Cedar Lakes
Lifestyle Estate

CEDAR LAKES WATER QUALITY TESTING AND MONITORING 2023/2024 : PROGRESS REPORT 25 March 2024

BACKGROUND

With the health of residents, pets, and our diverse natural occupants of the estate in mind, and because of the inconsistency of the water quality monitoring in the past, the Environmental Committee and their consultants embarked on a project to sample and analyses all the Lakes monthly, for one year to obtain a comprehensive microbiological and chemical view of our water quality by month.

The aim of the project with the data obtained to understand and assess how the water quality of our Estate seasonally varies and act accordingly to ensure water of the highest possible quality and safety for the future.

The microbiological and chemical parameters were chosen according to South African recreational and irrigation water standards, which follow international protocols.

This would give a baseline of the water quality by month and would also give some insights into what is happening in the lakes seasonally and other natural and unnatural events e.g. sewage spills, heavy rains, heat waves, droughts, street and surrounding estate activities, runoff, etc.

The water quality testing proposal was extended to three of the Estate's boreholes to be sampled and tested according to the South African drinking water quality standard SANS 241:2015 *(Blue Drop)* on a quarterly basis.

After budget approval the project and budget for 12 monthly sampling sessions of the lakes and quarterly sampling of the boreholes, and sampling began in April 2023 by Waterlab (Pty) Ltd.

PROGRESS REPORT - DAMS

Waterlab has sampled the dams monthly since April 2023 and we have received the results for 11 months.

There is therefore an enormous amount of data produced with 14 chemical parameters and 8 microbiological parameter results for each sample.

A progress report was published by the CLHOA with more background and information of the tests that have been conducted and results for 4 months of selected chemical and microbiological parameters was sent out in a memorandum in September 2023. This report should be read in conjunction with that one rather than repeating the text.

The overall results ***when there is no incidental contamination, e.g. sewage spills***, indicate that the water quality in general is reasonably good according to recreational (and irrigation) water use guidelines for the type of activities at Cedar Lakes, (reference: Dept of Water Affairs "Water Quality Guidelines" publications).

The parameters reported follow normal seasonal changes, e.g. dilution from rainfall, algal blooms in hot weather, microbiology in line with surrounding fauna and flora, etc. It has been postulated that there could be a small amount of seepage from a cracked sewer pipe around Con Dam that could have contributed to microbial contamination of the lakes.
Since November 2023, a sewage pipe at the lower end of The Village is being replaced and repaired, and we expect that water quality will improve once finally completed.

SEWAGE SPILLS

During this sampling period, we have had seven sewage spills, three from manholes overflowing due to sewer blockages, close to, and running into, Lake Willowmere. These were in April, May, and October, with the latter an estimated of 5000 liters spilling. There were two sewer blockages in The Ridge in May and June and effluent ran into Con Dam.

With the work in progress of replacement of the sewage pipe in the lower Village by Johannesburg Water, a blockage occurred in November 2024, and raw sewage flowed into Lake Willowmere and Leguaan A for over two weeks before it was contained.

The shock to the Cedar Lakes dam system was profound and the very high chemical (ammonia, COD, total nitrogen, dissolved oxygen,) and microbiological (total coliforms, eColi) parameters for sewage contamination reported. There were also protozoa detected for the first time in September and November (but back to zero in December 2023 and January 2024 sampling results).

A week into the big spill, Dissolved Oxygen was reduced at lower depths severely in Lake Willowmere and to a lesser extent Leguaan,(i.e. <3 mg/l O2) which stressed the fish and some died. Quick action by the Environmental Director, with dilution by adding water from the boreholes, relocation of fish, bioremediation and forced aeration, minimized the loss of fish life.

The spill produced an abundance of nutrients for plant and algae in Leguaan A. Comparing the chemical and microbiological results for Leguaan A and B in November and December, this overgrowth of plant material has "treated" the sewage with a number of the parameters largely reduced significantly on examining the differences in analysis in Leguaan B compared to Leguaan A.

With the new sewage pipe installed and the normal leakage contained we expect the water quality to improve.

Looking at the monthly microbial results from November 2023 to January 2024, the faecal contamination has been high with unacceptable contamination levels seen in all dams in January 2024, compounded by the circulation of the water around the dams.

The dam water results received for the February 2024 sampling saw a vast improvement over the month with all microbiological parameters diminishing. In particular the eColi count has come down very well following remediation and dilution with rains we've experienced.

Colour coded tables of the Total Coliforms and eColi over the 10 months are shown in Tables 1 and 2.

It is quite distressing to note that a new sewage spill from a blockage in the new sewage pipe close to Lake Willowmere occurred on 11th March which hopefully will be contained and remedied quickly.

Once the sampling project has been completed in April 2024, we will produce a detailed report and present the data in a meaningful form and endeavour to illustrate trends, effects of incidents (e.g. sewage spills, street run-off etc.), seasonal changes, etc. over the year.

Tables 1 to 12 show the results of selected parameters with the monthly results colour coded comparing to each of their limits.

CEDAR LAKES DAM ANALYSIS 2023-2024.

TABLE 1: **E Coli April 2023 to Feb 2024**

	E. COLI. MPN per 100ml											
	Date Sample	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2
Eschericiha Coli. (E.Coli) ***Predicted symtoms include: Skin irritations,infections and intestinal disorders if ingested.***	21-Feb-24	260	180	16	70	440	1100	44	54	190	40	22
	19-Jan-24	8800	4100	980	3500	2900	1000	730	300	5200	6800	1100
	14-Dec-23	270	290	96	980	730	250	5	18	33	520	440
	20-Nov-23	170	370	55	##980	##220	260	50	120	110	52	3
	23-Oct-23	340	340	130	23	820	130	32	80	870	2200	8100
	23-Sep-23	23	33	12	11	#1400	37	33	4	3		15
	21-Aug-23	<1	150	100	55	220	11	15	4	42		13
	20-Jul-23	140	19	3	16	**2400	2	24	54	5	10	1
	23-Jun-23	4	44	6	1	19	27	2	3	<1	<1	1
	24-May-23	16	23	2	1	16	23	5	*5200	9	3	6
	25-Apr-23	24	1	1	1	6	110	6	82	6	10	2

Circulation bewteen Dams?

Recreation Limits:-			
Low risk	<130	MPN/100ml	
Tolerable with slight risk	130-200	MPN/100ml	
Unacceptable Significant ris	200-400	MPN/100ml	
Unacceptable High risk	>400	MPN/100ml	
	Sewage spill		

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023
**Sewage spill ri=unning into Con Dam 23 May and 1st June 2023
#. Sewage Spill Willowmere south October
##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

TABLE 2: **TOTAL COLIFORM BACTERIA April 2023 to Feb 2024**

	TOTAL COLIFORM BACTERIA. MPN per 100ml										
	Date Sample	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2
TOTAL COLIFORM BACTERIA. ***Indication of Total Bacterial content which includes pathogenic and non-pathogenic bacteria.***	21-Feb-24	1700	1300	1300	2000	33000	2200	1400	2500	11000	2200	9200
	19-Jan-24	>100000	>100000	58000	29000	31000	19000	31000	39000	>100000	>100000	>100000
	14-Dec-23	49000	55000	6100	65000	92000	2900	2000	2400	55000	>100000	>100000
	20-Nov-23	30000	61000	4100	34000	9100	73000	21000	2400	>100000	490	4200
	23-Oct-23	25000	23000	21000	2000	>100000	>100000	12000	11000	>100000	>100000	>100000
	23-Sep-23	650	1700	1300	3100	37000	87000	>100000	2400	>100000		20000
	21-Aug-23	<1	910	200	330	1700	78	1200	66	14000		770
	20-Jul-23	410	440	1100	2000	>100000	22	140	1000	93	370	33
	23-Jun-23	190	1300	2400	140	690	99	99	310	130	160	93
	24-May-23	4600	57	820	2200	46000	1000	650	24000	6800	1600	310
	25-Apr-23	10000	2700	7500	730	4800	2000	3200	2400	6400	52000	58000

Recreation Limits:-			
Low	<2000	MPN/100ml	
Medium	2000-3000	MPN/100ml	
High	>3000	MPN/100ml	
	Sewage spill		

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023
**Sewage spill ri=unning into Con Dam 23 May and 1st June 2023
#. Sewage Spill Willowmere south October
##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

TABLE 3: ***Algal Pigments*** **µg/l Chorophyll-a** **April 2023 to Feb 2024**

ALGAL PIGMENTS as µg/l Chlorophyll-a Predicted nuisance conditions: Includes scums and smells .

	ALGAL PIGMENTS as µg/l CHLOROPHYLL-a											
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2	
21-Feb-24	134	64	30	103	161	75	82	32	75	20	32	
19-Jan-24	27	36	21	105	150	93	83	31	36	11	61	Circulation bewteen Dams?
14-Dec-23	118	64	6	9	99	41	32	<1	54	8	19	
20-Nov-23	156	229	17	64	110	108	49	11	158	<1	11	
23-Oct-23	121	31	31	21	134	73	11	6	16	156	15	
23-Sep-23	218	17	6	6	48	29	42	5	15		95	
21-Aug-23	592	<1	2	10	234	134	128	3	3		<1	
20-Jul-23	245	22	21	59	67	5	67	3	35	37	3	
23-Jun-23	80	8	5	16	39	20	13	15	8	29	5	
24-May-23	51	23	2	16	79	50	34	12	56	56	5	
25-Apr-23	35	17	6	19	61	17	11	17	37	70	64	

Recreation Limits:-

		µg/l Chlorophyll-a
Low	Algal scums >10 evident.Nuisance but no health effects	0 to 20
Medium	Nuisance conditions may occur, Surface algal blooms evident	20-30
High	Matts of rotting algae drying may produce severe odour problems. Minimal health effects expected.	>30
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023

**Sewage spill ri=unning into Con Dam 23 May and 1st June 2023

#. Sewage Spill Willowmere south October

##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

TABLE 4: **BLUE-GREEN ALGAE as µg/l Microcystin** **April 2023 to Feb 2024**

BLUE-GREEN ALGAE as µg/l Microcystin Microcystin is a dangerous toxin produced by blue-green algae.

	µg/l MICROCYSTIN											
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2	
21-Feb-24	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	
19-Jan-24	<0.15	<0.15	0.15	0.20	0.21	0.21	<0.15	<0.15	<0.15	0.20	<0.15	
14-Dec-23	0.16	<0.15	0.44	0.87	0.66	0.23	0.24	0.32	<0.15	<0.15	<0.15	
20-Nov-23	<0.15	<0.15	0.38	<0.15	0.17	0.46	0.38	<0.15	<0.15	<0.15	<0.15	
23-Oct-23	<0.15	<0.15	<0.15	<0.15	0.74	<0.15	<0.15	<0.15	0.15	<0.15	<0.15	
23-Sep-23	<0.15	<0.15	<0.15	<0.15	0.52	0.16	<0.15	0.17	0.19		<0.15	
21-Aug-23	<0.15	<0.15	<0.15	<0.15	0.18	<0.15	0.23	0.16	0.21		<0.15	
20-Jul-23	<0.15	<0.15	<0.15	<0.15	0.19	<0.15	<0.15	<0.15	0.15	<0.15	<0.15	
23-Jun-23	0.20	<0.15	0.21	0.21	0.43	0.20	0.18	0.19	0.27	0.17	0.16	
24-May-23	<0.15	0.15	0.44	0.26	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	
25-Apr-23	<0.15	<0.15	<0.15	<0.15	0.17	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	

Recreation Limits:-

		µg/l Microcystin
Low	Recreational Guideline limit	<10
Low	Detected but within limits	
High		>10
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023

#. Sewage Spill Willowmere south October

##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

TABLE 5: ***TOTAL PHOSPHOROUS*** **April 2023 to Feb 2024**

TOTAL PHOSPHOROUS as mg/l P

	TOTAL PHOSPHOROUS as mg/l P											
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2	
21-Feb-24	0.3	0.2	<0.2	0.2	0.3	0.2	<0.2	<0.2	<0.2	0.2	0.2	
19-Jan-24	0.2	0.2	<0.2	0.3	0.4	0.3	0.2	0.2	0.3	0.2	0.2	Circulation bewteen Dams
14-Dec-23	0.4	0.3	<0.2	0.2	0.2	0.2	<0.2	<0.2	0.2	0.2	<0.2	
20-Nov-23	0.4	0.3	<0.2	0.5	0.2	0.2	<0.2	<0.2	0.2	0.2	<0.2	
23-Oct-23	0.2	0.3	0.2	<0.2	0.4	0.2	0.2	<0.2	0.2	0.5	0.4	
23-Sep-23	0.5	0.2	0.2	<0.2	0.4	0.2	0.3	0.2	0.3		0.6	
21-Aug-23	0.3	0.2	<0.2	<0.2	0.3	0.2	0.2	<0.2	0.2		0.2	
20-Jul-23	0.4	0.2	0.2	0.2	0.4	0.4	0.3	0.2	0.2	0.6	0.3	
23-Jun-23	0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	
24-May-23	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	
25-Apr-23	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.2	

		mg/l P
Low	Low	<0.2
Medium	Aids eutrofication	0.2 to 0.5
High	High (Unacceptable Waste Water limit is 1.0 mg/l)	>0.5
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023

**Sewage spill ri=unning into Con Dam 23 May and 1st June 2023

#. Sewage Spill Willowmere south October

##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

TABLE 6: TOTAL NITROGEN (KJELDAHL) **as mg/l N : April 2023 to Feb 2024**

TOTAL KJELDAHL NITROGEN (organic and reduced Nitrogen) as mg/l N

	TOTAL KJELDAHL NITROGEN as mg/l N											
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2	
21-Feb-24	3.1	2.8	2	2.5	2.8	2.2	2.5	2	0.8	1.1	0.8	
19-Jan-24	0.8	0.8	1.1	1.4	2.0	1.4	1.1	1.1	1.4	1.4	1.7	
14-Dec-23	3.9	1.1	2.8	4.5	2.8	1.7	1.1	2.8	2.2	1.7	1.7	
20-Nov-23	1.7	2.0	1.1	4.8	4.8	2.2	2.0	1.7	3.1	2.0	1.1	
23-Oct-23	3.4	2.5	1.4	1.7	3.9	2	1.4	0.8	2	2.8	2	
23-Sep-23	3.1	2.2	0.6	0.8	1.4	1.4	2.8	1.1	1.1		5	
21-Aug-23	3.9	0.6	0.8	0.8	1.4	2.0	1.7	<0.5	1.4		2.0	
20-Jul-23	6.7	1.1	<0.5	0.8	2.8	2.2	0.6	1.4	1.1	3.4	1.1	
23-Jun-23	7.8	0.6	10	2.8	6.2	1.7	23	1.1	27	19	437	
24-May-23	2.0	1.1	0.6	0.8	2.0	1.1	1.1	1.1	1.7	2.0	1.7	
25-Apr-23	0.6	0.6	1.1	0.8	1.1	0.8	0.6	0.6	0.8	2.0	1.4	

EPA limits

Low		<2
Medium		>2 to 6
High		>6
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023

#. Sewage Spill Willowmere south October

##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

TABLE 7: ***pH*** **April 2023 to Feb 2024**

pH Measuerment of Acidity	pH										
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2
21-Feb-24	7.6	7.8	8.0	7.7	9.0	8.6	8.4	7.4	7.7	7.7	7.8
19-Jan-24	7.3	7.4	8.5	7.4	8.2	7.9	7.7	7.1	6.9	7.1	7.3
14-Dec-23	7.5	8.2	8.6	7.4	8.2	8.6	9.1	7.6	7.5	7.5	7.7
20-Nov-23	7.5	7.5	8.2	7.4	7.7	7.7	7.7	7.2	7.0	7.5	7.4
23-Oct-23	7.2	7.4	7.6	9	7.6	8.1	8.1	7.5	7.4	6.9	6.9
23-Sep-23	8.5	7.6	9.2	8.7	7.7	8.7	7.5	8.1	7.7	DRY	8.4
21-Aug-23	7.7	7.2	8.4	7.9	7.5	8.6	8.4	7.5	7.5	DRY	8.2
20-Jul-23	7.9	8.4	8.4	8.0	8.0	7.5	7.2	7.5	7.6	8.0	9.2
23-Jun-23	7.6	7.5	8.0	8.0	7.8	7.7	7.4	7.6	7.6	8.2	8.5
24-May-23	7.6	8.1	8.5	8.0	8.4	8.0	8.0	7.4	7.3	7.7	7.5
25-Apr-23	8.0	7.7	8.8	7.8	9.0	8.3	7.9	7.5	7.7	7.9	8.2

Circulation bewteen Dams

Recreation Limits:

		pH
Low	Acidic	<6.5
Ideal	Acceptable range for recreation	6.5 to 8.5
High	Alkaline	>8.5
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023
**Sewage spill ri=unning into Con Dam 23 May and 1st June 2023
#. Sewage Spill Willowmere south October
##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A Novem

TABLE 8: TURBIDITY **as mg/l N : April 2023 to Feb 2024**

TUBIDITY N.T.U (Nephelometric Turbidity Units)	TURBIDITY in N.T.U.										
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2
21-Feb-24	15.0	20.0	4.0	16.0	35.0	24.0	35.0	14.0	15.3	4.3	5.3
19-Jan-24	16	18	3.8	24	41	38	33	13	34	9.0	8.4
14-Dec-23	21	33	1.9	12	51	26	20	4.1	25	5.5	4.9
20-Nov-23	27	54	3.4	25	15	45	39	3.2	21	2.6	3.2
23-Oct-23	17.0	27.0	7.2	5.8	49.0	32.0	21.0	2.6	6.9	16.0	12.0
23-Sep-23	33.0	23.0	5.3	2.0	29.0	11.0	43.0	6.8	17.0	DRY	84.0
21-Aug-23	25	14	2.5	2.6	19	18	65	2.9	13	DRY	5.7
20-Jul-23	23	14	2.6	4.6	38	14	23	6.5	16	45	4.2
23-Jun-23	18	8.2	1.1	2.4	38	13	14	7.6	6.4	5.8	2.4
24-May-23	17	12	1.3	3.9	23	16	13	5.0	8.7	5.9	2.2
25-Apr-23	13	12	1.2	2.6	25	9.2	11	5.2	9.6	13	8.3

Nominal aesthetic Limits

		N.T.U.
Low	Good environmental quality and clarity	<10
Medium	Acceptable environmental quality and clarity	10 to 36
High	Poor environmental quality-effects fish reproduction and photosythesis	>36
	Sewage spill	

TABLE 9: ***NITRATE (NO3) as mg/l N*** **April 2023 to Feb 2024**

NITRATE (NO3) as mg/l N	NITRATE (NO3) AS mg/l N										
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2
21-Feb-24	0.5	0.8	0.6	0.7	0.6	0.6	0.7	0.6	0.6	0.6	0.5
19-Jan-24	2.3	2.5	2.0	2.7	2.1	1.9	4.1	1.9	2.2	2.1	1.9
14-Dec-23	0.3	0.3	0.2	0.4	0.5	0.3	1.1	0.3	0.5	0.6	0.3
20-Nov-23	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
23-Oct-23	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
23-Sep-23	<0.1	1.2	<0.1	<0.1	0.1	0.3	4.2	<0.1	<0.1		<0.1
21-Aug-23	<0.1	1.5	0.1	0.2	0.2	0.3	3.6	0.5	0.1		0.1
20-Jul-23	<0.1	0.4	<0.1	0.1	0.3	1.4	5.1	0.2	<0.1	<0.1	<0.1
23-Jun-23	<0.1	1.3	<0.1	<0.1	0.1	<0.1	0.7	<0.1	<0.1	<0.1	<0.1
24-May-23	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
25-Apr-23	<0.1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Nitrate results are all <10mg/l and therefore within safety specification.
Any Nitrate present in water will act as a nutrient for ALGAE

	<1.0 mg/l
	>1.0 mg/l N
	>3 .0 mg/l N

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023
**Sewage spill ri=unning into Con Dam 23 May and 1st June 2023
#. Sewage Spill Willowmere south October
##. Sewage Spill during new pipe installation-running into Willowmere and Legua

TABLE 10: FREE AND SALINE AMMONIA **as mg/l N : April 2023 to Feb 2024**

FREE AND SALINE AMMONIA mg/l N	AMMONIA as mg/l N										
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2
21-Feb-24	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
19-Jan-24	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.1	0.2	0.1	0.1
14-Dec-23	0.2	0.2	<0.1	0.3	0.5	<0.1	0.1	0.1	<0.1	0.1	<0.1
20-Nov-23	0.2	0.1	0.2	1.7	1.9	0.2	0.2	0.2	0.5	0.3	0.2
23-Oct-23	0.2	0.5	0.3	0.2	1.4	0.2	0.3	0.2	0.4	0.2	0.4
23-Sep-23	<0.1	<0.1	<0.1	0.1	2	<0.1	<0.1	0.3	1.6		<0.1
21-Aug-23	0.3	0.2	<0.1	0.3	<0.1	0.3	0.1	<0.1	<0.1		<0.1
20-Jul-23	1.9	0.1	<0.1	0.1	1.1	0.6	0.2	0.9	1.0	0.2	0.1
23-Jun-23	0.1	0.2	0.1	0.1	0.3	0.1	0.1	0.8	0.1	0.1	0.2
24-May-23	0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.5
25-Apr-23	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2

Any Ammonia 0.2mg/l and above indicates contamination. (Raw sewage is >10mg/l)

Ammonia limits for aethetics and human health		mg/l N
Low	No Health or aethetic effects	0 to 1.0
Medium	Possible taste and odour	1.0 to 2.0
High	Objectionable taste and odour	>2.0
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023
#. Sewage Spill Willowmere south October
##. Sewage Spill during new pipe installation-running into Willowmere and Legua

TABLE 11: ***CHEMICAL OXYGEN DEMAND as mg/l O2***

	CHEMICAL OXYGEN DEMAND (COD) mg/l O2											
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2	
21-Feb-24	40.0	44.0	32.0	48.0	48.0	48.0	44.0	44.0	64.0	32.0	52.0	
19-Jan-24	12	16	16	16	24	28	16	12	24	<10	16	Circulation bewteen Dams
14-Dec-23	44	40	24	32	44	20	24	24	28	24	28	
20-Nov-23	48	28	28	68	56	48	56	36	52	48	40	
23-Oct-23	32	40	24	52	56	56	48	52	44	52	64	
23-Sep-23	44	16	28	12	40	24	32	28	28		88	
21-Aug-23	84	28	36	20	48	32	32	24	24		44	
20-Jul-23	24	20	16	28	32	16	20	<10	16	52	28	
23-Jun-23	20	<10	<10	<10	24	16	12	12	16	28	24	
24-May-23	48	28	36	44	44	44	36	32	44	36	40	
25-Apr-23	16	12	12	12	32	12	12	12	20	36	32	

CHEMICAL OXYGEN DEMAND (COD) mg/l O2. Measure iof organic matter present in water

Recreation Limits:

	COD	mg/l O2
Good	Water considered unpolluted with organic matter	<20
Acceptable	Organic matter present	20 to 50
High for CL	High for Cedar Lakes	>50
Unacceptable		>250
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023
**Sewage spill ri=unning into Con Dam 23 May and 1st June 2023
#. Sewage Spill Willowmere south October
##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

TABLE 12: DISSOLVED OXYGEN mg/l as O2 **: April 2023 to Feb 2024**

	DISSOLVED OXYGEN mg/l as O2										
	Bass Creek	Padda Dam	Leguaan B	Leguaan A	Willowmere	Plover Pond	Carp Cove	Con Dam	Windy Lake	Tadpole 1	Tadpole 2
21-Feb-24	7.2	7.3	7.3	7.2	7.0	7.3	7.4	7.3	7.2	7.0	7.1
19-Jan-24	7.5	7.7	7.7	7.6	7.9	8.0	7.8	7.4	6.7	6.5	7.6
14-Dec-23	8.6	8.9	8.6	6.3	8.7	10.2	10.2	7.8	8.7	7.9	8.5
20-Nov-23	6.9	6.0	7.3	4.2	5.7	6.9	7.5	6.3	4.8	7.7	7.4
23-Oct-23	4.1	4.8	5.6	7.5	4.8	7	6.9	5.8	4.2	3.8	4.9
23-Sep-23	8.6	9.3	9.3	9.4	8.7	9.3	8.6	9.3	9.1		8.6
21-Aug-23	6.9	7.4	7.7	7.6	4.7	8.2	7.7	7.4	7.3		7.3
20-Jul-23	7.2	9.4	8.5	8.3	7.1	4.4	7.7	6.5	6.4	7.7	10.1
23-Jun-23	7.5	7.9	8.0	7.9	7.4	7.6	7.6	7.8	7.7	7.7	7.9
24-May-23	9.1	9.9	11.4	10.6	10.6	11.4	10.5	8.3	7.2	10.4	6.6
25-Apr-23	9.8	10.0	10.0	10.0	10.1	10.1	10.0	9.9	9.9	9.7	9.9

DISSOLVED OXYGEN mg/l O2

Limits

	Sampling of DO taken near surface of Dams	mg/l O2
Acceptable	Sustains fish ansd other aquatic life near surface	>5
Marginal	Stresses aquatic life	3 to 5
Unacceptable	Water becoming anaerobic, death of fish and aquatic life possible.	<5
	Sewage spill	

*Sewage spill Willowmere 30th April, 8th May and 3rd July 2023
#. Sewage Spill Willowmere south October
##. Sewage Spill during new pipe installation-running into Willowmere and Leguaan A November

PROGRESS REPORT - BOREHOLES

The boreholes were sampled according to SANS241:2025, the national specification for drinking water. The Con Dam borehole system has had technical problems, and it has not been sampled this year. There have been intermittent problems with some of the others during the sampling period with faulty pumps and loadshedding on sampling days, but the Yard and Telkom boreholes have been sampled regularly.

Overall, the water in the boreholes is of good quality with only one chemical parameter in the Yard Borehole, the nitrate content, being slightly elevated in some but not all samples (16mg/l vs a spec of <11mg/l limit).
Stand 90 borehole shows this in some samples.
With the sewage spill in November 2023 however, Total Coliforms and e Coli in totally unacceptable quantities were detected in the Telkom borehole in the January 2024 sampling indicating seepage of sewage into the aquifer during the pipe replacement operations.
Samples of Telkom Borehole were taken again on 7th March to test for e- Coli and results showed that Telkom e- Coli content is <1 and Total Coliform is 1 MPN/100ml, showing that the borehole had recovered and was back within SANS241 drinking water specification.

All Borehole results for 2023/2024 to date with limits are shown below.

CLHOA ENVIRONMENTAL COMMITTEE

CEDAR LAKES YARD BOREHOLE ANALYSES - 2022-2023

TESTED ACCORDING TO SANS 241-1:2015 DRINKING WATER STARDARDS

	2023/4 TESTING															SANS 241-1:2015 LIMITS	
DATE	**25-May-23**	**26-Jul-23**	**20-Oct-23**	**18-Jan-24**	**07-Mar-24**	**25-May-23**	**26-Jul-23**	**20-Oct-23**	**18-Jan-24**	**25-May-23**	**26-Jul-23**	**20 Oct 2023 and**	**20-Oct-23**	**07-Mar-24**		**SANS241-1:2015**	**Units**
SampleID	**Telkom Bore**	**Telkom Bore**	**Telkom Bore**	**Telkom Bore**	**Telkom Borehole**	**Yard Boreho**	**Yard Boreho**	**Yard Boreho**	**Yard Borehole**	**Stand 90**	**Stand 90**	**18-Jan-24**	**CLHOA OFFICES TAP**			**Limits**	
			No SAMPLE		**Special Sample**							**Stand 90**		**Special Sample**			
pH - Value @ 25 ºC	6.8	6.6	Load	6.8	6.7	6.5	6.5	6.3	6.3	6.5	6.4	NO SAMPLES	8.0	6.4		>5 to <9.7	
Electrical Conductivity in mS/m @ 25°C	39.6	39.4	shedding	39.6	41.2	66.6	69.4	67.4	65.1	38.1	31.0	Pump Faulty	21.8	67.8		<170	mS/m
Total Dissolved Solids @ 180°C	284	262		292		462	440	484	464	328	230		170			<1200	mg/l
Colour in PtCo Units	<1	1		1		1	<1	2	1	1	<1		11			<15	PtCo
Turbidity in N.T.U	0.7	0.4		1.0	0.1	0.2	0.3	0.2	0.5	6.6	0.2		1.2	0.1		>1/<5	NTU
Free Residual Chlorine as Cl_2	<0.1	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1			<5	mg/l
Monochloramine	<0.1	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1			<3	mg/l
Total Alkalinity as $CaCO_3$	84	80		84		100	100	96	108	60	56		68			---	mg/l
Langelier Index at 25°C	-1.3	-1.4		-1.2		-1.4	-1.4	-1.5	-1.5	-1.8	-2.0		-0.4			---	mg/l
Chloride as Cl	32	32		31		52	47	56	43	34	29		15			<300	mg/l
Sulphate as SO_4	37	36		29		84	88	98	93	13	15		9			<500/<250	mg/l
Fluoride as F	0.2	0.2		0.2		<0.2	0.2	0.2	<0.2	<0.2	0.2		0.3			<1.5	mg/l
Nitrate as N	4.2	4.3		4.2		16	16.0	16	14	14	8.1		0.4			<11	mg/l
Nitrite as N	<0.05	,0.05		<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		0.2			<0.9	mg/l
Combined Nitrate & Nitrite	0.4	0.4		0.3		1.4	1.5	1.5	1.2	1.3	0.7		0.2			<1	mg/l
Silica as SiO_2	70	64		58		67	65	61	61	70	65		14.8			---	mg/l
Free Cyanide as CN	<10	<10		<10		<10	<10	<10	<10	<10	<10		<10			<0.2	µg/l
Total Organic Carbon as C	<1.0	<1.0		<1.0		<1.0	<1.0	1.0	1.4	<1.0	<1.0		5.4			<10	mg/l
Microcystin as LR	<0.15	<0.15		<0.15		<0.15	<0.15	<0.15	<0.15	<0.15	<0.15		<0.15			<1	µg/l
Chloroform as $CHCl_3$	9	<5		10		6	5.0	9	11	6	<5		36			<300	µg/l
Bromoform as $CHBr_3$	<5	<5		<5		<5	<5	<5	<5	<5	<5		<5			<100	µg/l
Dibromochloromethane as $CHBr_2Cl$	<2	<2		<2		<2	<2	<2	<2	<2	<2		<2			<100	µg/l
Bromodichloromethane as $CHBrCl_2$	<10	<10		<10		<10	<10	<10	<10	<10	<10		13			<60	µg/l
Combined Trihalomethanes	<0.25	<0.25		<0.25		<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		0.34			<1	µg/l
Phenols	<10	<10		<10		<10	<10	<10	<10	<10	<10		<10			<10	µg/l
Total Coliform Bacteria	46	2.0		2600	1	4	3.0	4	<1	59	33.0		14	<1		<10	MPN/100ml
E. coli	2	<1		310	<1	<1	<1	<1	<1	<1	<1		2	<1		Not detected	MPN/100ml
Heterotrophic Plate Count	22	2		1100	23	530	19	770	19	1400	630		560	<10		<1000	cfu/1ml
Cryptosporidium species /	0	0		0		0	0	0	0	0	0		0			Not detected	per 10l
Giardia species /	0	0		0		0	0	0	0	0	0		0			Not detected	per 10l
Somatic Coliphages /	0	0		20		0	0	0	0	0	0		0			Not detected	per 10ml
Free and Saline Ammonia as N	0.2	<0.1		<0.1		0.2	0.1	<0.1	<0.1	0.3	<0.1		0.1			<1.5	mg/l
Sodium as Na	32	37		31		57	60	66	58	26	30		12			<200	mg/l
Potassium as K	1.3	1.5		1.2		1.8	2.5	2.4	1.7	1.9	2.2		4.2			---	mg/l
Calcium as Ca	33	36		36		51	48	60	50	32	28		20			---	mg/l
Magnesium as Mg	8	9		8		15	16	18	16	8	7		8			---	mg/l
Aluminium as Al	<100	<100		<100		<100	<100	<100	<100	<100	<100		<100			<300	µg/l
Antimony as Sb	<1	<1		<1		<1	<1	<1	<1	<1	<1		<1			<20	µg/l
Arsenic as As	<1	<1		<1		<1	<1	<1	<1	<1	<1		1			<10	µg/l
Barium as Ba	<25	37		<25		73	81	88	72	37	37		43			<700	µg/l
Boron as B	<25	<25		<25		<25	<25	261	<25	<25	<25		225			<2400	µg/l
Cadmium as Cd	<1	<1		<1		<1	<1	<1	<1	<1	<1		<1			<3	µg/l
Total Chromium as Cr	<25	<25		<25		<25	<25	<25	<25	<25	<25		<25			<50	µg/l
Copper as Cu	<10	<10		<10		<10	<10	<10	<10	<10	<10		19			<2000	µg/l
Iron as Fe	58	39		37		<25	54	<25	42	457	35		28			<2000/<300	µg/l
Lead as Pb	<1	<1		<1		<1	<1	<1	<1	<1	<1		2			<10	µg/l
Manganese as Mn	<25	<25		<25		<25	<25	<25	<25	<25	<25		<25			<400/<100	µg/l
Mercury as Hg	<1	<1		<1		<1	1	<1	1	<1	<1		<1			<6	µg/l
Nickel as Ni	<25	28		<25		<25	<25	<25	<25	<25	28		<25			<70	µg/l
Selenium as Se	<1	<1		1		<1	<1	<1	1	<1	1		<1			<40	µg/l
Uranium as U	3	3		6		4	4	3	4	<1	<1		<1			<30	µg/l
Zinc as Zn	<0.025	<0.025		<0.025		0.032	<0.025	<0.025	<0.025	<0.025	<0.025		<0.025			<5	mg/l
% Anion-Cation Balance	98.9	92.0		95.0		99.7	99.3	94.9	99.5	99.6	91.00		93.5				93.5