNyamazaneni	Waterlab/UP	30-03-2021
77	Mbombela (Kingstonvale)	Mpumalanga	Ehlanzeni District	Mbombela/ Umjindi	No subdistrict	Mbombela/ Umjindi	Gutshwa, eMpumalanga, eNyalungu, Dwaleni, Hlauhlau, Phasha, Ngodini	Lumegen	26-07-2021
78	Calvinia	Northern Cape	Namakwa	Hantam Local Municipality	No subdistrict	Hantam Local Municipality	Calvinia	NICD	06-07-2021
79	Homevale Kimberley	Northern Cape	Frances Baard	Sol Plaatjie Local Municipality	No subdistrict	Sol Plaatjie Local Municipality	Remount Camp, Kenilworth, Homevale	Lumegen	28-08-2021
80	Potchefstroom	North-West	JB Marks Local Municipality	JB Marks LM	No subdistrict	JB Marks Local Municipality	Harpington, Vyfhoek, Mooibank, Wilgeboom	Lumegen	17-08-2021

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S/ No	Wastewater plant name	Province	Metro or District	Official subdistrict SD or Local municipality	Subdistrict as represented on the graphs	Water service authority	Suburbs in drainage reticulation	Testing laboratory	Date quantitative testing started
81	Klerksdorp main	North-West	Matlosana Local Municipality	City of Matlosana LM	No subdistrict	Matlosana Local Municipality	Boetrand, Wilkoppies	Lumegen	02-08-2021
82	Rustenburg	North-West	Rustenburg Local Municipality	Rustenburg Local Municipality	No subdistrict	Rustenburg Local Municipality	Rustenburg	Lumegen and Waterlab/UP	Lumegen: 26-07-2021 Waterlab: 11-10-2021
83	Bellville	Western Cape	City of Cape Town Metropolitan Municipality	CT Northern SD	No subdistrict	City of Cape Town Metropolitan Municipality	Parow, Belhar, Brackenfell	MRC-BRIP	Not testing quantitatively
84	Cape Flats	Western Cape	City of Cape Town Metropolitan Municipality	CT Southern SD	No subdistrict	City of Cape Town Metropolitan Municipality	Khayelitsha, Mitchells Plain	Waterlab/UP	06-10-2022
85	Athlone	Western Cape	City of Cape Town Metropolitan Municipality	CT Tygerberg	No subdistrict	City of Cape Town Metropolitan Municipality	Crawford, Gleemore, Rondenbosch East	Waterlab/UP	06-10-2021
86	Borchard's Quarry	Western Cape	City of Cape Town Metropolitan Municipality	CT Tygerberg SD	No subdistrict	City of Cape Town Metropolitan Municipality	Belhar, Elsiesrivier	NICD	09-03-2021
87	Zandvliet	Western Cape	City of Cape Town Metropolitan Municipality	Stellenbosch LM	No subdistrict	City of Cape Town Metropolitan Municipality	Faure, Macassar, Somerset West	NICD	09-03-2021