California Regional Water Quality Control Board, Colorado River Basin
Prosecution Team Evidence
on the matter of
Administrative Civil Liability Complaint R7-2014-0041
Exhibit 38

Industrial Wastewater Pretreatment Plant

Preliminary Engineering Report

Prepared For National Beef Brawley, CA

Prepared by HR Green, Inc.
8710 Earhart Lane SW
Cedar Rapids, IA 52404

April 2013

HRGreen

NBC_ACLC_PT-001532

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APPENDIX

Certifications Page

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of California.

REGISTERED PROFESSIONAL ENGINEER
JAMAL AWAD
C 050719
Jamal Awad
9/30/2013
CIVIL
STATE OF CALIFORNIA

Executive Summary

Purpose and Objective

National Beef California, LP operates a beef slaughter and rendering facility in Brawley, California (City) that processes approximately 2,400 head of cattle per day. Currently, National Beef runs a wastewater pretreatment plant (WWPT) that discharges to the City sewer collection system for treatment in the City of Brawley Publicly-Owned Treatment Works (POTW). This Report is to respond to the City's September 7, 2012 letter request for "the preparation of a Preliminary Engineering Report by a State of California Registered Engineer, addressing the diversion of previously undocumented flows into the pretreatment system (referenced in this Report as the WWPT), the pretreatment process flow diagram, design criteria and expected performance of each unit process in the system, the overall treatment process performance, and a plan and timeframe to correct all of National Beef's pretreatment system deficiencies." The City of Brawley Wastewater Pretreatment Ordinance, Chapter 22, Article II, has local maximum discharge limits for BOD, TSS, and ammonia of 250, 250, and 30 mg/l, respectively. The City is in the process of preparing a pretreatment program submittal to the Colorado River Basin Regional Water Quality Control Board, which will include the Wastewater Pretreatment Ordinance. The City has informed National Beef that the City will issue National Beef a wastewater discharge permit pursuant to the pretreatment program requirements. This Report may be revised should applicable Wastewater Pretreatment Ordinance requirements be modified through the program submittal and approval process, and are necessary in response to terms and conditions of the wastewater discharge permit.

Summary of Findings

There have been several modifications, additions, and improvements made to the WWPT in the past 24 months and some improvements continue to be ongoing. These measures have improved the WWPT ability to manage aspects of the treatment operation such as sludge wasting and dissolved oxygen level enhancement in the aeration basin. Completion of ongoing work and the recommendations in this report will enhance the performance of the WWPT.

Recommendations

The purpose of the National Beef Brawley wastewater pretreatment plant is to meet the City's discharge limits. The existing limits include BOD, TSS, and ammonia. HR Green has evaluated the existing WWPT performance and offers the following recommended improvements:

1. Improve the existing DAF with respect to aeration, floatables, settleable solids and consistent operation.
2. Install permanent DO probes in Pond 2
3. Add four new TSS probes to control and alarm of TSS slugs
4. Automate Pond 3A/3B level control to maintain a consistent drop over the weir
5. Automate TSS slug diversion

In addition to the above improvements, HR Green recommends National Beef improve the anaerobic treatment process. HR Green has identified and presented several alternatives for improving Pond 1. After considering the pros, cons and costs of each alternative, National Beef and HR Green have developed the following short list of alternatives currently being further developed and considered for Pond 1, as follows:

1. Remediate or dredge Pond 1
2. Replace Pond 1
3. Installation of a new enhanced anaerobic contact digester

Each anaerobic alternative will have an individual impact on the downstream aeration improvements needed for Pond 2. The decision of the Pond 1 alternative will drive the subsequent Pond 2 aeration improvements. Regardless of which Pond 1 alternative is selected, Pond 2 will require aeration improvements to meet the discharge limits. However, the extent of aeration improvements will be dictated by the upstream Pond 1 anaerobic improvements. Finally, Pond 3A, 3B, and 3C improvements to accommodate the flow and loading to the clarification process downstream in Pond 3 can be determined after the treatment alternatives in the upstream Pond 1 and Pond 2 are selected.

1.0 Introduction

1.1. Purpose

National Beef in Brawley, CA is a beef slaughter and rendering facility that processes approximately 2,400 head of cattle per day. Currently, National Beef operates a wastewater pretreatment plant (WWPT) that discharges to the City of Brawley, CA sewer system. The WWPT consists of screening, dissolved air flotation (DAF), anaerobic lagoon, temporary DAF, aerobic lagoon, polishing pond, suspended air flotation (SAF), and discharge to the City sewer.

The City of Brawley Wastewater Pretreatment Ordinance has local maximum discharge limits for BOD, TSS, and ammonia. The plant has exceeded these limits in the past; however, with improved operations the excess events have decreased. In 2012, BOD was within the permit limit 100% of the time, TSS exceeded the limit 7% of the time, and ammonia exceeded the limit 49% of the time.

National Beef has developed an action plan and in September of 2012 completed a series of interim improvements. Additional recommended improvements will enhance operation and effluent ammonia concentrations.

1.2. Scope

The purpose of this document is to evaluate the Brawley WWPT as a whole and not focus on one process improvement. This document identifies improvements that enhance operation and achieve compliance with the existing discharge requirements. Further, once the new limits are established through City ordinance or a wastewater discharge permit issued to National Beef, recommendations can be expanded as needed. This report is based on HR Green's initial review of the WWPT data provided by National Beef, recent correspondence with the City of Brawley, preliminary site visits, and process flow diagrams developed by Heron Innovators (Heron). Figure 1 presents an update to the Heron wastewater process flow diagram.

2.0 Existing Conditions

2.1. Existing WWPT Limits

The current wastewater maximum limits for discharge to the City Publicly Owned Treatment Works (POTW) are listed below:

- BOD_5 – 250 mg/L
- TSS – 250 mg/L
- Ammonia-N – 30 mg/L

2.2. Existing Treatment Facilities

Refer to Figure 1 in Appendix A for the process flow diagram of the existing WWPT. The general process is as follows:

- Screening
- DAF
- Float Processing
- Pond 1 - Anaerobic Lagoon
- Second DAF
- Pond 2 - Aerobic lagoon
- Pond 3 – 3 cells (3A/B settling and 3C slug load diversion)
- SAF

2.3. Plant Wastewater Generation

The Brawley slaughter and rendering facility generates wastewater from processing of approximately 2,400 cattle per day. Details on wastewater generation are listed below:

- Wastewater flow going to the WWPT ranges from 700 to 2000 gallons per minute (gpm) with a daily average flow of 1.7 Million Gallons per Day MGD. Plant wastewater flow may decrease a small amount due to planned water reuse.
- The WWPT discharges at a maximum rate of 1200 gpm (1.728 MGD) and any influent wastewater flow over this amount is attenuated in the process and discharged on the weekends.
- Domestic wastewater is segregated.
- Review of flow rate trend records for a typical production day (December 11, 2012) show wastewater generation of:
  - Operation 1600 to +2000 gpm (5:30 am to 5:30 pm)
  - Cleaning 1200-1600 gpm (5:30 pm to 12:00 am)
  - Overnight 700-1000 gpm (12:00 am to 5:30 am)

The industrial process wastewater generation is presented in Figure 2 based on HR Green's evaluation of available facility records and drawings. Plant process wastewater discharges to a separate collection system from plant sanitary sewage. Process wastewater is generated in kill, refrigeration, boilers, rendering and fabrication operations. The process wastewater is screened and then routed to a wetwell equipped with two centrifugal pumps operated by variable frequency drives. The wetwell pumps route flow through a flow meter and splitter box, then to two DAF units to remove the bulk of grease and solids prior to anaerobic treatment.

The following sources of wastewater flow directly to the anaerobic lagoon at an estimated total of up to 95,000 gallons per day (gpd) maximum:

- Cooling water used to cool the iron sponge process (sulfur removal from biogas),
- Cattle pen misters (during production only),
- Pen washings (during production only),
- DAF grease refiners stick water (When DAF is operating at optimal conditions)

National Beef is planning to divert certain dilute streams (boiler blowdown, RO brine, and iron sponge cooling water) from the anaerobic treatment for potential reuse. The potential reuse of these wastewaters is shown on Figure 1. A large non-potable water tank is ready for use.

3.0 DAF Treatment

The Plant operates two Pre-Anaerobic DAF units that receive flow from a wetwell. Float switches control operation of the duplex wetwell pumps. Discharge of the wetwell pumps is routed through a magnetic flow meter, then a splitter box. The splitter box has two bottom outlets to distribute flow among the two DAF units. The DAF units are installed at different elevations so that series or parallel operation is possible.

Data on the DAF units is listed below:

- Two DAF units, Vanaire, Inc., each 12' by 60 feet (720 ft^2), installed in 2001.
- Design Max surface loading is rated at 4 gpm/ft^2; > 5000 gpm total.
- Design Max solid loading is 5000 mg/L FOG
- Temp out of DAF is 95-105°F

No wastewater treatment chemicals are added before the DAF units. Float from each DAF unit flows to a series of melt tanks, screens, and centrifuges to separate fats from the DAF float to produce tallow. These DAF units also utilize a bottom skimming chain to pull heavy solids and grit continuously from each DAF. Solids are captured and transported with an auger to a grit trailer for offsite disposal.

There are opportunities to optimize the performance of the DAF units with some improvements to the equipment (i.e. flow split, repairs, etc.), and by utilizing all facets of the equipment (i.e. skimmers, drag chains, etc.) to their full potential.

4.0 Pond 1 Anaerobic Lagoon

Pond 1 is a covered anaerobic lagoon operated to convert as much of the BOD in the DAF effluent as possible to biogas, which is used as fuel for a dedicated boiler. The original design documents indicate that this pond is clay lined. The Pond 1 system is shown in Figure 3, details are listed below:

- Pond 1 has been in use for approximately 10 years
- Pond 1 has a design operating volume of 9.5 million gallons.
- Bottom elevation 856 feet
- Design water surface 871 feet.
- Receives gravity flow from a manhole following DAF treatment
- A suction pipe was installed in the west end of Pond 1 in the fall of 2012 and connected to a pump, which routes flow from the mid depth of the pond to a new DAF for treatment before entering aerated Pond 2.
- The new Pond 1 outlet pump is operated at a constant speed (approximately 1200 gpm) and is only shut off when a new truck is needed to accept float and solids from the Pond 1 DAF.
- Pond 1 also serves as a storage and equalization basin to buffer daily influent flow variation due to production during weekdays. The average discharge rate out of Pond 1 is maintained at 1200 gpm. Influent wastewater flow during the week fluctuates, while on the weekend, flow is low and thus Pond 1 will bleed stored process wastewater to the downstream processes on the weekend.
- Average BOD reduction is 65%.

The digester performance is critical to control BOD loadings so that the downstream processes can meet treatment requirements. Pond 1 effluent has contained high grease concentrations in 2012 due to an accumulation of grease over its ten-year lifetime. National Beef investigated the accumulated grease and solids by opening the west discharge area of Pond 1 in early August 2012, and also installed a new effluent pipe at that time. A DAF unit was installed in September 2012 to prevent grease from entering Pond 2 which is discussed later. In February of 2013 National Beef performed another investigation of Pond 1. This investigation collected samples and data from 20 different locations. The data collected included grease and solids levels, pH, temperature, and some alkalinity. In addition, AWS, a dredging contractor, was on site to better understand the dredging needs of Pond 1. The dredging report is located in Appendix B, along with isometric diagrams of the data collected.

As mentioned above, Pond 1 has a design operating volume of 9.5 MG. This provides a 4 to 7 day detention time, depending on incoming flow and effluent pumping rate. Due to the accumulation of grease in Pond 1, the effective volume of Pond 1 is less than 9.5 MG, resulting in short circuiting and the detention time is less than 4 to 7 days. Ideal detention time for the anaerobic system would be greater than 10 days to achieve effective BOD reduction and biogas production.

Because of the accumulation of grease in Pond 1, rehabilitation or replacement with an equivalent system is being considered to obtain effective and more optimal BOD reduction and biogas generation. HR Green is evaluating viable digester options including, mixing or baffling in the existing Pond 1 to prevent short-circuiting. The options being evaluated for anaerobic treatment are shown in Appendix C. To further refine this comparison, more data is being collected and analyzed.

5.0 Pond 1 Effluent DAF

A 3,000 gpm rated DAF was installed in September 2012 to prevent grease from entering Pond 2 and this operation appears to be performing satisfactorily. Effluent from Pond 1 flows through the DAF prior to traveling to Pond 2 with an average transfer rate from the DAF of 1,200 gpm. Float from the DAF is sent to a belt filter press (BFP). The DAF installed was on loan from another National Beef facility. A new replacement DAF has been purchased and scheduled to be installed in April 2013. The replacement unit is a World Water Works unit with the following design parameters:

- Dimensions – approximately 12' W x 30' L
- Flow Capacity is 1500GPM average, 2000GPM Peak
- Influent TSS 1400 mg/l
- Influent FOG 1000 mg/l

Polymer is being utilized in the loaner DAF and will be used when the new DAF is installed in March.

6.0 Pond 2 Aerobic Lagoon

Pond 2 is an aerobic lagoon operated to remove BOD and ammonia. Review of original design documents indicate that this pond is clay lined. The Pond 2 system is shown in Figure 4, details are listed below:

- Design operating volume of 2.9 MG.
- Hydraulic Retention time of 1.7 days at 1.7 MGD
- Influent Loading (at 1.7 MGD) based on data from May 2011 to August 2012
    - Average BOD_5 = 25,249 lb/d
    - Average TKN = 1,946 lb/d
    - Peak BOD_5 = 46,117 lb/d
    - Peak TKN = 2,940 lb/d
- Aeration is supplied by 13 surface aerators, 8 at 40 hp each, and 5 at 75 hp, totaling 695 hp.
- Additional aeration is supplied by 4 Oxiworks floating laterals with 10 fine bubble diffusers per lateral.

- Two blowers (75 HP) rated for 1,400 scfm each, supply air to the laterals.
- Pond 2 is gravity fed from the Pond 1 DAF.
- RAS is introduced at the headworks of Pond 2.
- Pond 2 recycle is pumped from the downstream end of Pond 2 and introduced through four vortex air injectors on the upstream end.

Wastewater treatment performance was evaluated from May 2011 to August 2012. The average pH value was 6.6, which is low for typical nitrification design. pH range during the sample period was 6.3 – 9.0. Recommended pH for nitrification is 7.5 – 8.0. Therefore, increasing pH prior to Pond 2 may improve ammonia removal. At a design flow rate of 1.7 MGD, the Soluble BOD_5 loading is 65.1 lbs BOD_5/1,000 cu.ft./d during average loading and 119 lbs BOD/1,000 cu.ft./d during design maximum loading, which is within the design range.

The basis of design for this evaluation assumes a Mixed Liquor Suspended Solids (MLSS) concentration of 4,000 mg/L based on current practice, and a minimum Solids Retention Time (SRT) of 13 days to achieve nitrification during wintertime conditions (low water temperatures decrease biological nitrification rates). Nitrification rates are higher in summer months but can be conversely limited by high water temperatures, which reduce oxygen solubility and subsequently lower overall oxygen transfer.

Preliminary estimates for sludge yield indicate that Pond 2 contains sufficient volume to treat 1.7 MGD at the MLSS, SRT, and loading listed above for both average and peak conditions. While Pond 2 meets typical design criteria for aeration basin size, improved flow distribution at the inlet, interior and outlet will optimize the Pond's effective volume.

Total oxygen supply including both the surface aerators and diffusers is 662 lbs/hour actual oxygen transfer rate (AOTR). The currently installed aeration equipment is sufficient for BOD_5 oxidation, but not sufficient for full nitrification oxidation under the average or peak conditions listed above. Additional oxygen is required to provide nitrification under the varied conditions of loading, temperature, and pH. Moreover, remediation of Pond 1 will produce more ammonia, requiring more oxygen. A target minimum DO concentration of 2.0 mg/L is recommended. Installing permanent DO probes in Pond 2 is advised for optimizing operational monitoring and control.

Due to the high loading of Pond 2 during maximum conditions and the potential for increased ammonia load from Pond 1, rehabilitation or modification of the existing pond is recommended to reliably meet the effluent requirements. The existing pond is limited in terms of creating multiple process zones, air addition, flow distribution and mixing. Adding more oxygen in Pond 2 must be done carefully to ensure good DO availability and improve ammonia removal. The ultimate size and air requirements of the aerobic process are dependent on the upstream anaerobic improvements. HR Green is evaluating other options to complement the existing system and improve performance, refer to Appendix D for preliminary list of alternatives being considered.

7.0 Pond 3A, Pond 3B (Clarifier), Pond 3C, and SAF

Figure 5 presents a process flow diagram for the WWPT clarifier, biosolids pumps, SAF tertiary treatment, and biosolids dewatering, details are listed below:

- Pond 3 is 6.2 MG and has been retrofitted into three separate ponds (3A, 3B, and 3C).
- Wastewater flow from Pond 2 flows by gravity to Pond 3A, the main clarifier for the secondary treatment system.
- Flow overflows a weir on one side of Pond 3A into Pond 3B. Pond 3B is pumped to the SAF.
- The Pond 3B effluent pumps are set to discharge at 1.7 MGD (1200 gpm) to a SAF tertiary solids removal system, then effluent flows to the City sewer.
- Pond 3A is 60 ft. by 70 ft. The hydraulic loading rate at 1.7 MGD is approximately 400 gpd/sq.ft.in Pond 3A
- Pond 3C is not part of the current treatment process. It was dredged of a buildup of solids in the fall of 2012.

Based on HR Green's review of the operation and process data, the return activated sludge (RAS) rate is currently approximately 50% of forward flow. At a plant forward flow rate of 1.7 MGD, a RAS rate of 0.85 MGD, and a MLSS concentration of 4,000 mg/L, solids loading rate to the clarifier would be approximately 20 lbs/sq.ft./day, which is within the typical design range.

Between Pond 3A and 3B is a 60-foot weir with sufficient drop. However, periodically the weir is submerged. If the level control is not managed consistently between pond 3A and 3B, the clarifier operation will pass some suspended solids, presenting a load to the SAF. In addition, Pond 3A does not have baffling or a scum trough, typical of conventional clarifiers. Improvements to the clarifier system are needed to achieve higher removals, reduce TSS slug loads, and eliminate the dependency on the SAF to meet BOD and TSS limits. Modifications to Pond 3A/3B and/or properly sized conventional clarifier with consistent level control and equal flow distribution should be considered. The modifications or clarifier size will depend on the upstream treatment improvements and final effluent limits. In the interim, better level control operations are being implemented to reduce TSS passage.

Pond 3C was out of service for sludge dredging activities, which were completed during the week of December 3, 2012. Now that the dredging is complete, Pond 3C is available for use in the treatment process. Pond 3C will be used for TSS slug diversion. Based on TSS probe readings, the SAF effluent can be diverted to Pond 3C when a slug is detected.

8.0 Recommendations

The purpose of the National Beef Brawley wastewater pretreatment plant is to meet the City's discharge limits. The existing limits include BOD, TSS, and ammonia. HR Green has evaluated the existing WWPT performance and offers the following recommended improvements:

1. Improve the existing DAF with respect to aeration, floatables, settleable solids and consistent operation.
2. Install permanent DO probes in Pond 2
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4. Automate Pond 3A/3B level control to maintain a consistent drop over the weir
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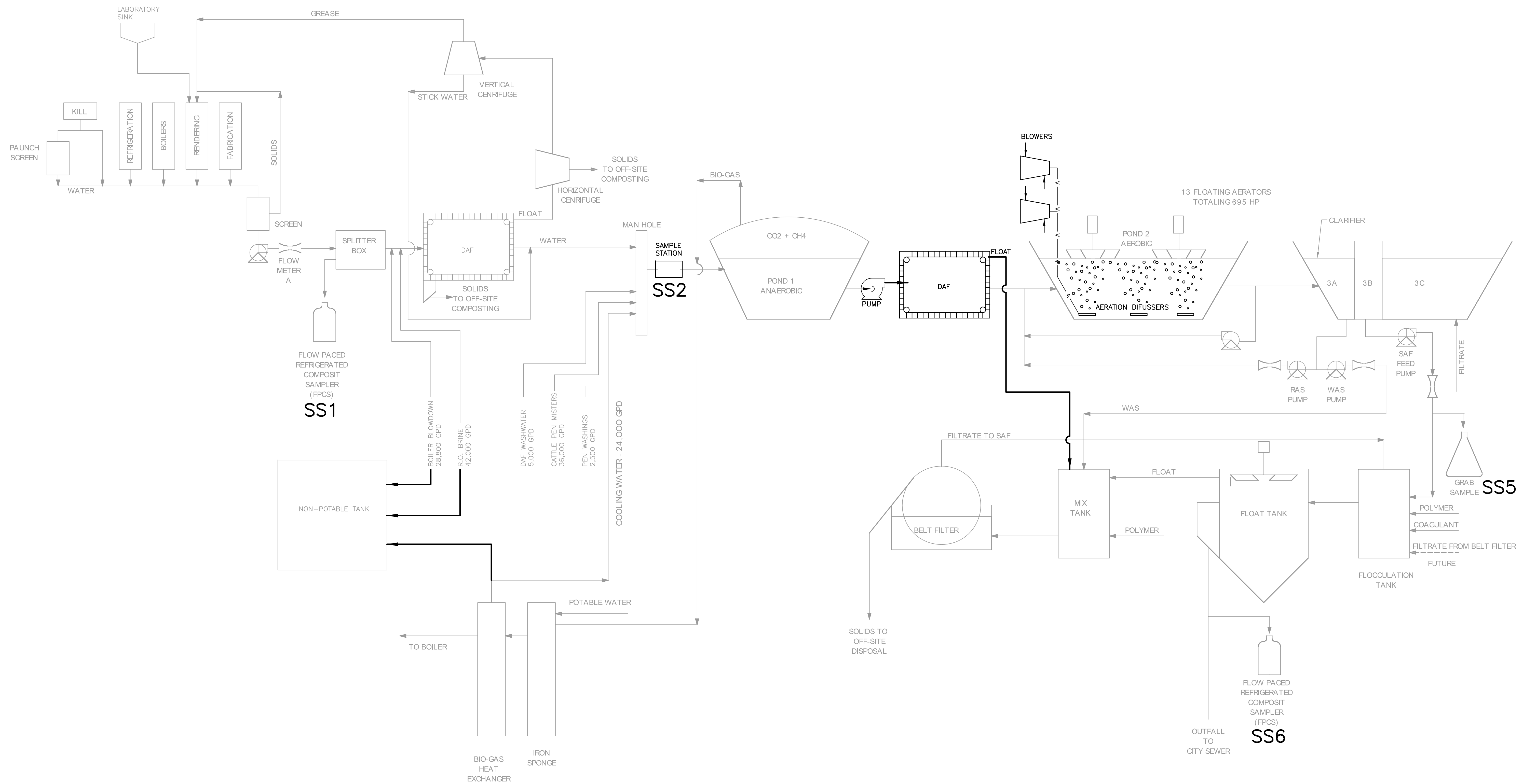
In addition to the above improvements, HR Green recommends National Beef improve the anaerobic treatment process. HR Green has identified and presented several alternatives for improving Pond 1. After considering the pros, cons and costs of each alternative, National Beef and HR Green have developed the following short list of alternatives currently being further developed and considered for Pond 1, as follows:

1. Remediate or dredge Pond 1
2. Replace Pond 1
3. Installation of a new enhanced anaerobic contact digester

Each anaerobic alternative will have an individual impact on the downstream aeration improvements needed for Pond 2. The decision of the Pond 1 alternative will drive the subsequent Pond 2 aeration improvements. Regardless of which Pond 1 alternative is selected, Pond 2 will require aeration improvements to meet the discharge limits. However, the extent of aeration improvements will be dictated by the upstream Pond 1 anaerobic improvements. Finally, Pond 3A, 3B, and 3C improvements to accommodate the flow and loading to the clarification process downstream in Pond 3 can be determined after the treatment alternatives in the upstream Pond 1 and Pond 2 are selected.

Appendix A - Figures



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NO.	DATE	BY	REVISION DESCRIPTION

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WASTEWATER TREATMENT EVALUATION
NATIONAL BEEF
BRAWLEY, CALIFORNIA

PROCESS
FIGURE 1 – OVERALL PROCESS FLOW DIAGRAM

SHEET NO.
P001

NBC_ACLC_PT-001546

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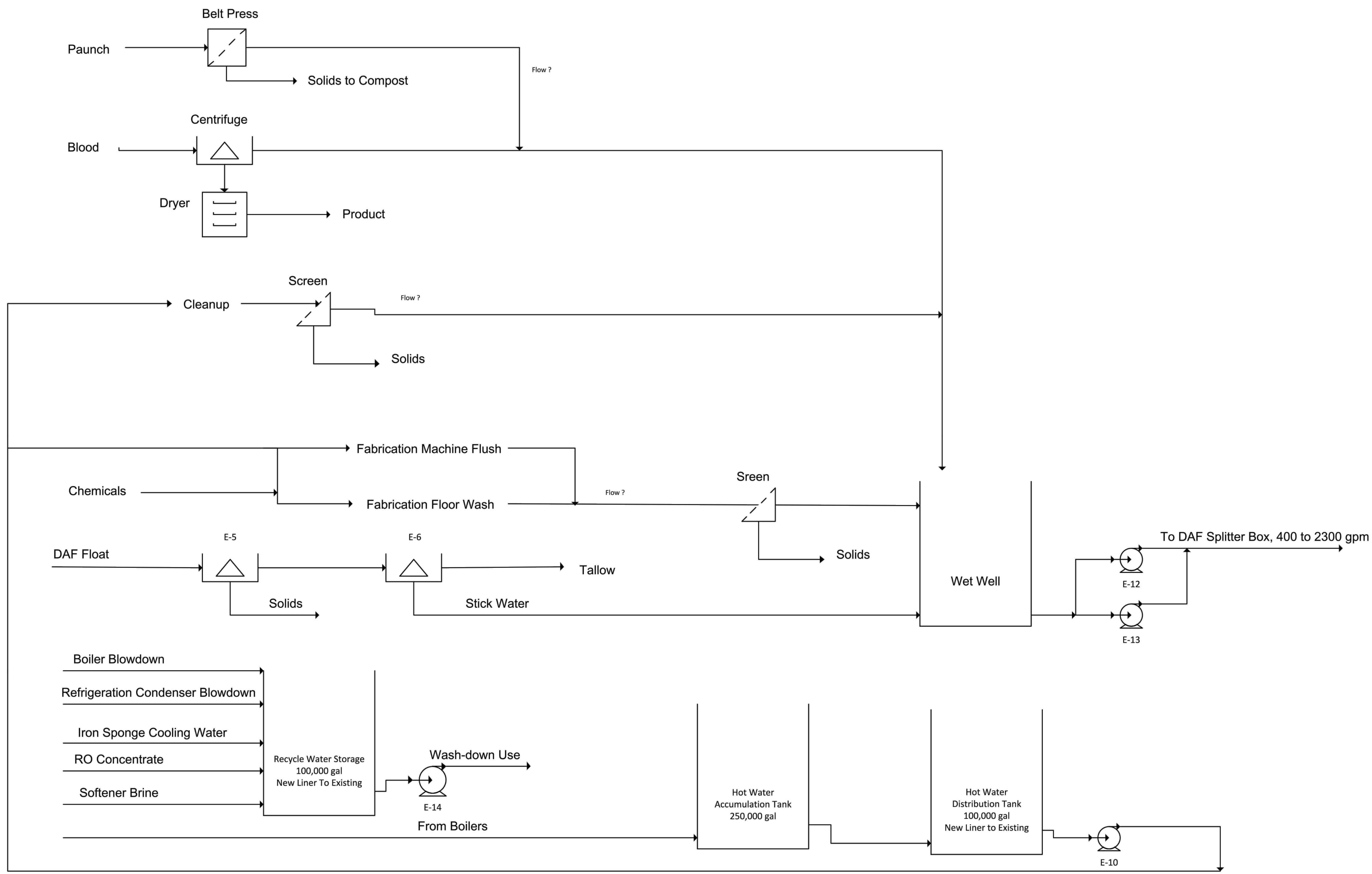

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WASTEWATER TREATMENT PLANT EVALUATION
NATIONAL BEEF
BRAWLEY, CALIFORNIA

PROCESS
FIGURE 2 — WASTEWATER GENERATION

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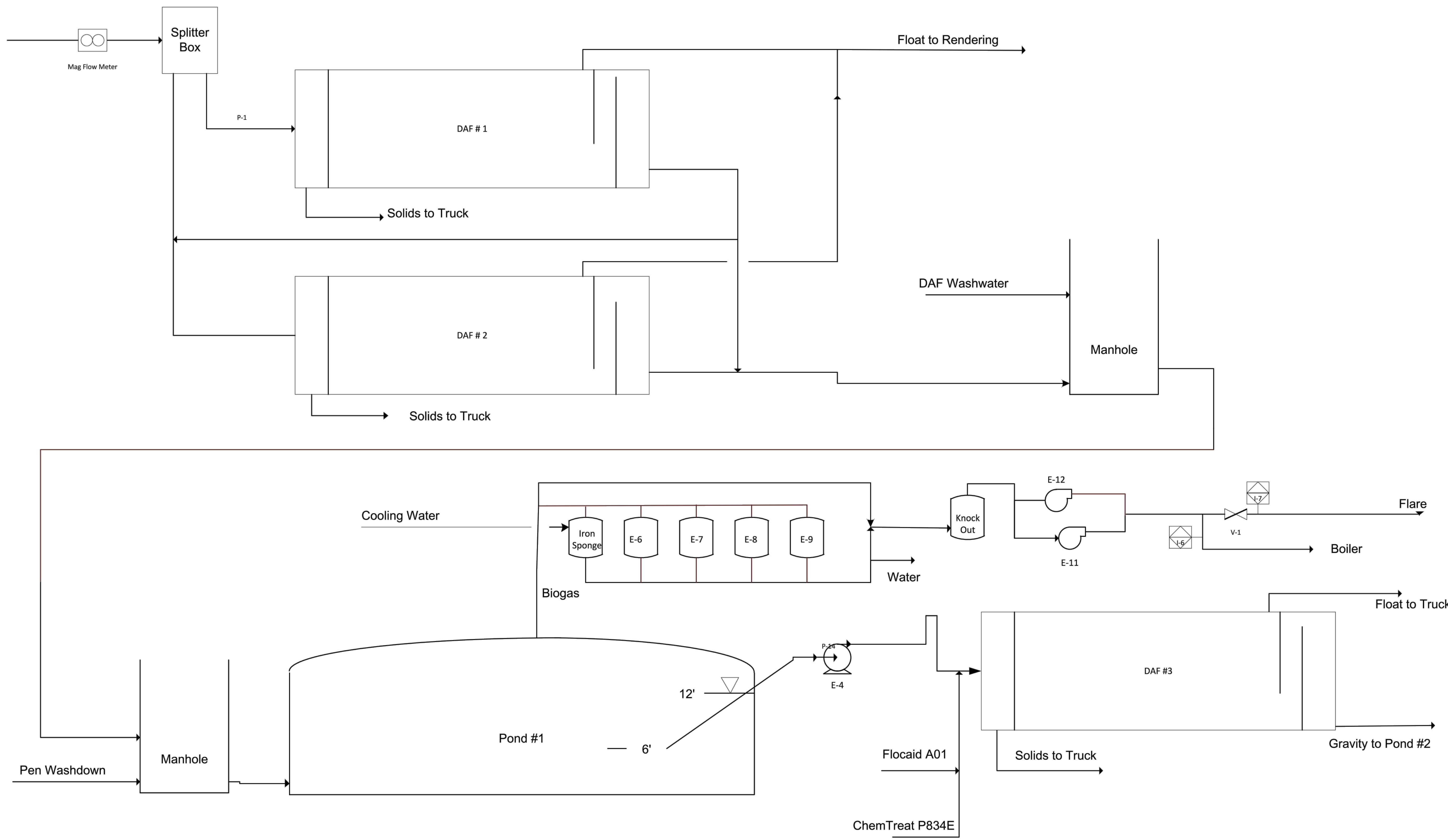
P002

NBC_ACLC_PT-001547

Xrefs: xgt-1-dh01



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WASTEWATER TREATMENT PLANT EVALUATION
NATIONAL BEEF
BRAWLEY, CALIFORNIA

PROCESS
FIGURE 3 – DAF AND POND #1

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P003

Xrefs: xgt-1-dh01

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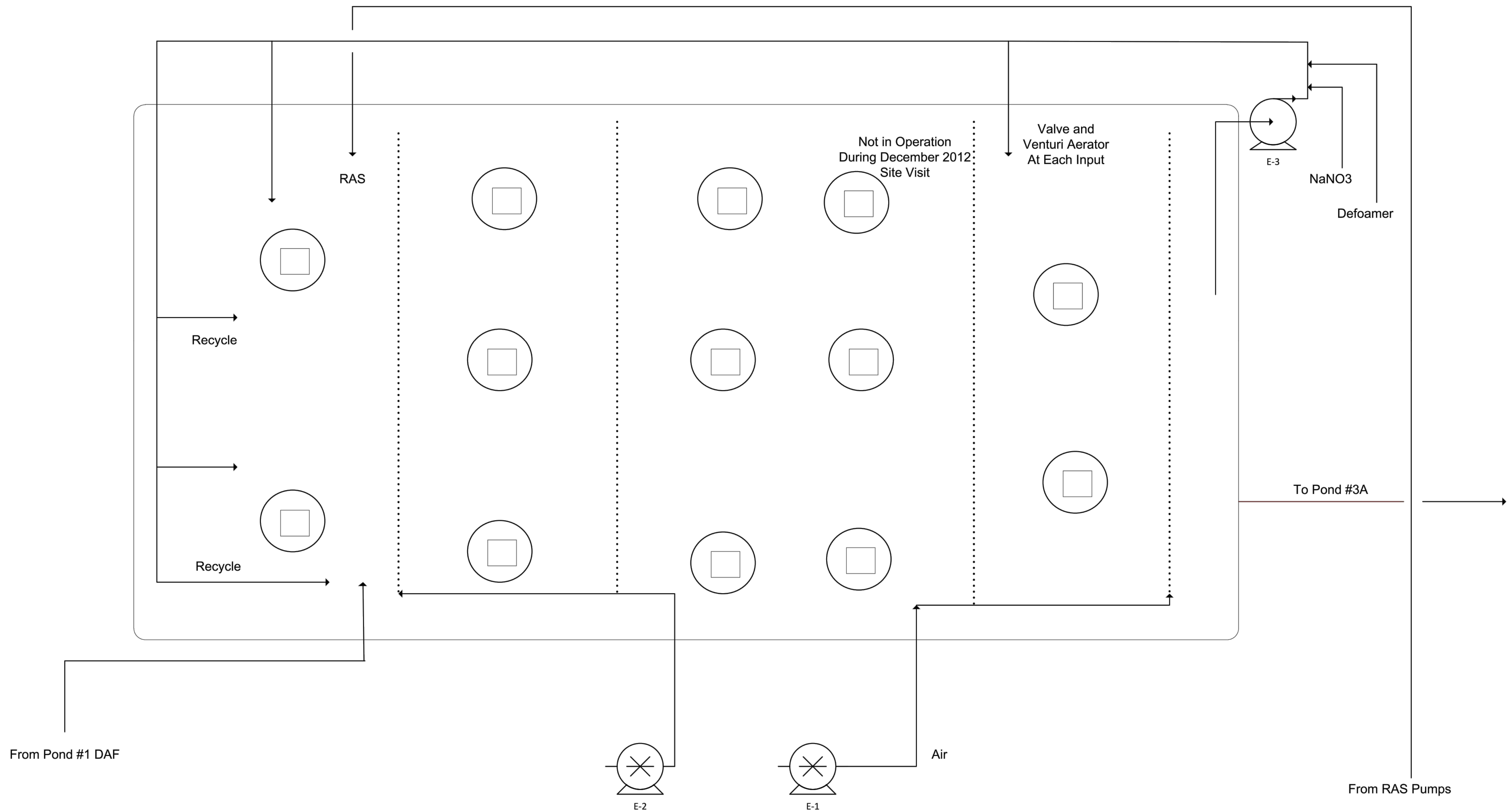

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WASTEWATER TREATMENT PLANT EVALUATION
NATIONAL BEEF
BRAWLEY, CALIFORNIA

PROCESS
FIGURE 4 – POND #2

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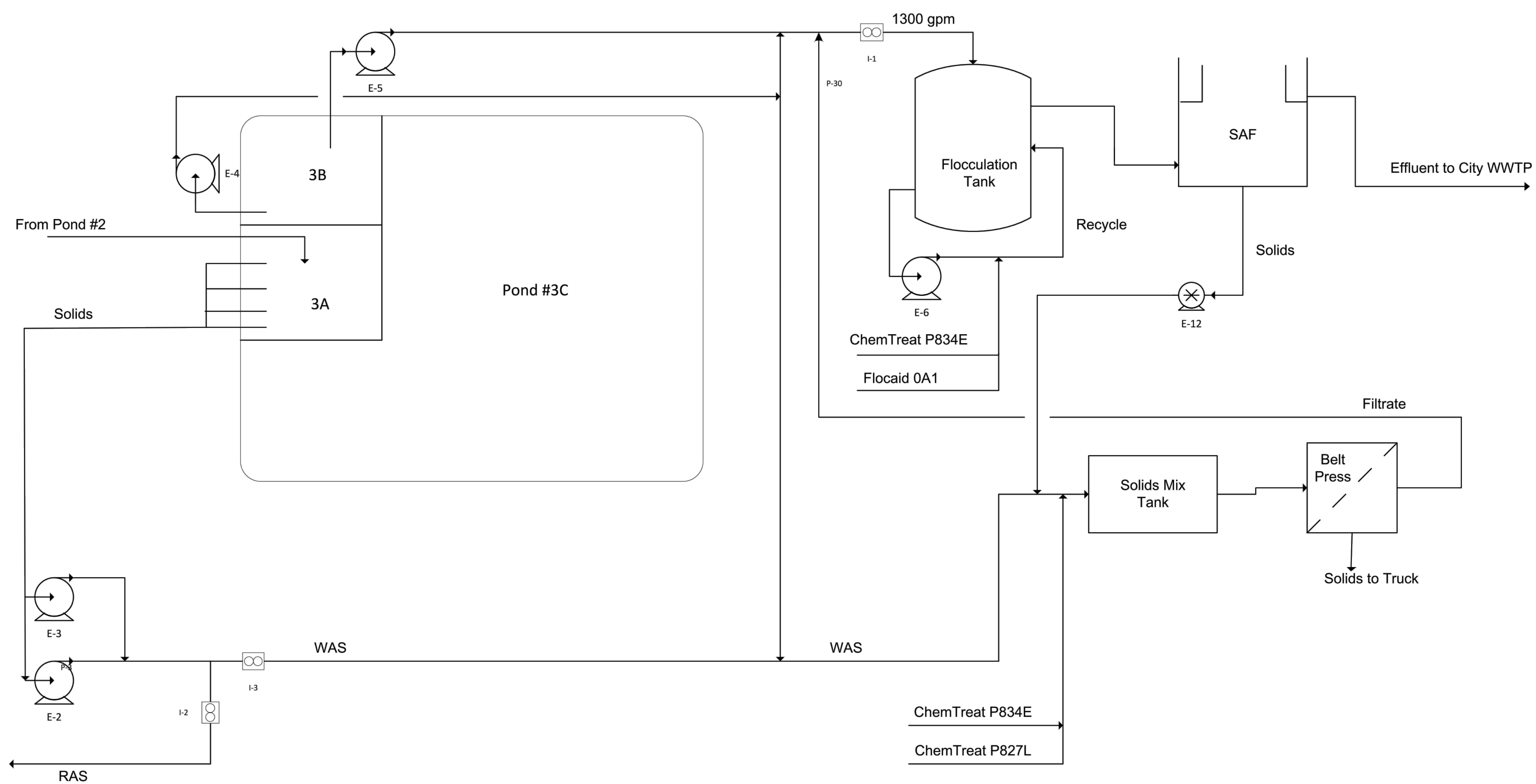

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WASTEWATER TREATMENT PLANT EVALUATION
NATIONAL BEEF
BRAWLEY, CALIFORNIA

PROCESS
FIGURE 5 – EFFLUENT TREATMENT

SHEET NO.
P005

NBC_ACLC_PT-001550

Xrefs: xgt-1-dh01

Appendix B - Pond 1 Profiling Report

National Beef®
BRAWLEY, CA.

February 16-17, 2013

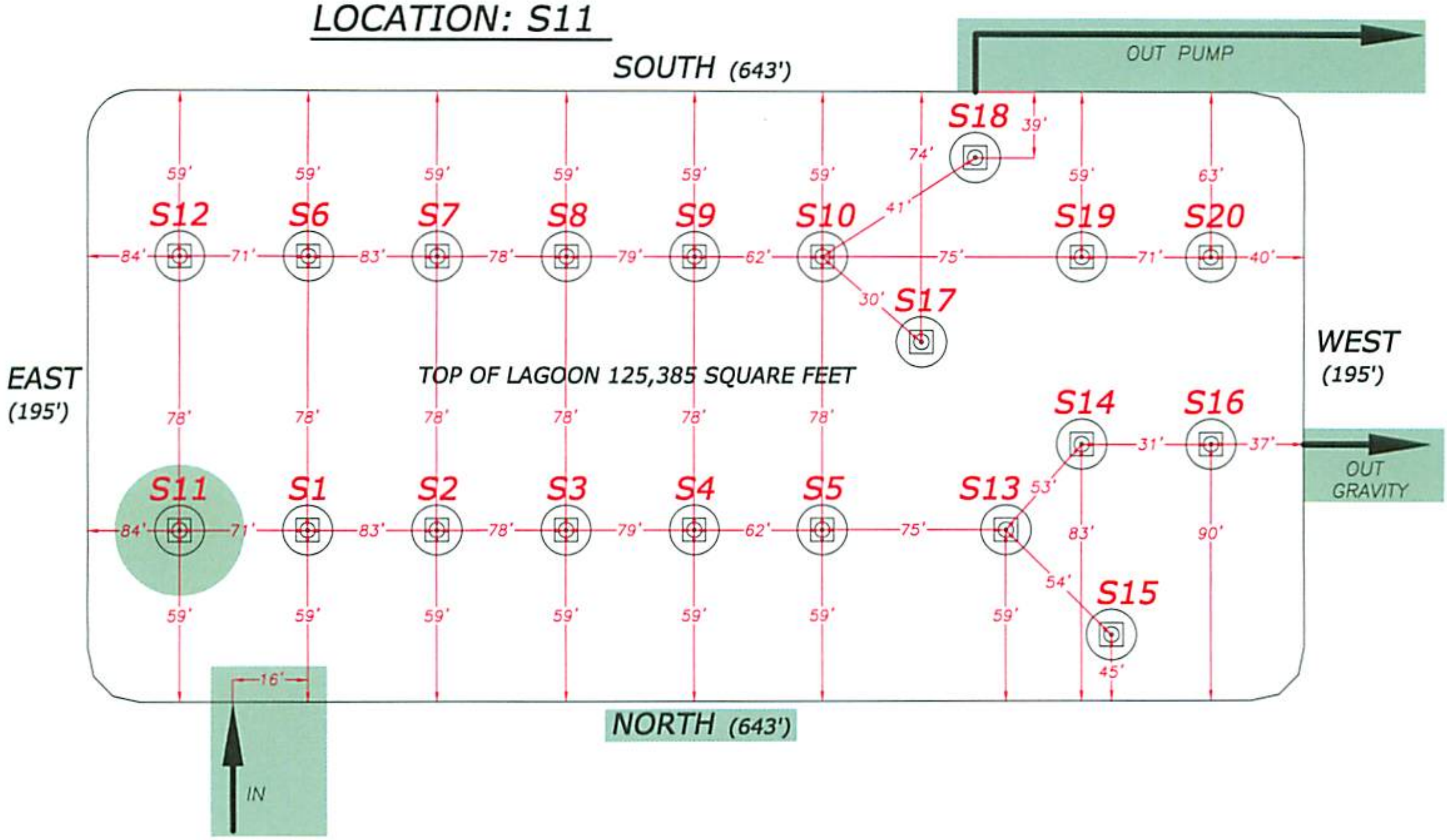
Brawley Pond 1 Profile
Covered Anaerobic Lagoon
Total of 20 Sample Points
Profile Measurements Of 10 North Sample Points
Profile Measurements Of 10 South Sample Points

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

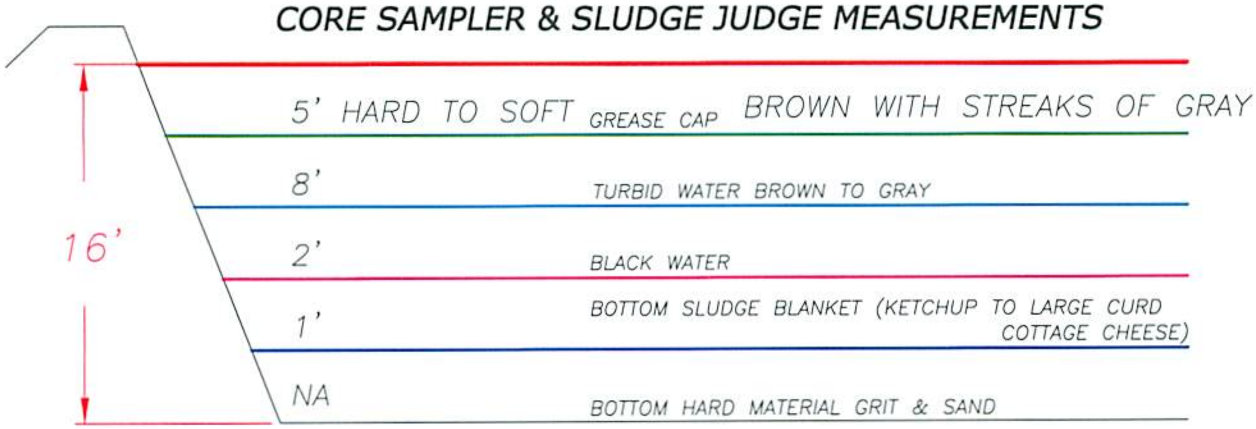
SAMPLE POINT LOCATION PROFILE

DATE: 2-16-13

LOCATION: S11



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



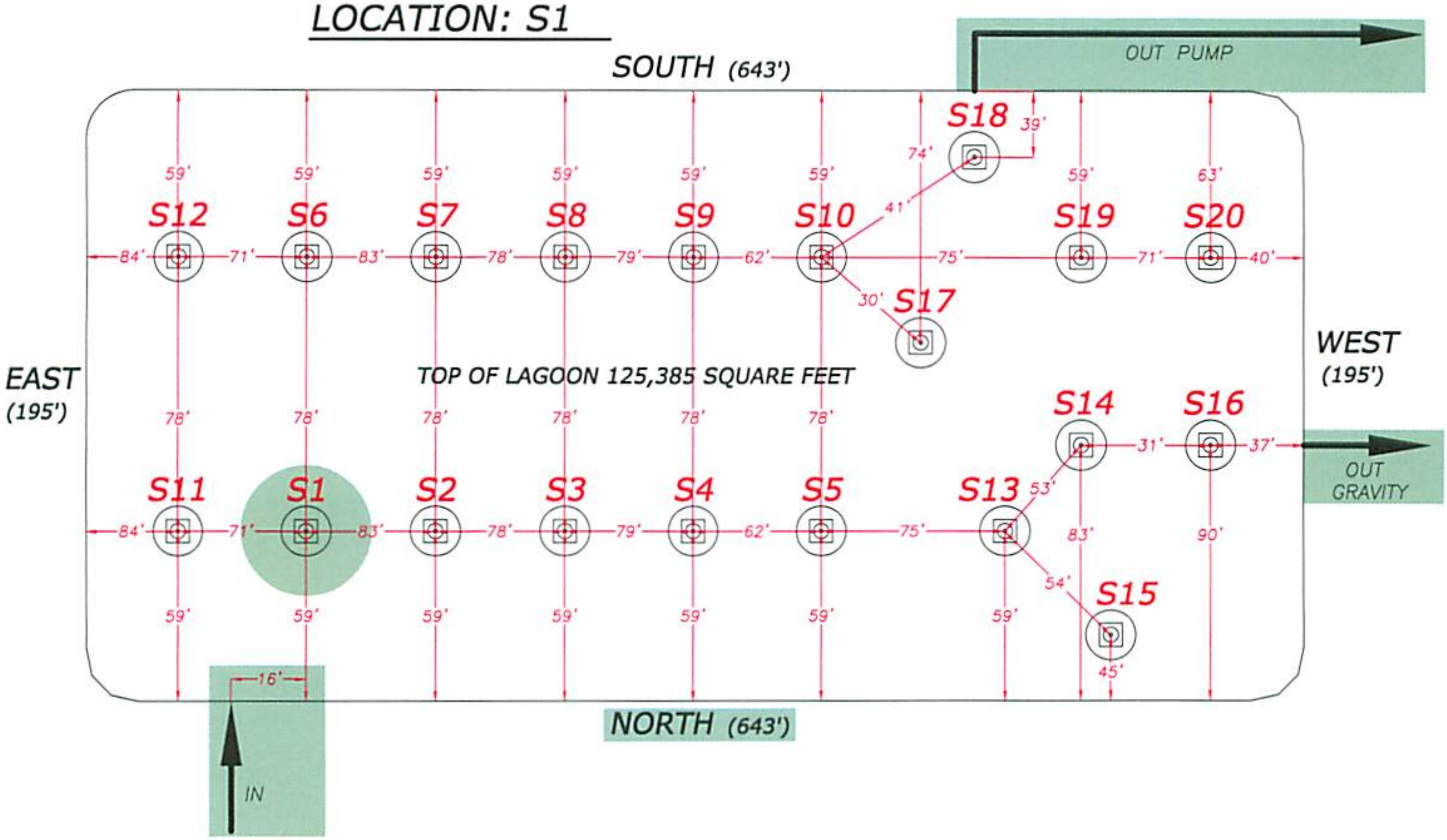
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	NA	NA
6 FT.	96.8	7.32
9 FT.	93.2	7.36
12 FT.	95.9	7.34
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

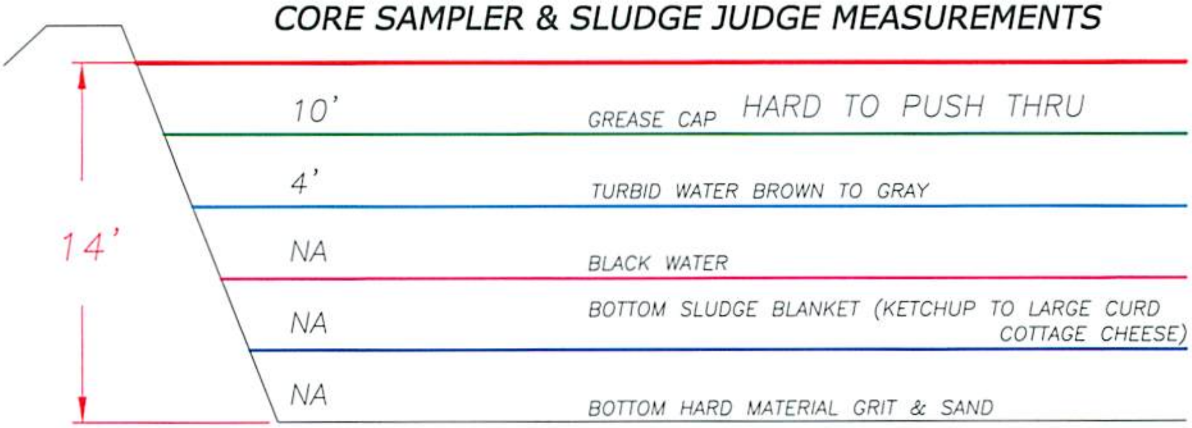
SAMPLE POINT LOCATION PROFILE

DATE: 2-16-13

LOCATION: S1



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	NA	NA
6 FT.	81.9	7.46
9 FT.	84.7	7.46
12 FT.	86.7	7.52
15 FT.	NA	NA

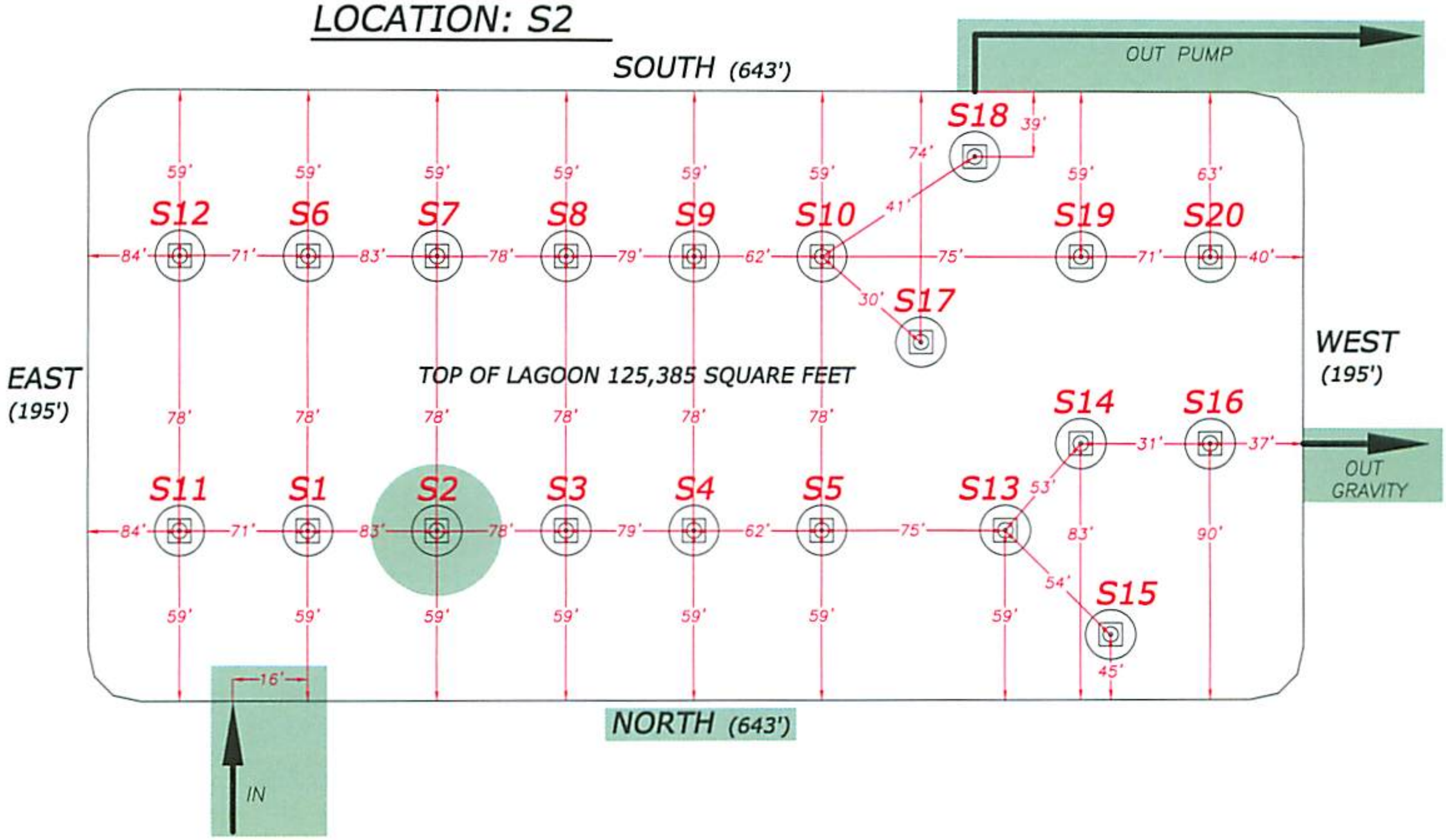
NBC_ACLC_PT-001554

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

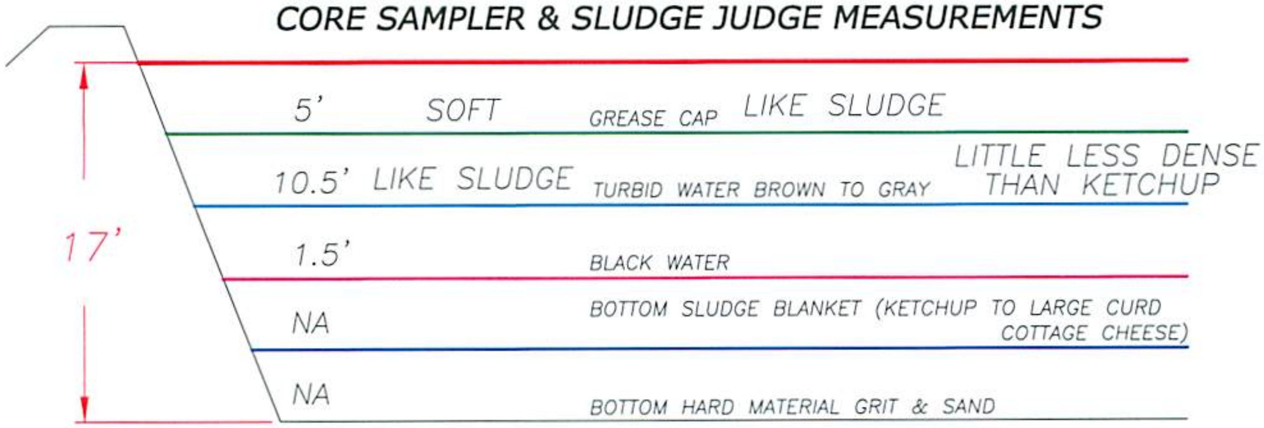
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S2



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	NA	NA
6 FT.	NA	NA
9 FT.	NA	NA
12 FT.	NA	NA
15 FT.	NA	NA

NBC_ACLC_PT-001555

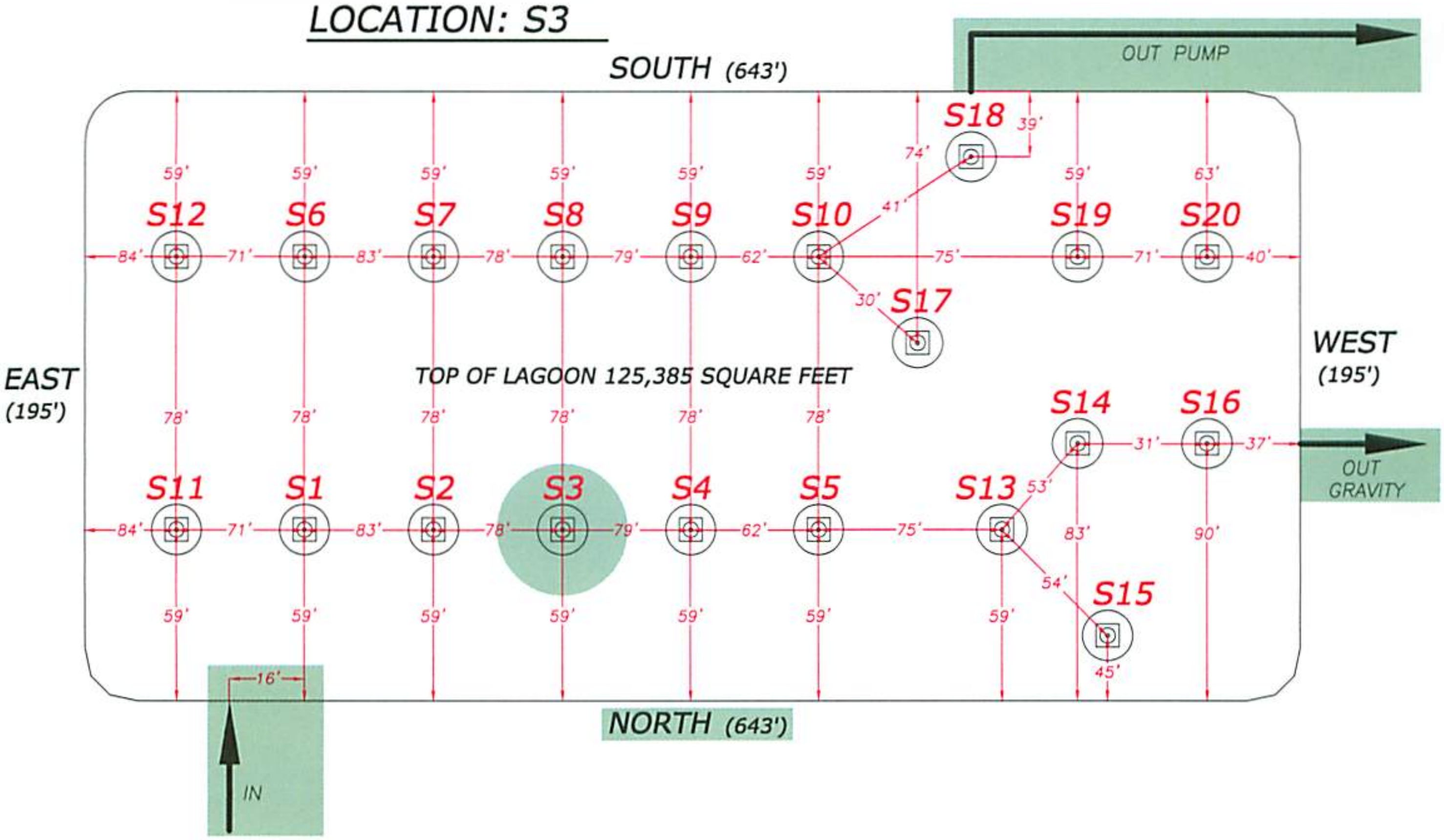
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 2 NORTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

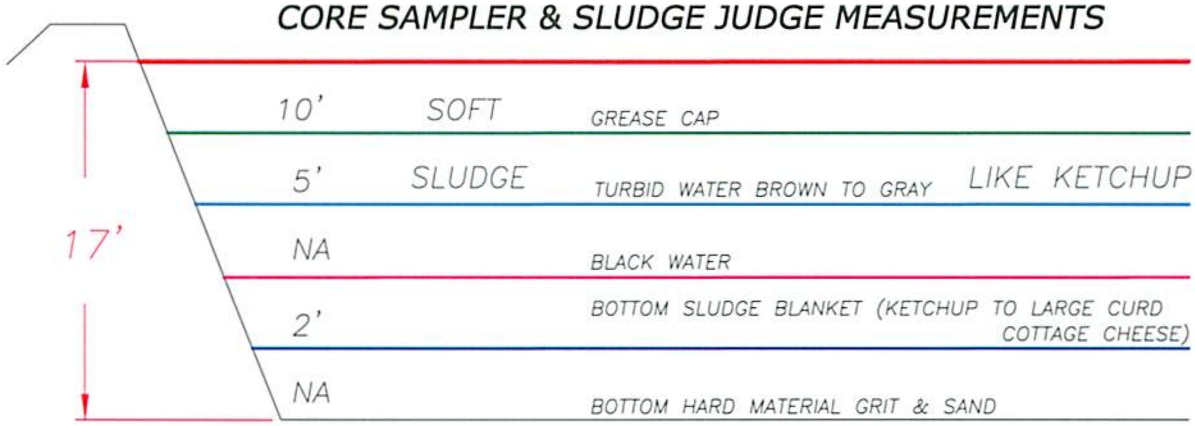
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S3



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



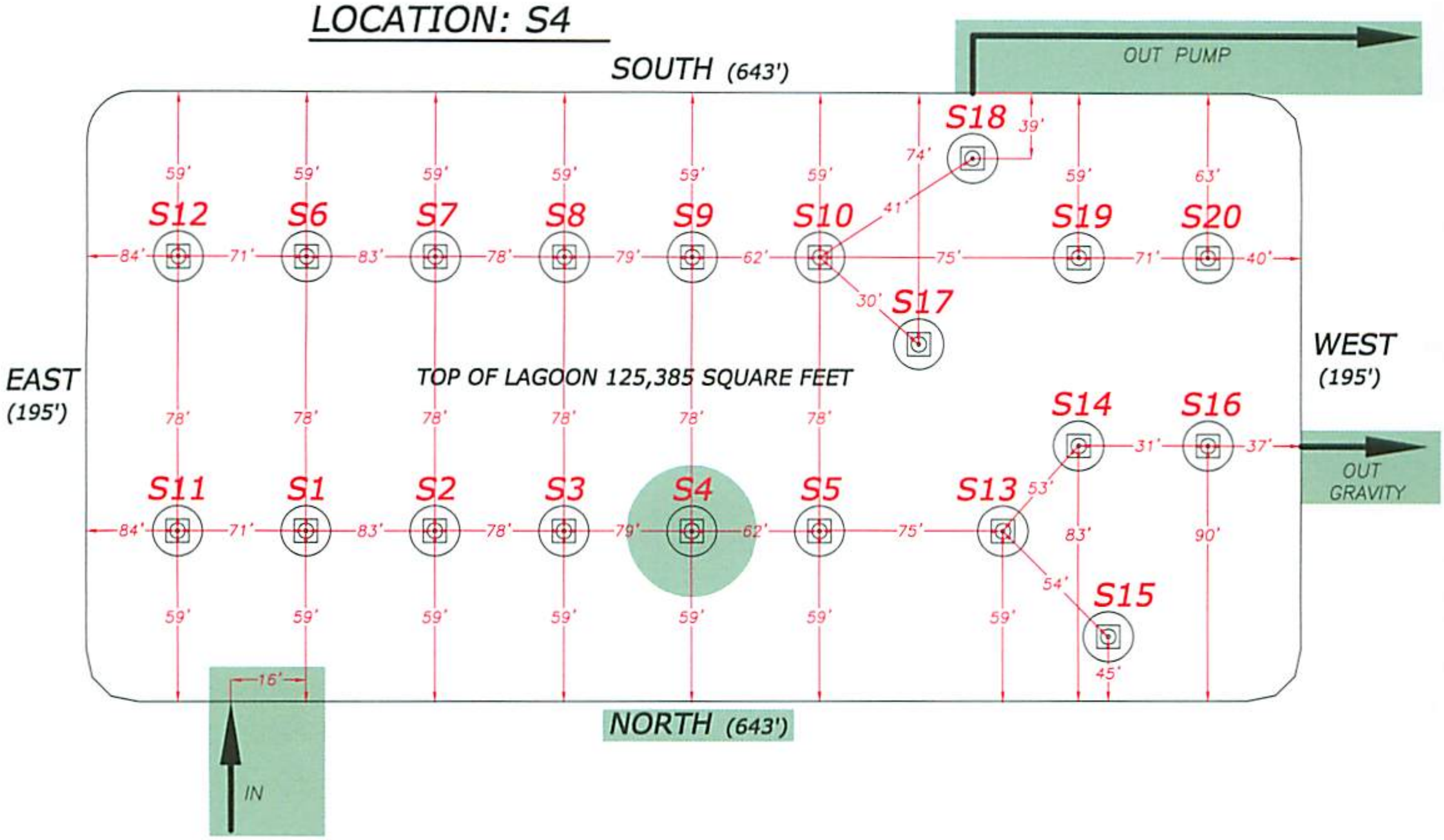
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	77.6	7.42
6 FT.	NA	NA
9 FT.	NA	NA
12 FT.	NA	NA
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

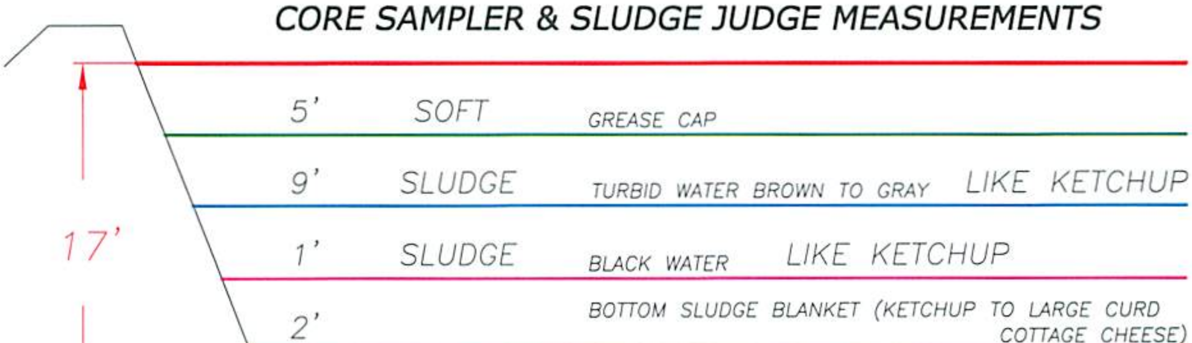
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S4



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	NA	NA
6 FT.	83.3	7.36
9 FT.	82.1	7.42
12 FT.	82.7	7.39
15 FT.	NA	NA

NBC_ACLC_PT-001557

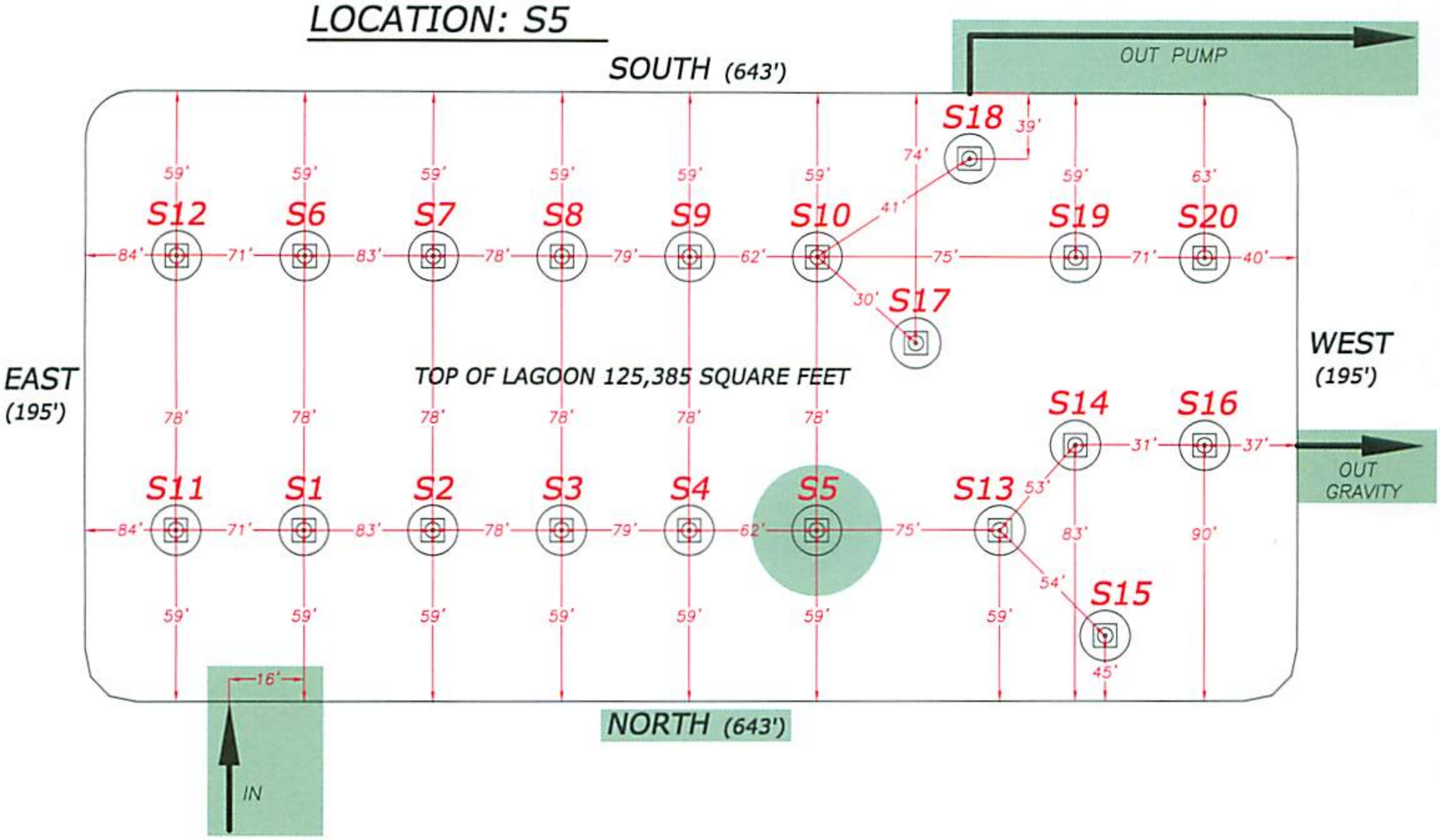
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2-16-17 13/S 4 NORTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

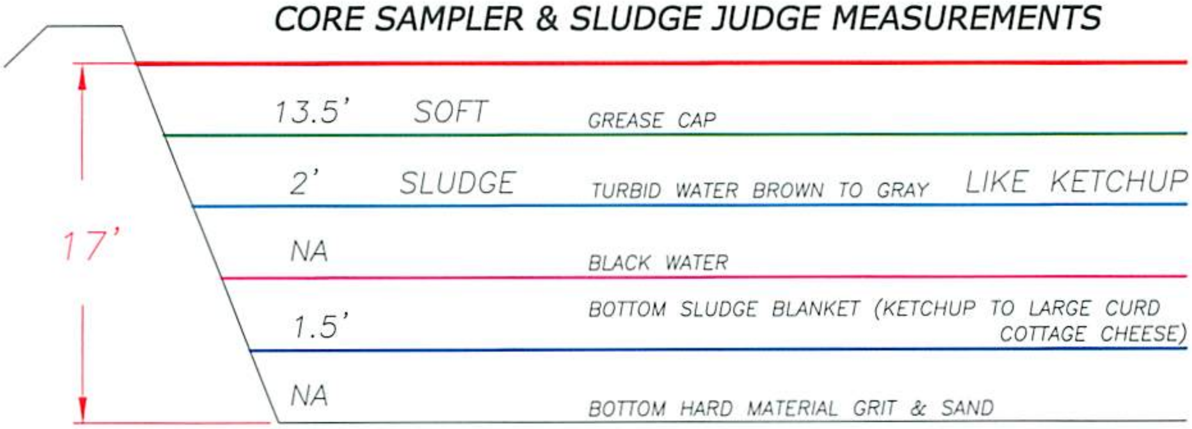
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S5



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	75.6	7.39
6 FT.	78.2	7.40
9 FT.	79.2	7.39
12 FT.	79.8	7.38
15 FT.	NA	NA

NBC_ACLC_PT-001558

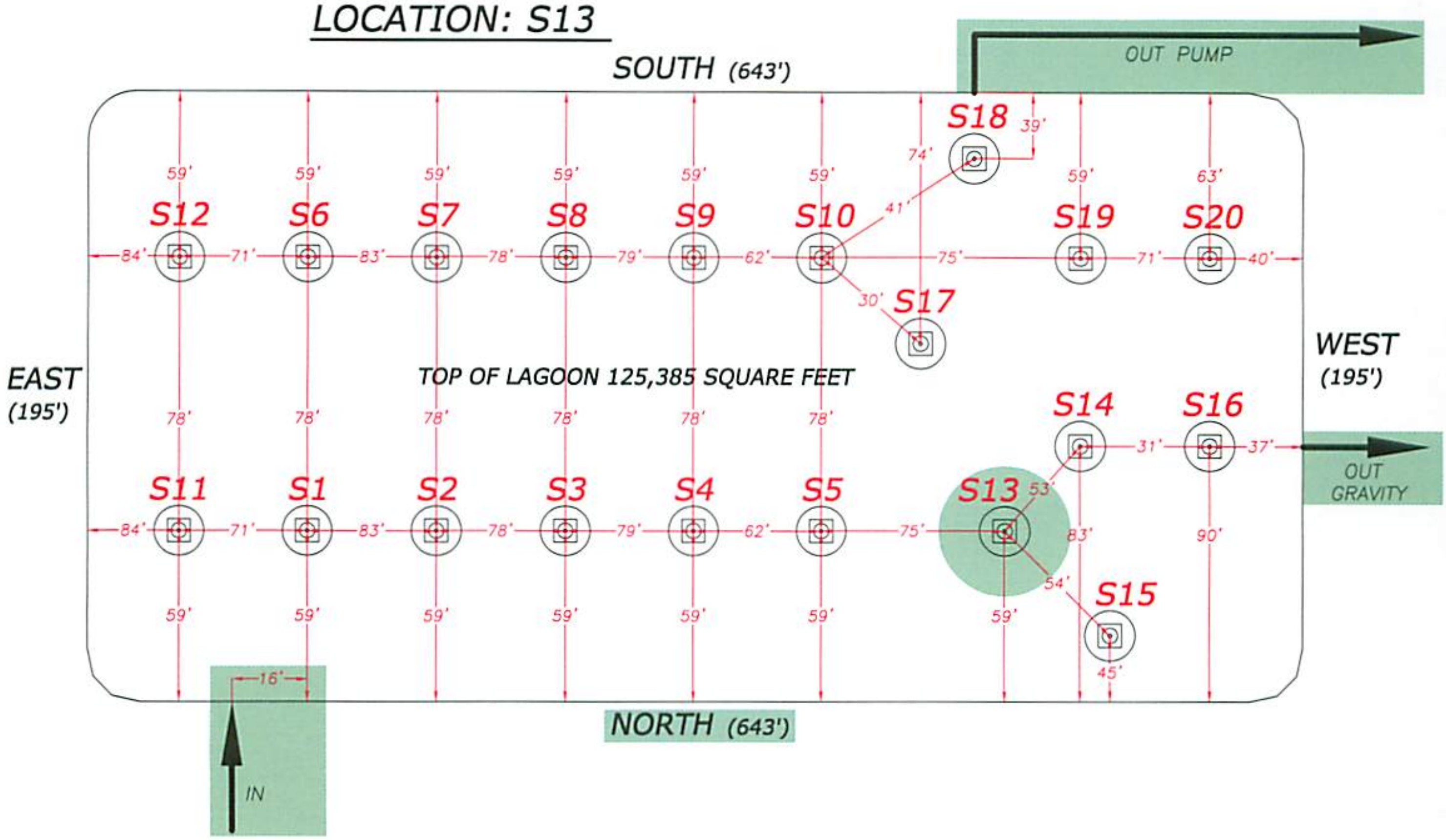
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 5 NORTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

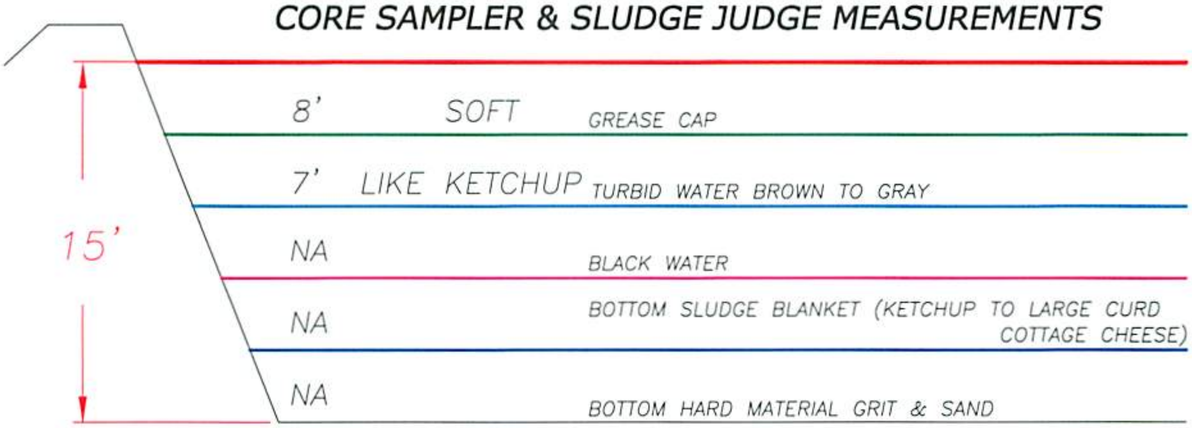
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S13



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	71.6	7.25
6 FT.	72.0	7.26
9 FT.	72.4	7.26
12 FT.	72.7	7.26
15 FT.	NA	NA

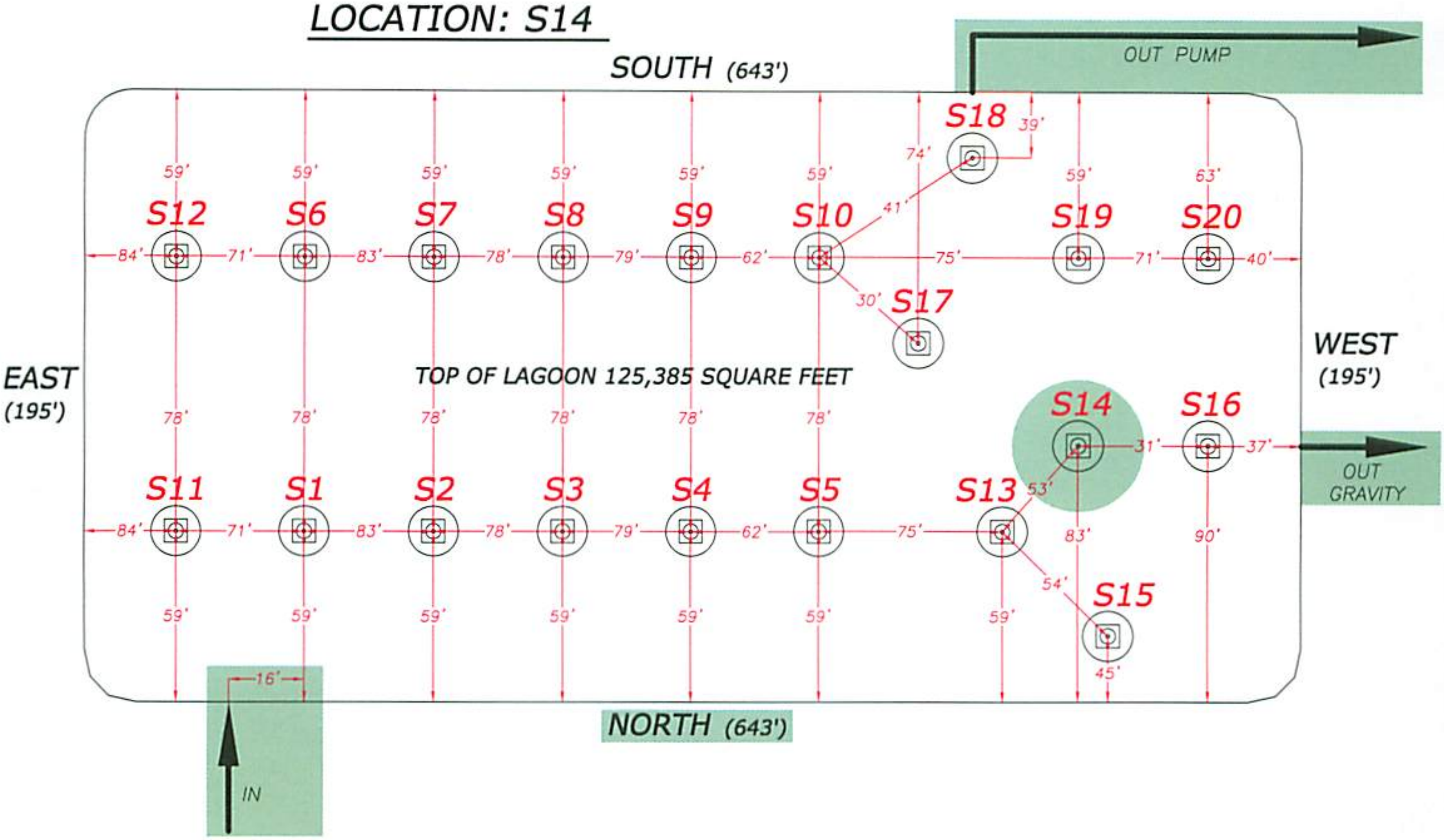
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 13 NORTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

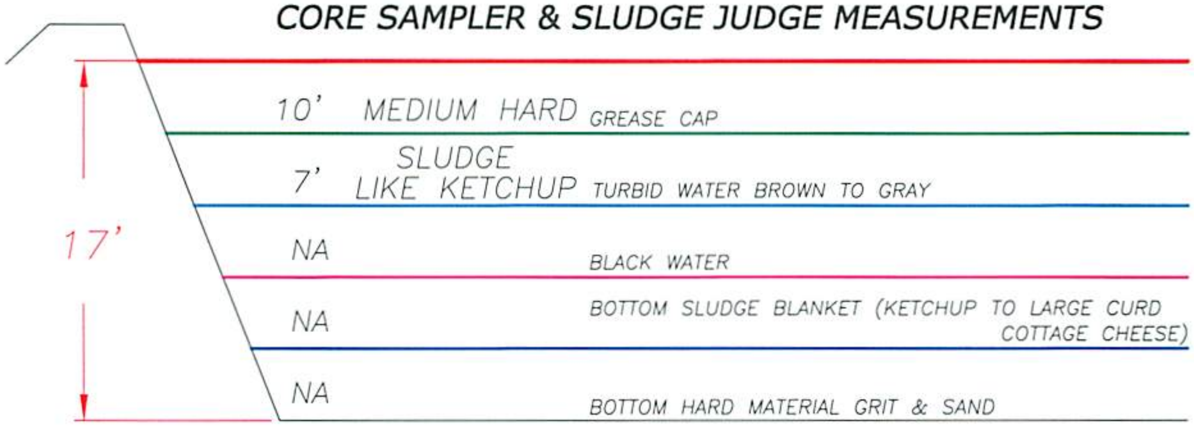
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S14



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	71.9	7.20
6 FT.	72.5	7.20
9 FT.	72.8	7.19
12 FT.	73.1	7.19
15 FT.	NA	NA

NBC_ACLC_PT-001560

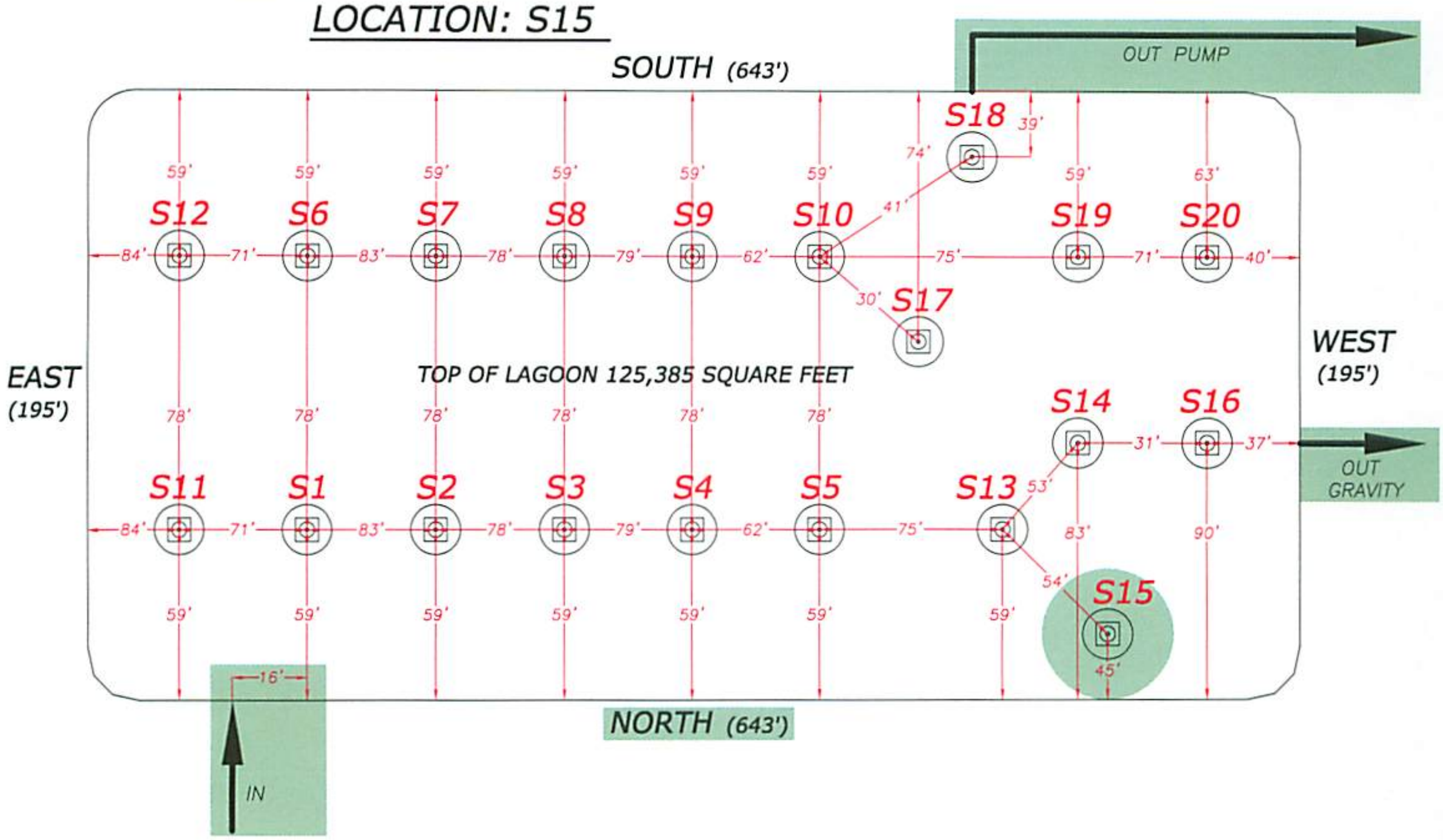
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 14 NORTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

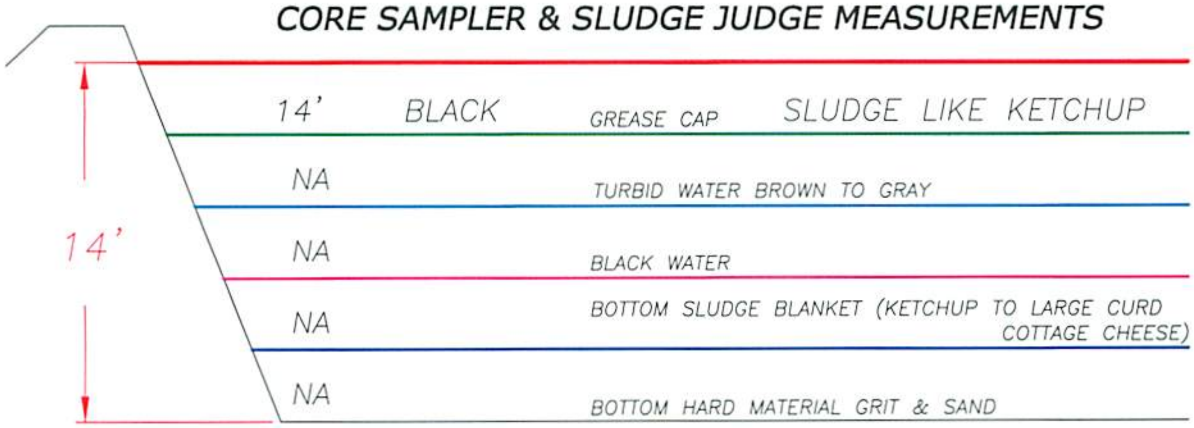
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S15



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	70.8	7.21
6 FT.	71.0	7.20
9 FT.	71.1	7.20
12 FT.	71.2	7.21
15 FT.	NA	NA

NBC_ACLC_PT-001561

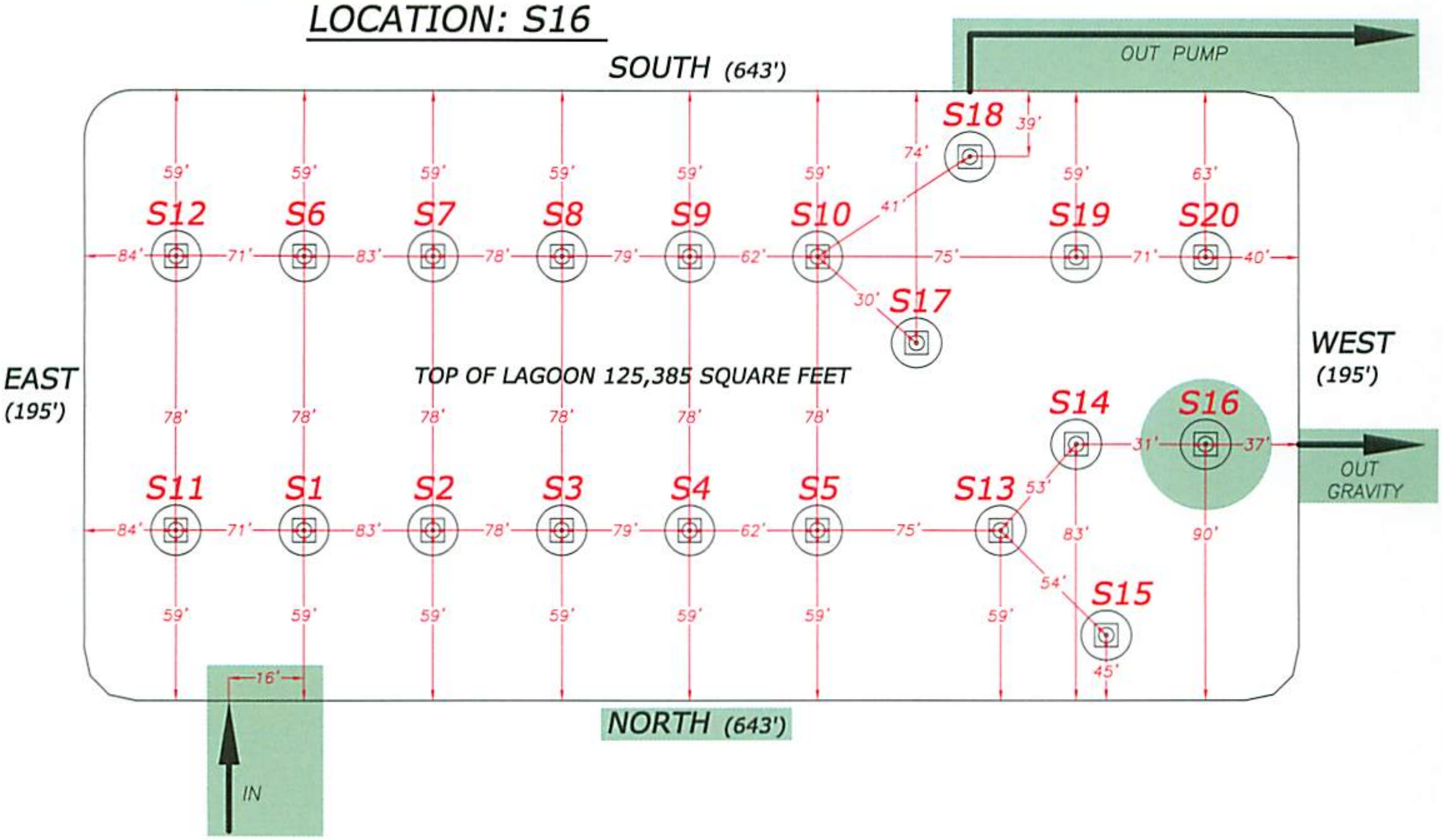
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 15 NORTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

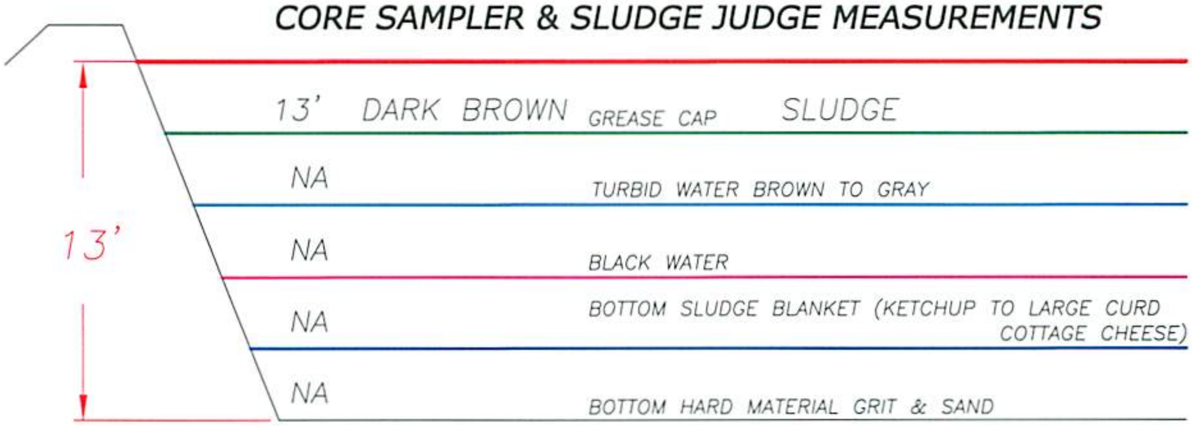
SAMPLE POINT LOCATION PROFILE

DATE:2-16-13

LOCATION: S16



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



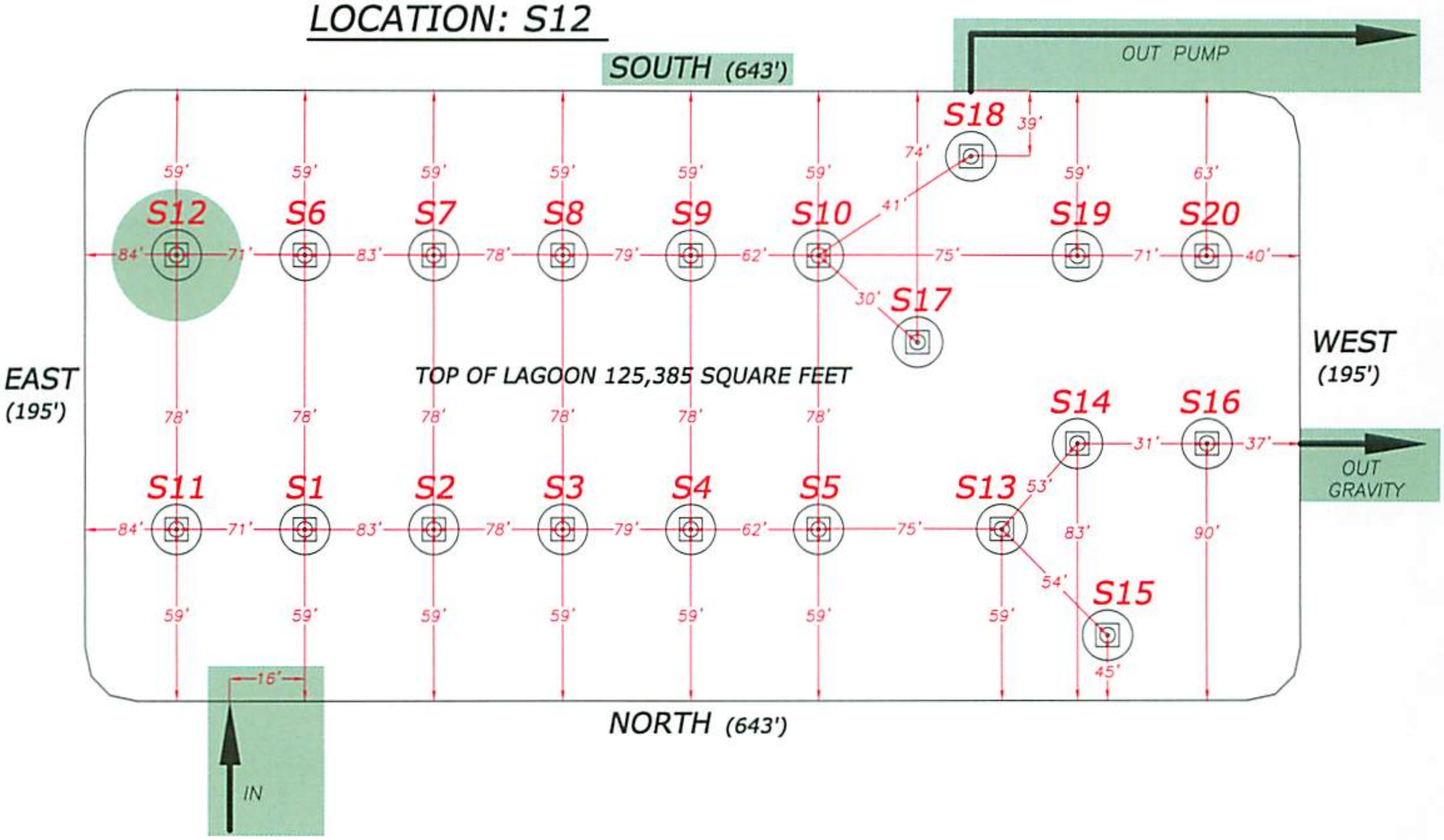
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	63.6	7.25
6 FT.	64.6	7.27
9 FT.	65.4	7.27
12 FT.	66.0	7.27
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

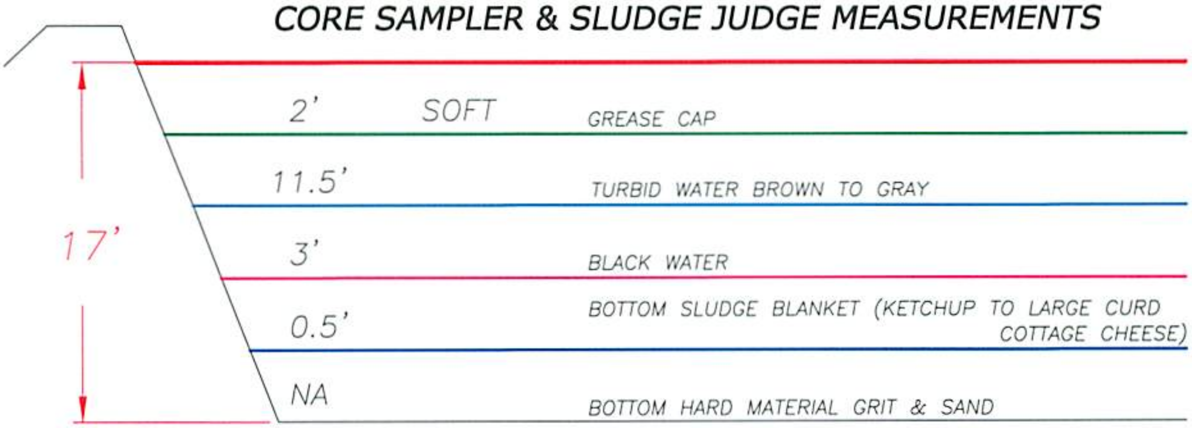
SAMPLE POINT LOCATION PROFILE

DATE:2-17-13

LOCATION: S12



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



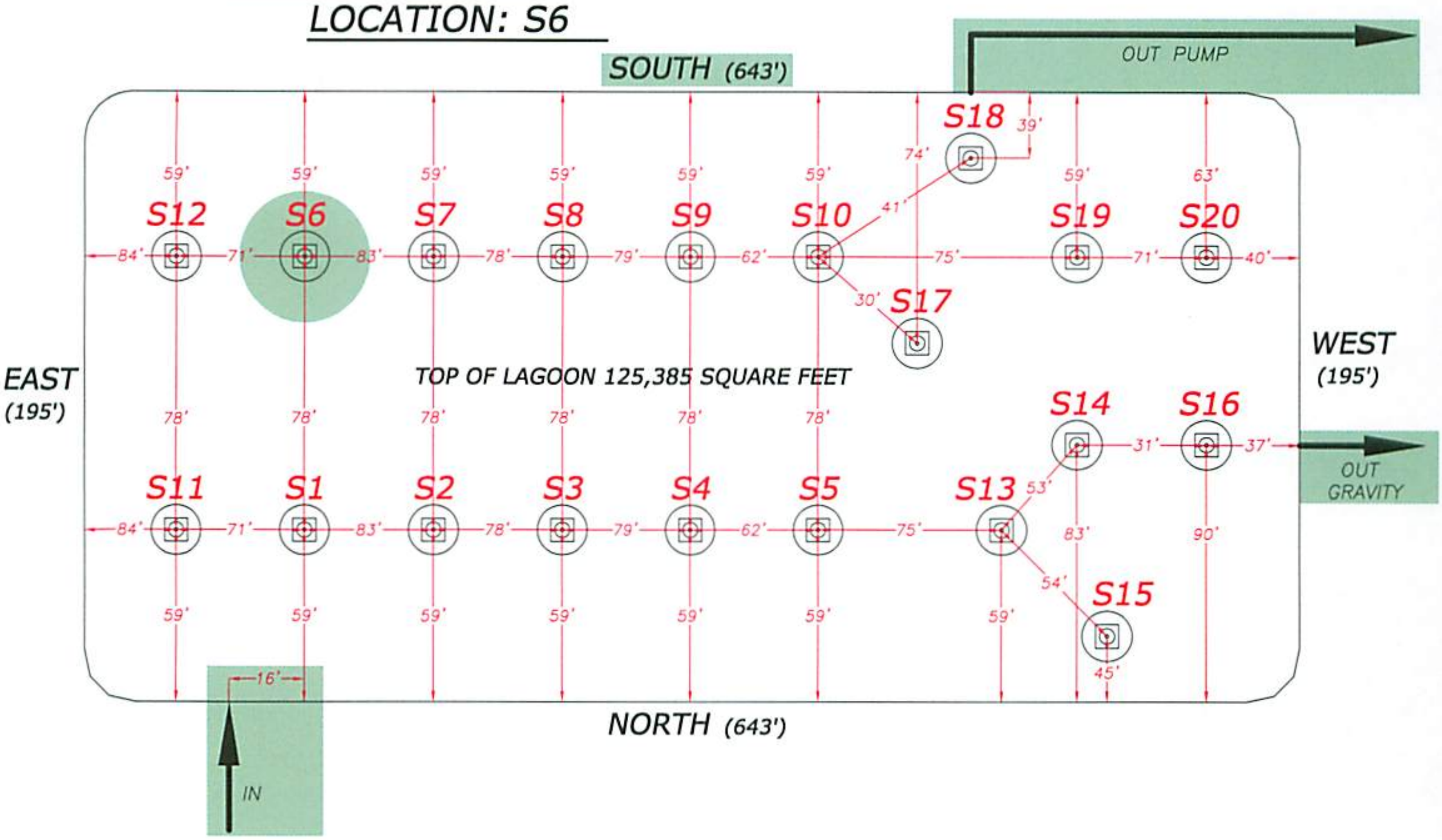
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	75.5	7.02
6 FT.	74.8	7.05
9 FT.	76.1	7.07
12 FT.	77.3	7.07
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

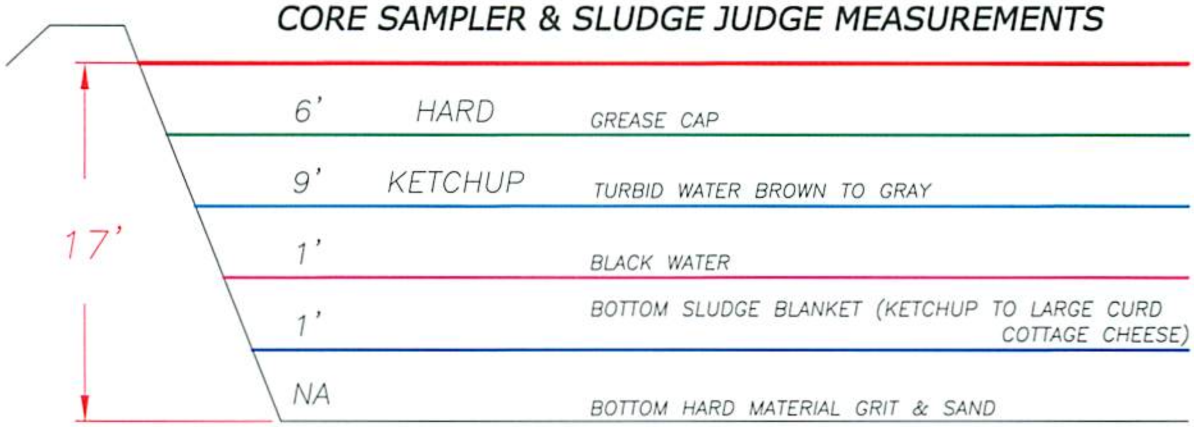
SAMPLE POINT LOCATION PROFILE

DATE:2-17-13

LOCATION: S6



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



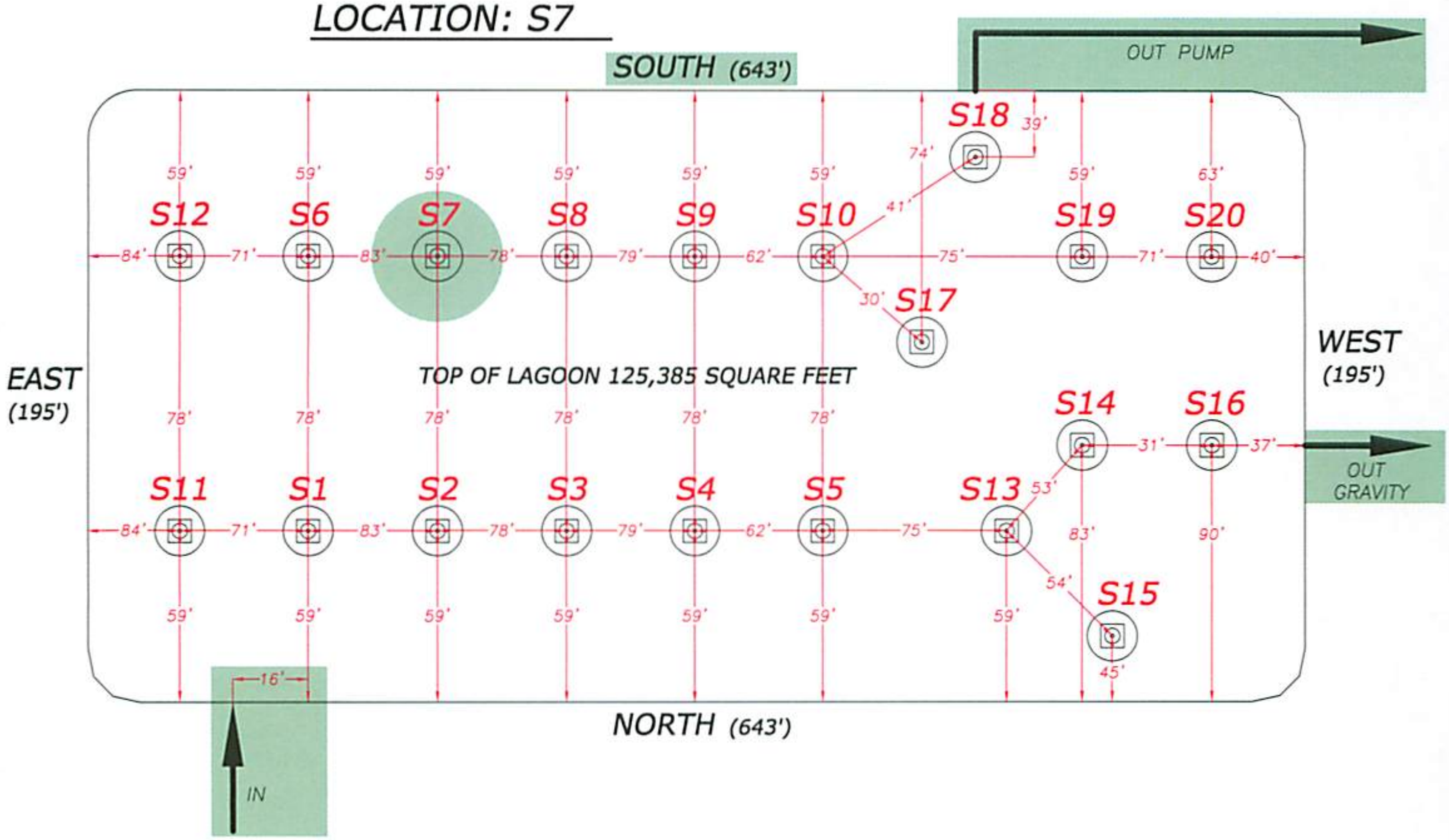
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	NA	NA
6 FT.	NA	NA
9 FT.	NA	NA
12 FT.	NA	NA
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

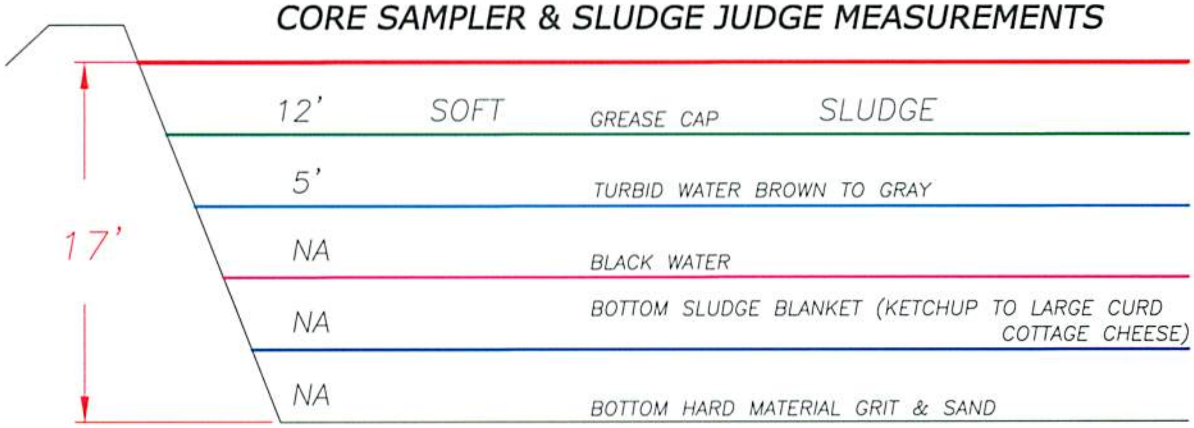
SAMPLE POINT LOCATION PROFILE

DATE: 2-17-13

LOCATION: S7



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	69.5	7.04
6 FT.	72.8	7.06
9 FT.	74.5	7.05
12 FT.	75.8	7.03
15 FT.	NA	NA

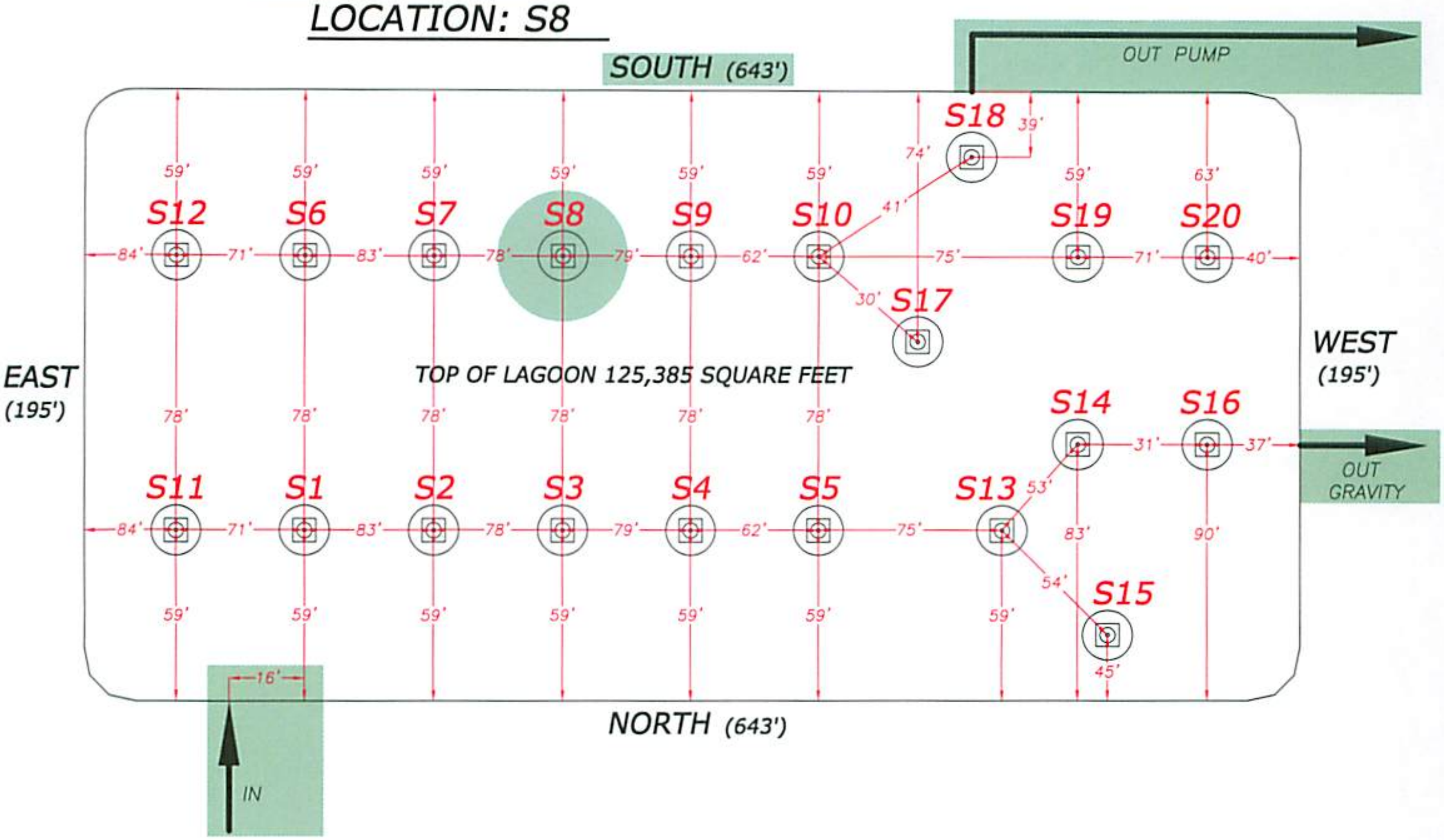
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 7 SOUTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

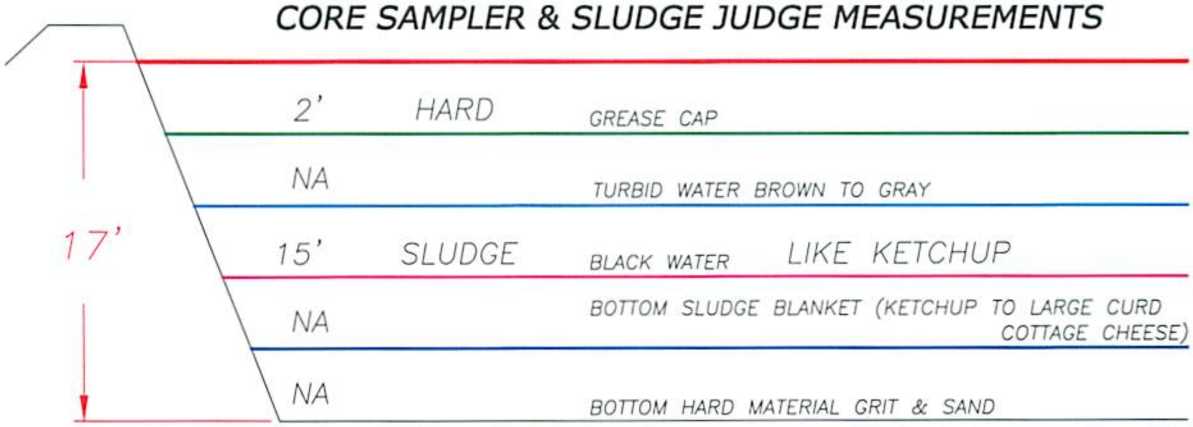
SAMPLE POINT LOCATION PROFILE

DATE:2-17-13

LOCATION: S8



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



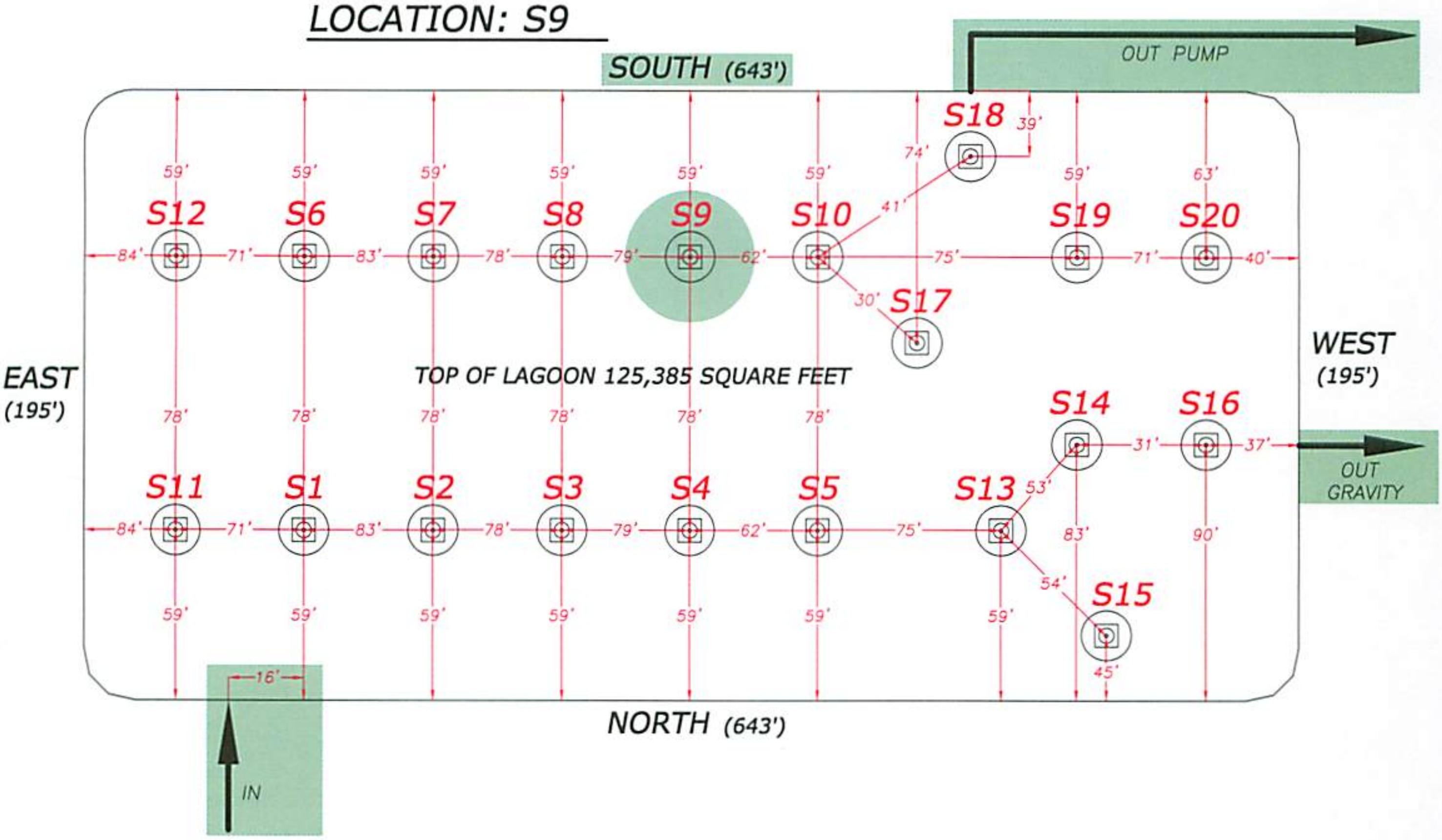
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	NA	NA
6 FT.	NA	NA
9 FT.	NA	NA
12 FT.	NA	NA
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

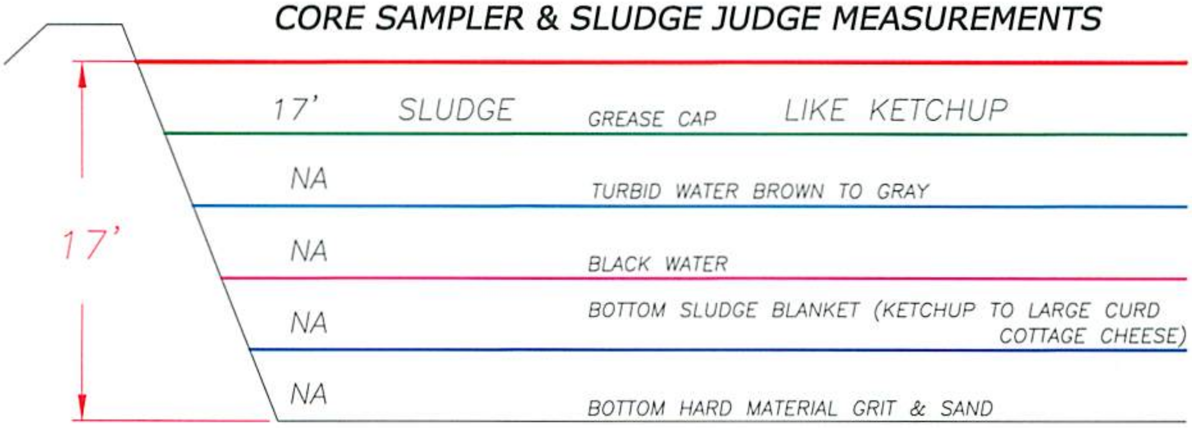
SAMPLE POINT LOCATION PROFILE

DATE: 2-17-13

LOCATION: S9



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	63.2	6.89
6 FT.	62.0	6.88
9 FT.	61.4	6.88
12 FT.	61.0	6.89
15 FT.	NA	NA

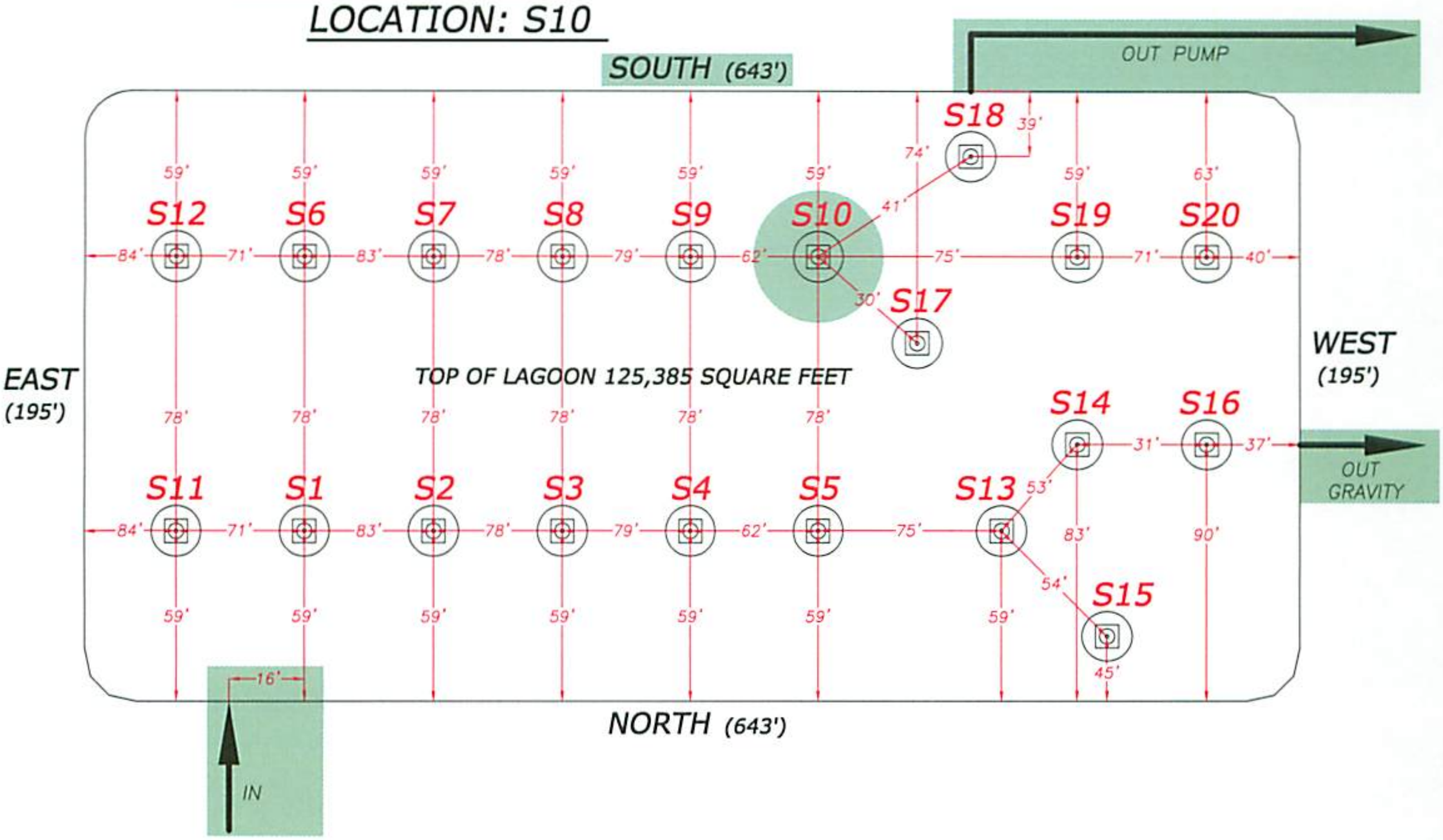
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 9 SOUTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

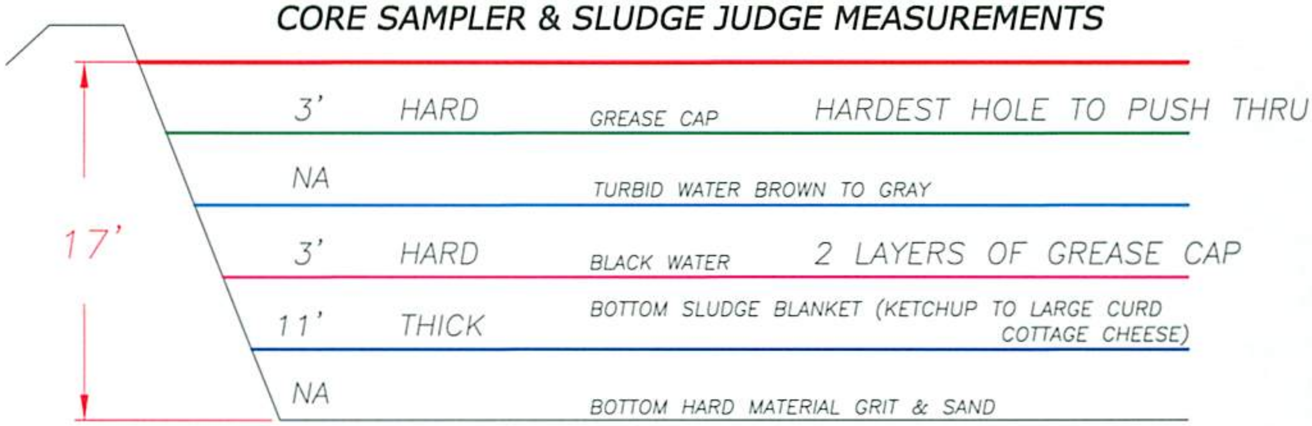
SAMPLE POINT LOCATION PROFILE

DATE:2-17-13

LOCATION: S10



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



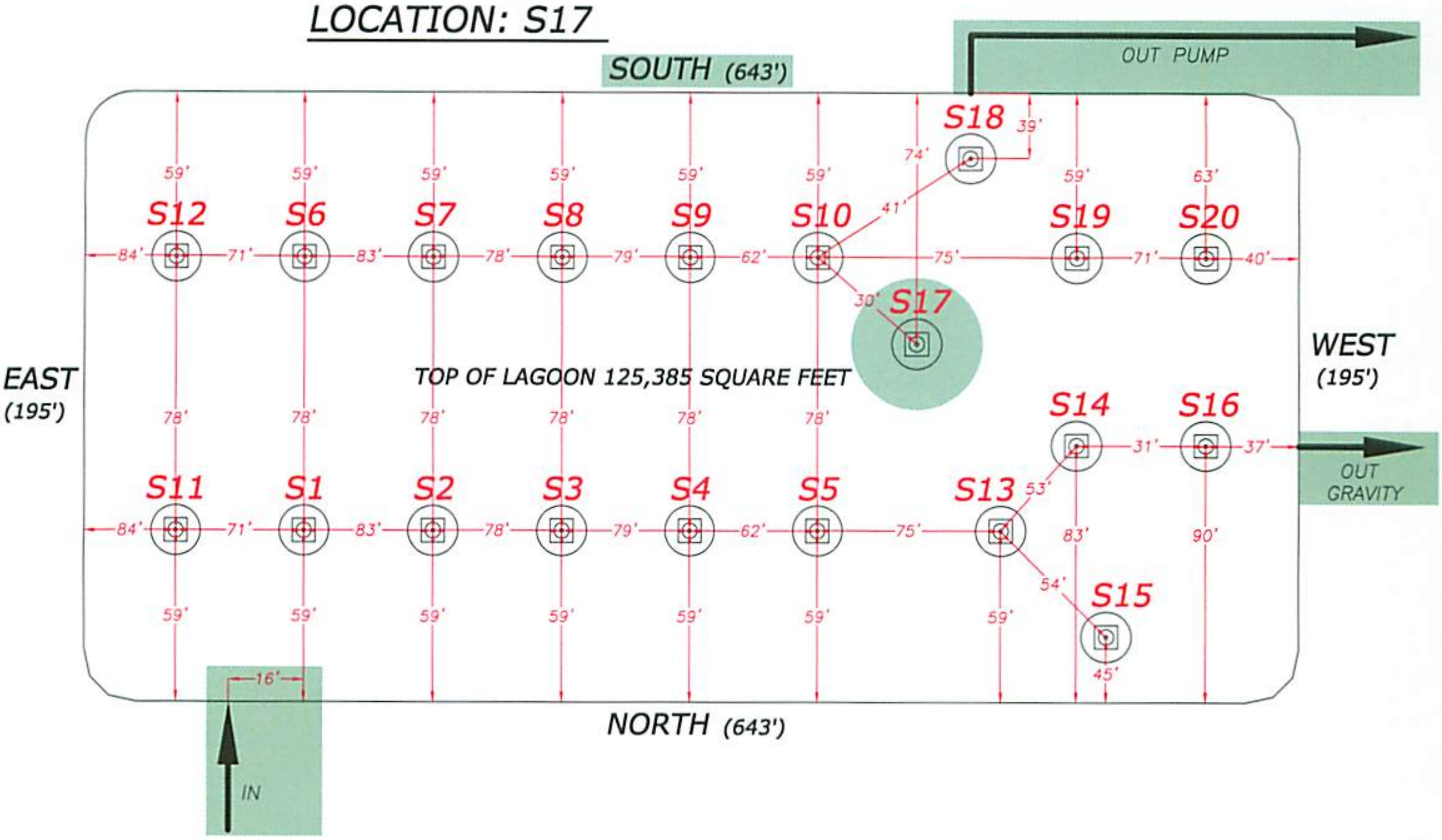
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	NA	NA
6 FT.	NA	NA
9 FT.	NA	NA
12 FT.	NA	NA
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

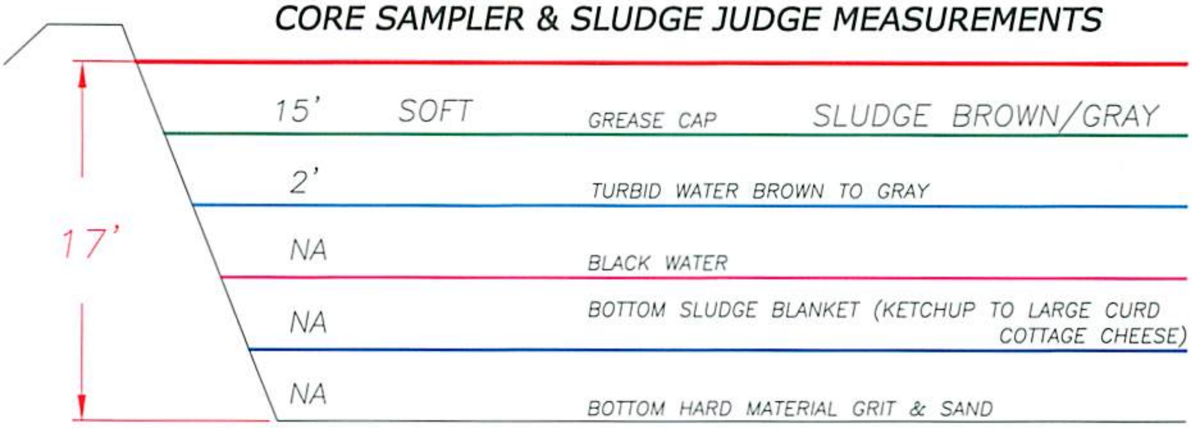
SAMPLE POINT LOCATION PROFILE

DATE:2-17-13

LOCATION: S17



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	66.0	7.01
6 FT.	68.5	7.02
9 FT.	70.3	7.03
12 FT.	71.3	7.02
15 FT.	NA	NA

NBC_ACLC_PT-001569

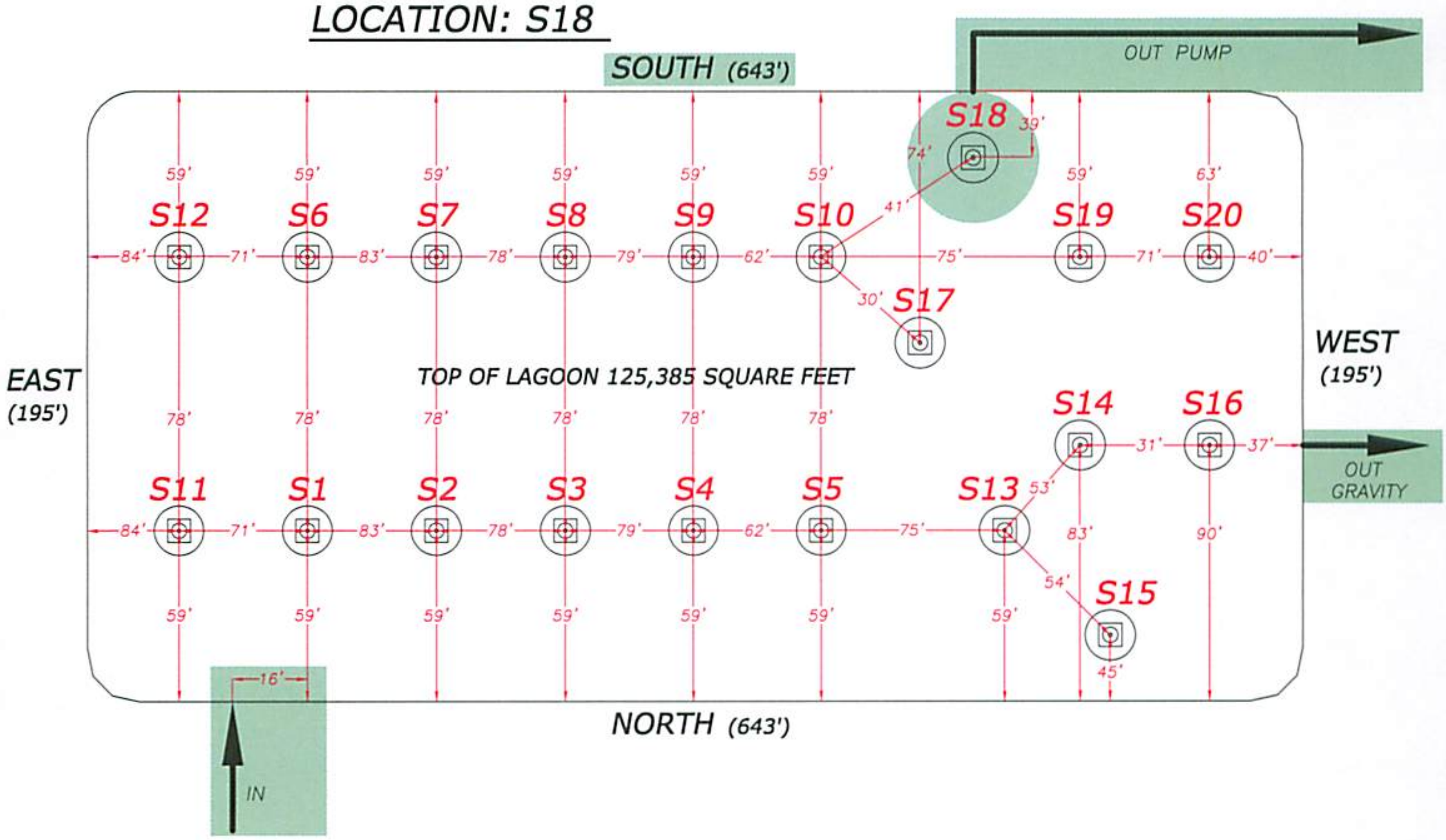
CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 17 SOUTH

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

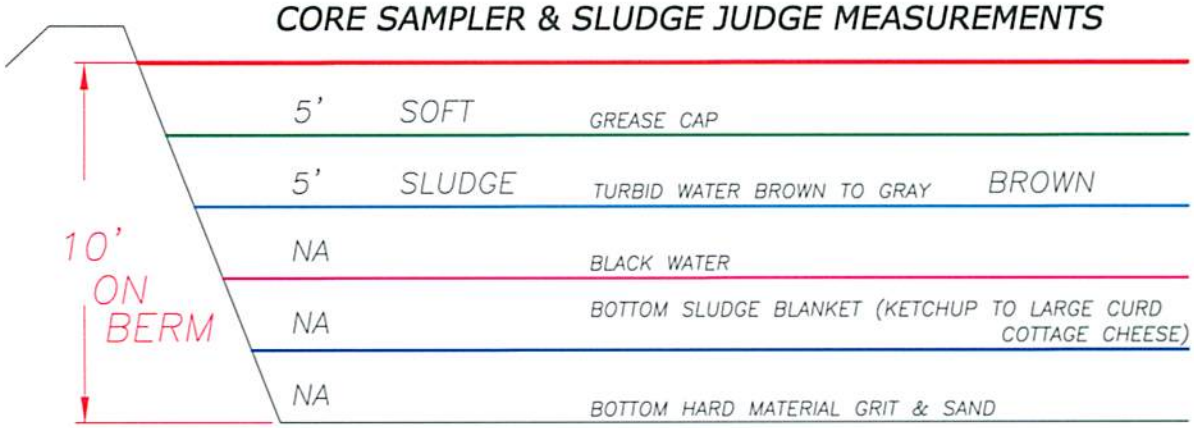
SAMPLE POINT LOCATION PROFILE

DATE: 2-17-13

LOCATION: S18



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



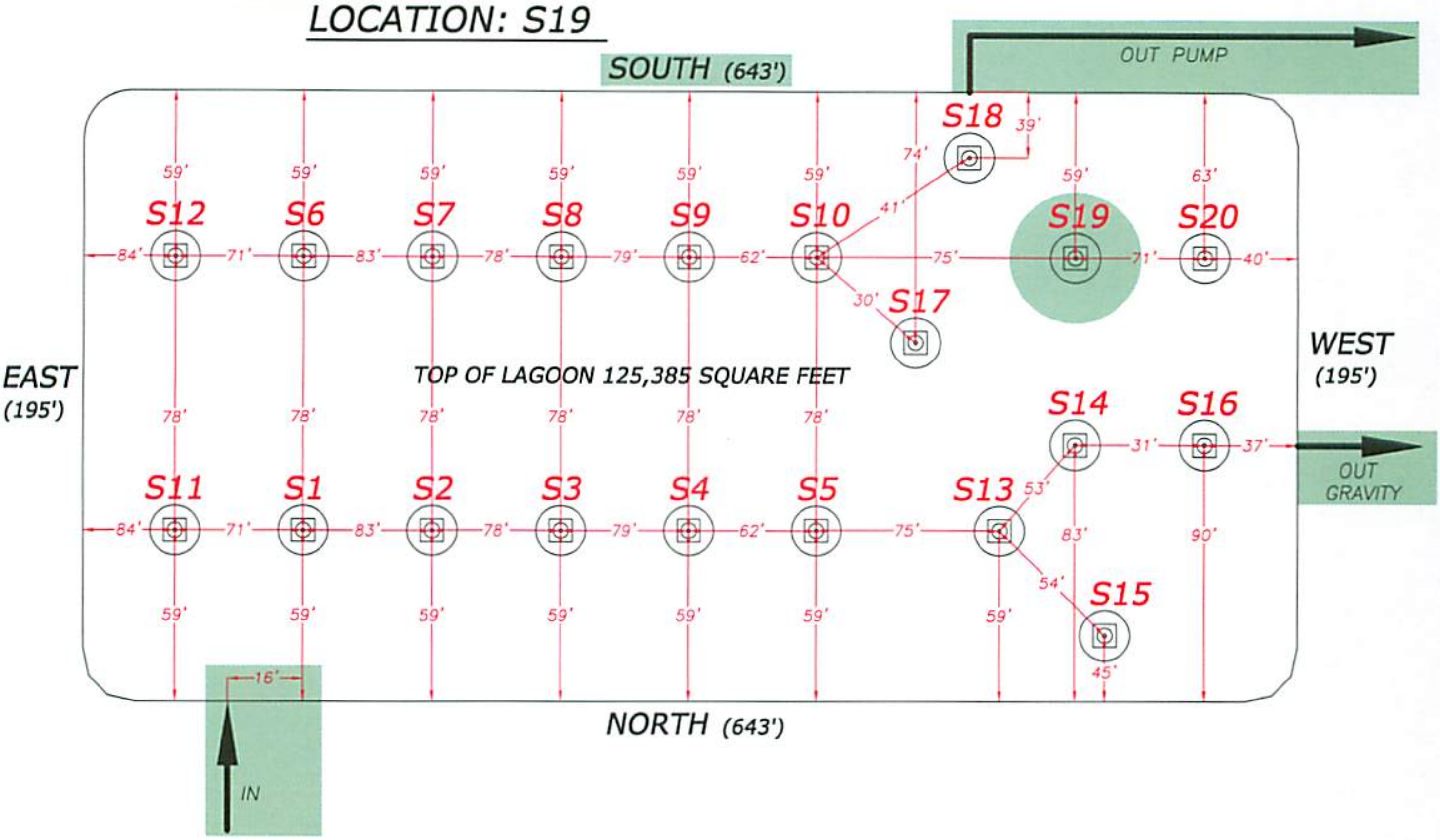
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	63.3	6.95
6 FT.	64.9	6.96
9 FT.	65.7	6.96
12 FT.	NA	NA
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

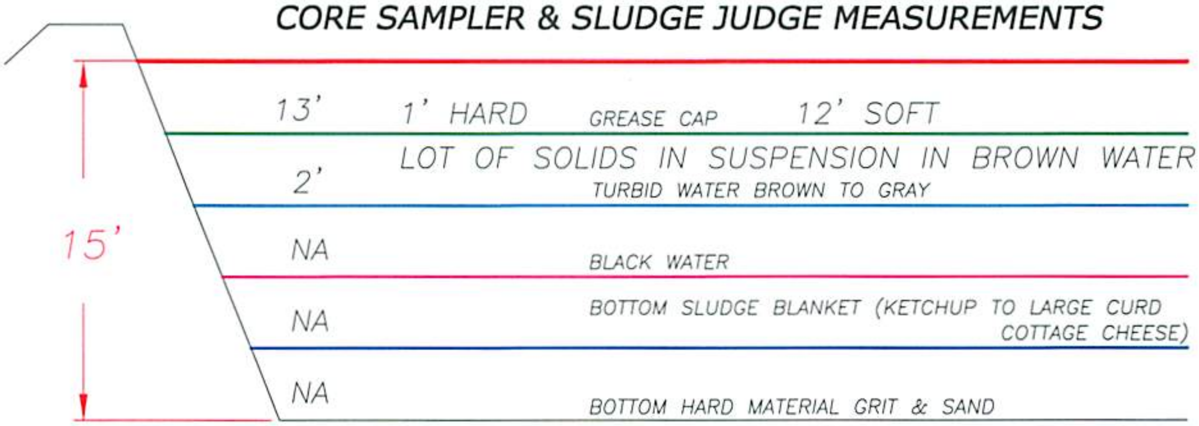
SAMPLE POINT LOCATION PROFILE

DATE:2-17-13

LOCATION: S19



CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



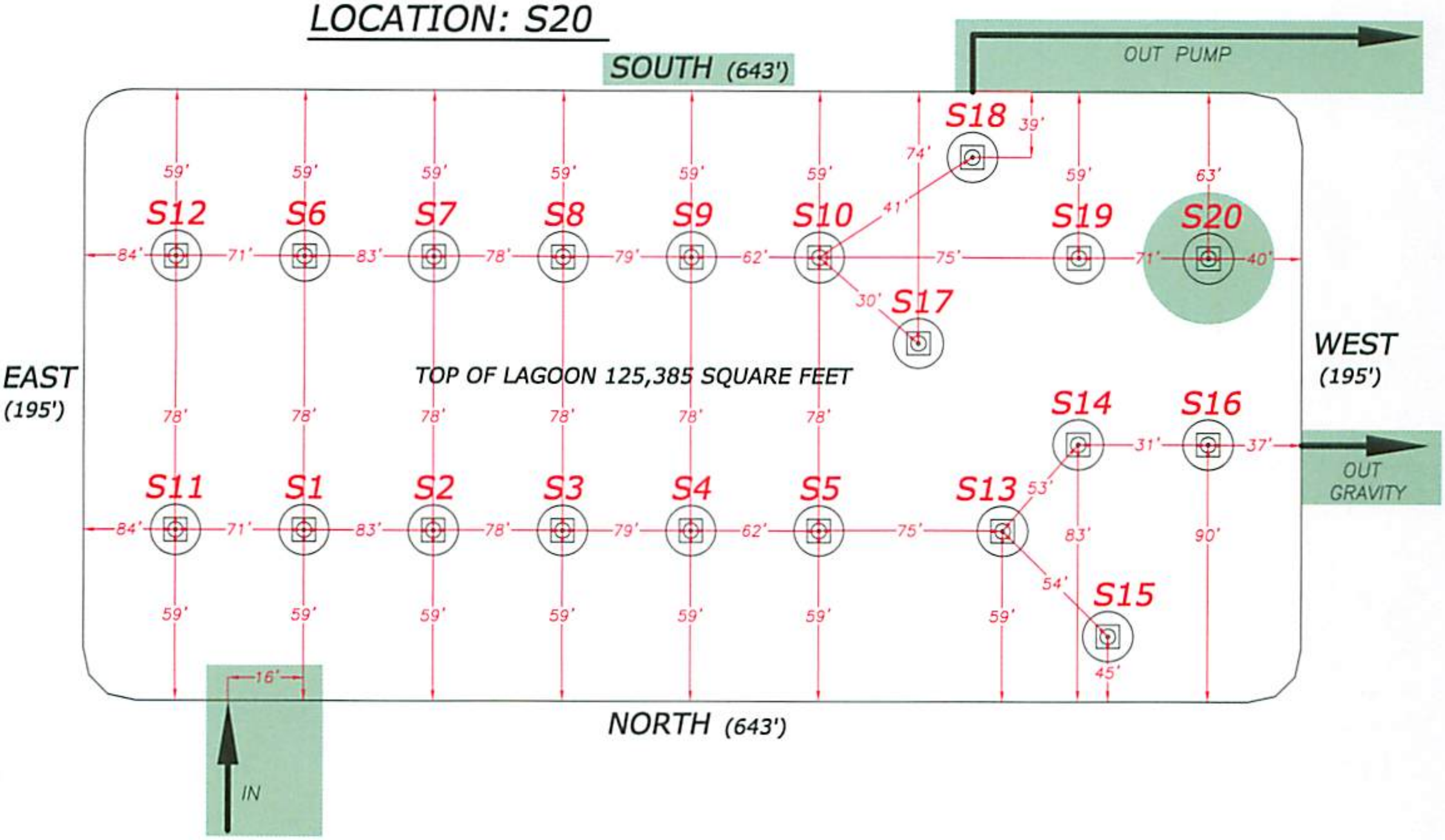
DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	64.1	7.20
6 FT.	67.5	7.20
9 FT.	69.7	7.18
12 FT.	73.7	7.08
15 FT.	NA	NA

BRAWLEY ANAEROBIC LAGOON PROFILING 2/16-17/13

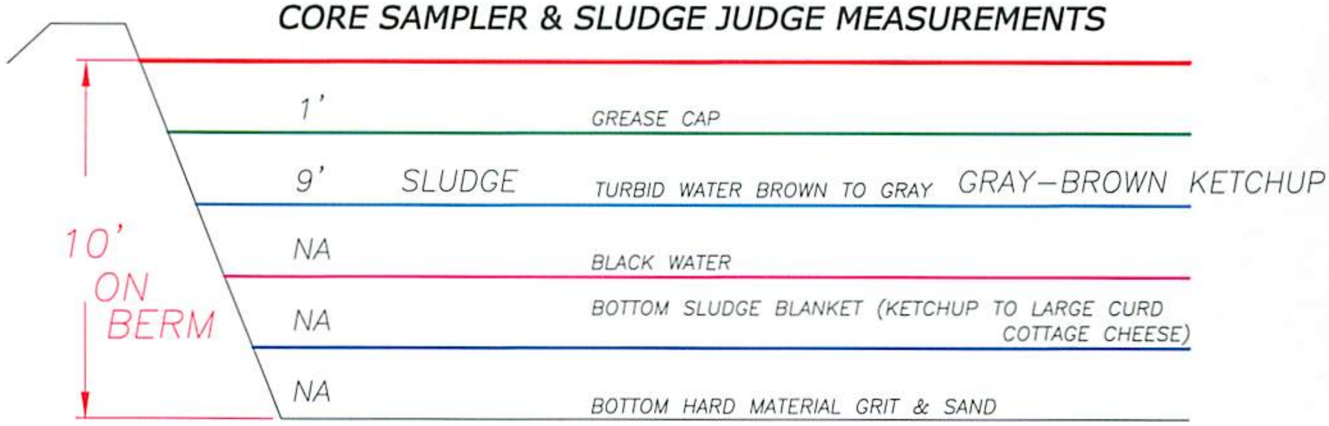
SAMPLE POINT LOCATION PROFILE

DATE:2-17-13

LOCATION: S20



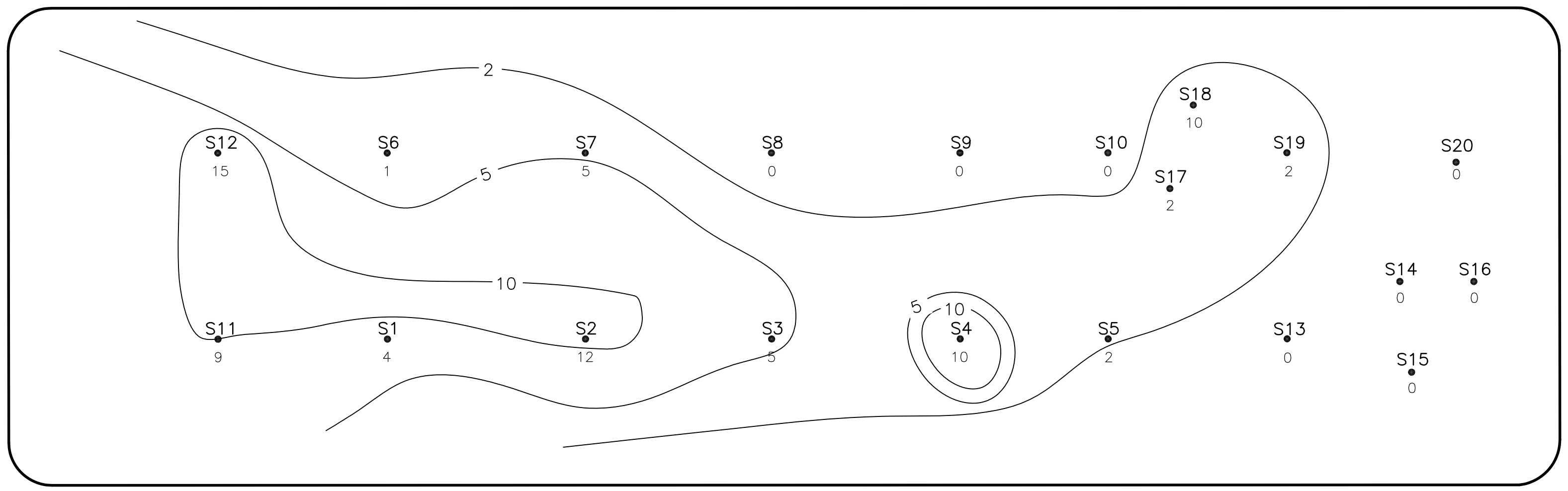
CORE SAMPLER & SLUDGE JUDGE MEASUREMENTS



DEPTH FROM SURFACE	TEMPERATURE °F	pH
3 FT.	64.2	7.13
6 FT.	67.4	7.15
9 FT.	69.2	7.14
12 FT.	70.5	7.11
15 FT.	NA	NA

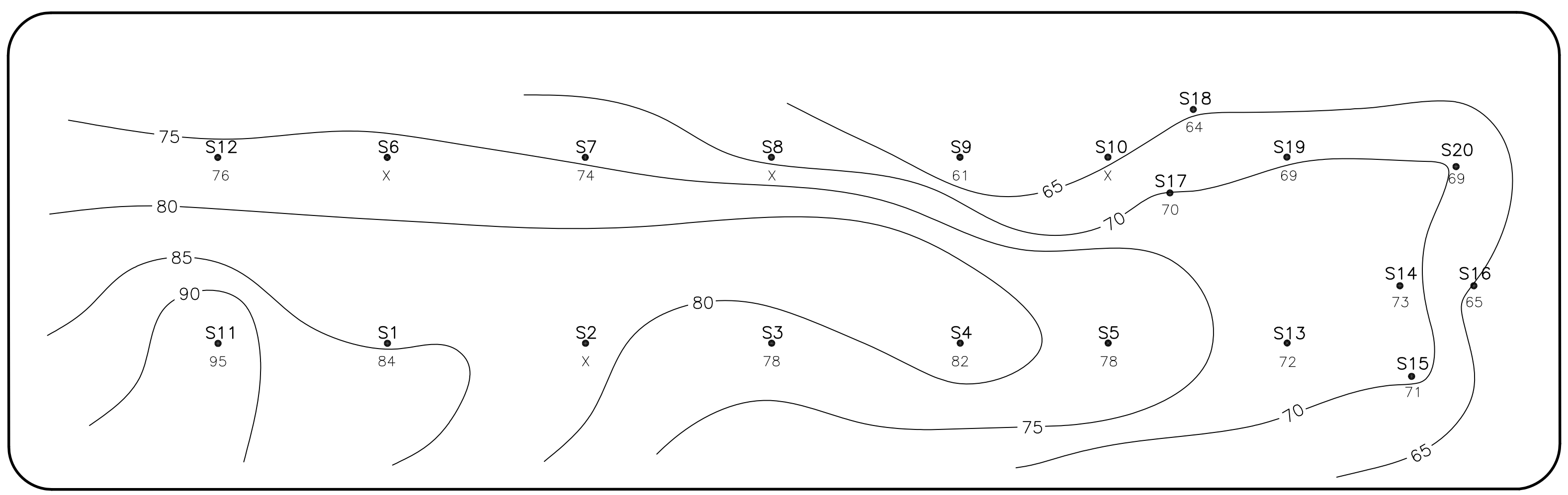
NBC_ACLC_PT-001572

CAD/BRAWLEY/BRAWLEY PLANT DISCHARGE/BRAWLEY ANAEROBIC LAGOON PROFILING 2 16-17 13/S 20 SOUTH



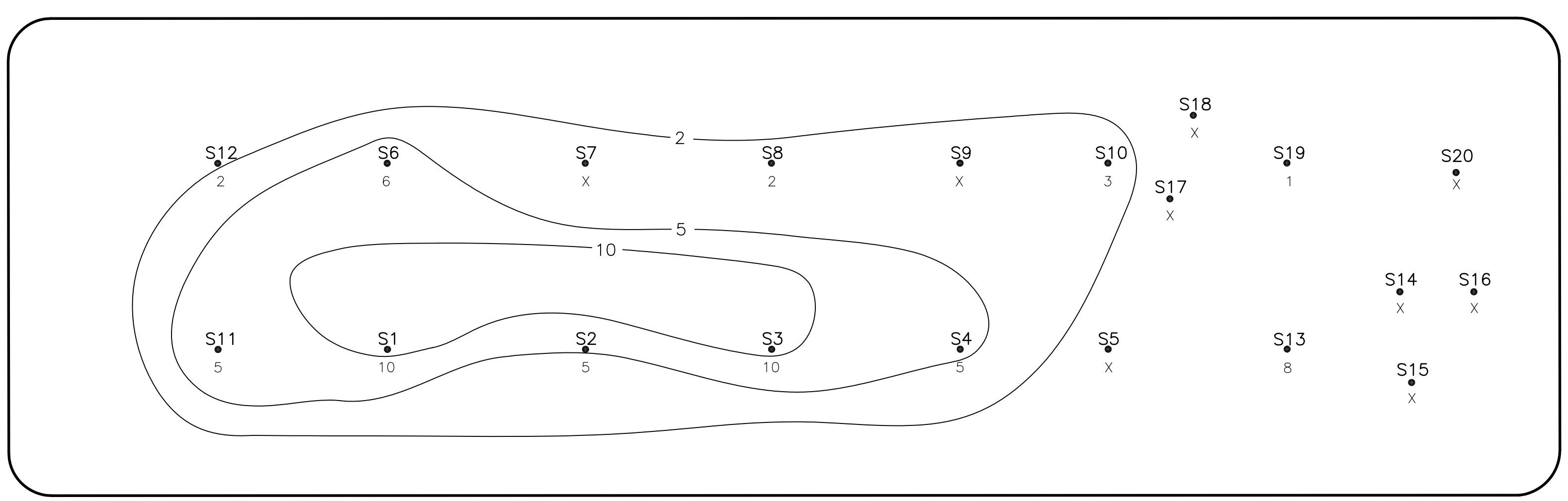
1 WATER THICKNESS

SCALE: 1"=40'



2 TEMPERATURE

SCALE: 1"=40'



3 GREASE THICKNESS

SCALE: 1"=40'

S14 SAMPLE POINT NUMBER

• SAMPLE POINT

10 MEASUREMENT AT THAT POINT

DRAWN BY: CRR	JOB DATE: 2013	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: JA	JOB NUMBER: 20120063		
CAD DATE: 3/1/2013 5:37:47 PM			
CAD FILE: O:\20120063\CAD\Dwgs_Prelim\Figures\POND1.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen HRGreen.com

WASTEWATER TREATMENT PLANT
NATIONAL BEEF
BRAWLEY, CALIFORNIA

FIGURE 1
POND 1 ISOMETRIC

SHEET NO. 1

NBC_ACLC_PT-001573

Xrefs: xgt-1-dh01; xgt-1-cert-Jawol; scale; X-BR UTILITIES 000976-00 1 21 13

Appendix C - Anaerobic Treatment Options

Industrial Wastewater Treatment Plant Improvements
National Beef
Brawley, CA

Anaerobic Treatment Comparison

Anaerobic Option Descriptions:

1 Clean and enhance existing digester
2 Pretreatment, clean existing digester, add second digester system for concentrates [1], OVIVO
3 Pretreatment, high rate digester, concentrates [1] off-site
4 New enhanced lagoon, OVIVO
5 New enhanced lagoon, ADI

Item	Description	Option 1	Option 2	Option 3	Option 4	Option 5
1	Mfg recommended improvements to existing DAFs and splitter box modification to equalize flow	Yes	Yes	Yes	Yes	Yes
2	New pretreatment - series DAF	Move DAF between Ponds 1 & 2 to series treatment after existing DAFs	Move DAF between Ponds 1 & 2 to series treatment after existing DAFs	Move DAF between Ponds 1 & 2 to series treatment after existing DAFs	No	No
3	Equalization tank required ahead of the digester	Use Pond 1 to serve as EQ	Use Pond 1 to serve as EQ	Yes - New	No	No
4	Clean grease accumulation in Pond 1	Yes	Yes	Yes	Yes	Yes
5	Other modifications to Pond 1	Improve inlet/outlet, add solids recycle and mixing, insulate cover	Improve inlet/outlet, add solids recycle	Close	Close	Close
6	Anaerobic inlet to main WW flow	BOD = 2500, COD = 3000, TSS = 1000, FOG < 100 mg/L	BOD = 2500, COD = 3000, TSS = 1000, FOG < 100 mg/L	BOD = 2500, COD = 3000, TSS = 1000, FOG < 100 mg/L	BOD = 5000, COD = 10,000, TSS = 2500, FOG = 900 mg/L	BOD = xx, COD = 7000, TSS = 900, FOG = 225 mg/L
7	Anaerobic outlet to main WW flow [2]	BOD = 1200, COD = 1500, TSS = 500, FOG = 50 mg/L	BOD = 1200, COD = 1500, TSS = 500, FOG = 50 mg/L	BOD = 350, COD = 400, TSS = 300 mg/L	BOD = 400, COD = 1000, TSS = 400, FOG = 20 mg/L	BOD = xx, COD = 1000, TSS = 400, FOG = xx mg/L
8	Impact on downstream aerobic treatment	Maintains moderate to high BOD loading	Low BOD loading, nitrogen loading may increase	Lowest BOD loading	Low BOD loading	Low BOD loading
9	Estimated biogas production from main WW flow [3]: cost basis @ 65% CH4	100 scfm	100 scfm	170 scfm	550 scfm	350 scfm
10	Anaerobic inlet to concentrate WW	NA	?	NA	NA	NA
11	Anaerobic biogas from Concentrate WW	NA	?	NA	NA	NA
12	Total Biogas flow [4]	100 scfm	?	170 scfm	550 scfm	350 scfm

Item	Description	Option 1	Option 2	Option 3	Option 4	Option 5
13	New enhanced lagoon digester	NA	NA	NA	ADI design-build, 13 MG, insulated cover, two submerged mixers and two recycle pumps.	OVIVO - 7.2 MG, design-build, inlet distribution, outlet solids separation and return, insulated cover.
14	New concentrate digester system	NA	Need data on concentrates to evaluate	NA	NA	NA
15	High Rate digester	NA	NA	Paques, includes 12' D by 52' tall rapid mix tank, 40'D by 54' tall digester and flare, design build. Does not include EQ tank or foundations	NA	NA
16	Site logistics	Small additional footprint	Relatively small footprint	Relatively small footprint for digester; however, EQ would require additional footprint	Large footprint, may need to close Pond 1 and build in its place. Aerobic system will have a very high load during construction.	Large footprint, may need to close Pond 1 and build in its place. Aerobic system will have a very high load during construction.
17	Plant operation logistics	Possible grease accumulation	Additional operation of concentrate digester	Must maintain low FOG to digester and consistent influent stream	Simple to operate	Simple to operate
18	Comments	Cleaning Pond 1 would lower biogas production	Hauling cost of solids and other material would be reduced or eliminated. Current chemical usage would be reduced significantly. Salts would be lower reducing treatment costs for "offsite" location.	Mostly done on soluble WW (sugars, alcohol, starches)		Possible retrofit of Pond 1, still verifying with vendor

Notes

1. Concentrates could include stick water, horizontal centrifuge bottom, DAF bottoms, paunch, biosolids from anaerobic treatment, and pond 1 cleaning. Pilot or bench study recommended, apx 3 to 4 months of time.
2. Ammonia effluent should be similar to current values, except for option 3, it may be lower
3. Flow rate reported is high, because it does not include COD conversion to reduce sulfate
4. Need analysis of concentrated waste stream, but total biogas would be same as others, if not the highest
5. Cost are preliminary and include pretreatment, anaerobic, and aerobic upgrades.

Appendix D - Aerobic Treatment Options

Industrial Wastewater Treatment Plant Improvements
National Beef
Brawley, CA

Aerobic Treatment Comparison

Aerobic Option Descriptions:

1st Step Remove mechanical aerators; Install Oxiworks Diffusers to maximize Ammonia removal capacity of existing Pond 2; Install level control and scum baffles in Pond 3A/B; Optimize RAS/WAS pumping rates

1 Modify Pond 2 to meet BOD5 and Ammonia removal needs (Denitrifying/Nitrifying zones and recirc. as needed), install conventional clarifiers with provisions for heavy solids loading and heavy scum removal; Upgrade RAS/WAS accordingly

2 Replace/Modify Pond 2, Pond 3A/B, recirc pump and RAS/WAS pumps with Moving Bed Bio Reactor (MBBR) and High Rate Clarification to meet BOD5 and Ammonia removal needs (denitrify/nitrify)

3 Replace Pond 2, Pond 3A/B, recirc pump and RAS/WAS pumps with Sequencing Batch Reactor to meet BOD5 and Ammonia removal needs (denitrify/nitrify)

4 Follow up on 1st Step - Modify Pond 3C to remove residual Ammonia and N with pond media system

5 Follow up on 1st Step - Modify/Replace Pond 3C to remove residual Ammonia and N with nitrogen filter system such as Parkson, IDI or Blue Pro upflow sand filters

Item	Description	1st Step	Option 1	Option 2	Option 3	Option 4	Option 5
1	Pond 2 Status	Optimized	Modified	Replaced/Modified	Replaced	Optimized	Optimized
2	Pond 3A/3B Status	Optimized	Replaced	Replaced/Modified	Replaced	Optimized	Optimized
3	Pond 3C Status	SAF Diversion	SAF Diversion and Final EQ	SAF Diversion and Final EQ	SAF Diversion and Final EQ	SAF Diversion/EQ/Modified	SAF Diversion/EQ/ Modified/Replaced
4	BOD Effluent	maintain secondary quality	<15 mg/l possible	<15 mg/l possible	<15 mg/l possible	<15 mg/l possible	<15 mg/l possible
5	TSS Effluent	maintain secondary quality, improve slug control	<30 mg/l possible	<30 mg/l possible	<30 mg/l possible	<30 mg/l possible	<30 mg/l possible
6	Ammonia Effluent	improve eff quality	< 10 mg/l possible	< 10 mg/l possible	< 10 mg/l possible	< 10 mg/l possible	< 10 mg/l possible
7	Site logistics	maximize effectiveness of existing ponds and processes	Small additional footprint	Reduced foot print or spare capacity	Reduced foot print or spare capacity	Increase capacity within existing foot print - TBD	Increase capacity within existing foot print
8	Plant operation logistics	Same technology, minor changes in operations	Similar process, slightly different but common technology, low learning curve	Relatively new and uncommon technology, steeper learning curve	Very simple technology, fully automated (adjustable) process, some learning curve	Relatively new and uncommon technology, some learning curve	Very simple technology, fully automated (adjustable) process, some learning curve
9	Relative Capital/Operating Costs	low/low	medium/medium	high/medium	medium/medium	medium-high/low-medium	high/high
10	Cost Remarks	Not Fully Compliant	1st Step costs lost	1st Step costs lost	1st Step costs lost, costs may be less than Option 1	In addition to 1st Step costs	In addition to 1st Step costs
11	Comments	May not fully address Ammonia compliance, may require alkalinity addition	Simple, conventional approach to secondary treatment, may require alkalinity addition	Potentially very good treatment quality in relatively small foot print - some concerns with scaling and fouling from FOG, may require alkalinity addition	Very flexible design, simple construction, flexible operation/automation for varying process/treatment, may require alkalinity addition	Multiple options for treatment TBD	Possibly more robust/controlled treatment than Option 4 - also produces tertiary effluent, can treat for total P, Possibly meet title 22, may require "clean" Carbon source addition i.e. methanol, acetic acid