February 2, 2024

Ms. Marjorie Mewbourn
Water and Science Administration
Maryland Department of the Environment
1800 Washington Blvd. Suite 605
Baltimore, MD 21230-1719

Re: Days Cove Rubble Landfill
Leachate Treatment Plant
6425 Days Cove Road, White Marsh, MD 21162
State Discharge Permit No. 12DP3782
NPDES Permit No. MD0071587

Dear Ms. Mewbourn:

On behalf of Days Cove Reclamation Company (DCRCo) and in reference to our conference call held on June 2, 2023, ARM Group LLC (ARM) hereby submits this letter to the Maryland Department of the Environment (MDE) for the above-referenced facility to request modifications and/or clarifications to the present discharge permit and the future discharge permit renewal, which is actively under MDE's review. The information provided herein is to supersede the previously requested modifications and/or clarifications sent to MDE on May 22, 2023.

1) Under Section I Special Condition Paragraph P, the permit states that the permittee is authorized to use effluent from the wastewater treatment plant for dust control or irrigation of vegetation provided it is applied at a rate that will not result in runoff to surface waters.
    a. On the basis that the treated wastewater is not be discharged in a manner that results in runoff to surface water from these alternative uses, ARM requests that the paragraph be revised to state that all water utilized via these alternative purposes (i.e., not directly discharged at the outfall location) is not counted against the monthly discharge limits outlined in Section I Paragraph A – Effluent Limitations and Monitoring Requirements.
    b. In conjunction with Item 1 herein, ARM requests that the Discharge Permit state that the Nitrogen Restrictions outlined in Section I Special Condition Paragraph O are only applicable to the wastewater treatment plant effluent volume that is discharged directly to the outfall, not the total discharge volume that is inclusive of treated effluent utilized for alternative purposes, as defined in Section I Special Condition Paragraph P.
2) Under Section I Special Condition Paragraph A, the permit states the effluent limitations and monitoring requirements are based on an annual average flow of 12,500 gallons/day.

   a. Based on the treatment plant's current setup and operation efficiency treating the leachate, ARM requests that the annual average flow is increased from 12,500 gallons/day to 20,000-25,000 gallons/day.

3) Per Section I Special Condition Paragraph A, the minimum allowable pH is 6 and the daily maximum is 7.5. Based on system operation in preparation for startup, it has been identified that the present system has optimum operation when the pH is between 8 and 8.5. ARM requests that the pH limits be revised to a daily maximum pH of 8 in lieu of 7.5.

4) Under Section I Special Condition Paragraph A Item 4, the permit states that effective December 31, 2016 (the date of completion of ENR upgrades at Back River Wastewater Treatment Plant), the annual maximum load shall be zero pounds per year net.

   a. Per a conference call held between MDE (Jonathan Rice and Marjorie Mewbourn) and ARM (Craig Schriner and Al Yates) on September 12, 2023, it is understood that the MDE was reallocating unused Nitrogen Credits from other NPDES Discharge Permits to the Days Cove NPDES Discharge Permit due to the nitrogen credits exchange not being a viable solution to aid Days Cove in achieving the annual maximum load of zero pounds per year (lbs/year) net. ARM/Days Cove asks for clarification from MDE on what the permitted maximum nitrogen loading discharge will be. Presently, Days Cove is operating on the assumption that the maximum annual loading from the on-site leachate treatment plant will not exceed 380.5 lbs/year, which is what the Days Cove NPDES Discharge Permit states for all discharge prior to the ENR upgrades at Back River Wastewater Treatment Plant.

5) Per previous correspondence between ARM, Days Cove, and MDE, Days Cove requests that the future NPDES Discharge Permit allow for Days Cove to directly haul and discharge at the Back River Wastewater Treatment Plant in the event it is needed to ensure compliance with the NPDES Discharge Permit effluent limitations. Days Cove understands that this will require the maintenance of a volume log detailing when effluent was hauled and directly disposed of at the Back River Wastewater Treatment Plant versus discharges at the on-site leachate treatment facility. Days Cove further understands that the discharge of effluent to the Back River Wastewater Treatment Plant does not count against the permit's annual maximum nitrogen loading limit and requests that this is defined as such within the permit.

6) Following review of Section I Special Condition Paragraph A, ARM has identified that the discharge limits for pH, Total Suspended Solids (TSS), and trivalent arsenic are more stringent than the Effluent Limitation Guidelines for landfills (40CFR445).

   a. ARM requests that the discharge limits for pH, TSS, and trivalent arsenic be revised to align with the 40CFR455 categorical limits.

7) ARM requests that the future permit further elaborates on the "Pond" location referenced within the permit, such that the reference to "Pond" to reworded to refer to the old mining pit connected to Gunpower Falls.

8) ARM requests consideration that the Trivalent Arsenic pollutant parameter be removed from the quarterly reporting on the basis that no exceedances have been encountered to date since the testing has begun on the effluent.

In addition to the aforementioned requests for modifications and/or clarifications to the current and future NPDES Discharge Permit, ARM is submitting the revised NPDES Discharge Permit application, which was previously submitted to the MDE in August 2012. Refer to Attachment 1. This submission is intended to supersede all previous NPDES permit application renewals that were submitted to MDE, but not approved.

A summary of the revisions to the NPDES Discharge Permit application made per our June 2, 2023 conference call include:

1) Removal of any reference to Outfall 003;

2) Update of any references to Outfalls 004-007 to Outfalls 003-006 due to the removal of Outfall 3. See Figure 2 of Attachment 1 for illustration on where the Outfalls are located. A summary table (Table 1) of the previous Outfall locations versus the present Outfall locations is shown below. Note that all Basins referenced under "Basin Per SWPP Rev 4" and "Basin Per SWPP Rev 5" (Columns 1 and 3 of Table 1) are in accordance with the Days Cove Landfill Erosion and Sediment Control approved on January 23, 2019 by Baltimore County Soil Conservation District (Plan No. 250-30G7-04).

Table 1 - Outfall Revisions

Basin Per SWPP Rev 4	Outfall Per SWPP Rev 4	Basin Per SWPP Rev 5	Outfall Per SWPP Rev 5
North Trap No. 1	Outfall 1	North Basin No.2	Outfall 1
North Trap No. 2	Outfall 2	North Basin No. 1	Outfall 2
North Trap No. 3	Outfall 3		
South Trap No. 1	Outfall 4	South Trap No. 1	Outfall 3
South Basin No. 1	Outfall 5	South Basin No. 1	Outfall 4
South Basin No. 2	Outfall 6	South Basin No. 2	Outfall 5
Pond	Outfall 7	Pond	Outfall 6

3) Revisions to the process flow diagram are presented in the Engineering Design Report (Figure 1) of the application package. The process flow diagram now illustrates a revised discharge flow path following the influent exiting the dissolved air flotation system.

4) Updates to Section V Effluent Characteristics of the Form 2510-2D with results based on the samples collected following the first nine months of discharge from the Leachate Treatment Plant (April through December 2023).

We thank you for your time to discuss this matter. If you have questions regarding any information discussed above, please feel free to contact the undersigned at (410) 290-7775 or cschriner@armgroup.net.

Sincerely,
ARM Group LLC

Craig Schriner, P.E.
Project Manager

QA Review Performed by: Al Yates, P.E.

Attachments:
1 – NPDES Permit Application dated January 2024
Form 3510-1
Form 3510-2D
Figure 1 – Site Location Map
Figure 2 – Site Plan
Table 1 – Days Cove Rubble Landfill Treated Discharge Samples Summary (4/2023 – 11/2023)
Days Cove Leachate Treatment Plant – Engineering Design Report
Existing Treatment Plants

cc: Darren Hunt – DCRCo

Form 3510-1

Please print or type in the unshaded areas only. Form Approved. OMB No. 2040-0086.

FORM 1 GENERAL — EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
GENERAL INFORMATION
Consolidated Permits Program
(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

S		T/A	C
F			D
1	2 13	14	15

LABEL ITEMS	
I. EPA I.D. NUMBER	PLEASE PLACE LABEL IN THIS SPACE
III. FACILITY NAME	
V. FACILITY MAILING ADDRESS	
VI. FACILITY LOCATION	

GENERAL INSTRUCTIONS
If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill-in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill-in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of **bold-faced terms**.

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)	16	X 17	18	B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)	19	X 20	21
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)	22	X 23	24	D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)	X 25	26	X 27
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	28	X 29	30	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)	31	X 32	33
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)	34	X 35	36	H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)	37	X 38	39
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)	40	X 41	42	J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)	43	X 44	45

III. NAME OF FACILITY

C	SKIP	
1		Days Cove Rubble Landfill
15	16 – 29	30 … 69

IV. FACILITY CONTACT

C	A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2	Darren Hunt	(410) 335-3778
15	16 … 45	46 48 / 49 51 / 52- 55

V. FACILTY MAILING ADDRESS

C	A. STREET OR P.O. BOX
3	6425 Days Cove Road
15	16 … 45

C	B. CITY OR TOWN	C. STATE	D. ZIP CODE
4	White Marsh	MD	21162
15	16 … 40	41 42	47 51

VI. FACILITY LOCATION

C	A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER
5	6425 Days Cove Road
15	16 … 45

B. COUNTY NAME
Baltimore County
46 … 70

C	C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6	White Marsh	MD	21162	005
15	16 … 40	41 42	47 51	52 -54

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST		B. SECOND	
7 4953	(specify) Refuse Systems	7	(specify)

C. THIRD		D. FOURTH	
7	(specify)	7	(specify)

VIII. OPERATOR INFORMATION

A. NAME: 8 Days Cove Reclamation Company

B. Is the name listed in Item VIII-A also the owner? ☑ YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box: if "Other," specify.)

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)

Answer: P (specify)

D. PHONE (area code & no.): A (410) 335-3778

E. STREET OR P.O. BOX: 6425 Days Cove Road

F. CITY OR TOWN: B White Marsh

G. STATE: MD

H. ZIP CODE: 21162

IX. INDIAN LAND

Is the facility located on Indian lands? ☐ YES ☑ NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)
9 N MDG-49, Reg#00-MM-8003	9 P

B. UIC (Underground Injection of Fluids)	E. OTHER (specify)	
9 U	9 2019-GWD-2311	(specify) Groundwater Discharge Permit

C. RCRA (Hazardous Wastes)	E. OTHER (specify)	
9 R	9 2016-WRF-0592A	(specify) Solid Waste Acceptance Facility

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers, and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

Consisting of approximately 70 acres, the Days Cove Rubble Landfill (DCRLF) is a rubble waste landfill located in White Marsh, Baltimore County, Maryland (Permit No. 2016-WRF-0592A). Landfilling activities have been underway at the site since the early to mid-1980s. Rubble wastes include: (1) Land clearing debris; (2) Demolition debris, not including: industrial waste or byproduct; any waste materials contained within a structure or on the grounds of the structure being demolished that are not physically part of the structure or which are comprised of or contain materials that pose an undue risk to public health or the environment; (3) Construction debris, not including: commercial, domestic, or industrial wastes or byproducts; paint, tar or tar containers; caulking compounds, glazing compounds, paint thinner or other solvents or their containers; creosote or other preservatives or their containers; tile, paneling, or carpet cement or other adhesives, and other solid waste which may contain an unacceptable waste or substance as may be determined by the approving authority to be unacceptable; (4) Scrap tires; (5) Asbestos waste; (6) Household appliances and white goods; and (7) Processed debris.

An application for and NPDES Industrial Waste Water Discharge Permit (Form 3510-2D) is being submitted for the purpose of discharging treated landfill leachate to on-site stormwater ponds.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Darren Hunt V.P. Operations	[signature]	2/6/24

COMMENTS FOR OFFICIAL USE ONLY

C

Form 3510-2D

Form Approved. OMB No. 2040-0086. Approval expires 8-31-98.

Please print or type in the unshaded areas only	EPA I.D. NUMBER (*copy from Item 1 of Form 1*)	

Form **2D** NPDES

New Sources and New Dischargers Application for Permit to Discharge Process Wastewater

I. Outfall Location

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water.

Outfall Number (*list*)	Latitude			Longitude			Receiving Water (*name*)
	Deg.	Min.	Sec.	Deg.	Min.	Sec.	
002	39	23	49	-76	22	39	North Basin No. 1

II. Discharge Date (When do you expect to begin discharging?)

10/31/2012

III. Flows, Sources of Pollution, and Treatment Technologies

A. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

Outfall Number	1. Operations Contributing Flow (*List*)	2. Average Flow (*Include Units*)	3. Treatment (*Description or List codes from Table 2D-1*)
002	Process Wastewater-Leachate	25,000 gpd	3-C, 3-B, 1-H, 1-4, 1-S, 2-H, 4-A

B. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item III-A. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

C. Except for storm runoff, leaks, or spills, will any of the discharges described in Items III-A be intermittent or seasonal?

☐ YES (*complete the following table*) ☑ NO (*go to Section IV*)

Outfall Number	1. Frequency		2. Flow		
	a. Days Per Week (*specify average*)	b. Months Per Year (*specify average*)	a. Maximum Daily Flow Rate (*in mgd*)	b. Maximum Total Volume (*specify with units*)	c. Duration (*in days*)

IV. Production

If there is an applicable production-based effluent guideline or NSPS, for each outfall list the estimated level of production (projection of actual production level, not design), expressed in the terms and units used in the applicable effluent guideline or NSPS, for each of the first 3 years of operation. If production is likely to vary, you may also submit alternative estimates (attach a separate sheet).

Year	A. Quantity Per Day	B. Units Of Measure	c. Operation, Product, Material, etc. (*specify*)
2023	8,842	gpd	Leachate Generation (value reported is from April 2023 through November 2023)
2024	25,000	gpd	Leachate Generation
2025	25,000	gpd	Leachate Generation

 CONTINUE ON NEXT PAGE

CONTINUED FROM THE FRONT	EPA I.D. NUMBER (*copy from Item 1 of Form 1*)	Outfall Number
		002

V. Effluent Characteristics

A and B: These items require you to report estimated amounts (*both concentration and mass*) of the pollutants to be discharged from each of your outfalls. Each part of this item addresses a different set of pollutants and should be completed in accordance with the specific instructions for that part. Data for each outfall should be on a separate page. Attach additional sheets of paper if necessary.

General Instructions *(See table 2D-2 for Pollutants)*
Each part of this item requests you to provide an estimated daily maximum and average for certain pollutants and the source of information. Data for all pollutants in Group A, for all outfalls, must be submitted unless waived by the permitting authority. For all outfalls, data for pollutants in Group B should be reported only for pollutants which you believe will be present or are limited directly by an effluent limitations guideline or NSPS or indirectly through limitations on an indicator pollutant.

1. Pollutant	2. Maximum Daily Value *(include units)*	3. Average Daily Value *(include units)*	4. Source *(see instructions)*
BOD	14 mg/l	7.6 mg/l	3
COD	1490 mg/l	663 mg/l	2*
TSS	16.02 mg/l	7.6 mg/l	3
Ammonia (as N)	6 mg/l	2 mg/l	2
Flow	12,254 gpd	8,842 gpd	1
Vinyl Chloride	0.006 mg/l	0.002 mg/l	2
Arsenic, total	0.06 mg/l	0.03 mg/l	3
Iron, total	0.9 mg/l	0.3 mg/l	2
Manganese, total	0.15 mg/l	0.05 mg/l	2
Copper, total	0.02 mg/l	0.006 mgl/l	3*
Selenium, total	0.082 mg/l	0.019 mg/l	2*
Zinc, total	0.086 mg/l	0.037 mg/l	3*
Chromium, total	0.1 mg/l	0.015 mg/l	2*
Nickel, total	0.024 mg/l	0.017 mg/l	2*
			*see Notes 1 and 2 on page 5 of 5

CONTINUED FROM THE FRONT	EPA I.D. NUMBER (*copy from Item 1 of Form 1*)	

C. Use the space below to list any of the pollutants listed in Table 2D-3 of the instructions which you know or have reason to believe will be discharged from any outfall. For every pollutant you list, briefly describe the reasons you believe it will be present.

1. Pollutant	2. Reason for Discharge
1) Carbon Disulfide	Carbon Disulfide has been detected at low levels in the raw leachate during several of the sampling events (average concentration = 0.0059 mg/l, max concentration = 0.018 mg/l)
2) Xylenes	Total Xylenes have been detected at low levels in the raw leachate during several of the sampling events (average concentration = 0.0099 mg/l, max concentration = 0.0281 mg/l)
3) Vanadium	Vanadium has been detected at low levels in the raw leachate during several of the sampling events (average concentration = 0.060 mg/l, max concentration = 0.160 mg/l)

VI. Engineering Report on Wastewater Treatment

A. If there is any technical evaluation concerning your wastewater treatment, including engineering reports or pilot plant studies, check the appropriate box below.

☑ Report Available ☐ No Report

B. Provide the name and location of any existing plant(s) which, to the best of your knowledge resembles this production facility with respect to production processes, wastewater constituents, or wastewater treatments.

Name	Location
See attached references to treatment facilities utilizing comparable treatment technologies.	

 CONTINUE ON NEXT PAGE

EPA I.D. NUMBER (*copy from Item 1 of Form 1*)

VII. Other Information *(Optional)*

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

Raw leachate collected at the landfill is stored in a 500,000 gallon storage tank. Leachate treatement and discharge at the facility began in April 2023. The 2023 average leachate generation rate was 8,842 gallons per day (gpd)from April 2023 to November 2023 with an expected increase to 25,000 gpd average in 2024 and beyond.

Periodic laboratory analyses were conducted on the leachate to evaluate raw leachate quality for previous NPDES permit applications. Those results are provided in Table 2 attached here. The treatment plant was designed to reduce contaminant concentrations, with particular focus on contaminants present in the raw leachate at levels exceeding USEPA drinking water standards.

Effluent concentrations presented in Section V are a combination of:

Source Code 1 - Pollutants tested within the treated effluent per the current discharge permit. Monthly average and maximum values reported are based April 2023 to November 2023 sampling (see Table 1).

Source Code 2 - For pollutants detected in the raw leachate and were analyzed as a part of the Engineering Evaluation, the estimated effluent concentrations based on the Engineering Evaluation are reported. No estimated range of concentration was provided so the max. daily values are estimated to be 3 times the average effluent concentration indicated in the Engineering Evaluation. For the raw leachate concentrations of pollutants that were analyzed as part of the Engineering Evaluation, refer to Table 2.

Source Code 2* - For pollutants detected in the raw leachate that were not analyzed as part of the Engineering Evaluation, the raw leachate concentrations from sampling data were provided. The average and maximum daily concentration for these constituents reflects the actual average and maximum concentration observed in the raw leachate sampling data from December 2010 to January 2012. Refer to Table 2.

Source Code 3 - For pollutants detected in the treated effluent (Table 1, Source Code 1) and were also a part of the Engineering Evaluation (Source Code 2), the reported maximum and average daily values from the treated effluent (Table 1, Source Code 1) are given.

Source Code 3* - For pollutants detected in the treated effluent (Table 1, Source Code 1) but were not a part of the Engineering Evaluation (Source Code 2*), the reported maximum and average values from the treated effluent (Table 1, Source Code 1) are given.

Since the start of leachate treatment plant, treated leachate that did not pass permit effluent requirments were temporarilly stored in tanks for disposal at an off-site permitted facilty. Laboratory analysis will continue to be conducted to verify that the leachate meets the permit requirements prior to discharge and reported on a quarterly basis. The discharge of treated leachate is continuous from the treament plant--bypassing storage tanks and eliminating batch sampling. Laboratory data gathered from sampled leachate at the treatment plant as well as the data gathered from the outfall at the pond will be and have been shared with MDE.

The treated effluent will be discharged to the existing storm water ponds listed in this permit application. The average flow rate to the ponds will be approximately 17 gpm. Due to the small flow rate, the discharge will not impact the ponds functionality during storm events.

Any reject water generated through the treatment process will be transported off site to a permitted disposal facility.

[continued on next page]

VIII. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title (*type or print*)	B. Phone No.
Darren Hoat V.P. Operations	410 335 3778
C. Signature	**D. Date Signed**
[signature]	2\6\24

EPA I.D. NUMBER (*copy from Item 1 of Form 1*)

VII. Other Information *(Optional)*

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.

Notes:

1) On page 3, Section V, all Group A pollutants that data was available for were provided. All group B pollutants that were at one time detected at concentrations above drinking water standards were also provided. Additional parameters in Group B were detected at levels below drinking water standards. The data for the parameters not listed on page 3 are attached in the complete table of leachate sampling data (Table 2). The Group A and Group B parameters have been highlighted. The maximum and average concentrations are summarized in the far right columns of the table.

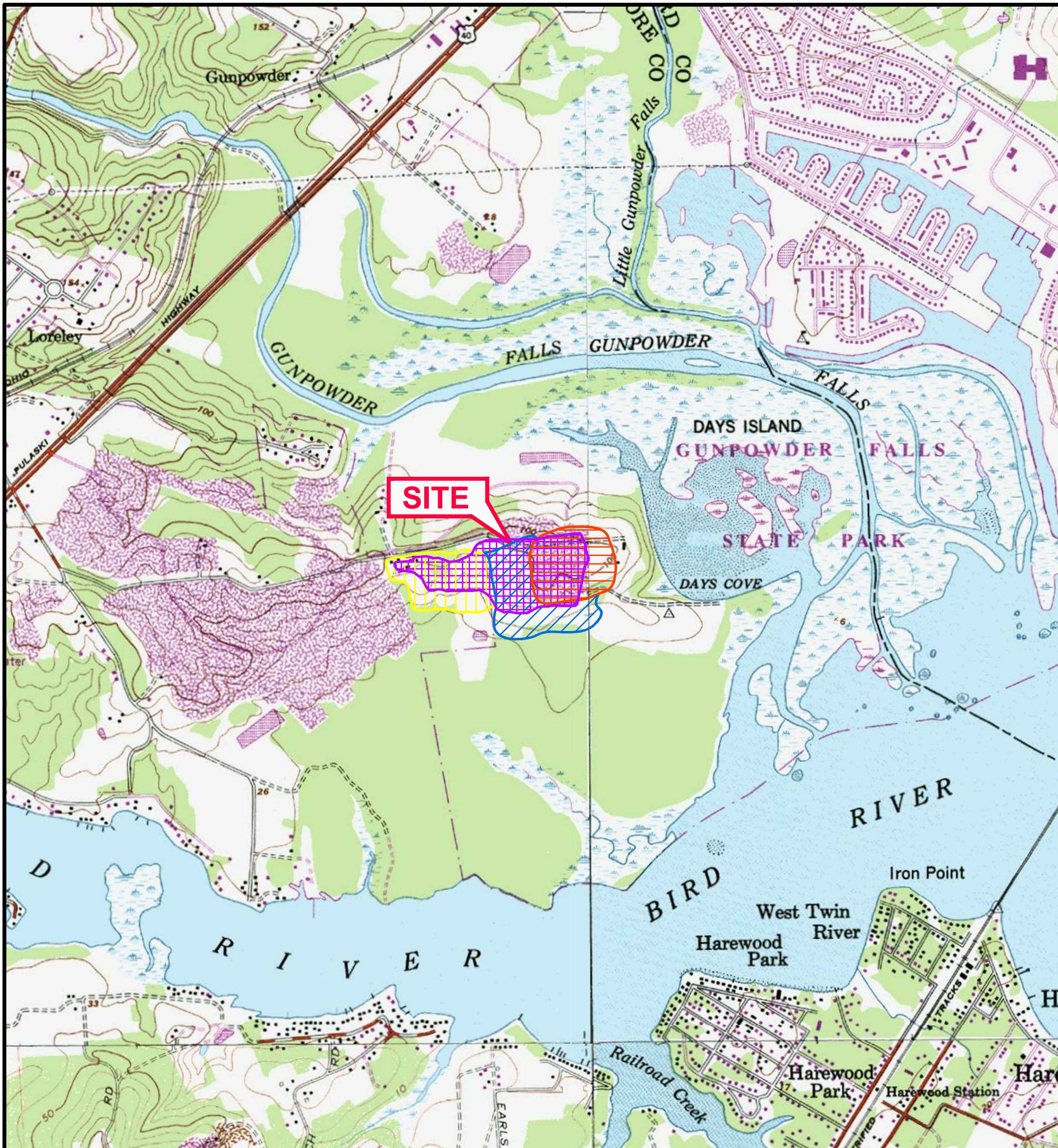
2) For all polluntants required to be tested per the current discharge permit, refer to Table 1 for a detailed summary of the pollutants measured from April 2023 to November 2023. The maxium and average concentrations are summarized in the far right columns of the table.

VIII. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. Name and Official Title (*type or print*)	B. Phone No.
Darren Hunt V.P. Operations	410 335 3778
C. Signature	D. Date Signed
[signature]	2/6/24

Figures



LEGEND

- Lateral Expansion Cell
- Original Cell
- Horizontal Expansion Cell
- Vertical Expansion Cell

0 2000 4000 6000

SCALE IN FEET

N

General Location Map

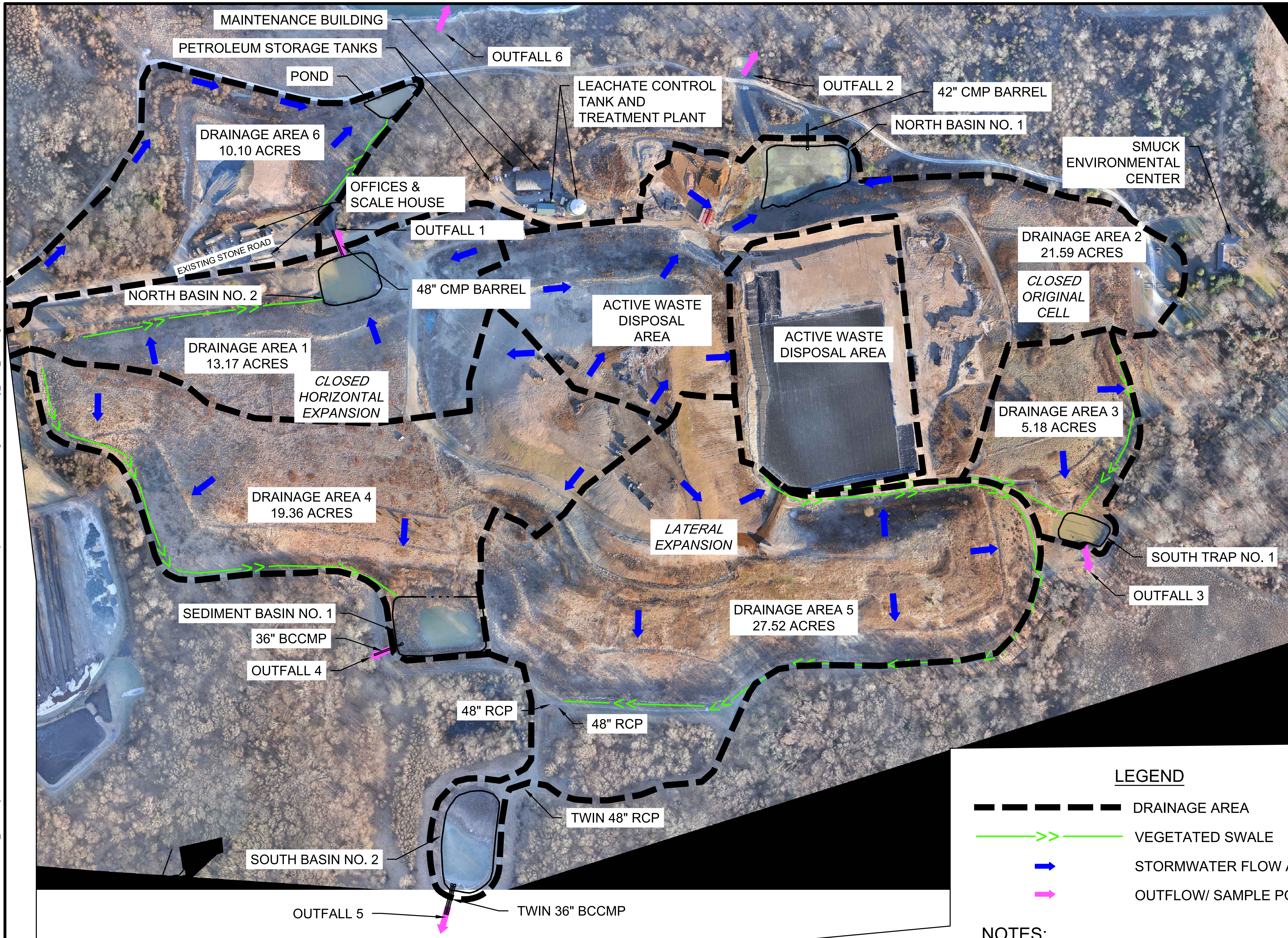
Days Cove Reclamation Company
2023 SWPPP Update

June 2023	Scale: 1" = 200'	M08101-3-2

ARM Group LLC
Engineers and Scientists
www.armgroup.net

Figure 1

\\armgroup.lcl\corpdata\Projects\Days Cove\M08101 Days Cove White Marsh Rubble LF_Docs\Project Phase 3 - CQA & Permitting\NPDES Industrial WW Permit\Ph 3-2_Land Application of Leachate\2022 Update\Figure 1 Site Location Map-2000scale.dwg Plotted: April 6, 2022



LEGEND

DRAINAGE AREA

VEGETATED SWALE

STORMWATER FLOW ARROW

OUTFLOW/ SAMPLE POINT FLOW ARROW

NOTES:

1. AERIAL PHOTOGRAPHY PROVIDED BY APEX COMPANIES, LLC DATED 12-29-2022.

ARM Group LLC
Engineers and Scientists
www.armgroup.net

designed	NMC
checked	CPS
drawn	FDV
scale	1" = 300'
date	07/17/2023
project no.	M08101-3-2

0 300 600
SCALE IN FEET

drawing title
SITE MAP

project title
WHITE MARSH
BALTIMORE COUNTY, MARYLAND
2023 SWPPP UPDATE
DAYS COVE RECLAMATION CO.

Figure
2

P:\Days Cove\M08101 Days Cove White Marsh Rubble LF_Docs\Project Phase 2 - GW, LFG, NPDES, Leachate\Stormwater & NPDES\Days Cove 2023 20SW\Old\Figure 2 Site Map_TMD_CPS.dwg Plotted: July 27, 2023

Table 1

Days Cove Rubble Landfill Treated Discharge Samples Summary (4/2023 – 11/2023)

Table 1

Days Cove Rubble Landfill Treated Discharge Samples Summary (4/2023-11/2023)

ARM Project M08101

Parameter	MCL		Sample Date																Influent Concentrations		
			4/2023		5/2023		6/2023		7/2023		8/2023		9/2023		10/2023		11/2023				
	Value	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Average		Max
Ammonia @ WWTP (Monthly Avg)	-	mg/L	0.1	mg/L	2.3	mg/L	2.7	mg/L	0.2	mg/L	0.20	mg/L	0.34	mg/L	0.47	mg/L	0.31	mg/L	0.8	mg/L	2.7
Ammonia @ Discharge Pond (Monthly Avg)	-	mg/L	0.0191	mg/L	0.3	mg/L	1.1	mg/L	0.1	mg/L	0.14	mg/L	0.24	mg/L	0.15	mg/L	0.03	mg/L	0.3	mg/L	1.1
Ammonia Nitrogen	-	mg/L	0.9	mg/L	1.1	mg/L	2.6	mg/L	0.585	mg/L	0.71	mg/L	0.60	mg/L	1.30	mg/L	5.60	mg/L	1.7	mg/L	5.6
Nitrogen, Total (Monthly Avg)	-	mg/L	14.57	mg/L	16.26	mg/L	16.02	mg/L	12.07	mg/L	15.52	mg/L	11.82	mg/L	14.23	mg/L	18.48	mg/L	14.9	mg/L	18.47647
Nitrogen, Total (Monthly Avg)	1.04	Lbs.	1.34	Lbs.	1.46	Lbs.	1.556	Lbs.	1.257	Lbs.	1.97	Lbs.	1.20	Lbs.	0.85	Lbs.	1.05	Lbs.	1.3	Lbs.	1.966945
Arsenic, Total	0.01	mg/L	0.008	mg/L	0.00753	mg/L	0.00104	mg/L	0.029	mg/L	0.04	mg/L	0.03	mg/L	0.06	mg/L	0.05	mg/L	0.03	mg/L	0.06425
Arsenic, Trivalent	-	mg/L		mg/L		mg/L		mg/L		mg/L	0.001	mg/L	0.000	mg/L	0.0004	mg/L	0.0004	mg/L	0.0	mg/L	0.000513
Biochemical Oxygen Demand	-	mg/L	8	mg/L	8	mg/L	14	mg/L	6.95	mg/L	9	mg/L	3	mg/L	6	mg/L	6	mg/L	7.6	mg/L	14
Copper, Total	*1*	*mg/L*	0.0043	mg/L	0.0131	mg/L	<0.002	mg/L	0	mg/L	0.020	mg/L	0	mg/L	0.0023	mg/L	0.00359	mg/L	0.006	mg/L	0.02015
Copper, Dissolved	-	*mg/L*	0.0106	mg/L	<0.002	mg/L	0.00363	mg/L	0	mg/L	0.0275	mg/L	*0*	mg/L	0.00258	mg/L	0.00366	mg/L	0.007	mg/L	0.0275
Dissolved Oxygen @ MZ	-	*ppm*	10.2	*ppm*	8.34	*ppm*	7.41	*ppm*	8.58	*ppm*	*6.42*	*ppm*	*6.42*	*ppm*	*9.98*	*ppm*	*12.75*	*ppm*	8.0	ppm	12.75
Dissolved Oxygen @ Discharge Pond	-	*ppm*	10.1	*ppm*	7.45	*ppm*	6.72	*ppm*	8.18	*ppm*	*6.18*	*ppm*	*6.12*	*ppm*	*9.68*	*ppm*	*12.47*	*ppm*	8.4	ppm	12.47
Dissolved Oxygen Difference	-	*ppm*	0.1	ppm	0.89	ppm	0.69	*ppm*	0.4	*ppm*	*0.18*	*ppm*	*0.3*	*ppm*	*0.3*	*ppm*	*0.28*	*ppm*	0.4	ppm	0.89
Flow (Daily Avg)	-	*Gal/Day*	5774.20	Gal/Day	9950.80	Gal/Day	10162.20	Gal/Day	11058.10	Gal/Day	12254.84	Gal/Day	10448.63	Gal/Day	4662.48	Gal/Day	6422.63	Gal/Day	8841.7	Gal/Day	12254.84
Hardness	-	-	430	mg/L	120	mg/L	210	mg/L	365	mg/L	310	mg/L	400	mg/L	310	mg/L	250	mg/L	299.4	mg/L	430
Nitrate-N	10	mg/L	1.4	mg/L	4.9	mg/L	6.9	mg/L	8.385	mg/L	6.3	mg/L	4.5	mg/L	14	mg/L	3.2	mg/L	6.2	mg/L	14
Phosphorus, Total (Monthly Avg)	-	mg/L	3.75	mg/L	2.0355	mg/L	2.72	mg/L	1.956	mg/L	1.72	mg/L	1.9	mg/L	3.33	mg/L	2.30	mg/L	2.5	mg/L	3.7456
Phosphorus, Total (Monthly Avg)	-	Lbs.	0.35	Lbs.	0.185	Lbs.	0.25	Lbs.	0.182	Lbs.	0.22	Lbs.	0.194	Lbs.	0.20	Lbs.	0.13	Lbs.	0.2	Lbs.	0.352
Total Kjeldahl Nitrogen	-	mg/L	4.7	mg/L	6.6	mg/L	9.6	mg/L	6.535	mg/L	5.2	mg/L	6.3	mg/L	8.3	mg/L	13	mg/L	7.5	mg/L	13
Total Suspended Solids (Monthly Avg)	-	mg/L	5	mg/L	8	mg/L	16.02	mg/L	6	mg/L	5.52	mg/L	7.15	mg/L	6.1	mg/L	6.9	mg/L	7.6	mg/L	16.02
Suspended Solids	-	mg/L	2	mg/L	4	mg/L	6	mg/L	3.75	mg/L	11	mg/L	6	mg/L	5	mg/L	7	mg/L	5.6	mg/L	11
Zinc, Total	*5*	*mg/L*	0.022	mg/L	0.0245	mg/L	<0.002	mg/L	<0.020	mg/L	0.086	mg/L	<0.0020	mg/L	0.0223	mg/L	0.03	mg/L	0.037	mg/L	0.086
Zinc, Dissolved	-	*mg/L*	0.112	mg/L	<0.020	mg/L	0.00129	mg/L	<0.020	mg/L	0.04	mg/L	<0.0020	mg/L	<0.020	mg/L	<.020	mg/L	0.1	mg/L	0.112
pH (field) (Monthly Avg)	5<pH<9	s.u.	8.10	s.u.	7.37	s.u.	7.57	s.u.	7.43	s.u.	7.41	s.u.	7.45	s.u.	7.01	s.u.	6.91	s.u.	7.4	s.u.	8.1
α-Terpineol	-	mg/L	0.03	mg/L	0.037	mg/L	0.02475	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	0.031	mg/L	0.037
Benzoic Acid	-	mg/L	<0.005	mg/L	<.025	mg/L	<.025	mg/L	<.025	mg/L	<.025	mg/L	<0.0025	mg/L	<0.025	mg/L	<0.025	mg/L		mg/L	
p-Cresol	-	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	0.014	mg/L	0.0	mg/L	0.014
Phenol	-	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L	<0.005	mg/L		mg/L	

*Unless otherwise noted within the Parameter Descriptions, all reported values are from collected Grab Samples at a frequency of 1/Month in accordance with the NPDES Permit.

Table 2

Days Cove Rubble Landfill
Leachate Samples and Analysis Summary
(12/2010 – 01/2012)

Table 2
Days Cove Landfill Leachate Samples and Analysis (12/2010-01/2012)
ARM Project M08101

Parameter	MCL		Sample Date 12/7/2010 10:00		1/6/2011 10:15		3/1/2011 11:00		4/8/2011 10:00		5/17/2011 8:00		6/9/2011 8:30		9/16/2011 12:00		11/22/2011 14:00		1/4/2012 11:30		Average	Units	Max	Units
	Value	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units	Result	Units				
1,2-Dichloroethane	5	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	2.1	ug/L	2.3	ug/L	2	ug/L	1.1	ug/L	2.3	ug/L	ND	ug/L	1.08888889	ug/L	2.3	ug/L
2-Butanone	-	-	ND	ug/L	ND	ug/L	ND	ug/L	223	ug/L	217	ug/L	167	ug/L	308	ug/L	11800	ug/L	299	ug/L	1446	ug/L	11800	ug/L
4-Methyl-2-Pentanone(MIBK)	-	-	ND	ug/L	ND	ug/L	ND	ug/L	14.8	ug/L	ND	ug/L	14.4	ug/L	17.9	ug/L	52.0	ug/L	35.9	ug/L	15.0	ug/L	52	ug/L
Acetone	-	-	ND	ug/L	ND	ug/L	11	ug/L	861	ug/L	566	ug/L	390	ug/L	786	ug/L	6870	ug/L	1080	ug/L	1173.77778	ug/L	6870	ug/L
Alkalinity, Total	-	-	1320	mg/L	1260	mg/L	1040	mg/L	1070	mg/L	1670	mg/L	1730	mg/L	1770	mg/L	3340	mg/L	2320	mg/L	1724.44444	mg/L	3340	mg/L
Ammonia-N	-	-	20	mg/L	19.5	mg/L	16.6	mg/L	20.7	mg/L	22.8	mg/L	27.6	mg/L	15.9	mg/L	41.1	mg/L	50.5	mg/L	26.0777778	mg/L	50.5	mg/L
Antimony, Total	0.006	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	0.0024	mg/L	0.0057	mg/L	0.0044	mg/L	0.0014	mg/L	0.0057	mg/L
Arsenic, Total	0.01	mg/L	0.012	mg/L	0.013	mg/L	0.0089	mg/L	0.052	mg/L	0.037	mg/L	0.033	mg/L	0.058	mg/L	0.28	mg/L	0.25	mg/L	0.08265556	mg/L	0.28	mg/L
Barium, Total	2	mg/L	0.22	mg/L	0.33	mg/L	0.18	mg/L	0.16	mg/L	0.18	mg/L	0.19	mg/L	0.17	mg/L	0.23	mg/L	0.2	mg/L	0.20666667	mg/L	0.33	mg/L
Benzene	5	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	2	ug/L	2.6	ug/L	2.2	ug/L	1.8	ug/L	5.1	ug/L	5.3	ug/L	2.11111111	ug/L	5.3	ug/L
Biochemical Oxygen Demand	-	-	19.4	mg/L	10.6	mg/L	11.3	mg/L	156	mg/L	111	mg/L	135	mg/L	-	mg/L	299[4]	mg/L	619	mg/L	170.1625	mg/L	619	mg/L
Cadmium, Total	0.005	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	0.0091	mg/L	ND	mg/L	0.0010	mg/L	0.0091	mg/L
Calcium, Total	-	-	288	mg/L	318	mg/L	272	mg/L	372	mg/L	434	mg/L	389	mg/L	412	mg/L	648	mg/L	502	mg/L	403.888889	mg/L	648	mg/L
Carbon Disulfide	-	-	ND	ug/L	ND	ug/L	ND	ug/L	10.5	ug/L	4.3	ug/L	3.6	ug/L	4.6	ug/L	18.0	ug/L	12.1	ug/L	5.9	ug/L	18	ug/L
Chemical Oxygen Demand (COD)	-	-	256	mg/L	248	mg/L	214	mg/L	467	mg/L	506	mg/L	597	mg/L	710	mg/L	1490	mg/L	1480	mg/L	663.111111	mg/L	1490	mg/L
Chloride	*250*	*mg/L*	141	mg/L	139	mg/L	135	mg/L	176	mg/L	168	mg/L	192	mg/L	151	mg/L	359	mg/L	306	mg/L	196.333333	mg/L	359	mg/L
Chromium, Total	0.1	mg/L	0.018	mg/L	0.02	mg/L	0.013	mg/L	0.022	mg/L	0.033	mg/L	0.12	mg/L	0.043	mg/L	0.14	mg/L	0.12	mg/L	0.05877778	mg/L	0.14	mg/L
Copper, Total	*1*	*mg/L*	0.1	mg/L	ND	mg/L	ND	mg/L	0.013	mg/L	0.015	mg/L	0.0084	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	0.01515556	mg/L	0.1	mg/L
Ethylbenzene	700	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	3.3	ug/L	4.9	ug/L	3.6	ug/L	3.8	ug/L	8.5	ug/L	6.8	ug/L	3.43333333	ug/L	8.5	ug/L
Fecal Coliform	[1]	-	1	col /100mL	-	-	ND	col /100mL	ND	col /100mL	130	col /100mL	ND	col /100mL	-	-	ND	MPN/100mL	ND	MPN/100mL	18.7142857	MPN/100mL	130	MPN/100mL
Hardness	-	-	1410	mg/L	1480	mg/L	990	mg/L	1340	mg/L	1600	mg/L	1660	mg/L	1520	mg/L	498	mg/L	2040	mg/L	1393.11111	mg/L	2040	mg/L
Iron, Total	*0.3*	*mg/L*	3.3	mg/L	5.2	mg/L	5.6	mg/L	3.9	mg/L	1.9	mg/L	0.48	mg/L	2.4	mg/L	2.4	mg/L	3	mg/L	3.13111111	mg/L	5.6	mg/L
Lead, Total	0.015	mg/L	0.0033	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	0.00036667	mg/L	0.0033	mg/L
Magnesium, Total	-	-	119	mg/L	127	mg/L	108	mg/L	102	mg/L	129	mg/L	130	mg/L	122	mg/L	228	mg/L	198	mg/L	140.333333	mg/L	228	mg/L
Manganese, Total	*0.05*	*mg/L*	2.4	mg/L	2.7	mg/L	2.4	mg/L	2.8	mg/L	2	mg/L	1.4	mg/L	1.4	mg/L	1.2	mg/L	1.3	mg/L	1.95555556	mg/L	2.8	mg/L
Methyl t-Butyl Ether	12	ug/L	29.6	ug/L	22.6	ug/L	25.5	ug/L	21.7	ug/L	39	ug/L	25.8	ug/L	17.8	ug/L	31.0	ug/L	40.9	ug/L	28.2111111	ug/L	40.9	ug/L
Methylene Chloride	5	ug/L	1.3	ug/L	2.5	ug/L	ND	ug/L	21.1	ug/L	16.5	ug/L	14.8	ug/L	9.4	ug/L	-	ug/L	13.7	ug/L	9.9125	ug/L	21.1	ug/L
Nickel, Total	-	-	0.02	mg/L	0.017	mg/L	0.011	mg/L	0.018	mg/L	0.019	mg/L	0.0087	mg/L	0.012	mg/L	0.024	mg/L	0.02	mg/L	0.01663333	mg/L	0.024	mg/L
Oil/Grease Silica Gel Treated	-	-	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	-	mg/L	2.0	mg/L	ND	mg/L	0.3	mg/L	2	mg/L
Potassium, Total	-	-	45.3	mg/L	46	mg/L	38.3	mg/L	47	mg/L	65	mg/L	65.9	mg/L	56.4	mg/L	102	mg/L	87.9	mg/L	51.6875	mg/L	102	mg/L
Selenium, Total	0.05	mg/L	ND	mg/L	0.0083	mg/L	ND	mg/L	ND	mg/L	ND	mg/L	0.082	mg/L	0.054	mg/L	0.012	mg/L	0.012	mg/L	0.0187	mg/L	0.082	mg/L
Sodium, Total	-	-	163	mg/L	171	mg/L	146	mg/L	180	mg/L	206	mg/L	217	mg/L	168	mg/L	317	mg/L	279	mg/L	205.222222	mg/L	317	mg/L
Specific Conductance	-	-	2670	umhos/ cm	2620	umhos/cm	2540	umhos/cm	2770	umhos/cm	3400	umhos/cm	3340	umhos/cm	3620	umhos/cm	5570	umhos/cm	4790	umhos/cm	3480	umhos/cm	5570	umhos/cm
Sulfate	*250*	*mg/L*	181	mg/L	213	mg/L	346	mg/L	555	mg/L	194	mg/L	52.1	mg/L	43.1	mg/L	63.9	mg/L	87	mg/L	192.788889	mg/L	555	mg/L
Tetrachloroethene	5	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	1.4	ug/L	ND	ug/L	0.15555556	ug/L	1.4	ug/L
Toluene	1000	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	45.5	ug/L	43.6	ug/L	42.5	ug/L	43.0	ug/L	86.5	ug/L	67.5	ug/L	36.5	ug/L	86.5	ug/L
Total Dissolved Solids	*500*	*mg/L*	1720	mg/L	1670	mg/L	1540	mg/L	2150	mg/L	1170	mg/L	1860	mg/L	2330	mg/L	3980	mg/L	3470	mg/L	2210	mg/L	3980	mg/L
Total Kjeldahl Nitrogen	-	-	26.3	mg/L	22.5	mg/L	19.7	mg/L	29.6	mg/L	31.1	mg/L	32.8	mg/L	-	mg/L	47.1	mg/L	66.6	mg/L	34.4625	mg/L	66.6	mg/L
Total Suspended Solids	-	-	10	mg/L	18	mg/L	12	mg/L	14	mg/L	11	mg/L	9	mg/L	-	mg/L	30	mg/L	24	mg/L	16	mg/L	30	mg/L
Total Xylenes	10000	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	9.3	ug/L	9.6	ug/L	10.8	ug/L	10.4	ug/L	28.1	ug/L	21.3	ug/L	9.94444444	ug/L	28.1	ug/L
Trichloroethene	5	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	1.4	ug/L	ND	ug/L	0.15555556	ug/L	1.4	ug/L
Trichlorofluoromethane	-	-	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	17.3	ug/L	ND	ug/L	ND	ug/L	1.92222222	ug/L	17.3	ug/L
Turbidity	5	NTU	30.9	NTU	36.3	NTU	38.4	NTU	85.4	NTU	28.3	NTU	334	NTU	267	NTU	708	NTU	290	NTU	202.033333	NTU	708	NTU
Vanadium, Total	-	-	0.012	mg/L	0.011	mg/L	0.0064	mg/L	0.033	mg/L	0.054	mg/L	0.065	mg/L	0.065	mg/L	0.16	mg/L	0.13	mg/L	0.0596	mg/L	0.16	mg/L
Vinyl Chloride	2	ug/L	1.4	ug/L	1.1	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	2.7	ug/L	ND	ug/L	0.57777778	ug/L	2.7	ug/L
Zinc, Total	*5*	*mg/L*	0.26	mg/L	0.011	mg/L	0.0067	mg/L	0.031	mg/L	0.053	mg/L	0.13	mg/L	0.032	mg/L	0.19	mg/L	0.011	mg/L	0.08052222	mg/L	0.26	mg/L
cis-1,2-Dichloroethene	70	ug/L	ND	ug/L	1.2	ug/L	ND	ug/L	ND	ug/L	1.1	ug/L	ND	ug/L	ND	ug/L	2.1	ug/L	ND	ug/L	0.48888889	ug/L	2.1	ug/L
mp-Xylene	10000	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	6.2	ug/L	6.5	ug/L	7.5	ug/L	7.1	ug/L	19.3	ug/L	14.1	ug/L	6.74444444	ug/L	19.3	ug/L
o-Xylene	10000	ug/L	ND	ug/L	ND	ug/L	ND	ug/L	3.1	ug/L	3	ug/L	3.3	ug/L	3.3	ug/L	8.9	ug/L	7.3	ug/L	3.21111111	ug/L	8.9	ug/L
pH (field)	5<pH<9	s.u.	-	s.u.	-	s.u.	-	s.u.	-	s.u.	-	s.u.	-	s.u.	6.97	s.u.	-	s.u.	-	s.u.	6.97	s.u.	6.97	s.u.
Temperature	-	C	-	C	-	C	-	C	-	C	-	C	-	C	25.20	C	-	C	-	C	25.2	C	25.2	C

Notes:
1. No more than 5.0% samples total coliform-positive in a month.
2. Blue highlight and italicized text indicates paramater is regulated by a secondary MCL (sMCL).

Group A
Group B
Group B - Section 1
Group B - Section 3 - Volatile Compounds

Leachate Treatment Plan
Engineering Design Report

A R M G r o u p L L C

Leachate Wastewater Treatment Facility

Engineering Design Report

Location: Days Cove Rubble Fill
6425 Days Cove Rd.
White Marsh, MD 21162

Report Date: November 1, 2023

To: Maryland Department of the Environment
Water and Science Administration

Capacity: 12,500 GPD

WSI Job No.: 103

Revision: 1

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

Signature   License Expiration Date

DAYS COVE RECLAMATION CO.
LEACHATE WASTEWATER TREATMENT FACILITY

ENGINEERING DESIGN REPORT

Submitted To:	Maryland Department of the Environment
Prepared By:	WSI International, LLC
Prepared For:	Days Cove Reclamation Company
Date:	November 1, 2023
Revision:	1

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1 EXECUTIVE SUMMARY

The purpose of this engineering design report is to re-establish the original design constraints of the project, and to update the process design documents to reflect the current operational status of the Days Cove Reclamation Company (DCRC) Leachate Wastewater Treatment Facility (LWTF).

Most importantly, to address forthcoming updates to the Maryland Department of the Environment (MDE) issued National Pollutant Discharge Elimination System (NPDES) permit, this document will provide a complete account of the facility as it is operating today.

2 GENERAL INFORMATION

2.1 FACILITY INFORMATION

The LWTF at the Days Cove Rubble Landfill (DCRLF) is a full-scale biological wastewater treatment package designed to treat landfill leachate to meet NDPES requirements as stated in NPDES Permit MD0071587.

Table 1: Facility Information

Facility Name:	Leachate Wastewater Treatment Facility
Physical Address:	6425 Days Cove Road White Marsh, MD 21162
NPDES Permit No.	MD0071587
Outfalls	002 Located at Latitude: 39.397136, Longitude: -76.377530
State Discharge Permit No.	12-DP-3782
Effective Date	12/17/2013
Expiration Date	12/16/2018

The facility is operating on the existing permit and renewal of the permit is currently ongoing. This report is intended to support the Owner's renewal effort.

2.2 PROJECT HISTORY

The DCRLF has been in operation since 1991. The DCRLF is composed of four landfill disposal cells: 1) Original Cell; 2) Lateral Expansion; 3) Horizontal Expansion; and 4) Vertical Expansion. The Original Cell and Horizontal Expansion disposal cells are unlined disposal cells; whereas, the Lateral Expansion is a lined disposal cell and the Vertical Expansion is a disposal cell to be constructed directly overtop of the three aforementioned disposal cells where a piggyback liner system is present atop the unlined disposal cells. All leachate to be treated by the LWTF is to be collected from the Lateral Expansion and the Vertical Expansion Footprints. This leachate is pumped to a 500,000 gallon storage tank adjacent to the Leachate treatment facility site.

State discharge permit number 12DP3782 was issued on December 17, 2013 and the facility was constructed and installed by August of 2016. Plant commissioning initiated in January of 2017. During the commissioning phase, it was determined that additional pretreatment of the raw leachate was required to mitigate scaling of the MBBR media in the reaction vessels.

A primary contact clarifier with lime conditioning system was designed, fabricated and installed by February 2019 and commissioned in March 2019. The system continued in a start-up phase through 2022 and began discharge to the permitted outfalls in April of 2023. Prior to effluent being discharged, all leachate and treatment effluent was hauled for disposal.

2.3 Owner Information

Table 2: Owner Information

Owner:	Days Cove Reclamation Company
Owner Address:	6425 Days Cove Road White Marsh, MD 21162
Contact:	Darren Hunt
Phone:	(443) 375-8512
Email:	dhunt@dayscove.com

2.4 Preparer Information

Table 3: Preparer Information

WWRF Facility Design	WSI International, LLC
Address:	469 West Wesley Ave. Denver, CO 80223
Phone:	(303) 985-0885
Email:	aburke@wsi-llc.com

2.5 Civil Design and Applicant Information

Table 4: Civil Design & Applicant Information

WWRF Civil & Application:	ARM Group LLC
Address:	9175 Guilford Road, Suite 310 Columbia, MD 21046
Phone:	(410) 290-7775
Email:	cschriner@armgroup.net

3 INTRODUCTION

3.1 Purpose

The purpose of this engineering design report is to update the technical information for the Days Cove LWTF to reflect the current operational status of the facility. The basic design approach remains the same as when the facility was first designed, permitted, and installed, however, years of operations coordination and minor hardware improvements have occurred since the initial build.

3.2 Description of Project

3.3 Locations

The project is located at the Days Cove Reclamation Company rubble landfill site Northeast of Baltimore, MD, in Baltimore County. See Appendix 1 for detailed site location maps.

3.4 Existing Facilities

Unit operations at the LWTF consist of the following:

- Flow Equalization (11.X.X)
- Lime Softening with Primary Clarification (7.X.X)
- Pre-Anoxic BCR Reactor with Paddle Mixer (20.X.X)
- 2-Stage Aerobic BCR Reactors (21.X.X and 22.X.X)
- Internal Recycle Pump Station (a.k.a. Intermediate Tank, 24.X.X)
- Reaction Tank (a.k.a. Floc Tank, 29.X.X)
- Dissolved Air Flotation System (30.X.X)
- Bag Filter System (36.X.X)
- Optional Ultrafiltration System (37.X.X)
- Optional Reverse Osmosis System (40.X.X)
- Optional Hydrogen peroxide Contact Tank (42.X.X)
- Aerobic Solids Holding System (50.X.X)

There are also several supporting chemical systems located throughout the facility:

- Hydrated Lime Slurry (5.1.X) for leachate softening
- Hydrogen Peroxide (27.1.1) for disinfection
- Sodium Sulfate (27.1.2) for neutralization
- Polymer (31.1.1/2) for pre-DAF flocculation
- Poly Aluminum Chloride (PAC, 31.1.3) for phosphorus sequestration
- Ethanol (XX.X.X) for supplemental carbon
- Powdered eggs (XX.X.X) for supplemental nutrients
- Phosphoric Acid (XX.X.X) for supplemental phosphorus

These chemicals are utilized as needed to provide the optimum treatment effectiveness to accomplish the permit requirements.

The system reactors are as shown in Table 5, below.

Table 5: Existing Reactor Sizes

Reactor	Width (ft)	Length (ft)	Side Water Depth (ft)	Volume (ft3)	Volume (gal)	Total Volume (gal)
Flow EQ	41.6 (dia)	-	49.5	67,300	503,000	503,000
Lime Reaction Tank	3 (dia)		2.9	20	152	152
Primary Clarifier	8.25	-	14.4	664	5,000	5,000
Pre-Anoxic BCR	7.16	7.33	7.92	415	3,100	3,100
Aerobic BCR (each reactor)	7.16	7.33	7.92	415	3,100	6,200
Internal Recycle	3.5	2.67	7.92	74	550	550
Reaction Tank	3.5	2.67	7.16	67	500	500
DAF (Float Zone)	3.5	2.83	5.5	170	1,300	1,300
Chlorine Contact Tank	4 (dia)	-	7.6	96	720	720
Aerobic Solids Holding	8 (dia)	-	6	300	2,250	2,250

The facility currently has one available outfall: 002 located at the stormwater detention pond and identified on page 25 of the existing permit.

3.5 Flow Projection

Wastewater leachate flows for landfills are generally categorized as:

- PRIMARY: resulting from expulsion of liquid due it its own weight or compaction loading, or
- SECONDARY: resulting from percolation of water through the landfill.

As a rubble landfill, the bulk of the leachate water source is due to secondary/percolation, which can be from precipitation, irrigation, groundwater, or leachate recirculation. In the case of LWTF, the influent leachate flows are primarily due to precipitation as the site is not irrigated and does not have a leachate recirculation system. Leachate received for the LWTF originates from a lined cell disposal area and groundwater is not expected to be incorporated in the leachate flow.

System design flows are based on average expected leachate generation, in this case an average of 12,500 gallons per day.

3.6 Design Basis

Since the facility has been in operation for several years there is recent data to support the influent design constituents. However, in contrast with typical municipal solid waste (MSW) landfills, rubble landfills produce lower strength wastes which are often nutrient deficient. In this case, the LWTF uses nutrient supplements to add carbon, nitrogen, and phosphorus to stimulate biological growth for treatment of the waste.

The design basis assumes that supplemental carbon and phosphorus will be dosed to produce a biologically treatable waste stream.

3.6.1 Plant Loading

The plant design loading is based on a combination of 2010, 2012, and 2023 influent sampling taken at the facility. 2010 and 2012 values were sampled before the treatment facility was constructed, however, 2023 values were sampled after the primary clarifier and prior to chemical dosing for biological treatment. The design criteria are summarized in Table 6 and Table 7.

Table 6: Initial Influent Constituent Concentrations (2010, 2012)

Parameter	Units	Minimum	Average	Maximum
BOD_5	mg/L	10.6	151	621
TSS	mg/L	9	16	30
TDS	mg/L	1,170	2,210	3,980

Table 7: Recent Influent Constituent Concentrations (2023)

Parameter	Units	Minimum	Average	Maximum
Average Dry Weather Flow	Gallons/Day			12,500
COD	mg/L	305	536	1,100
NH_3-N	mg-N/L	7	87	134
TKN	mg-N/L	9.5	91	134
Total Phosphorous	mg-P/L	0	0.5	3.0

Influent wastewater analysis shows a clear phosphorus nutrient limitation. Additionally, comparing influent carbon/BOD to ammonia indicates a clear carbon deficiency for biological growth. For purposes of equipment sizing and process modeling, this report assumes that the chemical dosing program will provide a more well-rounded influent chemistry that will be biologically treatable. Since total nitrogen is the significant effluent constituent of concern, no additional nitrogen will be dosed.

Table 8: Assumed Adjusted Influent Constituent Concentrations

Parameter	Units	Value
COD	mg/L	800
BOD_5	mg/L	400
TSS	mg/L	20
NH_3-N	mg-N/L	100
TKN	mg-N/L	100
TP	mg-P/L	10

3.6.2 Site Conditions

Parameter	Value

Wastewater Temperature	60°F to 90°F
Ambient Atmospheric Temperature	60°F to 90°F
Blower Intake Design Temperature	90°F
Elevation	80 FT AMSL
Atmospheric Pressure	14.54 psia
Average Dew Point	67°F
Air Density at Site Elevation and Blower Temperature	0.07216 lb_m/ft^3
$\%O_2$ in Atmosphere by weight	23.18%

3.6.3 Flow Peaking

Leachate wastewater flows to the facility are pumped via speed-controlled influent pump. A large flow equalization tank temporarily stores excess flow above what the treatment facility can process.

4 LEACHATE COLLECTION SYSTEM

Leachate is collected on the floor of the lined cells and flows by gravity to leachate collection sumps equipped with submersible pumps. The leachate is then pumped to the double walled 500,000 gallon equalization tank. As the active cells within the landfill are completed, they will be capped with a geomembrane to limit stormwater infiltration into the cell and thus reduce the amount of leachate produced during a storm event.

5 PROCESS DESIGN

5.1 DESIGN CONSIDERATIONS

5.1.1 Biological Treatment Process

The biological wastewater treatment process is the most proven technology for organic matter removal and nutrient removal. Based upon the growth type of the microorganisms, the biological wastewater treatment can be divided into two major groups, suspended growth process (e.g., activated sludge) and attached growth process (e.g., trickling filter).

In a suspended growth process (e.g., activated sludge), the microorganisms are suspended in mixed liquor and have more opportunities to capture food sources (organic matter and nutrients) and dissolved oxygen. The advantages of a suspended growth process include: higher quality effluent (90-95% BOD_5 removal), nitrogen and phosphorus removal, and the flexibility to adapt to minor pH, organic and temperature changes. However, the major disadvantages of a suspended growth process include sludge bulking, highly skilled labor requirements, and sensitivity to shock loads, metallic and other toxic compounds.

An attached growth process (e.g., trickling filter) consists of a bed of permeable medium of either rock or plastic media used to host the microorganisms. The organic matter (BOD_5) and nutrients in the wastewater diffuse into a film, where it is then metabolized. To acquire a good quality effluent (80-90% BOD_5 removal), multiple stages of the attached growth system may be required.

Some of the disadvantages of attached growth process include:

- Potential odor problems
- Flow distributors and beds are prone to clogging
- Major Biofilm sluffing events
- The media can become infested with snails and support populations of mosquitoes and other insects

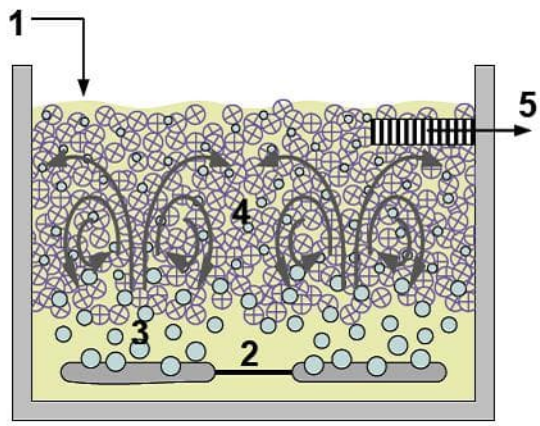
WSI's BCR (Bio-Chip Reactor) system is a dual mode enhanced activated sludge process with the biomass attached onto a small bio-media that is suspended in the mixed liquor. The BCR system combines the advantages of a suspended growth process and an attached growth process by having the flexibility to run in an integrated fixed film activated sludge (IFAS) mode. Compared to conventional activated sludge and extended aeration system, the BCR system has the advantages of providing greater biomass concentration, therefore increasing treatment capacity, eliminating sludge bulking concerns, stabilizing process operations, reducing sludge production, enhancing sludge settleability, and lowering costs for operations and maintenance. Compared to other attached growth processes, the BCR system has the advantages of providing a higher quality effluent, is easily adapted for nitrogen and phosphorus removal, provides more opportunities for contact with organic matter nutrients and eliminates odor and insect problems.

5.1.2 Anoxic-Aerobic BCR System

The BCR system is an enhanced activated sludge process with biomass attaching to the small Bio-Chip media that are suspended in the mixed liquor and mobilized within the reactor by the aeration system. The innovative design of the BCR system creates a higher percentage of protected surface area for microorganisms to adhere to and propagate. This feature results in increased levels of overall biomass concentrations inside the reactor and the reduction of the required reactor volume for the biodegradation of organic matter in the influent as compared to conventional activated sludge processes. Since much of the biomass is retained on the Bio-Chip, the solids loading on the secondary DAF is greatly reduced.

In the Anoxic BCR system, the media is mobilized by a VFD controlled low shear mechanical mixer. Nitrified wastewater is returned to the anoxic zone from the intermediate tank at a rate controlled by the operator (typically 2 to 5 times the process flow) and a VFD driven submersible pump. The anoxic zone is located on the front of the process train and thus utilizes incoming cBOD to facilitate denitrification. This reduces the BOD load on the aerobic reactor and resulting aeration demand to conserve power. The media is retained in the anoxic zone with a cylindrical wedge wire sieve.

In the Aerobic BCR system, medium bubble diffusers distribute air across the basin. The aeration system provides the oxygen needed for the growth of the aerobic microorganisms attached on the bio-chip media and suspended in the liquid. The aeration also supplies mixing energy which causes the bio-chips to be dispersed throughout the tank. The healthy and thin layer of biofilm is maintained by the shear forces enacted on the Bio-Chips from the mixing action. The large openings on the bio-chips allow the wastewater to freely pass through the chips; this also helps to refresh the biofilm which mature within this protected area. The figure below shows the schematic of a typical BCR system.



1. Influent
2. Coarse Bubble Diffuser
3. Air Bubble
4. Bio-Chip
5. Effluent Sieve

A BCR system consists of tanks equipped with the outlet sieves for retaining the media, the bio-chip media, and aeration grid.

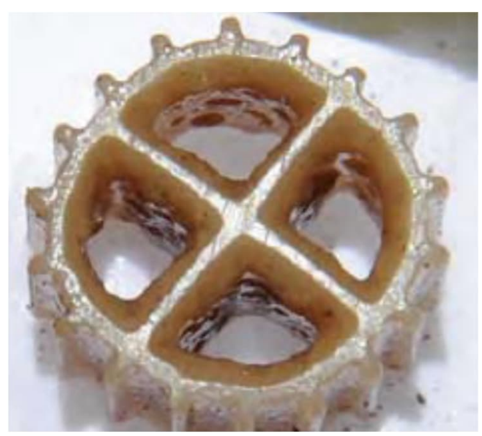
Within the reactor, the media, mixed liquor, wastewater, and air are completely mixed resulting in very efficient contact between the biofilm and the substrates (organic matter and nutrients) within the liquid.

- The thickness of the biofilm is controlled by the movement of the media so that oxygen diffusion through the biofilm is enhanced.
- The detached biofilm is suspended within the reactor and leaves the reactor with the treated effluent.

Aeration is provided by blowers and the medium bubble air distribution system.

5.1.3 Bio-Chip Media

The Bio-Chip media used in the support of biofilm growth is made of a high-density polyethylene (HDPE) which is approximately 0.8-inch in diameter and 3/8-inch long as shown below. The bio-chips are lightweight, durable, and rugged. The media has an effective specific surface area of 152.4 ft^2/ft^3 (500 m^2/m^3) for biofilm growth and has a void space of 92%.



The amount of air sent to the BCR can be varied by adjusting the speed of the blower VFD. The aeration grid system is designed to allow a turndown of air (approximately 50%) into the grids and still maintain mixing of the media and provide enough oxygen for the biomass.

5.2 System Design Parameters

This BCR system consists of an anoxic zone and an aerobic zone. These zones function in removing organic matter (BOD_5), TSS, and nutrients (TN). The internal pumps will return the flow from the end of the aerobic zone to the front of the anoxic zone, for the purpose of nitrogen removal.

Nitrogen removal processes incorporate aerobic zones for nitrification, anoxic zones for denitrification, and mixed liquor recirculation (MLR) to transfer the nitrate-N generated in the aerobic zone back to the initial anoxic zone.

Nitrification is an aerobic process and will occur only in the aerobic zones. Nitrosomonas oxidizes ammonia to the intermediate product nitrite. Nitrite is converted to nitrate by Nitrobacter. The conversion from ammonia to Nitrite involves a complex series of reactions that control the overall conversion process as evidenced by the lack of nitrite build-up in the system. Dissolved oxygen concentrations above 1 mg/L are essential for nitrification to occur.

Denitrification is the conversion of nitrate-N to nitrogen gas by heterotrophic bacteria that utilize nitrate-N as their terminal electron acceptor as they oxidize organic matter in the absence of dissolved oxygen. The process of denitrification requires the presence of nitrates, the absence of DO, and a source of Rapidly Biodegradable Organic Matter (RBOM). Alkalinity is produced during the conversion of nitrate to nitrogen gas resulting in an increase in pH.

5.3 Proposed System Description

The biological treatment system is sized to treat at least 12,500 gpd of rubble landfill leachate. The system uses a combination of biological treatment and chemical supplement to ensure suitable nutrient ratios for cell growth; typically 100:10:1 for Carbon:Nitrogen:Phosphorus.

Leachate is collected and pumped to the 500,000 gal flow equalization tank. This tank buffers peak flows and allows operators the ability to control influent flows to the treatment system. When the EQ tank fills to a certain level, excess water is hauled for off site treatment.

The primary clarifier is used in conjunction with hydrated lime to soften the raw leachate to prevent scaling of the BCR media. Chemical dosing systems are used to neutralize the primary clarifier effluent as well as add nutrients to obtain the ideal nutrient ratios for biological cell production.

The biological system consists of a Modified Ludzack-Ettinger (MLE) process which includes pre-anoxic and aerobic basins for carbon and nitrogen removal. Since the system is severely lacking phosphorus, phosphoric acid is dosed to provide just enough phosphorus for cell activity. The internal recycle chamber recirculates process water at a ratio of 5Q to 6Q for denitrification. Polyaluminum Chloride (PAC) and/or cationic polyacrylamide can be dosed to sequester and flocculate residual phosphorus, if needed.

After biological treatment, solids are separated using Dissolved Air Flotation (DAF). Both the float solids and DAF underflow solids may be returned to the pre-anoxic zone, which effectively converts the treatment process from pure MBBR to combined IFAS, allowing a best-of-both-worlds treatment approach. Solids from the DAF process are also wasted to the solids holding basis to maintain mixed liquor biological populations in the targeted ranges.

Tertiary treatment after the DAF unit includes the following optional systems. These systems are not necessary to meet anticipate effluent requirements, but they are there to assist if needed:

1. Ultra-filtration Membranes;
2. Reverse Osmosis;
3. Hydrogen Peroxide Disinfection by Contact
4. pH neutralization

These optional systems will be utilized when DAF effluent is insufficient to meet the targeted effluent values.

A block diagram of the system is shown in Figure 1 below.

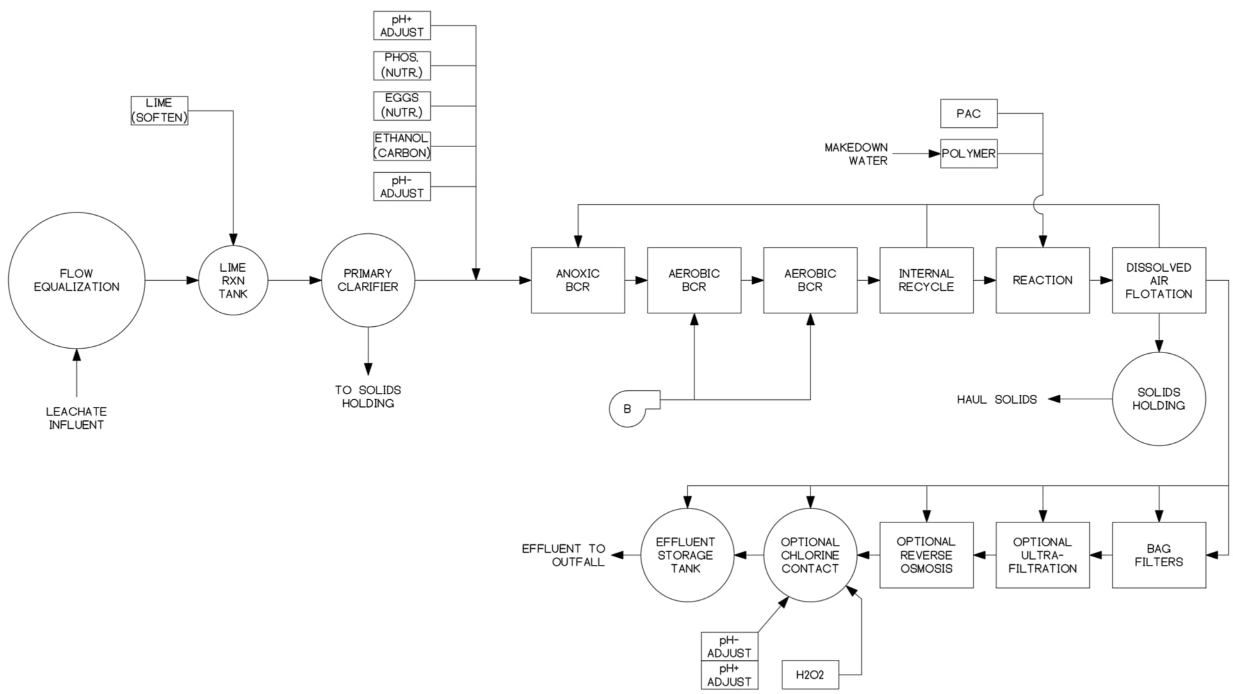


Figure 1: LWTF Block Flow Diagram

6 BIOLOGICAL PROCESS MODELLING

6.1 ANOXIC ZONE SIZING

Both the volume of the anoxic zone and the internal recycle rate play a role in the sizing of the anoxic system. A baseline volumetric fill of 50% media was established. The volume of the anoxic tank was first calculated using the following equation:

$$V_{nox} = \frac{\dot{NO}}{SDNR \times MLVSS}$$

Where: NO = mass flow rate of Nitrate, g/d
SDNR = specific denitrification rate, g NO_3-N/g MLVSS·d
MLVSS = Mixed liquor volatile suspended solids concentration, mg/l

The initial internal recycle ratio was calculated using the following equation:

$$IR = \frac{NO_x}{N_e} - 1.0$$

Where: IR = Internal Recycle Ratio
NO_X = nitrate production in aeration zone, mg NO3-N/L
Ne = effluent NO3-N concentration, mg NO3-N/L

6.2 AEROBIC ZONE SIZING

The baseline design loading rate and media fill are the two key parameters for initial sizing of the aerobic zone. A media fill of 50% and an initial design loading rate of 5.0 g-BOD/m^2/day were established for the basis of design. The surface area of the media required is first calculated with the following equation:

$$A_{media} = \frac{\dot{m}_{BOD}}{SALR}$$

Where: A_{media} = Surface area of the media required, m^2
m_{BOD} = mass flow rate of BOD, g/day
SALR = Surface Area Loading Rate, g BOD/m^2/day

The volume of media is then calculated by dividing the required surface area by the specific surface area of the media and then by the percent fill, as shown in the following equation:

$$V_{aerobic} = \frac{A_{media}}{A_{media,specific} / \%Fill}$$

Where: $A_{media,\ specific}$ = Specific surface area of the media, m^2/m^3
% Fill = percent of media by volume in reactor tank, %

The aerobic volume is secondarily calculated as follows:

DETERMINATION OF AEROBIC ZONE VOLUME

$$V = \frac{QS_0}{X_{MLVSS}(F/M)}$$

Where V = reactor volume, gallons

F/M = food to microorganism ratio, g BOD_5/g MLVSS.d

Q = flowrate, gpd

S_0 = influent BOD_5 concentration, mg/L

X_{MLVSS} = biomass concentration in reactor, mg/L MLVSS

BOD concentrations are important parameters to be monitored for the correct operation of the BCR treatment system. The typical BOD_5 loadings of the BCR system are in the range of 40 - 200 lb BOD_5/1000 ft^3 as calculated using the equation below.

VOLUMETRIC LOADING RATE

$$L = \frac{8.34QS_0}{10^3 V}$$

Where L = volumetric BOD loading, lb BOD/1,000 ft^3

V = aerobic zone volume, gallons

Q = flowrate, gpd

S_0 = influent BOD_5 concentration, mg/L

The dissolved oxygen concentration is a critical parameter in controlling the growth of the microorganisms and in determining the performance of the BCR system.

OXYGEN REQUIREMENTS CALCULATIONS

$$R_o = Q(S_0 - S) - 1.42P_{X,VSS} + 4.33QNO_x$$

$$NO_x = TKN - N_e - 0.12P_{X,VSS} / Q$$

Where R_o = total oxygen required, lb/d

TKN = influent TKN concentration, mg/L

N_e = effluent NH_4-N concentration, mg/L

Excess biosolids in the tank are wasted as wasted activated sludge and are calculated below:

BIOSOLIDS PRODUCTIONS

$$P_{X,VSS} = \frac{QY(S_0 - S)}{1 + k_d SRT} + \frac{f_d k_d QY(S_0 - S)SRT}{1 + k_d SRT} + \frac{QY_n(NO_x)}{1 + k_{dn} SRT} + QX_{0,i}$$

Where $P_{X,VSS}$ = total solids wasted daily, lb VSS/d
S = effluent BOD_5 concentration, mg/L
$X_{0,i}$ = non-biodegradable VSS in influent, mg/L
SRT = solids retention time, d
Y = biomass yield, g VSS/g BOD_5 (typical 0.30-0.50)
k_d = endogenous decay coefficient (typical 0.10)
f_d = fraction of biomass that remains as cell debris (typical 0.10-0.15)
Y_n = biomass yield in nitrification, g VSS/g BOD_5 (typical 0.12)
k_{dn} = endogenous decay coefficient for nitrifying organisms (typical 0.08)
NO_x = concentration of NH_4-N in influent that is nitrified, mg/L

The detailed mass balance analysis was performed to size the reactors based on the above equations as included in APPENDIX 1. The design loading parameters for the aerobic BCR℠ system are summarized in Table 8.

7 FACILITY DESIGN & SPECIFICATIONS

7.1 EQUALIZATION TANK SIZING

Equalization tanks are usually sized to trim daily peak diurnal flows to allow for near-constant forward flow to the treatment process. In this case, the flow equalization tank is considerably larger than would otherwise be needed to account for large swings in influent flow that might be attributable to rainfall events, and also to provide a leachate storage buffer to minimize hauling urgency.

Table 9: Flow Equalization Tank Specifications

Parameter	Value
Dimensions	41.6 ft DIA x 49.5 ft SWD
Volume	67,300 ft^3 503,000 gal 1,900 m^3

The equalization tank does not include any mixing or aeration for odor control, although the tank does have a closed top deck.

7.2 LIME SOFTENING SYSTEM

The Lime Softening System consists of a hydrated lime storage tank, lime reaction tank and primary clarifier. The lime softening system acts to reduce the hardness of the raw leachate to prevent downstream scaling as well as react and precipitate soluble metals within the leachate. The hydrated lime storage tank is sized to receive bulk tanker loads of hydrated lime slurry and maintain suspension with a mechanical mixer.

Influent raw leachate from the equalization tank is rapidly mixed with hydrated lime slurry (dosed from the hydrated lime storage tank) in the lime reaction tank. The hydrated lime and leachate mixture overflows the lime reaction tank to the primary clarifier where both solids present in the raw leachate and solids generated through precipitation are settled and periodically pumped to the lime sludge storage tank and are hauled to another facility for treatment and disposal. Additionally, the lime reaction tank has a cone bottom to draw out heavy solids which are periodically pumped to the lime sludge storage tank. The clarified effluent flows by gravity to the biological treatment reactors. The pH is adjusted down to levels that are conducive to nitrification after the primary clarifier

Table 10: Primary Clarifier Specifications

Parameter	Value
Diameter	8.25 ft DIA x 14.4 ft SWD
Surface Overflow Rate @ Design Flow	233 gpd/ft^2

7.3 Chemical Dosing Systems

As is the case with most rubble landfill leachates, the DCRC leachate is nutrient limited in both carbon and phosphorus. Chemical dosing systems are used to achieve pH and nutrient balancing to reach the targeted treatment objectives. Chemicals are dosed in suitable quantities to provide an artificially "typical" influent.

7.3.1 Supplemental Carbon Dosing

Additional readily biodegradable carbon is supplied by a pure ethanol mixture that is dosed to the pre-anoxic zone. This chem system provides food for heterotrophic denitrifiers to convert nitrate (NO_3-N) to nitrogen gas and oxygen.

7.3.2 Powdered Eggs

A powdered egg product is batch mixed into a slurry to provide a consistent blend of macro- and micro-nutrients for the microbiology.

7.3.3 Phosphoric Acid

Phosphoric Acid is introduced to boost orthophosphate levels in the influent waste stream to encourage cell growth in the biological reactors.

7.3.4 *pH Adjust*

Three pH adjust systems are provided; 1) At the hydrated lime reaction tank; 2) At the Pre-Anoxic zone; and 3) At the final effluent. Hydrated lime slurry is used in the lime softening system and hydrochloric acid is used to reduce the pH at the pre-anoxic chamber and at the final effluent.

7.4 Anoxic BCR

The anoxic chamber allows for denitrification (conversion of nitrate to nitrogen gas and oxygen). The chamber is outfitted with a 1 HP low speed and low shear mixer to mobilize the HDPE media. The mixer has a single impeller mounted at the bottom of the shaft to move chips upwards. The mixer is operated on a Variable Frequency Drive to provide agitation control and flexibility. The chamber is filled to a 50% volume with WSI Anoxic Bio-Chips and retained in the tank with a bar screen incorporated into the outlet baffle wall. The Anoxic BCR specifications are presented in Table 11.

Table 11: Anoxic Tank Specifications

Parameter	Phase 3
Dimensions	7.33 ft L x 7.16 ft W x 7.92 ft SWD
Tank Volume	415 ft^3 3,100 gal 11.7 m^3
Hydraulic Retention Time	6 hr
Media Fill	50%
Media Protected Specific Surface Area	152 ft^2/ft^3 500 m^2/m^3
Media Volume	208 ft^3 5.9 m^3
Media Surface Area	31,600 ft^2 3,000 m^2
Mixer Rated Horsepower	1 HP
Type	Axial Flow Low Shear
Number of Mixers	1

7.5 Aerobic BCR

The aerobic BCR reactor chambers are mainly responsible for BOD reduction and nitrification. The aerobic BCR consists of a total of three equally sized chambers with medium bubble diffusers constructed of 304 stainless steel pipe using WSI's proven orifice sizing guidelines. The chambers are filled to a 50% volume with WSI's HDPE Bio-Chips and retained in the tank with wedgewire sieves affixed to the outlet baffle walls and supported from the bottom of the tank.

The design surface area loading rate of the aerobic BCR tanks is 5.0 g-BOD/m^2/day, at the lower range of a typical loading rate. The serial zone configured aerobic BCR system will grow different species of microorganisms in each zone to accommodate the organic loading changes along the stream line and promote nitrification in the second and third zones. This feature is also helpful in producing a higher quality effluent and makes the system more resilient to shock flows and organic loadings.

The amount of air sent to the BCR can be varied by adjusting the speed of the blower VFD. Each basin is outfitted with a single aeration grid. The air supply to the aeration grids can be balanced by throttling the header valves. The aeration grid system was designed to allow a turndown of air (approximately 50%) into the grids and still be able to maintain mixing of the media.

Table 12: Aerobic BCR Specifications

Parameter	Phase 3
Dimensions	2 each, identical 7.33 ft L x 7.16 ft W x 7.92 ft SWD
Tank Volume (total)	830 ft^3 6,200 gal 23.5 m^3
Media Fill	50%
Maximum Design Loading Rate	0.001 lb BOD_5/ft^2/day 5 g-BOD_5/m^2/day
Media Protected Specific Surface Area	152 ft^2/ft^3 500 m^2/m^3
Media Volume	415 ft^3 11.8 m^3
Media Surface Area	63,000 ft^2 5,900 m^2
Media Surface Area Loading Rate	0.00066 lb BOD_5/ft^2/day 3.2 g BOD_5/ft^2/day
Volumetric BOD Loading Rate	50.3 lb BOD/1000 ft^3/day
Hydraulic Retention Time	12 hr

Table 13: Aerobic BCR Blower Specifications

Parameter	Phase 3
Air Flow Required	106 SCFM
Air Flow Provided	108 SCFM EA
Pressure (at Air Flow Above)	100 inWC (3.6 psig)
Discharge Temperature Rise	60°F
Motor Rated Power	5.5
Type	Regenerative
Quantity	2 (1 duty, 1 standby)

7.6 INTERNAL RECYCLE TANK

The Internal Recycle tank serves as an oxygen degassing tank and sump for the internal recycle pumps. Process water from this tank is returned to the anoxic tank for denitrification. There is one tank per process train. Each tank comes with two submersible pumps and valve manifold that provides for isolation of the pumps and the ability to periodically recirculate water within the intermediate tank to eliminate scum.

Table 14: Internal Recycle Tank Specifications

Parameter	Phase 3
Dimensions	2.67 ft L x 3.5 ft W x 7.92 ft SWD
Volume	74 ft^3 550 gal 2.1 m^3

Table 15: Internal Recycle Pump Specifications

Parameter	Phase 3
Min. Required Internal Recycle Ratio	8.2
Min. Required IR Flow Rate	70 gpm
Design Operating Point	70 gpm @ 28 ft TDH
Motor Rated Power	1 HP
Type	Submersible
Quantity	2 (1 duty, 1 standby)

7.7 Reaction Tank

The Reaction tank ensures adequate mixing for chemicals prior to entry into the Dissolved Air Flotation. These chemicals may include polymers to improve solids flocculation or metals for phosphate precipitation. The tank includes an axial mixer to keep particulates suspended and gently mixed.

Table 16: Internal Recycle Tank Specifications

Parameter	Phase 3
Dimensions	2.67 ft L x 3.5 ft W x 7.16 ft SWD
Volume	67 ft^3 500 gal 1.9 m^3

Table 17: Internal Recycle Pump Specifications

Parameter	Phase 3
Motor Rated Power	1 HP
Type	Axial Flow Low Shear

Parameter	Phase 3
Quantity	1

7.7.1 DAF Polymer System

Polymer addition to the DAF unit is utilized to enhance the solids separation effectiveness. The polymer system is comprised of a neat polymer dispensing system, dilution, rapid mixing, and solution injection systems.

The objective of a polymer preparation system is to fully hydrate or "uncoil" the polymer molecule to expose the maximum number of charge sites to the treatment process. The process of the polymer activation and blending system is to gently and thoroughly activate the polymer without damaging the molecular chain.

Maintaining a uniform shear field of energy is vitally important to the polymer activation process. The polymer system is designed to apply an ultra-high mixing energy at the point of initial polymer and water contact to prevent the polymer from gelling or agglomeration. This is accomplished in the mixing chamber of the rapid mixing polymer batching system.

Polymer is batched in the polymer mixing tank and the polymer solution dosage is flow paced from the equalization transfer system flow meter. The operator is able to set the desired dosage rate in the main HMI and the metering pump flow will autoregulate based on flow to meet the target dosage rate.

The polymer system is designed to batch and inject a 0.25% polymer solution at a maximum dosage of 5 ppm but can dose a maximum of 73 mg/l at a polymer solution concentration of 0.5%.

Table 18: Polymer System Specifications

Parameter	Phase 3
Polymer System Type	Batch-in-Place
Maximum Polymer Solution Pump Flow	4.0 gph @ 110 psi
Design Dosage Rate	10 ppm
Water needed per batch	50 gal
Neat Polymer per batch	2.09 lbs or 33 ounce

7.7.2 Polyaluminum Chloride (PAC) System

PAC may optionally be dosed into the reaction tank to sequester residual phosphorus and bind it to the floc before separation in the DAF.

7.8 Dissolved Air Flotation Cell

The DAF unit acts to remove the suspended solids (Biomass) from the BCR reactor effluent. The BCR reactors convert soluble nutrients into cell mass and the DAF removes the cell mass and inorganic suspended solids from the reactor effluent through dissolved air flotation. The DAF pump recirculates DAF effluent and flash mixes it with ambient air (aspirated on the suction side of the DAF pump). The air dissolves into the effluent under the pressure of the pump. The air-water solution is then passed through a saturation tank to allow additional time for the air to dissolve and to remove any coalesced air bubbles. The solution is then expanded across diaphragm control valves leading into WSI's proprietary diffusers inside the body of the DAF. By reducing the pressure of the solution rapidly (expanding), the dissolved air is forced out of solution in the form of micro-bubbles (90% of the bubbles formed are less than 10 µm in diameter). The small bubbles collect under the biomass floc and float it to the surface, forming a thickened sludge blanket on the surface of the DAF that is raked directly into the aerobic digester. The DAF provides greater thickening of the sludge as well as a reduced footprint from a conventional clarifier. Settled sludge is periodically discharged to the aerobic digester via gravity.

The DAF for this system is designed and manufactured by WSI. The unit is an 8-SSBCR model, entirely constructed from 304 Stainless steel to provide longevity in a salty and humid climate. The unit comes equipped with two KTM25 304SS Nikuni dissolved air pumps (one back-up) and all ancillary components for operation. The DAF unit installed on each phase is integral to the stainless-steel reactor assembly.

Table 19: Dissolved Air Flotation Cell Specifications

Parameter	Phase 3
Dissolved Air Pump	Nikuni KTM 25N
Dissolved Air Pump Flow Rate	11 GPM/ea
Aspirated Air Flow	7 SCFH/ea
Saturation Rate	90%
Microbubble Size	90% < 10µm
Design Operating Pressure	45 PSIG
Surface Area	24 ft^2/ea
Air to Solids Ratio	0.026 lb air/lb solid at 3,800 mg/L MLSS IFAS
Hydraulic Loading Rate	0.25 gpm/ft^2
Hydraulic Residence Time	142 minutes
Solids Loading Rate	0.47 lb/ft^2-hr
Recirculation rate	120%
DAF Pump Motor Rating	2 hp
Sludge Rake Motor Rating	0.5 HP (0.37 kW)/ea

7.9 Bag Filters

The bag filter system includes a filter feed tank, feed pump, and bag filter housings which are compatible with a variety of different mesh size opening bags. 50 micron bags offer a consistent balance of capturing solids without blinding too quickly and sacrificing downstream filtration.

7.10 Optional Tertiary Unit Operations

The following unit operations are provided as bypass-able options and are valved into the primary effluent plumbing system should they be necessary to meet permit requirements.

7.10.1 Optional Ultra-Filtration Units

Bag filter effluent can be routed through the ultra-filtration membranes for additional TSS removal. A small air blower provides air scour for the membranes, and the backwash pump is used to clear the membrane surface. Backwash solids are returned to the plant sump.

7.10.2 Optional Reverse Osmosis Units

A reverse osmosis system is currently installed but has not been necessary to operate to meet effluent discharge requirements. This unit will remain in place should such treatment needs arise.

7.10.3 Optional Hydrogen Peroxide Disinfection & Final pH Adjustment

The final unit operation of the plant consists of a vertical contact tank for optional hydrogen peroxide dosage and pH adjustment.

Table 20: Chlorine Disinfection Specifications

Parameters	Phase 3
Dimensions	4 ft DIA x 7.6 ft SWD
CCT Volume	96 ft^3 720 gal 2.7 m^3
Contact Time Provided	83 min

7.11 Solids Holding

The aerobic solids holding tank will be used for stabilizing wasted sludge removed in the DAF unit. The solids holding tank has a dedicated blower controlled on a duty cycle timer.

7.11.1 Determination of Aerobic Solids Holding

Two methodologies are used to determine the aerobic sludge digester size: 1) WEF method based on volatile solids destruction; and 2) Calculation of volumetric sludge production from the DAF from the mass flow analysis multiplied by the required minimum hydraulic residence time (20 days). The larger result from the two methods is used to size the aerobic digester.

The aerobic sludge digester size based upon (WEF 1998)

$$V = \frac{Q_i(X_i + YS_i)}{X(k_d P_v + 1/SRT)}$$

Where V = volume of aerobic digester, ft^3

Q_i	= influent average flowrate to digester, ft^3/d
X_i	= influent SS, mg/L
Y	= fraction of the influent BOD_5 consisting of raw primary solids
S_i	= influent BOD_5
k_d	= reaction rate constant, 1/d
P_v	= volatile fraction of digester SS
SRT	= solids retention time, d

Table 21: Aerobic Solids Holding Specifications

Parameter	Phase 3
Dimensions	8 ft DIA x 6 ft SWD
Volume	300 ft^3 2,250 gal 8.5 m^3
Solids Holding volume required for 20-day HRT @ calculated sludge production rates	2,250 gal
Number of Solids Holding Tanks	1
Sludge Production Rate	114 gpd
Sludge Solids Concentration	3.0 %
Hydraulic Residence Time	20 days
Volatile Solid Loading Rate	45.1 lb VS/1,000 ft^3/day

Table 22: Digester Blower Specifications

Parameter	Phase 3
Air Flow Provided	42 SCFM
Air:Volume Ratio	140 SCFM/1,000 ft^3
Operating Pressure	100 inWC (3.6 psig)
Motor Power Rating	2 hp
Number of Blowers	1

7.12 Sludge Disposal

Digested sludge will be periodically pumped and hauled to a local publicly owned treatment works.

8 CONTROLS AND INSTRUMENTATION

The master control panel centralizes all of the key inputs and outputs for the automated control system. A separate online monitoring system provides remote access to observe key performance metrics of the system.

In the event of a total PLC failure, the motor control panels are designed to be able to be run manually if needed through a series of physical Hand-Off-Auto Switches. Hand-Off-Auto (HOA) switches are provided for each motor in the plant, allowing the system to be operated manually and by-passing the control system. This function is useful for start-up, check-out and troubleshooting activities and provides a redundant means of operating the plant in the event of PLC failure.

The entire process is tied into a customer supplied static IP address and has a distinct IP Address on the internet. In the event of an alarm or malfunction, alarms are sent to user specified email addresses or cell phones. This process allows the operator to be notified directly and able to login remotely to assess alarm conditions.

The PLC trends all critical process values, and stores them for documentation including equipment runtime, tank levels, influent and effluent flow rates and totals as well as analog inputs from analytic instruments if provided (pH, DO, ORP, Turbidity, etc.).

9 OTHER CONSIDERATIONS

9.1 Odor Control

9.1.1 *Active Odor Control*

The wastewater treatment system is installed inside an enclosed building and does not include any mechanical odor control devices.

9.2 Corrosion Control

The liquid holding reactors are manufactured from 304 stainless steel and polypropylene. The biofilm carrier media is HDPE. All wetted components in the WWRF are highly corrosion resistant. Process piping will be schedule 80 PVC, HDPE and 304 Stainless steel. The system design and material selection are focused on corrosion resistance due to high TDS influent water.

9.3 Noise Control

The process blowers and odor control equipment are the only high frequency noise producers in the system. The main air blowers and digester blower produce a sound pressure level of 79 dB(A) and 72.2 dB(A), respectively. The main process blowers are operated on variable frequency drives and the sound pressure level listed above is the maximum when operating at full speed. The variable frequency drive allows for resonant frequencies to be skipped and further reduce any noise produced by the facility.

9.4 Energy Conservation

The major continuous loads in the facility are operated on variable frequency drives, allowing the system to operate at the demand flow without using return or by-pass flow valves that waste power. When a motor operates on a VFD, it consumes only the power required to operate at that speed and significantly reduces overall power consumption. The high horsepower motors use premium efficiency electric motors to further reduce power consumption. The main reactor blower motor efficiency is 90.2%.

9.5 Safety

The system conforms to OSHA safety requirements for machine guarding, fall protection, handrails and operator access. Tank access hatches are secured. An eye wash station and safety shower are currently installed at the site.

9.6 Labor Requirements

The facility is currently staffed/operated with a full time operator. Minimally, at least 2 hours per day should be budgeted to perform the sampling and routine inspection of the plant, including monitoring chemical and flocculant volumes. The control system is accessible remotely, allowing the operator to check the status of the plant without physically being on site and respond to alarm conditions quickly by remotely mitigating issues before arriving on site.

10 EFFLUENT DISPOSAL

10.1 Surface Water Discharge

The treated effluent is stored in an effluent disposal tank, and is pumped to the outfall location through a magnetic flow meter. Effluent that meets the permit criteria is discharged to the receiving body of water. Effluent that does not meet the discharge criteria is sent to an effluent storage tank for final disposal at a publicly owned treatment works. These effluent streams are independently monitored and recorded.

11 ABBREVIATIONS

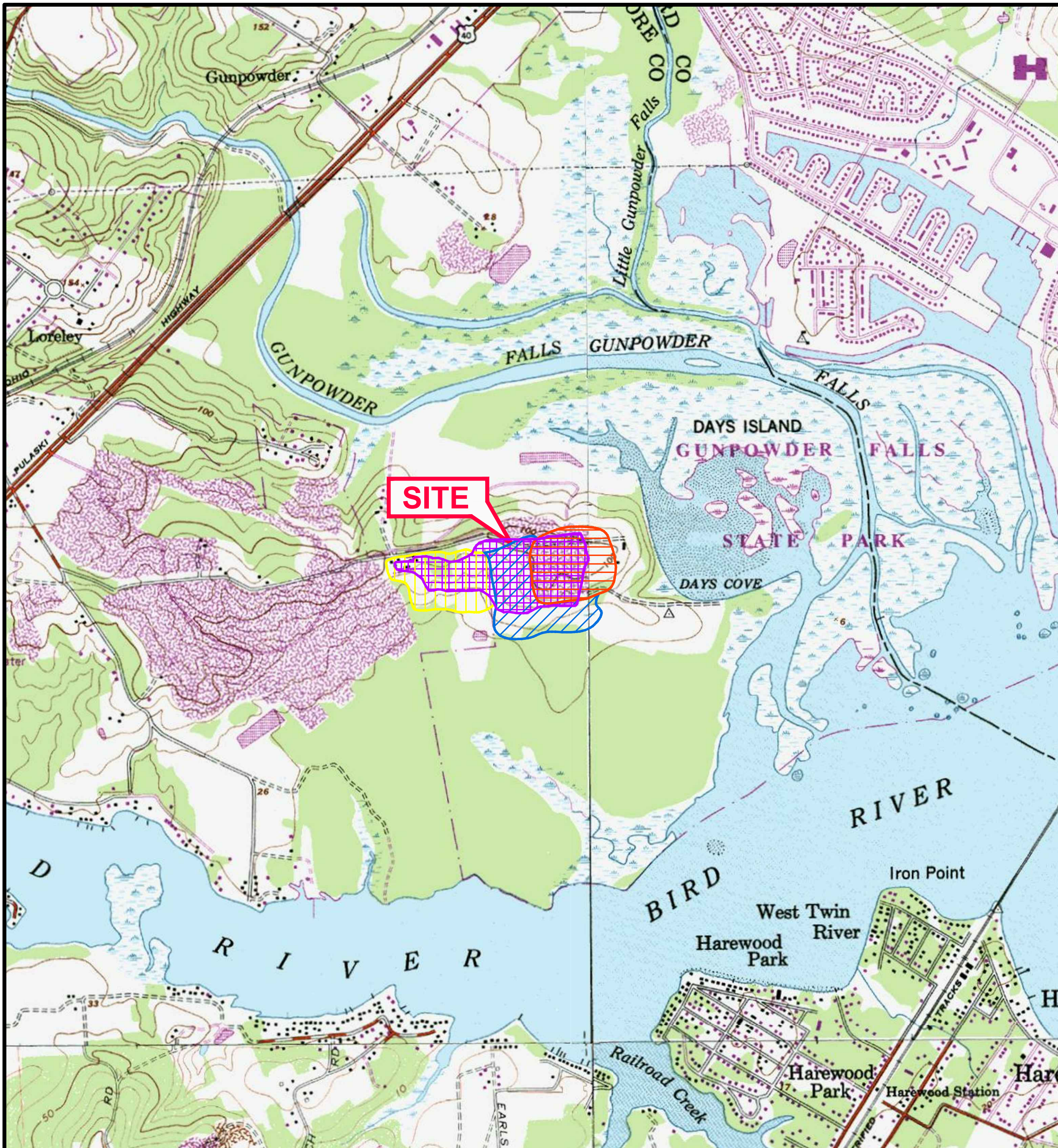
Abbreviation	Meaning
ADWF	Average Dry Weather Flow
AE	Analog Element
AIT	Analog Indicating Transmitter
ASSY	Assembly
BCR℠	Bio-Chip Reactor (Moving Bed BioReactor)
BOD_5	5-Day Biochemical Oxygen Demand
CFH	Cubic Feet Per Hour
CFM	Cubic feet per minute
CFU	Colony Forming Unit
COD	Chemical Oxygen Demand
CV	Check Valve
DAF	Dissolved air flotation
DO	Dissolved Oxygen
DOH-SDB	Department of Health Safe Drinking Branch
DOH-WWB	Department of Health Wastewater Branch
DRC	Direct Responsible Charge

EA	Environmental Assessment
EQ	Equalization
EV	Electronic Valve or Solenoid
FI	Flow Instrument - Local Display Only
FIT	Flow Indicating Transmitter
ft	Feet
gal	Gallons
gpd	Gallons per day
GPH	Gallons Per Hour
gpm	Gallons per minute
HAR	Hawaii Administrative Rules
HDPE	High-density polyethylene
HMI	Human Machine Interface (Touch Screen Panel)
HOA	Hand-Off-Auto Switch
hp	Horsepower
HRT	Hydraulic retention time
HV	Hand Operated Valve
inHG	Inches Mercury Column (Pressure or Vacuum)
inWC	Inches Water Column (Pressure or Vacuum)
LCP	Local Control Panel
Lp dB(A)	Sound Pressure Level measured in A-weighted decibels
LSH	Level Switch High
LSHH	Level Switch High-High
LSL	Level Switch Low
LT	Level Transmitter
M	Motor
MBBR	Moving Bed BioReactor or Mobilized Bed BioReactor
MCC	Motor Control Center
MCP	Main Control Panel
MDF	Maximum Design Flow
mg/L	Milligram per liter
mgd	Million gallons per day
MLSS	Mixed Liquor Suspended Solids
MPN	Most Probable Number (Bacteriological Testing)
MV	Motor Valve
NPS	National Park Service
NTU	Nephelometric turbidity unit
OCA	Open-Close-Automatic Switch
PFR	Peak Flow Rate
PI	Pressure Indicator - Local Display Only
PLC	Programmable logical controller

PRT	Part Component
PSI	Pounds per Square Inch
R-1	Reuse Water Meeting State Requirements to be classified as R-1
R-2	Reuse Water Meeting State Requirements to be classified as R-2
RBOM	Rapidly Biodegradable Organic Matter
SALR	Surface Area Loading Rate
SARR	Surface Area Removal Rate
SCFM	Standard Cubic Feet per Minute
SRT	Solids retention time
TKN	Total Kjeldahl nitrogen
TN	Total nitrogen
TP	Total Phosphorus
TSS	Total suspended solids
UIC	Underground Injection Control
UPS	Uninterruptable Power Supply
VFD	Variable Frequency Drive

APPENDIX 1 – SITE LOCATION MAPS

\\armgroup.lcl\corpdata\Projects\Days Cove\M08101 Days Cove White Marsh Rubble LF_Docs\Project Phase 3 - CQA & Permitting\NPDES Industrial WW Permit\Ph 3-2_Land Application of Leachate\2022 Update\Figure 1 Site Location Map-2000scale.dwg Plotted: April 6, 2022



LEGEND

Lateral Expansion Cell
Original Cell
Horizontal Expansion Cell
Vertical Expansion Cell

0 2000 4000 6000
SCALE IN FEET

N

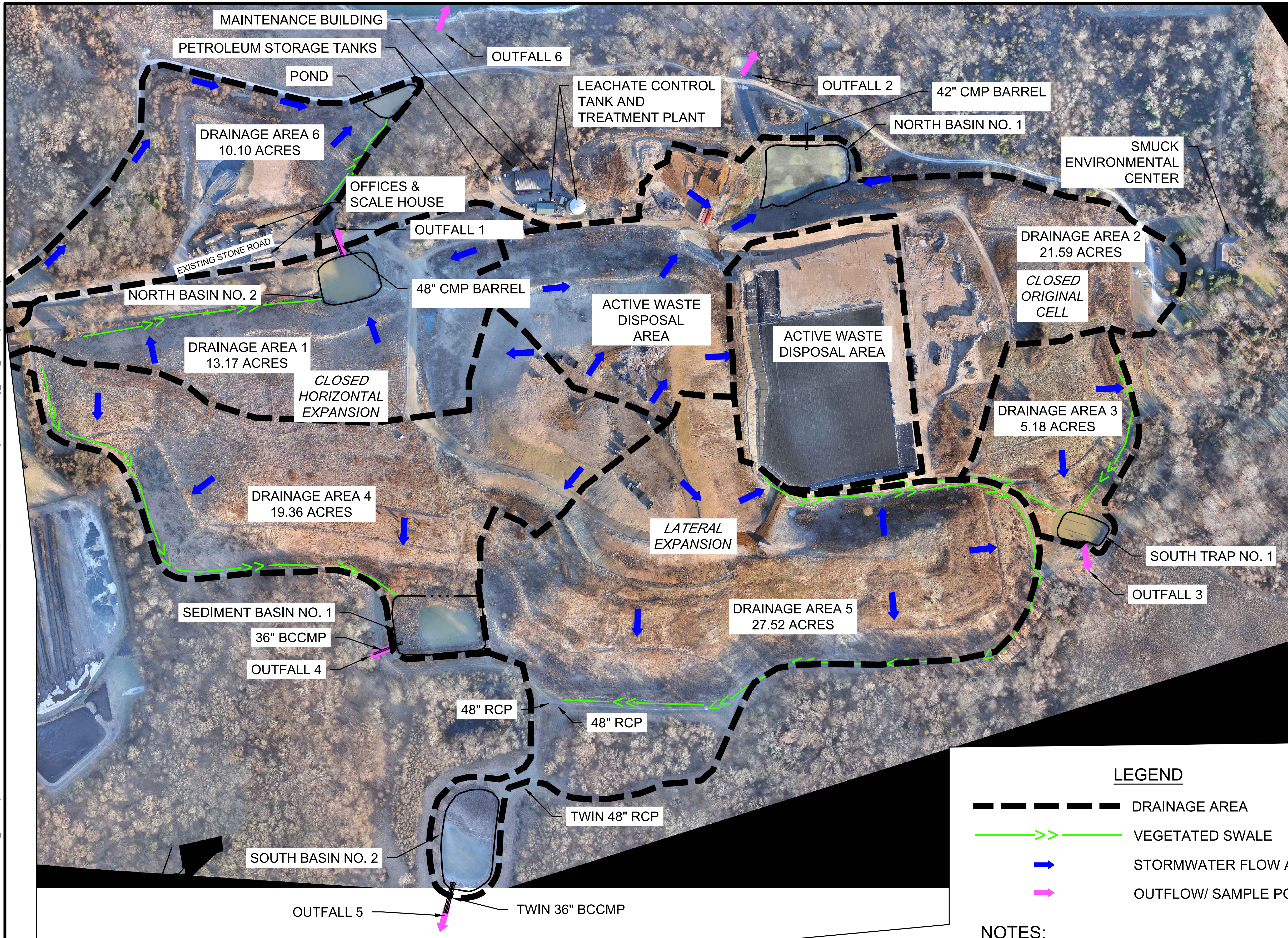
General Location Map

Days Cove Reclamation Company
2023 SWPPP Update

June 2023	Scale: 1" = 200'	M08101-3-2

ARM Group LLC
Engineers and Scientists
www.armgroup.net

Figure
1



N

LEGEND

DRAINAGE AREA

VEGETATED SWALE

STORMWATER FLOW ARROW

OUTFLOW/ SAMPLE POINT FLOW ARROW

NOTES:

1. AERIAL PHOTOGRAPHY PROVIDED BY APEX COMPANIES, LLC DATED 12-29-2022.

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scale 1" = 300'
date 07/17/2023
project no. M08101-3-2
designed NMC
checked CPS
drawn FDV

0 300 600
SCALE IN FEET

drawing title
SITE MAP

project title
2023 SWPPP UPDATE
DAYS COVE RECLAMATION CO.
WHITE MARSH
BALTIMORE COUNTY, MARYLAND

Figure
2

P:\Days Cove\M08101 Days Cove White Marsh Rubble LF_Docs\Project Phase 2 - GW, LFG, NPDES, Leachate\Stormwater & NPDES\Days Cove 2023 20SW\Old\Figure 2 Site Map_TMD_CPS.dwg Plotted: July 27, 2023

APPENDIX 2 – PROCESS DESIGN CALCULATIONS SUMMARY

Influent Criteria

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Average Design Flow for Phase	12,500	GPD	8.7	GPM	47.3	m^3/day
Ultimate Average Design Flow	12,500	GPD	8.7	GPM	47.3	m^3/day
Influent BOD	400	mg/l	41.7	lb/day	18.9	kg/day
Influent TSS	300	mg/l	31.3	lb/day	14.2	kg/day
Influent NH_3-N	100	mg/L	10.4	lb/day	4.7	kg/day
Influent Organic N	0	mg/l	0.0	lb/day	0.0	kg/day
Influent TKN	100	mg/L	10.4	lb/day	4.7	kg/day
Influent TN	100	mg/l	10.4	lb/day	4.7	kg/day
Influent TP	10	mg/l	1.0	lb/day	0.5	kg/day
Temperature	68	°F	20.0	°C	293.0	Kelvin
Alkalinity	200	mg/l as $CaCO_3$	20.9	lb/day	9.5	kg/day

Effluent Criteria

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Effluent Flow	12,443	GPD	8.6	gpm	47.1	m^3/day
Target Effluent BOD	10	mg/l	1.0	lb/day	0.5	kg/day
Target Effluent TSS	10	mg/l	1.0	lb/day	0.5	kg/day
Target Effluent NH_3-N	1	mg/l	0.1	lb/day	0.0	kg/day
Target Effluent Organic N	0	mg/l	0.0	lb/day	0.0	kg/day
Target Effluent TKN	7	mg/l	0.7	lb/day	0.3	kg/day
Target Effluent NO3-N & NO2-N	1	mg/l	0.1	lb/day	0.0	kg/day
Target Effluent TN	10	mg/l	1.0	lb/day	0.5	kg/day
Target Effluent TP	10	mg/l	1.0	lb/day	0.5	kg/day
Effluent Quality Standard	Primary					

Site Conditions

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Ambient Temperature	60 - 90	°F	15.6 - 32.2	°C		
Air Temperature for Blower Sizing	90	°F	32.2	°C	305.2	°K
Elevation	80	ft	24	m		
Atmospheric Pressure	14.66	PSIA	101.05	kPa	757.9	mmHg
Average Dew Point	43	°F	6	°C		
Air Density	0.0720	lb_m/ft^3	1.1536	kg/m^3		
%O_2 in Atmosphere	23.18%	O_2				
Atmospheric O_2 Density	0.017	lb_m/ft^3	0.267	kg/m^3		

Bio-Chip Reactor (BCR) Design

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Design Surface Area Loading Rate (SALR)	5	g-BOD/m^2/day	0.001024087	lb-BOD/ft^2/day		
Media Fill	50%					
Specific Surface Area of Media	152.4	ft^2/ft^3	500	m^2/m^3		
Aeration Tank Depth @ WL	7.92	ft	2.4	m		
Aeration Tank Width	7.16	ft	2.2	m		
Required Surface Area	40,744	ft^2	3,785	m^2		
Required Volume of Media	267	ft^3	7.6	m^3		
Required Tank Volume for Design Loading Rate	4,000	Gallons	535	ft^3	15.14	m^3

Bio-Chip Reactor (BCR) Actual

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Tank Volume Provided	6,200	Gallons	829	ft^3	23.5	m^3
Media Fill	50%					
Surface Area Provided	63,160	ft^2	5,868	m^2		
Volume of Media Provided	414	ft^3	11.7	m^3		
BCR Total Length	14.6	ft	4.5	m		
Available Biomass in Tank	11,250	mg/l	582	lbs		
Equivalent MLVSS	9,562	mg/l	494	lbs		
Surface Area Loading Rate	3.23	g-BOD/m^2/day	0.000661	lb-BOD/ft^2/day		
Volumetric BOD Loading Rate	50.3	lb BOD_5/1000 ft^3/day	0.81	kg-BOD/m^3/day		
Hydraulic Residence Time (HRT)	11.9	hrs				
MBBR Sieve Loading Rate	55.4	ft/hr	16.9	m/hr		
MBBR Approach Velocity	6.1	ft/hr	1.9	m/hr		
F/M Ratio	0.08	kg-BOD/kg MLVSS.d				

BCR Biomass Production Inputs

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Biomass Yield (Y)	0.60	g VSS/ gBOD				
Non-Biodegradable VSS in effluent ($X_{0,i}$)	2	mg/l				
Endogenous Decay Coefficient (k_d)	0.10	1/d				
Biomass Cell Debris Fraction (f_d)	0.15	g-VSS/g-VSS				
Biomass Yield Nitrification (Y_n)	0.12	g-VSS/g-NH_4-N.d				
Endogenous Decay Coefficient (k_{dn})	0.08	g-VSS/g-VSS.d				
Oxygen Inhibition Coefficient (K_o)	0.50	g/m^3				
Thickness of Biofilm	0.50	mm				
Dry Density of Biofilm	90.00	mg/cm^3				
MLVSS/MLSS	0.85					
Solids Retention Time (SRT)	12.00	days				

BCR Biomass Production Outputs

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Biomass production - Heterotrophic Biomass	11.32	lb VSS/d	5.13	kg VSS/d		
Biomass Production - Cell Debris	2.04	lb VSS/d	0.92	kg VSS/d		
Biomass Production - Nitrifying Bacteria Biomass	0.64	lb VSS/d	0.29	kg VSS/d		
Biomass Production - Non-Biodegradable VSS	3.70	lb VSS/d	1.68	kg VSS/d		
Total Volatile Solids Wasted Daily ($P_{x,VSS}$)	17.70	lb VSS/d	8.03	kg VSS/d		
Total Suspended Solids Wasted Daily ($P_{X,TSS}$)	26.43	lb TSS/d	11.99	kg VSS/d		

BCR Effluent

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
BCR Effluent VSS	14.0	lb TSS/d	169.8	mg/l	8.0	kg TSS/d
BCR Total Effluent Solids	26.4	lb TSS/d	253.4	mg/l	12.0	kg TSS/d
BCR Effluent Soluble BOD_5	0.68	lb BOD_5/d	6.5	mg/l	0.3	kg TSS/d
BCR Effluent Suspended BOD_5	22.46	lb BOD_5/d	215.5	mg/l	10.2	kg TSS/d

BCR Aeration Factors

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Beta Factor (β)	0.95	0.95-0.98 for Municipal				
$C_{S,T,H}$	9.80	mg/l O_2				
Height of Diffuser above floor	12.00	inches	30.48	cm		
O_t	18.0%	% O_2 Leaving Tank				
C_L	3.00	mg/l O_2 (Set point Concentration)				
$C_{S,20}$	9.60	mg/l O_2				
Alpha Factor (α)	0.6	0.4-0.6 for coarse bubble diffusers				
Fouling Factor (F)	0.90	0.65-0.9				
Theta Factor (θ) - Temperature	1.024					
Oxygen Transfer Efficiency per foot Immersion	0.95%	Eff/ft				
Oxygen Safety Factor	1.00					

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Oxygen Required for BOD Removal	62.3	lb-O_2/d	2.6	lb-O_2/hr	28.3	kg-O_2/d
Total Standard Oxygen Requirement (SOR)	2.6	lb-O_2/hr	1.2	kg-O_2/hr		
P_d	121.7	kPa				
AVG $C_{S,T,H}$	10.10	mg O_2/l				
Correction Factor Combined	0.37					
Standard Oxygen Transfer Efficiency	6.57%					
Actual Oxygen Transfer Efficiency (η)	2.440%					
Min. Required Air Flow	106.2	SCFM	180.4	SCM/Hr		
Air Flow Provided	108.0	SCFM	183.5	SCM/Hr		
Pressure at Air Flow Provided	122.7	inWC	4.43	psig	0.31	Bar
Air:Volume Ratio	130.3	SCFM/1000 CF	7.82	SCMH/m^3		
Air: BOD Ratio	2.59	SCFM/lb BOD.day	9.94	SCMH/kg BOD.day		

Secondary Dissolved Air Flotation

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
DAF Size	R-25					
No. of Units Operating @ Design Flow	1					
DAF Pump	KTM25N					
DAF Pump Horsepower	2.00	HP	1.49	kW		
Recycle Flow	11.00	GPM	0.20	SCMH	0.7	l/s
Air Flow	6.99	SCFH	3.3	Sl/min		
Operating Pressure	45	PSIG	3.1	Bar		
Volume	1,278	Gal	4.84	m^3		
Surface Area	36.1	ft^2	3.36	m^2		
Air Solubility	18.70	ml/l				
Saturation Efficiency	90%					
DAF Capture Rate	97%					
Air to Solids Ratio	0.377	lb air/lb solid				
Recycle Ratio	126.7%					
Hydraulic Loading Rate w/ Recycle (HLR)	0.54	gpm/ft^2	1.33	m^3/m^2-hr		
Hydraulic Loading Rate w/o Recycle (HLR)	0.24	gpm/ft^2	0.59	m^3/m^2-hr		
Hydraulic Residence Time w/ Recycle (HRT)	64.94	Minutes				
Hydraulic Residence Time w/o Recycle (HRT)	147.23	Minutes				
Solids Loading Rate (SLR)	0.03	lb/ft^2-hr	0.16	kg/m^2-hr		
Volumetric Efficiency	0.64	SCFH Air/GPM Recycle	0.079	l air/l water		
DAF Effluent TSS	0.87	lb TSS/d	8.4	mg/l	0.4	kg TSS/d
DAF Effluent BOD_5	1.4	lb BOD_5/d	13.0	mg/l	0.6	kg TSS/d
DAF Sludge Production	28.5	lb TSS/d	114.1	GPD	15.3	ft^3/day
DAF Sludge VSS Production	13.6	lb VSS/d	6.2	kg VSS/day		

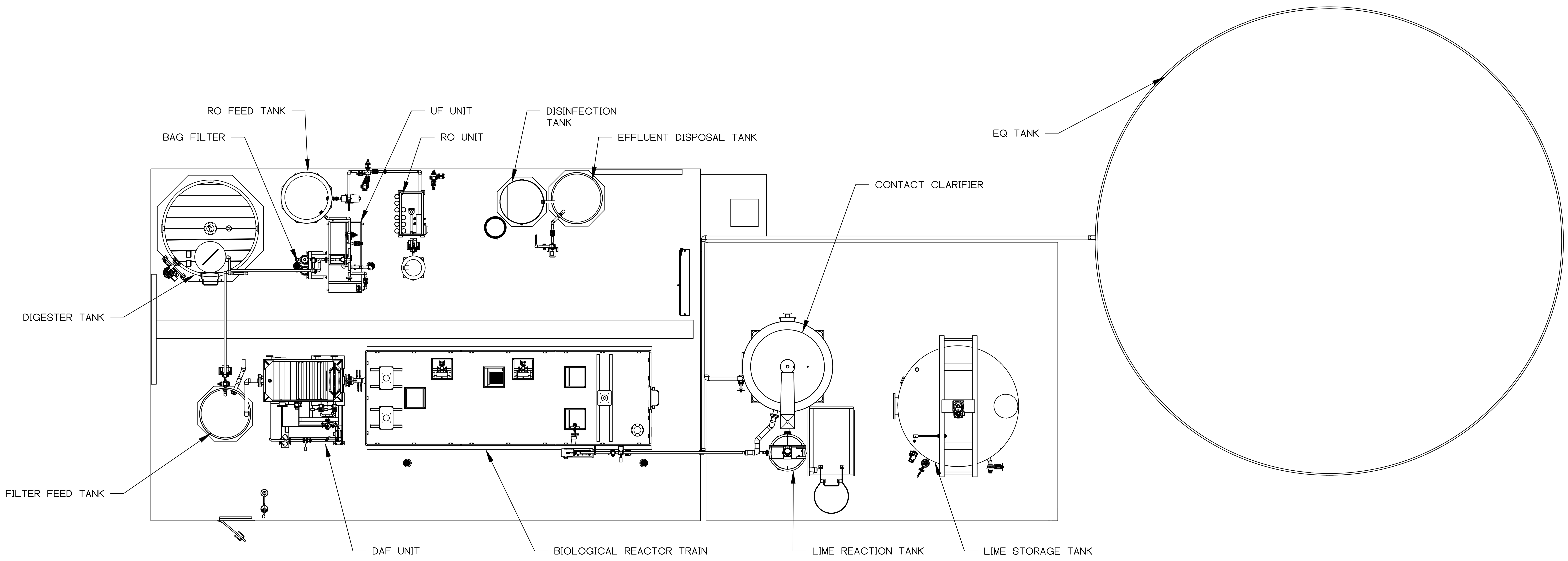
Secondary DAF Polymer System

Polymer Pump Max Capacity	0.5	gph	12	gpd		
Maximum Dosage Rate	418.7	mg/l				
Poly conc. @ Max Dosage	0.50%					
Poly. Active Conc.	40%					
Poly. Density	9.1	lbs/gal	1.090	S.G.		
Design Dosage Rate	5.0	mg/l				
Active Polymer Consumpt.	0.52	lbs-dry polymer/day	0.2	kg-dry polymer/day		
Neat Polymer Consumption	1.3	lbs neat polymer/	0.1	gpd	0.5	lpd
Design Polymer Conc.	0.25%					
Makedown Water Consump.	0.04	gpm	57.3	gpd	9	l/hr

Aerobic Digester

Parameter	Value	Prim. Unit	Value	Alt. Unit	Value	Alt. Unit
Influent Solids Concentration	3.0%		29,982	mg/l		
Min. Required HRT Digester	20	days				
VSS Destruction in Digester	40%					
VSS/TSS of Sludge	0.48	VSS/TSS				
Air Required for Mixing (Min)	20	SCFM/1000CF				
Air Required for Mixing (Max)	40	SCFM/1000CF				
Digester Oxygen Requirement	2.3	lb O_2/lb VSS				
Digester Percent Solids	2.43%		24,294	mg/l		
Fraction of Primary BOD to Digester (Y)	0.00					
Digester Reaction Rate Constant (k_d)	0.10	1/d				
Solids Retention Time (SRT)	40	days				
Required Digester Size for min HRT	2,282	Gal	8.6	m^3	305.1	ft^3
Required Digester Size for 38% VS Destruction (WEF,1998)	1,941	Gal	7.3	m^3	259.4	ft^3
Actual Digester Size	2,250	Gal	8.5	m^3	300.8	ft^3
HRT Provided	20	Days				
Required Digester Length	9.34	ft				
VS Loading	0.045	lb VS/ft^3-day	45.1	lb VS/1000 ft^3-day		
VS Destruction	5.43	lb VS/day	2.46	kg VS/Day		
Solids Accumulation Rate	23.12	lb TSS/day	10.49	kg TSS/Day		
O_2 Demand	12.49	lb O_2/day	5.67	kg O_2/day		
P_d	113.0	kPa				
AVG $C_{S,T,H}$	9.68	mg O_2/l				
Correction Factor Combined	0.38					
Standard Oxygen Transfer Efficiency	3.00%					
Actual Oxygen Transfer Efficiency (η)	1.138%					
Min. Air Demand for VSS	46	SCFM	78	SCMH		
Min. Air Demand for Mixing	12	SCFM	20	SCMH		
Air Flow Provided	42	SCFM	71	SCMH		
Pressure at Air Flow Provided	100	inWC	3.60	psig	0.25	Bar
Air:Volume Ratio	139.6	SCFM/ 1000 CF	8.38	SCMH/m^3		

APPENDIX 3 – ENGINEERING DRAWINGS



WSI International
469 W. WESLEY AVE
DENVER, CO 80223
PHONE: (303) 985-0885

DESCRIPTION: LEACHATE TREATMENT FACILITY
PROJECT NAME: DAYS COVE
PROJECT NUMBER: 103
CREATION DATE: 10/16/2023
DRAWN BY: BG
FILE NUMBER: 0380523.DWG

REVISIONS

NO.	DESCRIPTION	DATE

SHEET C-1

SIZE ARCH-D

Existing Treatment Plants

Existing Treatment Plants

WSI's WWTP Installations/References

Plants in Hawaii

- **Contact:** Poe Tyler, WSI International LLC

  Tel: 808-265-2060

  Poe Tyler is WSI's Operations Manager in Hawaii. Poe will be able to provide you operational data regarding plant performance which is certified by lab results.

- **Contact:** Bruce Witcher

  Tel: 808-334-0322

  Bruce Witcher has been the engineer used on several of our projects working with the client as to plant performance etc. Bruce is very familiar with our designs and plant operations.

- **Contact:** Victor Limacher

  Tel: 808-895-9041

  Victor is an independent plant operator hired by our clients to operate our plants; he is very familiar with plant design and in particular plant operations.

- **Contact:** Mrs. Makani Maeva, Pacific Housing Advisors:

  Tel: 808.263.7657

Waikoloa: This is a design-build project for the existing SBR plant upgrading and expansion. The existing plant had three SBR trains and the total treatment capacity was 200,000 gpd. The plant was upgraded by using the WSI designed BCR® system and the treatment capacity of their upgraded plant is now at 800,000 gpd.

During the Phase I upgrade, one existing SBR tank was converted to a Bio-Chip Reactor (BCR®) system. Other furnished and installed process units included screening, dissolved air flotation (DAF), aeration blowers and continuous flow, pH and DO measurement and logging.

During the Phase 2 expansion, the second SBR was converted to a BCR® system, a stand-by DAF was installed as well as aerobic digestion, centrifuge dewatering, grit removal, a new MCC control system. At the completion of the two phases of expansions, the rated capacity of the plant was increased from 200,000 GPD to 533,000 GPD.

The Phase 3 final expansion has converted the third SBR to a WSI BCR® system and the total plant capacity after upgrading is now at 800,000 gpd.

Seascape: Seascape is a BCR® plant; the final flow of the plant is over 200,000 GPD.

WSI designed and built this underground plant with a BCR® system. The process includes inlet screen, EQ tank, aerobic BCR® system, DAF units, chlorination, aerobic sludge digester and sludge dewatering unit.

Palamanui: This plant has been designed as a 1 MGD plant using our BCR® process. The owner(s) of this facility is Charles Schwab and Guy Lamb. This plant will support the New Town Center as well as facilities being built on Kona for the University of Hawaii. This plant has already been approved by DOH to produce the R-1 quality reclaimed reuse water. This plant will begin construction this year.

Kaupulehu: This plant has been designed and approved by the State of Hawaii for a build-out capacity of 200,000 gpd.

Currently we have been operating a temporary plant rated at 7,000 GPD for over one and half years. This temporary plant is a skid mounted plant serving homes prior to the installation of the permanent plant. The temporary plant will be decommissioned after the build out of the permanent primary 200,000 GPD plant

Kohanaiki: The owner of this plant is Discovery Land.

This plant is permitted to produce tertiary quality reclaimed water (R-1) and the construction will begin this year; the plant will have a final capacity of 210,000 gpd. This plant will be built in three phases of 70,000 gallons per phase. This is being done to match the development phasing.

Plants in California

29 Palms Hotel: An underground BCR® plant with a capacity of 12,000 gpd.

The plant consists of: EQ tank, anoxic and aerobic (BCR®) system, DAF unit, chlorination, aerobic sludge digester. The plant has been installed underground and is waiting for start-up upon the completion of the hotel complex.

- **Contact:** Carl Petty

  Tel: 562-941-6095

Bear River: The plant is under construction with a capacity of 50,000 gpd.

The plant was design to produce Title 22 tertiary quality recycled water for irrigation. The plant consists of inlet lift station with submersible pumps, an inlet screen, two parallel trains with EQ tank, anoxic and aerobic BCR® system, DAF unit, disk filters, chlorination, and aerobic sludge digester. A 10,000-gallon effluent holding tank with two booster pumps was designed for irrigation system.

- **Contact:** John Bergenske

  Tel: 707-443-5054

Costa Rica

- **Contact:** Edgar Gonzalez: 011-506-8845-3495

  Edgar is working for the Papagayo Peninsula project. This project is one of the largest in Costa Rica. Currently we have built multiple plants on the peninsula under a DBO contract, these plants range in size from 30,000-750,000 GPD.

  Edgar will be able to speak with you or your client about our plant designs, operations, and quality as the plants on the peninsula are required to meet the California Title 22 regulations. Currently we have under construction a new plant for this large marina/village complex.

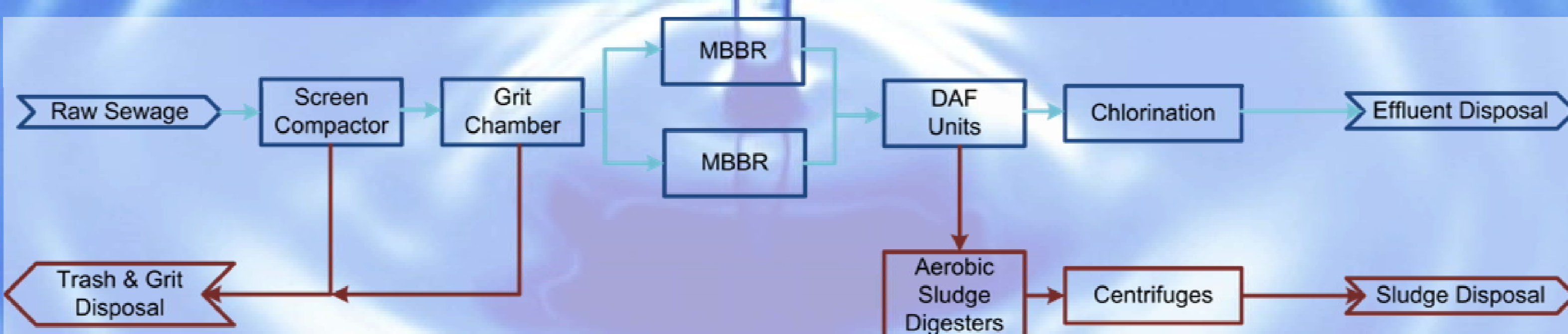
Waikoloa Village WWTP
533,300 GPD – Phase 2
800,000 GPD Full Build-Out

During the Phase I upgrade, one existing SBR tank was converted to a biochip reactor. Other furnished and installed process units included screening, dissolved air flotation (DAF), aeration blowers and continuous flow, pH and DO measurement and logging.

During Phase 2, another SBR was converted to a biochip reactor, a stand-by DAF was installed as well as aerobic digestion, centrifuge dewatering, grit removal, a new control system and MCC. Due to limited available space, mezzanine structures were installed to support a new control building and MCC room above the process area.

During the two phases, the rated capacity of the two SBR reactors was increased from 200,000 GPD to 533,000 GPD.

Waikoloa, Hawaii



ITEMS	INFLUENT	TARGET EFFLUENT
Average dry weather flow (gpd)	533,300	
BOD_5 (mg/L)	300	20
TSS (mg/L)	225	20
TKN (mg/L)	30	
NH_3-N (mg/L)	20	2.0
Alkalinity (mg/L)	220	
Total Coliform (MPN)		≤2.2 colonies/100 mL weekly average ≤23 colonies/100 mL in any 30 days ≤200 colonies/100 mL in any sample

WSI International, LLC
Office: 303-985-0885
www.wsi-llc.com

Main Process Area & Upper Mezzanine

Lower Process Area & Side view of Upper Mezzanine

Side View of Upper Mezzanine

Dissolved Air Flotation Cells

Aerobic Digesters and Centrifuge Dewatering

Headworks Screens

Grit Removal - PistaGrit

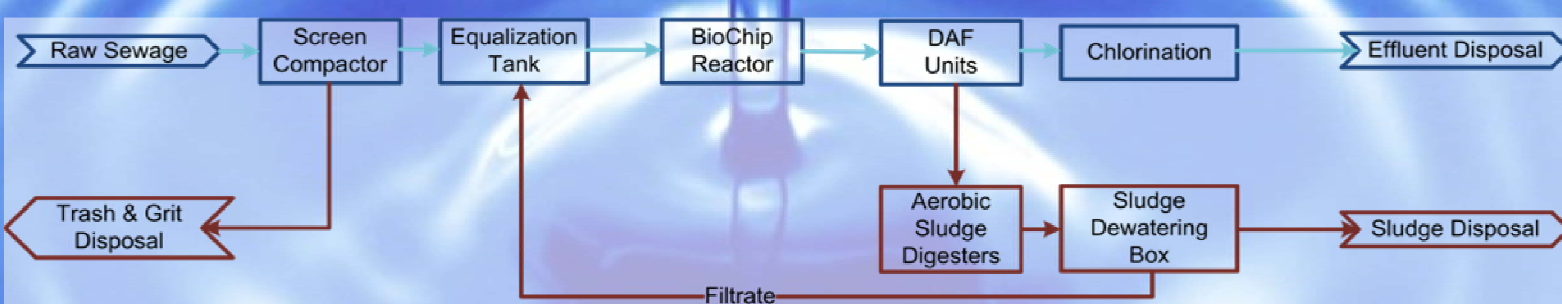
BioChip Reactor

Seascape/Lokahi Ka'u WWTP
180,000 GPD Phase 2
Residential Development

Seascape and Lokahi Ka'u are residential communities in Kailua-Kona, HI with views of the ocean. Below grade BCR tanks and recessed Dissolved Air Flotation Cells (DAFs) were selected to maintain the ocean views.

The WWTP services both communities and was designed for a third phase expansion to raise the rated capacity to 250,000 GPD when the community expands.

Kailua-Kona, HI



Item	Amount
Design flow:	180,000 gallon/day
Influent:	
BOD_5	220 mg/L
TSS	250 mg/L
Effluent:	
BOD_5	15 mg/L
TSS	15 mg/L

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Dewatering Box

Inside BCR Reactor
Partially Filled

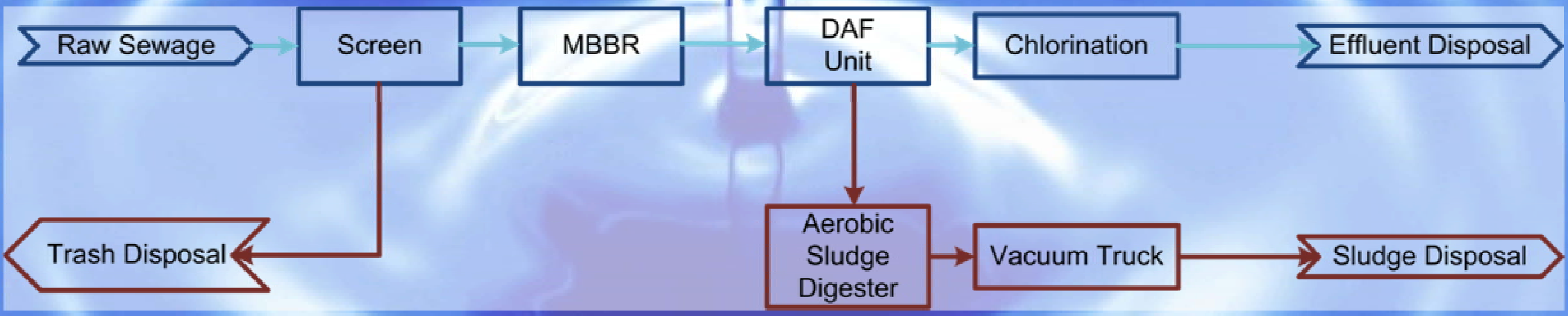
Foreground: DAF Units
Background: Below Grade Reactor Tanks

Front View of DAF Units

Ka'upulehu Interim WWTP
3,500 GPD Interim Phase Plant

The Ka'upulehu WWTP was a fast track project that was designed, permitted, built, and started-up in 90 days. This plant was sized to meet the front end wastewater requirements of a new development. When the development expands a larger wastewater treatment plant will be installed. This skid mounted treatment plant can then be mobilized to another site or facility requiring immediate wastewater treatment.

Kailua-Kona, Hawaii



ITEMS	INFLUENT	TARGET EFFLUENT
Average dry weather flow (gpd)	3,500	
BOD_5 (mg/L)	300	20
TSS (mg/L)	225	20
TKN (mg/L)	30	
NH_3-N (mg/L)	20	2.0
Alkalinity (mg/L)	220	
Total Coliform (MPN)		≤2.2 colonies/100 mL weekly average ≤23 colonies/100 mL in any 30 days ≤200 colonies/100 mL in any sample

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