

LPID Board Meeting
March 12, 2026

Treatment System and Impact Fee Project
Discussion

LPID Sewer Treatment Average Day Flow

From Aug 14, 2025
Board Meeting

LAKE POINT IMPROVEMENT DISTRICT FLOW DATA

Lagoon Influent Flows

Pump Station

Flow X 1000

RPS #4

Jan-94	0.283	0.029
Feb	0.302	0.027
Mar	0.382	0.022
Apr	0.485	0.032
May	0.598	0.045
June	0.477	0.049
July	0.326	0.026
Aug	0.289	0.025
Sep	0.326	0.025
Oct	0.337	0.021
Nov	0.346	0.024
Dec	0.327	0.027
Jan-95	0.357	0.024
Feb	0.354	0.025
Mar	0.409	0.025
Apr	0.452	0.048
May	0.4253	0.042
June	0.371	0.030
July	0.364	0.025
Aug		
Sep		
Oct		
Nov		
Dec		

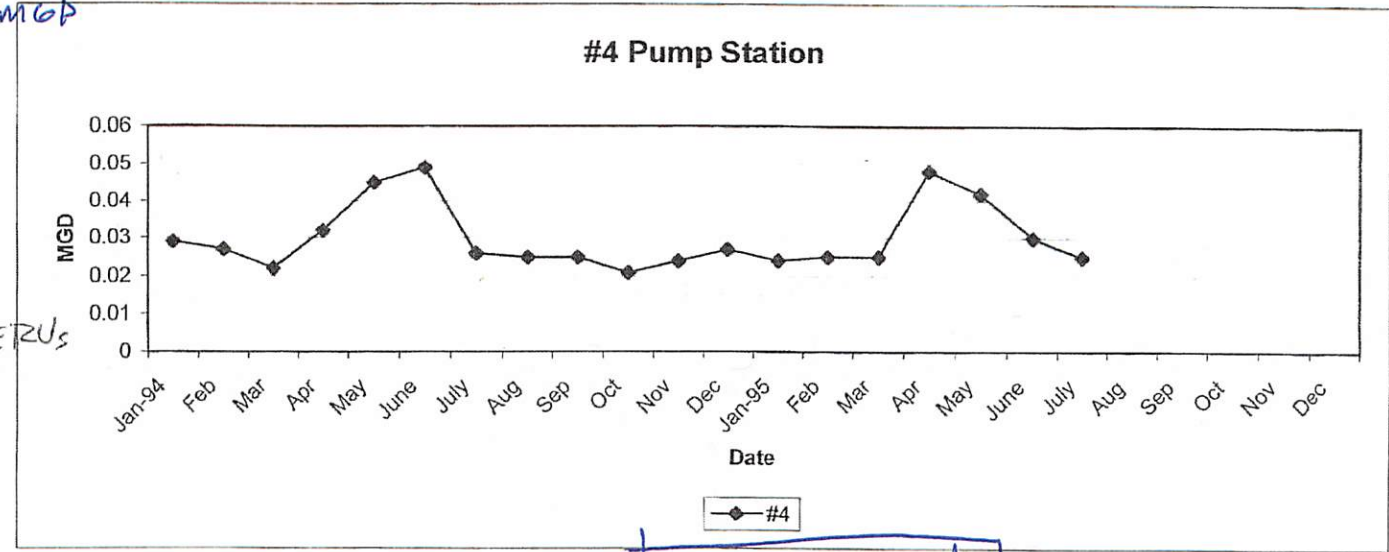
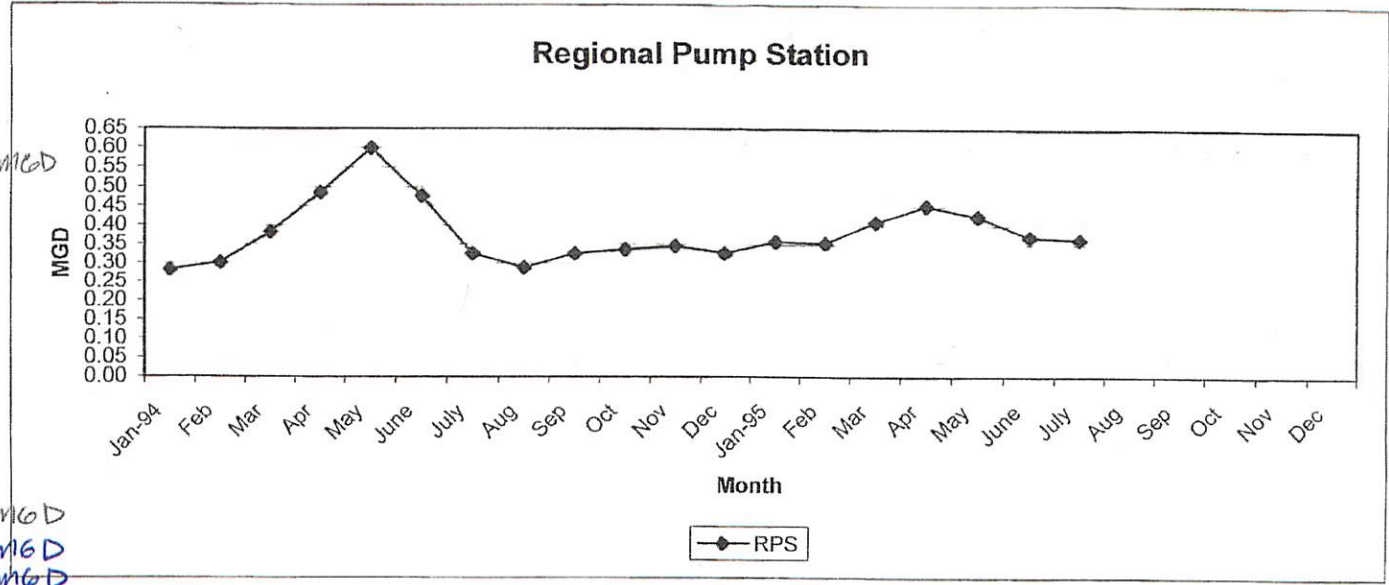
2024

2025

0.65 MGD

0.50 MGD
0.47 MGD
0.40 MGD
0.39 MGD

$$\frac{650,000 \text{ GPD}}{300 \text{ GPD/ERU}} = 2167 \text{ ERUs}$$



4-month Average April-July = 0.44 mgd

LPID Aeration Calculations and Demands

Aeration Calculations, March 14, 2020 - LPID 2011 NO. 1

Population = 3,23 capita per ERU (LPID Master Plan)
 Four month Average Flow = 0.44 mgd (2025 Manager's Data)
 1 ERU = 314 gpd (LPID Master Plan)

$$\frac{3,23 \text{ cap}}{\text{ERU}} \times \frac{\text{ERU}}{314 \text{ gpd}} \times \frac{440,000 \text{ gal}}{\text{day}} = 4,526 \frac{\text{cap}}{\text{day}}$$

Loading (R317-1 : with garbage Grinders)

$$\text{Per capita} \rightarrow \frac{0.22 \text{ lbs BOD}}{\text{cap/day}} \times 4,526 \text{ cap/day} = 996 \frac{\text{lbs BOD}}{\text{day}}$$

$$\text{Concentration} \rightarrow \frac{260 \text{ mg}}{\text{L}} \times \frac{440,000 \text{ gal}}{\text{day}} \times \frac{\text{L}}{0.2642 \text{ gal}} \times \frac{\text{lb}}{453592 \text{ mg}} = 95.5 \frac{\text{lbs BOD}}{\text{day}}$$

Demand

Conversion Factor from AEROMIX (Page 2) = 1.96

Tornados transfers 1.65 lbs Oz/HP/hr or 39.6 lbs Oz/HP/DAY

State Requires 2 lbs Oz / 1b BOD (R317-1)

TKN Demand = 0

$$1.96 \left[\frac{\text{HP}}{39.6 \text{ lbs Oz}} \times \frac{2 \text{ lbs Oz}}{1 \text{ lb BOD}} \times \frac{95.5 \text{ lbs BOD}}{\text{day}} \right] = 94.5 \text{ HP}$$

$$\text{Required Aerators} = \frac{94.5 \text{ HP}}{7.5 \text{ HP/unit}} = \boxed{12.6 \text{ units}}$$

2.3. Existing

LPID currently operates
aerobic/facultative

Table 2.3A contains

Cell				
1	Primary	9.0	4.5	12.4
2	Secondary	7.4	6.0	13.6
3	Tertiary	5.0	6.0	9.2
TOTAL		21.4		35.2

The capacity of each cell is based upon 94% of the total volume of the cell. This is to account for the side slopes of each of the lagoons.

For complete mix calculations the full depth of primary cell is to be used. This equates to a total volume of 16.5 Million Gallons (MG) (2,205,730 cubic feet).

For odor control calculations the effective depth of Cell No.1 of 4.5-feet (12.4 MG or 1,657,640 cubic feet) will be used. This is to account for the depth of the sludge blanket. The sludge blanket is not to be disturbed by the aerators.

The existing lagoon system has an overall hydraulic capacity of 0.293 million gallons per day (MGD) or approximately 837 ERUs based upon 350 gallons per day (gpd) per ERU and a hydraulic retention time of 120 days. This hydraulic capacity does not include inflow and infiltration (I/I).

Additionally the lagoons have the capacity to treat 315 pounds of BOD based upon a maximum BOD loading rate of 35 pounds per day (ppd) per Acre (UAC R317-3-10.3.A.1.) and the 9-acre area of the primary cell. This equates to 431 ERUs based upon 0.73 ppd of BOD per ERU.

Currently LPID serves 498 Equivalent Residential Units (ERUs), with an additional 274 ERUs that are inactive. Table 2.3B contains a summary of the paid active and inactive ERUs.

Table 2.3B – Summary Of Paid Active And Inactive ERUs

Connection	Paid Active	Paid Inactive	Total
Commercial	286	0	286
Residential	212	274	486
TOTAL	498	274	772

Table 2.3C contains a summary of the paid active and total paid ERUs as compared to lagoon capacities.

Table 2.3C – Remaining Lagoon Capacity

Parameter	Active ERUs	Total ERUs
Hydraulic Loading (MGD)	0.174	0.270
BOD Loading (ppd)	363	563
Hydraulic Capacity Remaining	41%	8%
BOD Capacity Remaining	-15%	-79%

Based upon these figures the lagoons are at their BOD loading capacity and measures should be taken as soon as possible to increase the treatment capacity of the lagoons.

2.4. Wastewater Constituents

Historic sampling data collected by the LPID for January 2000 through March 2003 is contained in *Appendix C* along with graphical representations of the sampling data. Table 2.4 contains the average BOD and Total Suspended Solids (TSS).

Table 2.4 – Historic Influent Sampling Data

Average BOD (Mg/l)	Average TSS (Mg/l)
161	197

The historic sampling data indicate that the average BOD and TSS concentrations are not increasing even though there are wide variations in the data.

For this study the District standard of an average BOD concentration of 250 mg/L will be used in all calculations.

3. POPULATION AND FLOW PROJECTIONS

3.1. Population Projections

Population projections for the LPID service area from the *Preliminary Engineering Report for Wastewater Treatment* have been revised and used in this study. The projections have been extended to 2023. Due to the uncertain time frame of development, the population and flow projections for future developments have not been taken into account. Therefore, only the paid active ERUs have been used as a base line for projects. The population projections from the *Preliminary Engineering Report for Wastewater Treatment* were determined based upon a flat residential and commercial growth rate of 6% per year and are related in terms of ERUs.

An ERU is defined as being the equivalent flow of one residential unit or home. Based upon District standards, this is assumed to be approximately 350 gallons per day or 3.5 persons per ERU and 100 gallons per day per capita, as prescribed in *Utah Administrative Code (UAC) R317-3*.

7.2. Horsepower Requirements

Based upon the regulatory requirements and horsepower design parameters discussed in Sections 4 and 5 of this report, the horsepower requirements for mixing are summarized in Table 7.2A.

Table 7.2A – Mixing Horsepower Requirements

Parameter	Required Horsepower*
Complete Mix	176
Partial Mix	88
Odor Control	26

* - Based upon continuous operation.

A total of 24-7.5 hp aerators will be required in Cell No. 1. At the present time, it is not necessary for LPID to install all of the aerators that will be required at build out. Therefore a phasing plan has been developed based upon the calculated BOD loading rate. Table 7.2B contains a summary of aeration phasing.

Table 7.2B – Aeration Phasing

#ERU	Flow (MGD)	BOD (ppd)**	Horsepower*	7.5 hp Aerators
772	0.270	563	56	8
1,000	0.350	730	72	10
1,250	0.438	912	91	12
1,500	0.525	1,095	109	15
1,750	0.6123	1,277	126	17
2,000	0.700	1,460	144	20
2,250	0.788	1,642	163	22
2,425	0.849	1,770	176	24

* - Based upon continuous operation.

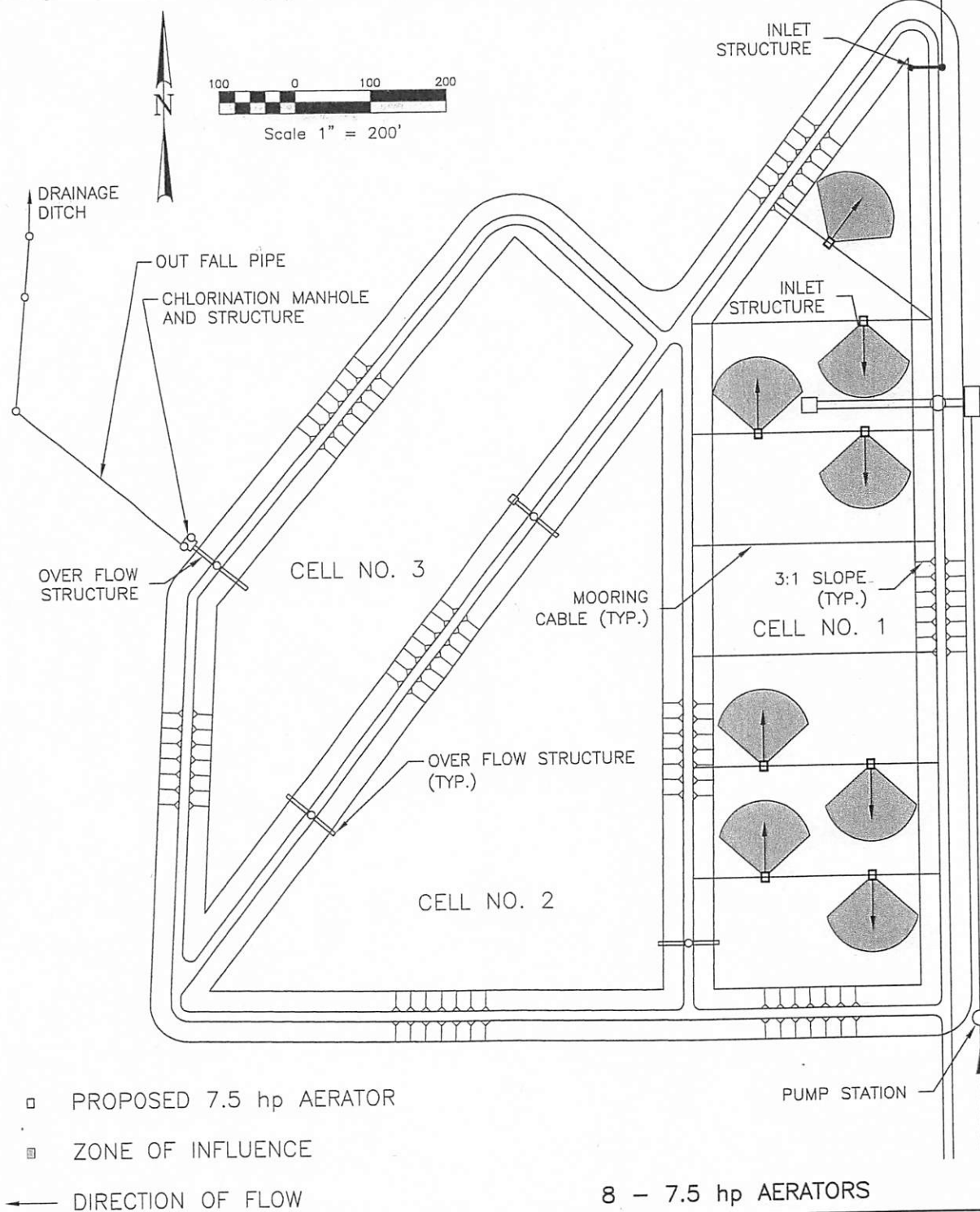
** - Based upon $250 \text{ mg/L} \times 8.34 \times \text{Flow (MGD)}$

← 0.44 mgd

As the number of ERUs increases thus increasing the flow and BOD loading additional aerator can be installed.

It is feasible to install aerators into all three lagoons. With aerators in all three lagoons the hydraulic retention time can be reduced to 30 days (*UAC R317-3-10.3.F.2.a(1)*). This equates to a hydraulic capacity of 1.31 MGD or 3,743 ERUs. Cell No. 2 would require 20-7.5 hp aerators and Cell No. 3 would require 13-7.5 hp aerators operating continuously to provide complete mix. However at this point a mechanical wastewater treatment plant may be more economically viable.

	CELL NO. 1	CELL NO. 2	CELL NO. 3
AREA	9.0 AC	7.4 AC	5.0 AC
MAX. WATER SURFACE ELEV.	4236.50	4235.50	4234.50
MAX. WATER DEPTH	6.00	6.00	6.00



- PROPOSED 7.5 hp AERATOR
- ZONE OF INFLUENCE

← DIRECTION OF FLOW

8 - 7.5 hp AERATORS

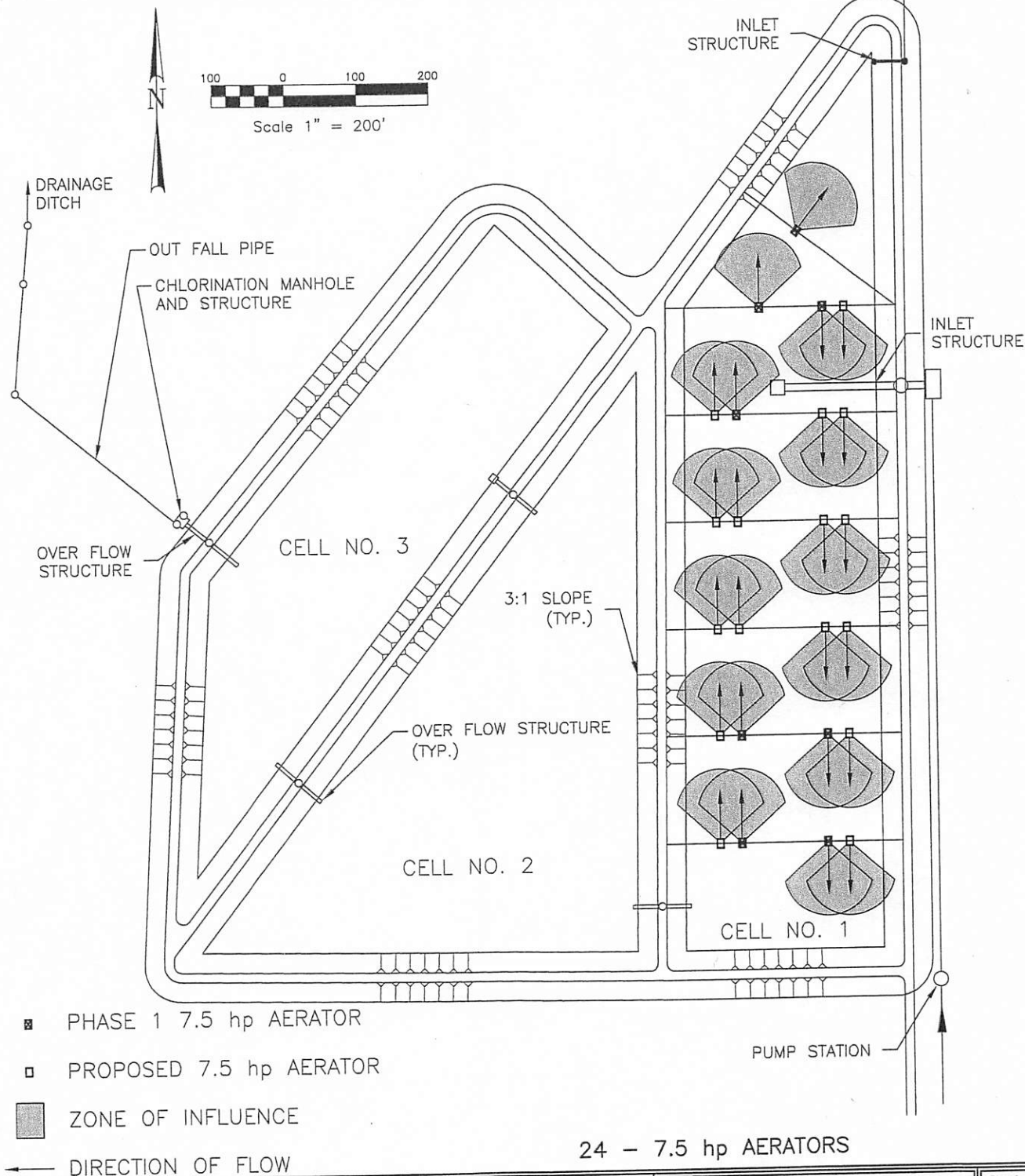
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 Design by: _____
 Checked by: _____ Drawing: Existing Lagoons
 Date: JUL 03 Job NO. LPID 23

Lagoon Aerators - Cell No. 1
 Figure 2

Ward Engineering Group

Sheet:

	CELL NO. 1	CELL NO. 2	CELL NO. 3
AREA	9.0 AC	7.4 AC	5.0 AC
MAX. WATER SURFACE ELEV.	4236.50	4235.50	4234.50
MAX. WATER DEPTH	6.00	6.00	6.00



Drawn by: _____ Client: LPID
 Design by: _____
 Checked by: _____ Drawing: Existing Lagoons
 Date: JUL 03 Job NO. LPID 23

Lagoon Aerators - Cell No. 1

Figure 3



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Design Study Report

Lagoon Aerators Cell No. 1

Oxygen transfer rates for aerators are reported under standard conditions. In order to make proper comparisons under field conditions, Total Oxygen Requirement (TOR) should be converted to Standard Condition Total Oxygen Requirement (STOR). Conversion from field conditions can be accomplished with the following equation:

$$No = \frac{N}{\frac{\text{Beta} * C_{\text{walt}} - C_l}{9.17} * \text{Alpha} * 1.024^{(T-20)}}$$

Where:

No = STOR lbs. / day

N = TOR =

1,124 lbs. per day

Beta = Salinity, surface tension factors =

0.95

C_{walt} = Saturation at given altitude & temp =

7.90

C_l = Residual oxygen =

2.00 mg/l

Alpha = Oxygen transfer correction factor =

0.85

T = Operating temperature (68 degrees F)

20 degrees C

$$= \frac{1124}{\frac{(0.95 * 7.9) - 2}{9.17 \text{ mg/l}} * 0.85 * 1.024^0}$$

$$= 2,203 \text{ lbs. of O}_2/\text{day}$$

Conversion Factor
 $= \frac{2,203}{1,124} = 1.96$

At standard conditions, the TORNADO aerator transfers up to 2.5 lbs. / HP. For this system, an Oxygen Transfer rate of 1.65 lbs. O₂ / HP per hour is used, and 24 hours of daily operation is assumed.

$$\text{Oxygen power} = 2202 \text{ lbs. / day} / 1.65 \text{ lbs. / Hp per hour} * 24 \text{ hours per day} = 56 \text{ HP}$$

Calculation of Mixing Requirements

Treatment efficiency is directly related to mixing. To completely mix and keep all biological solids in suspension, for a lagoon application, typically required the application of 0.08 HP per 1000 cubic feet of wastewater. Lower power to volume ratios produce different results as shown below.

Cell	Complete Mix HP	Partial Mix HP	Odor Control HP
1	176	88	35
2	145	72	29
3	98	49	19

TOTAL POWER RECOMMENDATION:

The total power recommended is generally the greater of the mixing and oxygen requirements, AEROMIX recommends:

Cell 1	-	-	HP TORNADO Aerators
Cell 2	-	-	HP TORNADO Aerators
Cell 3	-	-	HP TORNADO Aerators

Lagoons Total Hydraulic Capacity

Lagoon Hydraulic Capacity

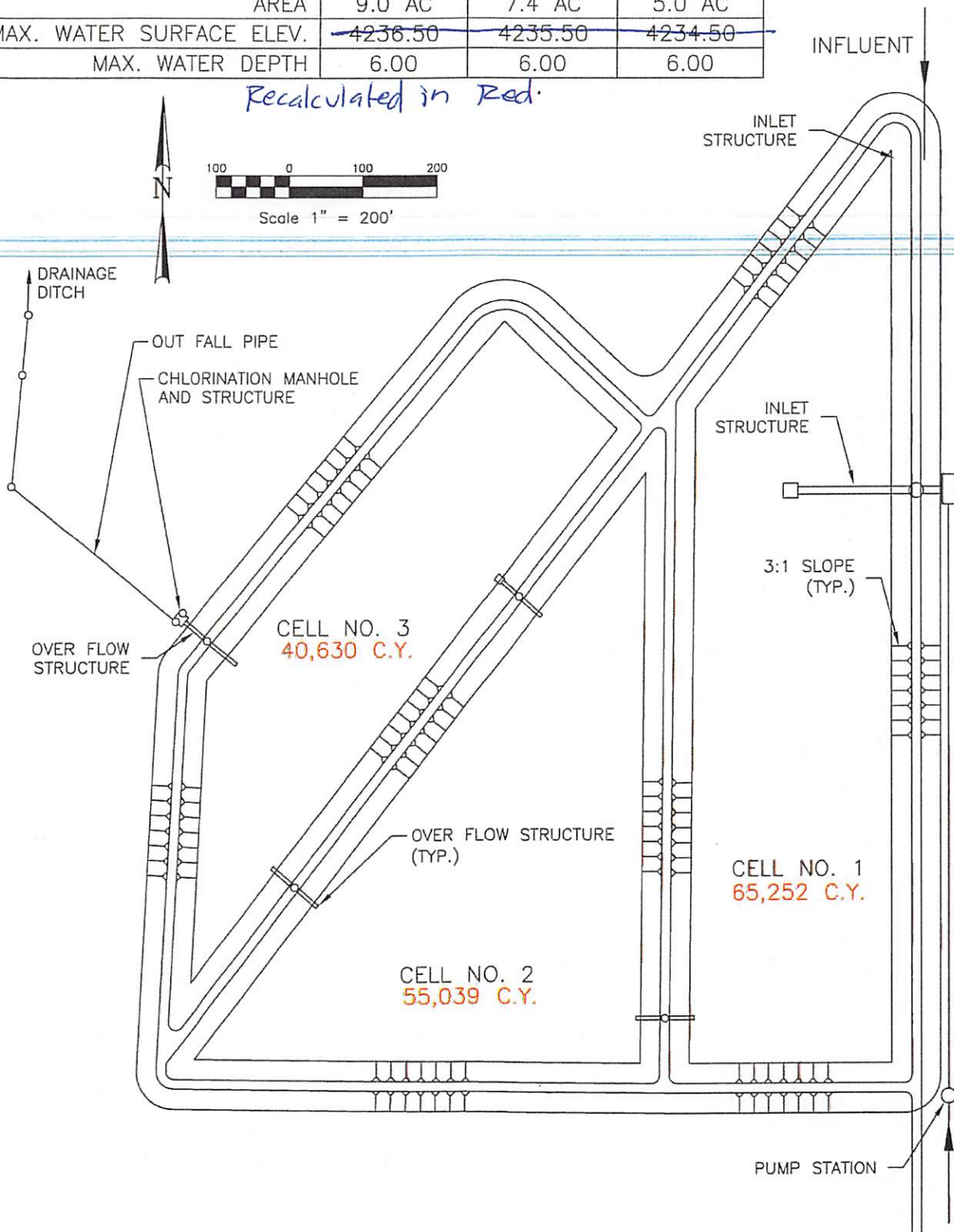
Estimated Volume = 160,921 c-y. (32,501,863 gal)

Required minimum Hydraulic Retention Time (HRT) = 30 days
(R317-3-10.F.2)

$$32,501,863 \text{ gal}_v \times \frac{\text{Day}}{440,000 \text{ gal}_F} = 73.9 \text{ Days HRT}$$

	CELL NO. 1	CELL NO. 2	CELL NO. 3
AREA	9.0 AC	7.4 AC	5.0 AC
MAX. WATER SURFACE ELEV.	4236.50	4235.50	4234.50
MAX. WATER DEPTH	6.00	6.00	6.00

Recalculated in Red.



Drawn by: _____ Client: LPID
 Design by: _____
 Checked by: _____ Drawing: Existing Lagoons
 Date: JUL 03 Job NO. LPID 21

Lagoon Aerators - Cell No. 1

Figure 1



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